



EWN<sup>®</sup>

# Engineering With Nature<sup>®</sup> at DoD Installations, Workshop Outputs

September 2021

Workshop Results



US Army Corps  
of Engineers<sup>®</sup>

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ERDC  
ENGINEER RESEARCH & DEVELOPMENT CENTER

# Document Guide

**Section 1** Engineering With Nature® - Setting the Stage

**Section 2** EWN at DoD Installations – Case Studies

**Section 3** Exploring Future EWN Scenarios

**Section 4** Identifying Enablers to Achieve Vision for the Future

**Section 5** Developing an Action Plan

**Section 6** Appendices

# Engineering With Nature® at DoD Installations



## Workshop Background

Dr. Todd S. Bridges, Senior Research Scientist for Environmental Science, U.S. Army Engineer Research and Development Center (ERDC), commissioned Toffler Associates, a futures-focused strategic advisory firm, with conducting a workshop focused on identifying opportunities and approaches for driving awareness and adoption of nature-based solutions (NBS) on DoD installations and collect perspectives on the Engineering With Nature® (EWN) initiative's role in achieving this goal.

On 24 and 25 August, 2021, over 40 individuals from across the DoD engineering community, DoD installations community, industry, non-governmental organizations, and academia gathered virtually to enhance understanding, share ideas, and explore the future of NBS and how they can contribute to mission assurance and resilience of installations along with providing environment, economic, and quality-of-life benefits to installations, their surrounding communities, and the ecosystems of which they are a part.

To begin the workshop, Dr. Bridges debunked common myths about NBS and three installations that are pursuing the implementation of NBS shared their case studies.

## Working Groups and Outcomes

To help participants determine actions to take today, the workshop began by immersing them in three future scenarios that featured NBS on installations in 2050. By exploring these scenarios participants identified possible uses of NBS, the opportunities created by these solutions, and the value accrued by the installations, their residents, and the surrounding communities.

Once the possible futures were explored, participants then analyzed these futures to determine what series of events had to occur for NBS to be used as a common method of providing mission assurance, installation resilience, positive quality-of-life impacts, and environmental benefits. This allowed participants to identify the enabling actions that led to the desired futures.

The final activity was identifying what actions can be taken in the near-term that starts the DoD down the desired path of implementing NBS as options to meet installation facilities needs. Moreover, mid-term and long-term actions were also identified that would further advance the incorporation of NBS into DoD's approach to creating greater resilience for its assets.

The content of the presentations and the output of these steps are provided here.

# Engineering With Nature® at DoD Installations – Workshop Agenda



## Day 1 Agenda – 24 August 2021

Welcome, overview, and ground rules	0900-0905
Opening Remarks - Mr. Richard Kidd	0905-0915
EWN on DoD Installations – Setting the Stage	0915-1000
Question and Answer Session	1000-1015
BREAK	1015-1025
Live in the Future Breakout Activity	1025-1145
Closing Remarks – Dr. Todd Bridges	1145-1200

## Day 2 Agenda – 25 August 2021

Welcome, overview, and ground rules	0900-0905
Opening Remarks - Dr. Todd Bridges	0905-0915
Overview of Day 1 Value and Opportunities Identified	0915-0930
Making the Future a Reality Breakout Activity	0930-1040
BREAK	1040-1050
Action Planning Breakout Activity	1050-1150
Closing Remarks – Dr. Todd Bridges	1150-1200

# Engineering With Nature® at DoD Installations – Workshop Summary Findings



**For NBS to become a commonly implemented infrastructure solution for the DoD, enablers must be achieved along a multitude of pathways – to include guidance, policy, standards, and cultural avenues.**



## Value in an EWN Future

- Direct installation resilience value
- Broader installation benefits
- Enhanced local community value
- Value to the nation and the world



## Opportunities in an EWN Future

- An ecosystem approach to NBS
- Built and natural infrastructure synthesis
- Practitioner awareness and need for education
- Installations as proving grounds for NBS



## Guidance

- Support from the EWN Initiative based on its mission, strategy, and goals
- Well-documented case studies and step-by-step guidance
- Integrated natural resource planning, design, and tools
- Alignment and collaboration of large and complex stakeholders



## Policy

- Integrated funding classifications for installations resilience and NBS
- Funding for continuous monitoring to understand efficacy and long-term impact
- Programming and agreements in place at the national level
- Financial incentives for implementation of NBS



## Standards

- Interdisciplinary Climate Resilience Working Group
- NBS specifications in the Unified Facilities Criteria (UFC) and other DoD design standards
- Cost-benefit analysis enhancements for NBS
- Common repository of NBS data and examples



## Culture

- Senior-level champions to effect policy changes
- Installation leadership champions to support NBS
- DoD stakeholder champions to effect design and implementation
- Future generation practitioners educated on NBS
- NBS viewed as effective for mission assurance and installation resilience



# Section 1

## Engineering With Nature® - Setting the Stage

# 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

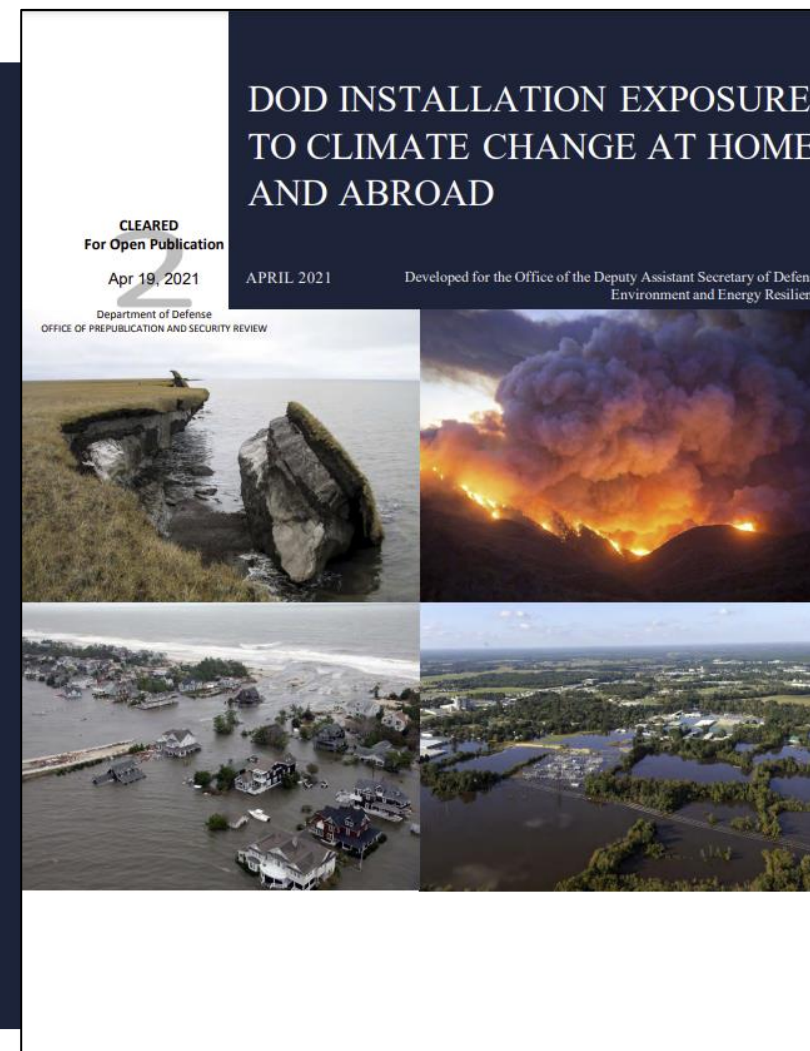
*“Climate change has been identified by the DoD as a critical national security threat and a threat multiplier.*

*Improvements to master planning and to infrastructure planning and design are recognized as vital for reducing current and future vulnerability to climate hazards to installations...”*

*“Engineering With Nature® is front and center in DoD’s Climate Adaptation Plan.”*

## Mr. Richard Kidd

Deputy Assistant Secretary of Defense for  
Environment and Energy Resilience



# Dr. Todd Bridges

## Engineering With Nature® Initiative National Lead



### Myths surrounding NBS on DoD Installations

*“The tried-and-true methods are adequate to combat the future.”*

*“There are no prescribed manuals or standards for natural infrastructure.”*



*“Total lifetime costs of natural features are exorbitant.”*

*“Where are the demonstrated results?”*

*“I can’t quantify return on investment (ROI) and cost/benefit.”*

# Dr. Todd Bridges

## Engineering With Nature® Initiative National Lead



MYTH	RESPONSE
<i>"The tried-and-true methods are adequate to combat the future."</i>	The climate threats to installations are becoming more frequent, diverse, and uncertain. This requires a suite of engineering methods that will provide flexibility, to include NBS, to combat climate impacts to mission resilience.
<i>"There are no prescribed manuals or standards for natural infrastructure."</i>	Engineering as a practice is a creative enterprise. Every NBS is unique and designed to meet the needs of the installation and the surrounding environment. Creativity in approach and engineering is encouraged in NBS development.
<i>"I can't quantify ROI and cost/benefit."</i>	The benefits and value that can be provided by NBS are diverse, ranging from engineering, economic, operational, social, and environmental outcomes. The motivating purpose and co-benefits of infrastructure (including NBS) must be accounted for holistically, and there are tools for doing this. These differences must be accounted for holistically when considering infrastructure selection.
<i>"Total lifetime costs of natural features are exorbitant."</i>	Lifetime costs for NBS can be less than conventional engineering, including O&M. Nature can repair itself. Conventional infrastructure cannot.
<i>"Where are the demonstrated results?"</i>	The suite of successful examples of natural infrastructure within and outside of the DoD is growing and include documented results against sea level rise and other challenges.

The background of the slide is a dark gray wireframe illustration. The upper portion shows a city skyline with various rectangular buildings of different heights. The lower portion depicts a rugged, mountainous terrain with a grid-like mesh overlaying the landscape. The overall aesthetic is technical and digital.

# Section 2

## EWN at DoD Installations – Case Studies

# EWN at DoD Installations – Practical Application



Tyndall Air Force Base



Naval Base Ventura County  
Point MUGU



Aberdeen Proving Ground

These vignettes will illustrate:

- Unique installation resilience challenges posed by climate impacts
- EWN 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

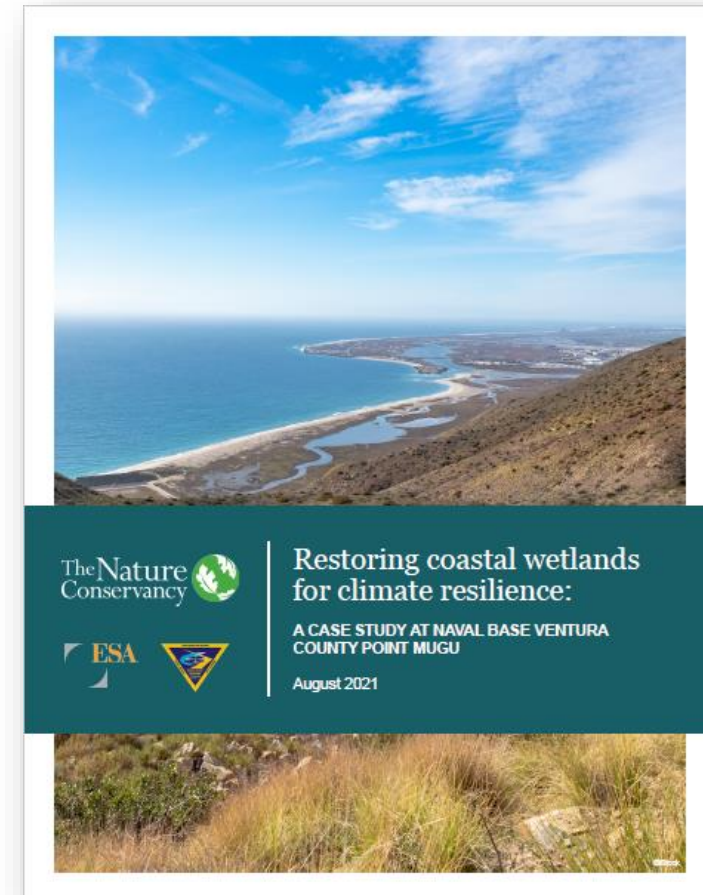
Unique partnership between Commander Navy Region Southwest (CNRSW) and The Nature Conservancy.

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.

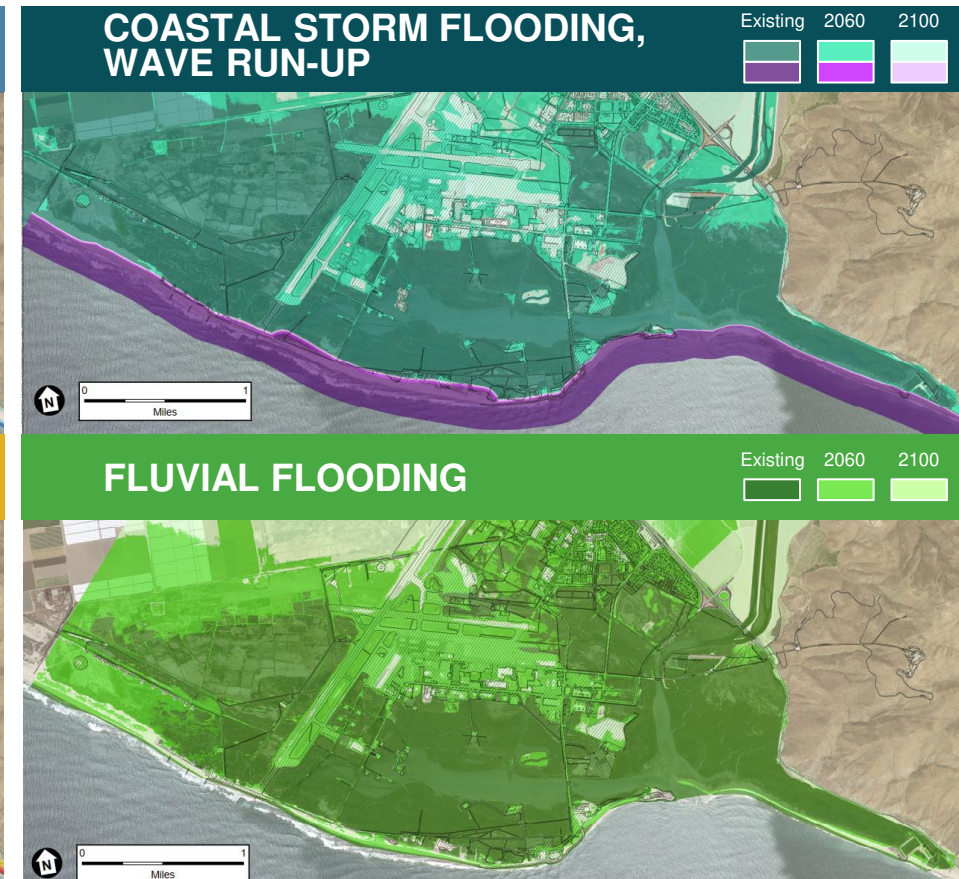
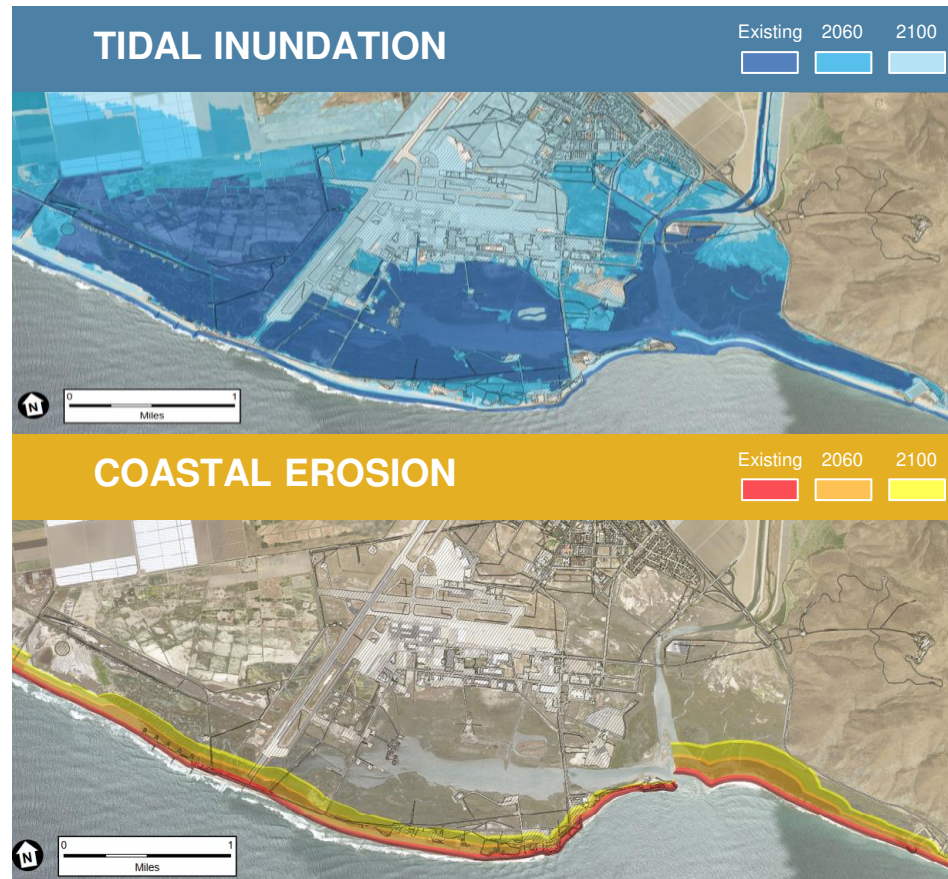
Point Mugu is home to one of the largest remaining salt marsh habitats in southern California, which serve as critical buffers to base assets and support critical biodiversity.

## 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.

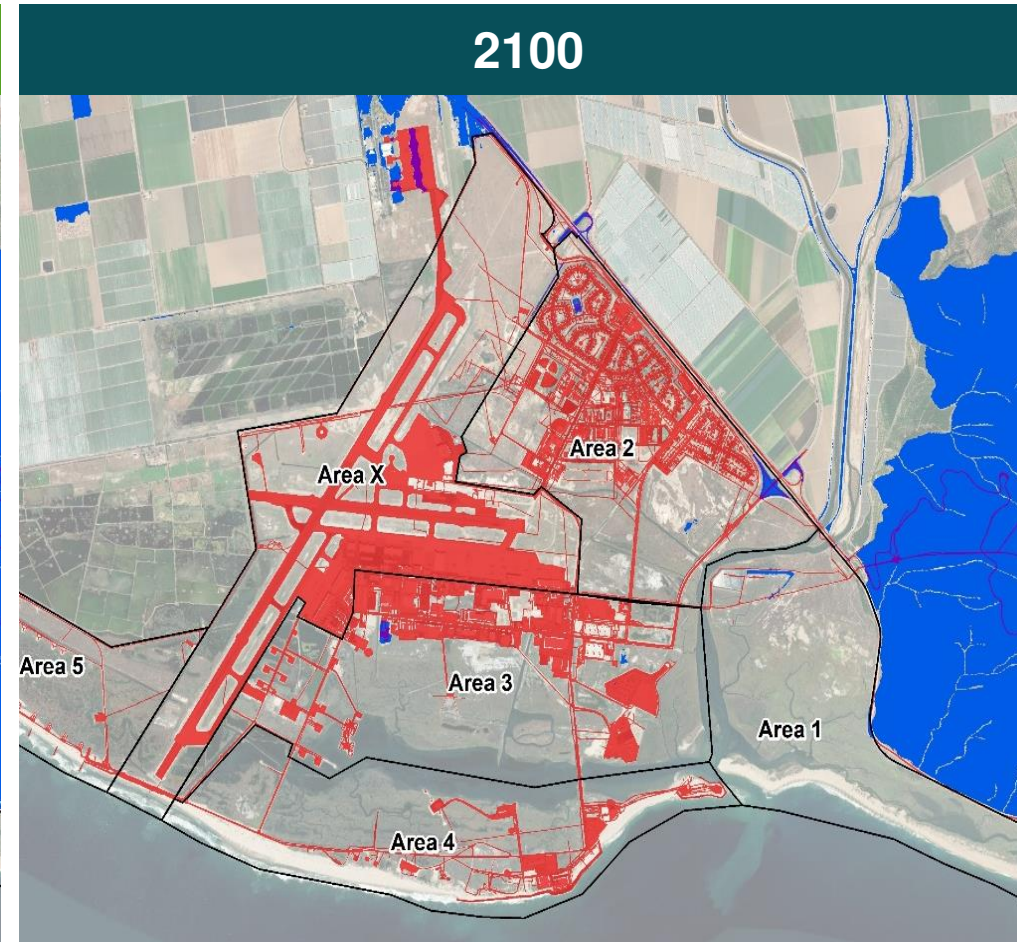
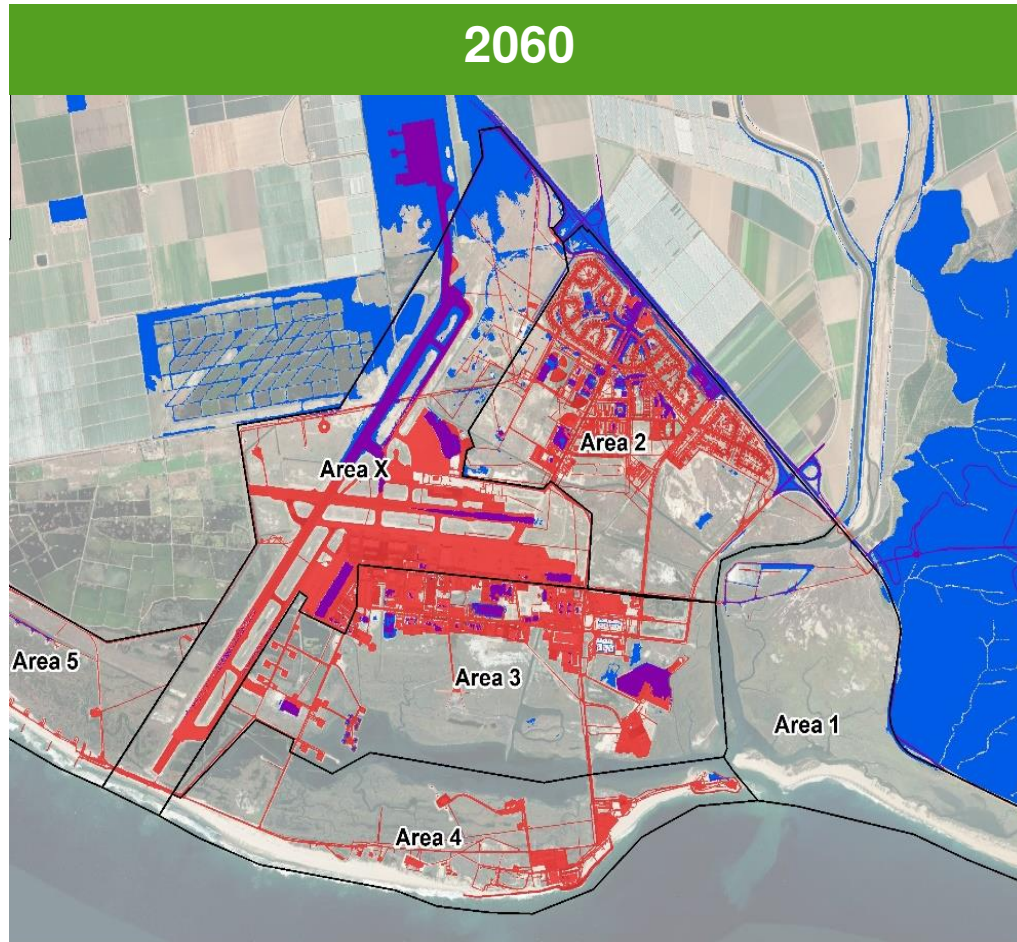


# Without Action, NBVC Assets are Vulnerable to Erosion and Flooding



Source: Environmental Science Associates 2020

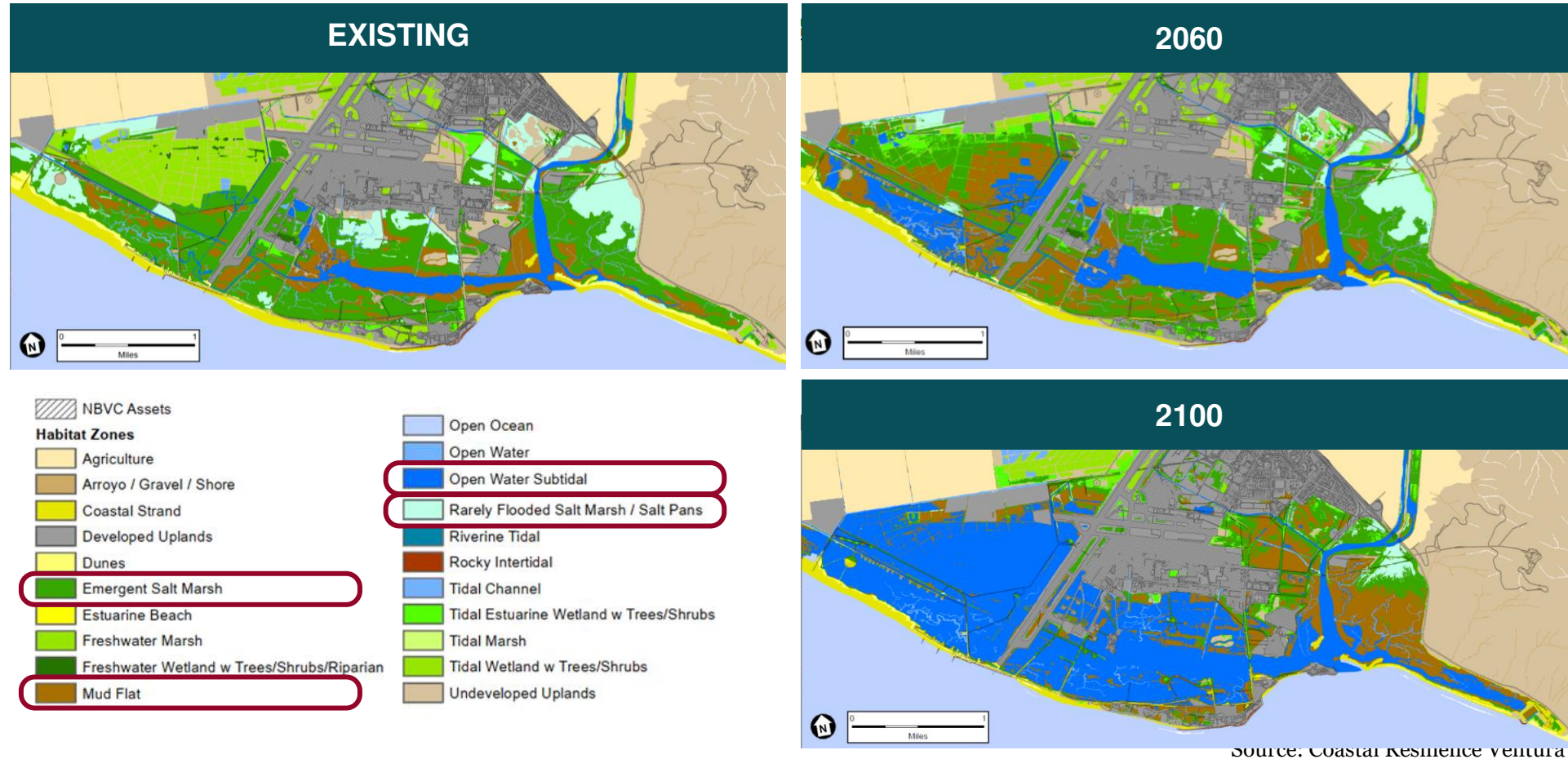
# Asset Vulnerability and Resilience at Mugu



- Mugu Areas
- Resilient Assets
- Resilient Uplands
- Vulnerable Assets

Source: Environmental Science Associates 2020

# Without Action, Salt Marsh is Lost with Sea-level Rise, a Critical Buffer to Base Assets



# Adaptation Vision



**DEFEND**



**RELOCATE**



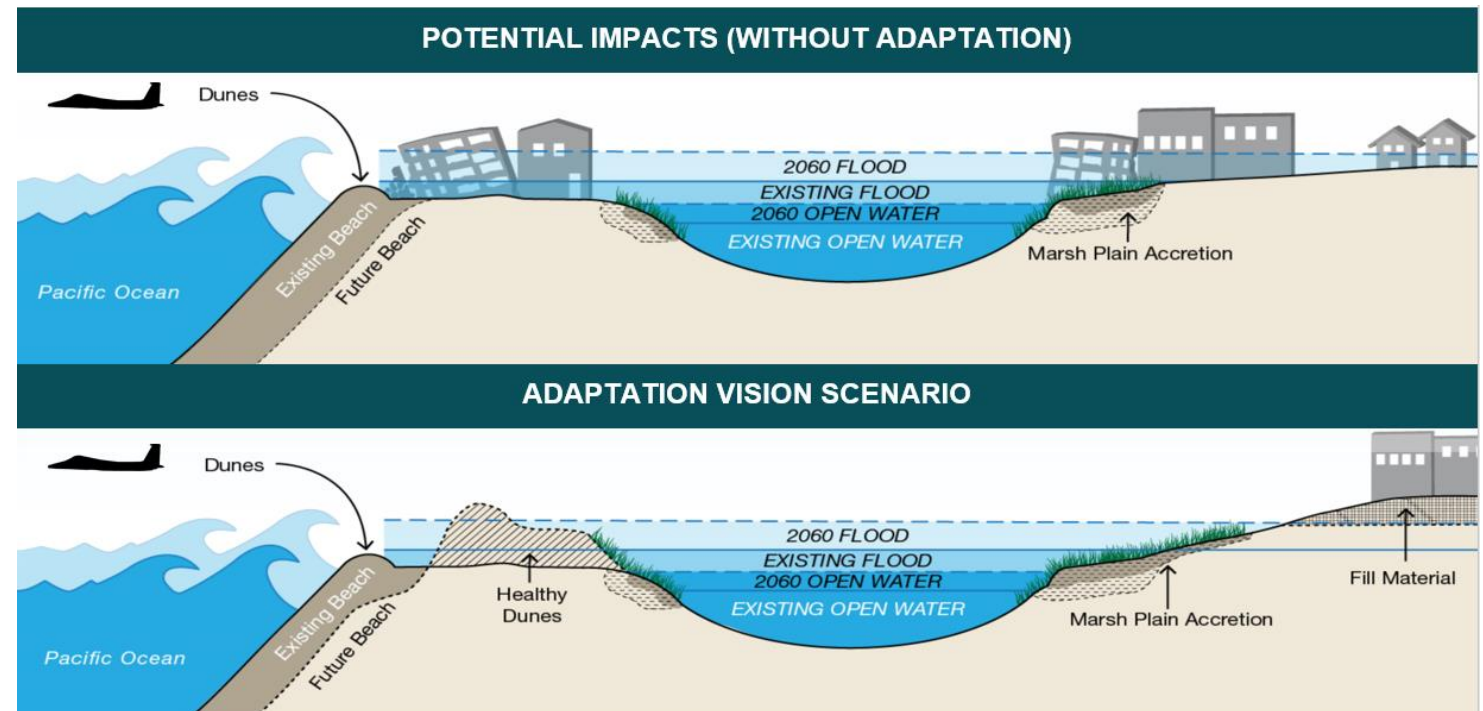
**REMOVE**



**RESTORE & ENHANCE**

# 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 is 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



# Engineering With Nature® Workshop on DoD Installations

Aberdeen Proving Ground – Upper Chesapeake Bay  
Coastal Resilience Plan

**Sam Whitin, CERP**

*EA Engineering, Science, and Technology*

AUGUST 24, 2021



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# US Army Aberdeen Proving Grounds

## *Coastal Resilience Regional Planning*



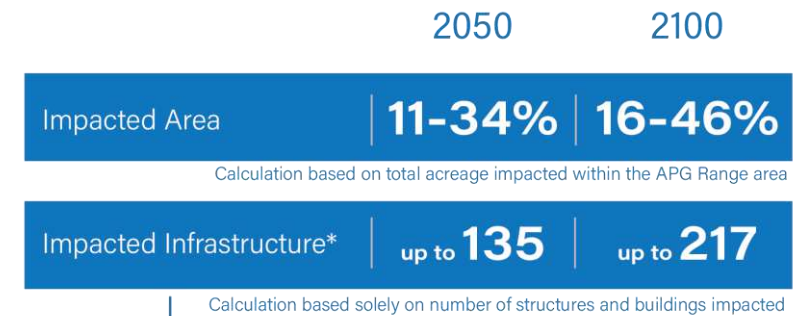
Regional planning process to protect installation mission as well as community assets

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

Unique features of the installation/EWN solution:

- Plan looked at *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.

### IMPACTS FOR SEA LEVEL RISE



#### CRITICAL INFRASTRUCTURE



Military Ranges/  
Training Areas



Airfields



Buildings



Railroads



Roads



Electrical  
Substations

#### OTHER CONCERNS



Wetlands/  
Critical Area  
Buffers



Species  
with Special  
Status

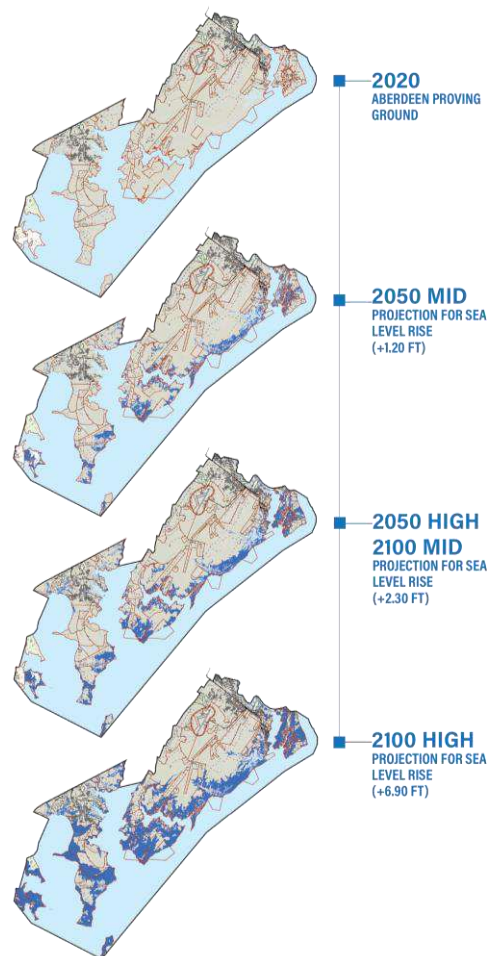


Historic  
Resources

# US Army Aberdeen Proving Grounds

## Coastal Resilience Regional Planning

### PROJECTIONS FOR SEA LEVEL RISE



- 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 success
- 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.**



# Engineering With Nature® Workshop on DoD Installations

## TYNDALL AFB COASTAL RESILIENCE

**JEFF MIXSON**  
*USAF, TAFB CR Program Manager*

AUGUST 24, 2021



Engineering With Nature®  
+ Landscape Architecture  
Design Research Initiative



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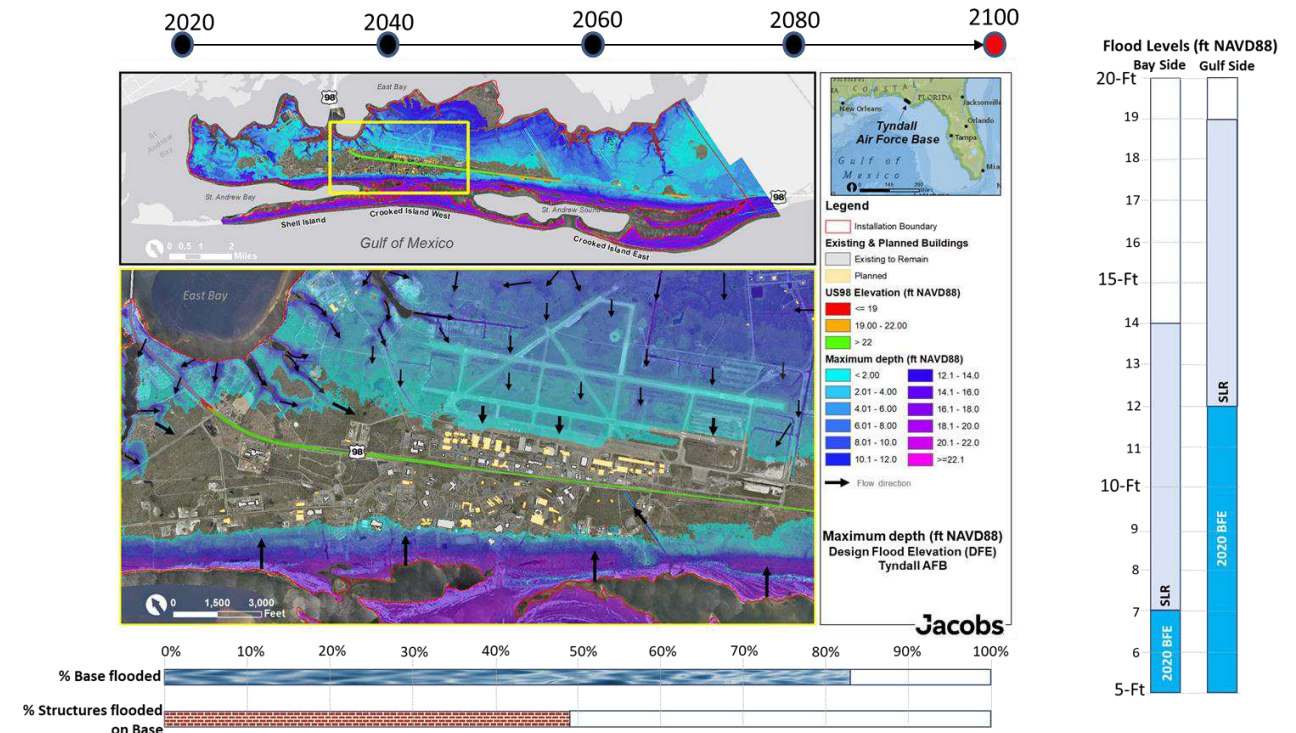
# Tyndall AFB Coastal Resilience Overview

## 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:

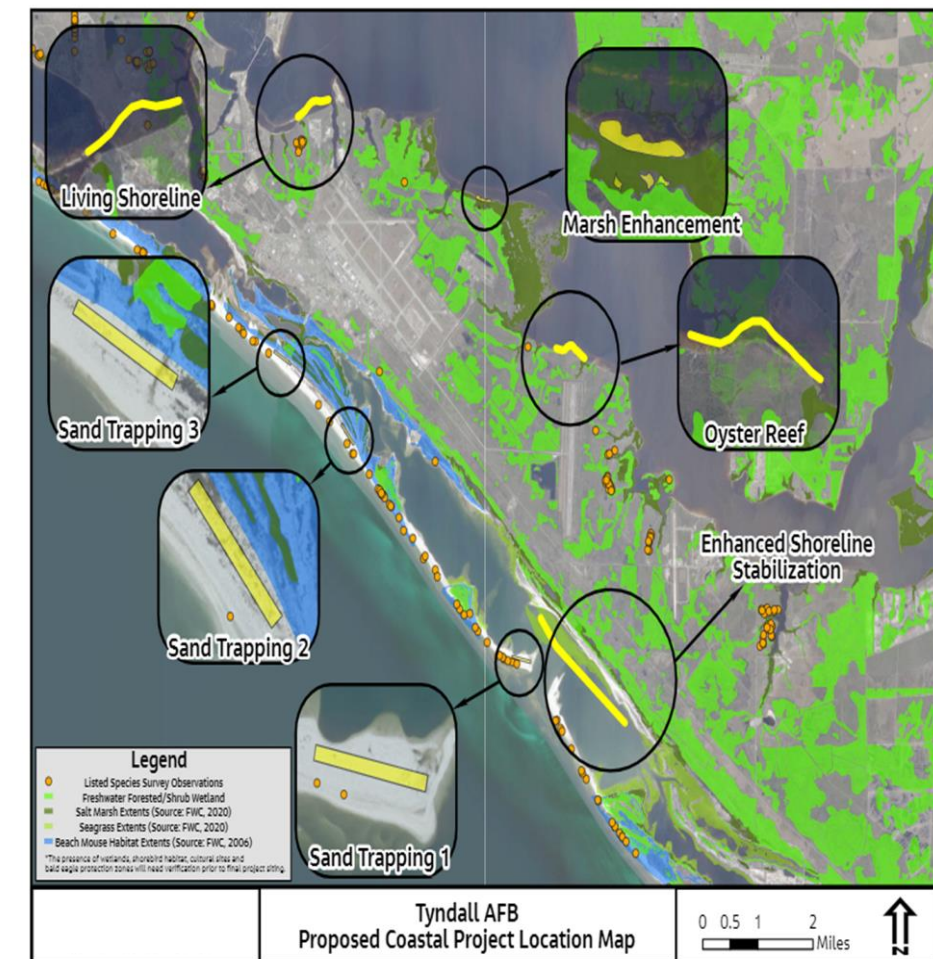
- USAF charged by Congress to make TAFB a resilient base after \$4B Infrastructure Rebuild Appropriation.
  - Funding not sufficient for anything outside of infrastructure (e.g., buildings, flight lines)
- USAF funded study to evaluate coastal resilience alternatives and funding solutions outside MILCON.
  - 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.



# Tyndall Coastal Resilience Pilot Projects

## Tyndall AFB Engineering With Nature:

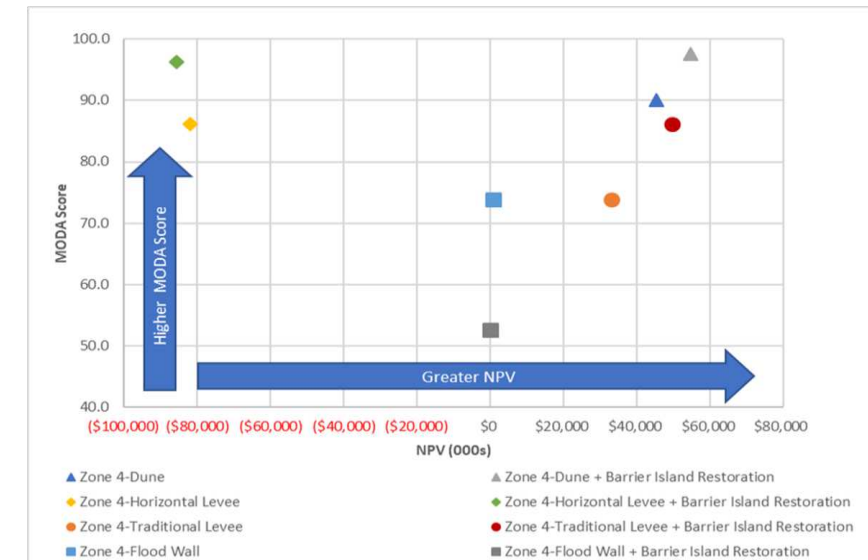
- TAFB plans on executing 4 major pilot projects and monitoring their outcomes for larger scale implementation.
- TAFB developed and planned a multi-pronged approach based on environmental characteristics & geography of the base.
- Nature-based solutions were specifically targeted due to low lifecycle costs, numerous co-benefits, modeling & 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 modeling 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.



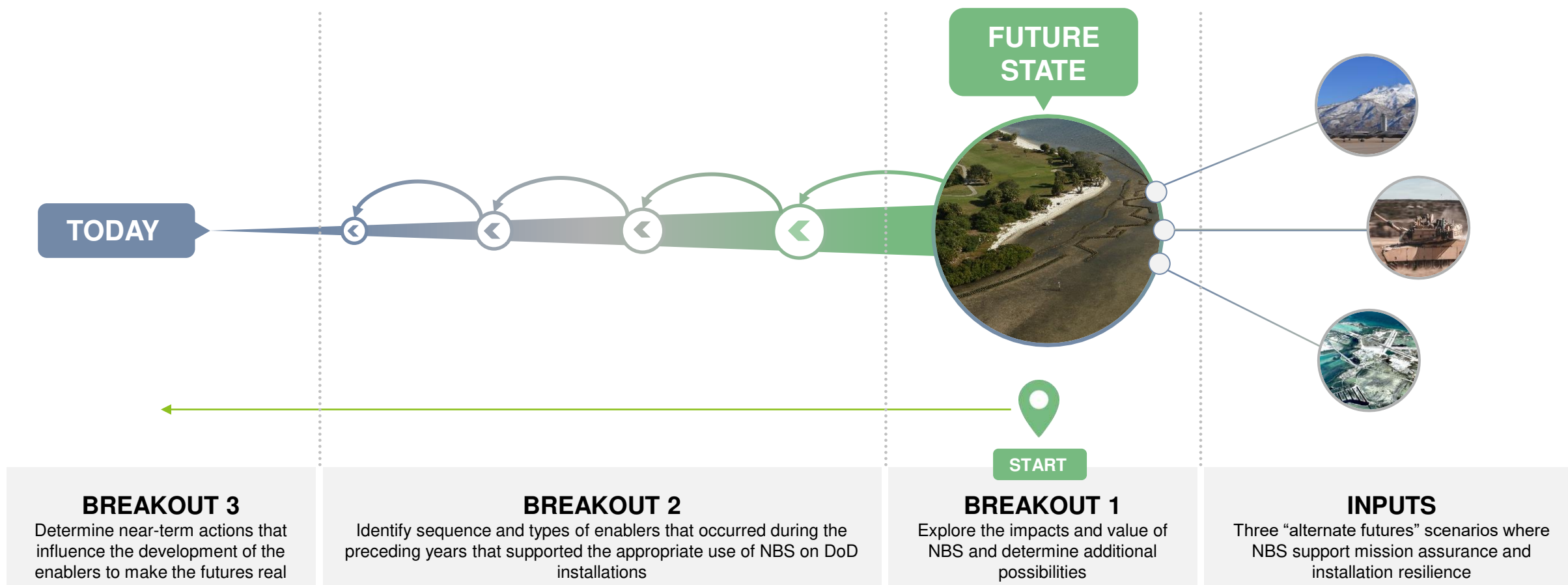


# Section 3

## Exploring Future EWN Scenarios

# Immersing in an EWN Future

Participants were immersed in future scenarios through three targeted breakout sessions to envision possibilities, opportunities, and value of mature NBS.



# Immersing in an EWN Future

Participants were presented with three fictional 2050 scenarios that illustrated the value and opportunities presented by NBS on DoD installations in the future.

## Naval Air Station Curry Gulf Coast, US



A coastal naval air installation challenged by rising sea levels and more frequent climate extreme weather events, to include hurricanes and storm surge.

## Fort Allen Midwest, US



A large midwestern US Army installation with a large maneuver and training footprint. This installation is increasingly susceptible to drought and subsequent impacts.

## Prince Air Force Base Rocky Mountains, US



A mountainous USAF installation facing increased impacts from frequent wildfires that threaten flight operations, maintenance, and testing of key R&D systems.

# Values and Opportunities of EWN in the Future

Participants brainstormed the following values and opportunities derived from NBS in present day and were exhibited in the future scenarios.



Value



Opportunities

Direct installation resilience value

An ecosystem approach to NBS

Broader installation benefits beyond resilience

Built and natural infrastructure synthesis

Enhanced local community value

Practitioner awareness and the need for education

Value to the nation and the world

Installations as proving grounds for NBS



# Value in an EWN Future

## INSTALLATIONS – DIRECT

The most direct requirement for any facilities solution is to support mission assurance and resilience of installations related to their missions. Direct alternatives or complementary NBS to conventional infrastructure are available to meet these core requirements.

### EXAMPLES

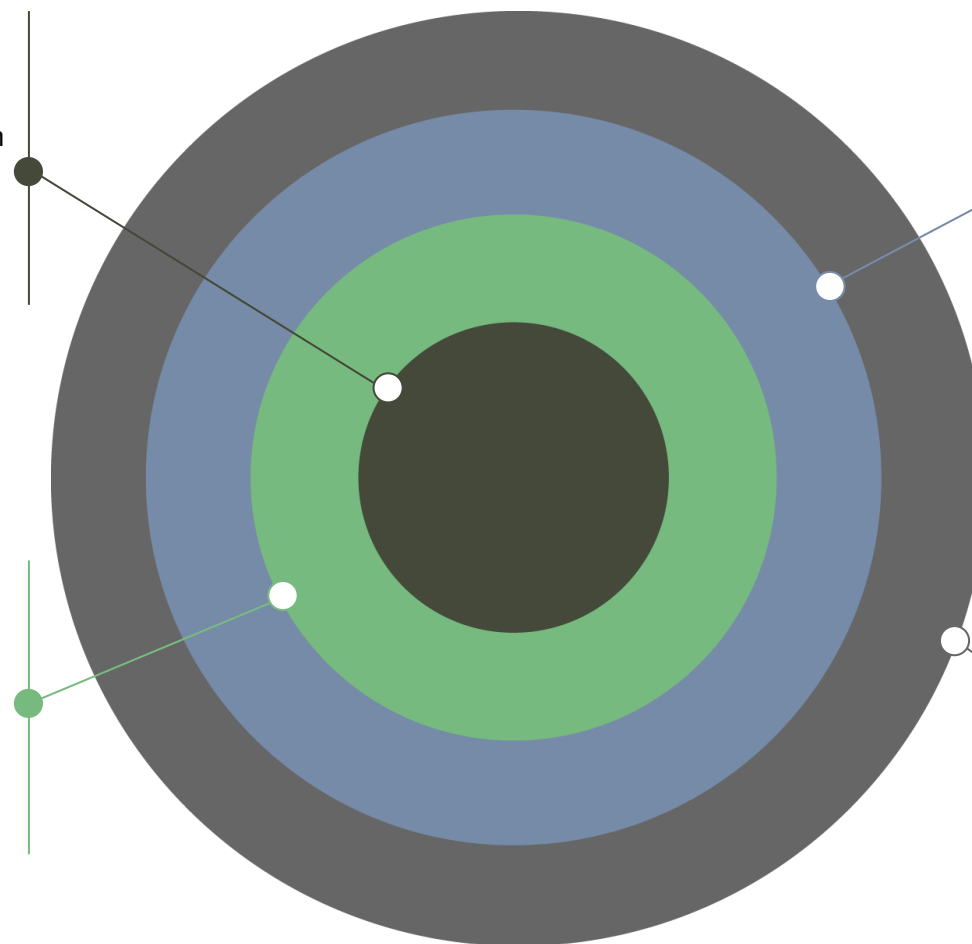
- Mission assurance
- Installation resilience

## INSTALLATIONS – BROAD

NBS present value beyond the traditionally quantifiable measures of conventional infrastructure. These “co-benefits” must be considered when making decisions about engineering solution implementation.

### EXAMPLES

- Economic benefits
- Quality of Life (QoL) benefits
- Reputational improvement
- Avoided losses



## LOCAL COMMUNITIES

NBS, and their associated benefits, don't follow fence lines and jurisdictional boundaries; therefore, when implemented, the value of NBS can also extend to local communities that are part of each installation's ecosystem.

### EXAMPLES

- Community resilience
- Economic benefits (e.g., agriculture, tourism)
- Community-based QoL benefits

## NATION AND WORLD

Beyond the local ecosystems and communities, NBS can contribute to reducing climate impacts on a national and global scale..

### EXAMPLES

- CO2 sequestration
- Habitat and species preservation
- Pollinator revitalization
- Improved air and water quality



# Opportunities in an EWN Future

Opportunities	Definition
<b>An ecosystem approach to NBS</b>	NBS and infrastructure do not follow the boundaries of installation fence lines and silos of organizational ownership. Engineering <b>with</b> nature means following geographical contours, ecosystem processes, and climate patterns; local communities will have to be part of the solution.
<b>Built and natural infrastructure synthesis</b>	NBS and conventional infrastructure must be considered in concert when considering the future of installation and mission resilience. NBS need to be considered and implemented when careful attention has been given to the full scope of the problem, and objectives can be met through both built and natural infrastructure investment.
<b>Practitioner awareness and the need for education</b>	Practitioners, engineers and the broader DoD community would benefit from a greater awareness and education around NBS. Like any new concept, adoption of NBS will require a basic understanding of concepts, approaches and value.
<b>Installations as proving grounds for NBS</b>	The scale and ecologically diverse locations of DoD installations, along with a more centralized regulatory structure, make them good candidates to be proving grounds for NBS.





The background of the slide is a dark gray wireframe illustration. The upper portion shows a city skyline with various rectangular buildings of different heights. The lower portion depicts a rugged, mountainous terrain with a grid-like mesh overlaying the landscape, suggesting a digital or engineering environment.

# Section 4

## Identifying Enablers to Achieve Vision for the Future

# Enablers for EWN from Across the DoD

Participants identified key enablers that would spark growth of EWN and NBS across the DoD, as exhibited in the scenarios.

 Guidance	 Policy	 Standards	 Culture
<p><b>G1)</b> Support from the EWN Initiative based on its mission, strategy, and goals</p> <p><b>G2)</b> Well-documented case studies and step-by-step guidance</p> <p><b>G3)</b> Integrated natural resource planning, design, and tools</p> <p><b>G4)</b> Alignment and collaboration of large and complex stakeholders</p>	<p><b>P1)</b> Integrated funding classifications for installations resilience and NBS</p> <p><b>P2)</b> Funding for continuous monitoring to understand efficacy and long-term impact</p> <p><b>P3)</b> Programming and agreements in place at the national level</p> <p><b>P4)</b> Financial incentives for implementation of NBS</p>	<p><b>S1)</b> Interdisciplinary Climate Resilience Working Group</p> <p><b>S2)</b> NBS specifications in the Unified Facilities Criteria (UFC) and other DoD design standards</p> <p><b>S3)</b> Cost-benefit analysis enhancements for NBS</p> <p><b>S4)</b> Common repository of NBS data and examples</p>	<p><b>C1)</b> Senior-level champions to effect policy changes</p> <p><b>C2)</b> Installation leadership champions to support NBS</p> <p><b>C3)</b> DoD stakeholder champions to effect design and implementation</p> <p><b>C4)</b> Future generation practitioners educated on NBS</p> <p><b>C5)</b> NBS viewed as effective for mission assurance and installation resilience</p>



# Guidance

Enabler	Definition	Next Steps
<b>G1) Support from the EWN Initiative based on its mission, strategy, and goals</b>	A clear chartering document that describes the EWN's mission, strategy, goals, and objectives in context of the DoD and expansion of efforts across the DoD. Provides clarity to DoD installation stakeholder on the scope and expectations of the EWN Initiative	<ul style="list-style-type: none"> <li>● Conduct outreach to understand DoD community wants/needs from EWN initiative</li> <li>● Craft mission/strategy and objectives for program execution across DoD</li> </ul>
<b>G2) Well-documented case studies and step-by-step guidance</b>	Creation of case studies with detailed qualitative and quantitative benefits provided by the solution – to include benefits inside/outside the fence line, performance of solution. Additionally, step-by-step or how to guides that instruct on NBS implementation, challenge areas, and key stakeholders.	<ul style="list-style-type: none"> <li>● Identify more mature NBS and document robust case studies</li> <li>● Format case studies to convey relevant and critical aspects of NBS,--to include specifications and performance metrics for NBS and integrated/hybrid systems that are complementary to specifications and metrics for conventional measures</li> <li>● Create NBS implementation guidance</li> <li>● Monitor NBS implementation progress and update guidance over time</li> </ul>
<b>G3) Integrated Natural Resource Planning, Design, and Tools</b>	Natural resource planning tools and templates that integrate NBS into larger installations resilience planning. These tools need to be widely applicable across the DoD portfolio to chart the course for NBS implementation as part of larger resilience efforts. The tools would link resilience goals, threats, and environmental conditions to potential NBS options and support planning and design of the solutions.	<ul style="list-style-type: none"> <li>● Understand current resilience planning tools and template landscape</li> <li>● Identify areas for synergy and inclusion of NBS</li> <li>● If necessary, develop new templates for installation resilience planning that include NBS as part of a suite of solutions</li> <li>● Develop NBS report card to evaluate progress and build robust solution performance database</li> </ul>
<b>G4) Alignment and collaboration of large and complex stakeholders</b>	Gathering and aligning the diverse landscape of stakeholders involved in NBS solution implementation on DoD property toward common objectives. This includes stakeholders from localized installations and communities to national level policymakers.	<ul style="list-style-type: none"> <li>● Conduct stakeholder mapping and inventory to identify key groups</li> <li>● Formalize the interaction process through working groups or regular interactions to facilitate progress on key issues</li> </ul>

● NEAR-TERM ● MID-TERM ● LONG-TERM



# Policy

Enabler	Definition	Next Steps
<b>P1) Integrated funding classifications for installations resilience and NBS</b>	Currently, funding lines for natural infrastructure and ecosystem management are separate from installation resilience funding. Creation of integrated funding lines or inclusion of NBS under larger installation resilience funding may open other avenues for use and implementation.	<ul style="list-style-type: none"> <li>● Explore the levers and drivers for NBS solution funding and ability to integrate with resilience funding</li> <li>● Find areas of synergy and common goals between different funding organizations</li> <li>● Scope possible funding agreement construction</li> </ul>
<b>P2) Funding for continuous monitoring to understand efficacy and long-term impact</b>	One of the main challenges with solutions selections and implementation, whether conventional or NBS, is a lack of long-term understanding of performance. When these solutions are programmed, there must be funding lines included for the continued monitoring and evaluation of the solution over time to support future efforts and planning of similar solutions across installations.	<ul style="list-style-type: none"> <li>● Ensure funding at project initiation for long-term project evaluation (engineering performance, operations and maintenance cost analysis, capturing different dimensions of value, etc.)</li> </ul>
<b>P3) Programming and agreements in place at the national level</b>	Creating policy from higher level DoD or USG authorities that would require consideration of natural infrastructure options as part of the project planning process in DoD and USG projects would create more opportunities for NBS expansion. Additionally, examining and leveraging current DoD policies that are not being used or enacted to broaden NBS adoption. These policies would begin the process of institutionalizing NBS for creating resilience.	<ul style="list-style-type: none"> <li>● Explore the levers and drivers for NBS policies at the national level; i.e., across DoD and other USG agencies</li> <li>● Develop strategies to drive policy formulation and adoption requiring consideration of NBS during planning</li> </ul>
<b>P4) Financial incentives for implementation of NBS</b>	Creation of “community-based funding” where costs are shared across the DoD installation with local governments, NGOs, or other agencies that stand to benefit from implementation of the solution. Leveraging the idea that NBS benefits extend beyond fence lines to impact the community.	<ul style="list-style-type: none"> <li>● Explore the levers and drivers for NBS solution funding</li> <li>● Engage senior champions in DoD, legislative, and local ecosystems to propose financial structures</li> <li>● Guide development of incentive programs with willing senior champion partners</li> </ul>

● NEAR-TERM ● MID-TERM ● LONG-TERM



# Standards

Enabler	Definition	Next Steps
<b>S1) Interdisciplinary Climate Resilience Working Group</b>	Unify climate resilience working groups across services to actively share information about initiatives and projects using NBS to support Services' efforts to increase resilience.	<ul style="list-style-type: none"> <li>● Define a working group charter</li> <li>● Identify cross-Service stakeholders</li> <li>● Host regular working group discussions to identify common objectives, share ideas and examples, and identify EWN points of synergy</li> </ul>
<b>S2) NBS specifications in the Unified Facilities Criteria (UFC) and other DoD design standards</b>	One of the many challenges that engineers, and landscape designers run in to is a lack of specific unified facilities criteria that would inform NBS planning and implementation. Efforts to create an NBS specific UFC would reduce barriers for designers and engineers to NBS introduction and implementation	<ul style="list-style-type: none"> <li>● Identify key stakeholders across DoD engineering community and the Services</li> <li>● Collect information from existing NBS guidance, literature, and data to inform UFC/design guidance content</li> <li>● Host discussions on necessary UFC revisions and finalize guidance for broad distribution</li> </ul>
<b>S3) Cost-benefit analysis enhancements for NBS</b>	Practical cost-benefit analysis tools, information, specifications, and values and making them easily accessible to practitioners via the EWN network and website.	<ul style="list-style-type: none"> <li>● Work with existing NBS pilot projects (e.g., Tyndall AFB) to document and share their cost-benefit evaluations among practitioners across the Services.</li> <li>● Post templates and tools in widely accessible location</li> <li>● Collect engineering performance, operational cost, and benefit data to augment UFC and cost-benefit models</li> </ul>
<b>S4) Common repository of NBS data and examples</b>	A singular location that houses feature data, implementation guides, and performance metrics for engineers and landscape designers looking for quick and easy access resources.	<ul style="list-style-type: none"> <li>● Build a repository of all NBS projects on DoD installations</li> <li>● Build a repository with robust engineering, performance, and cost/benefit data</li> </ul>

● NEAR-TERM ● MID-TERM ● LONG-TERM



# Culture

Enabler	Definition	Next Steps
<b>C1) Senior-level champions to effect policy changes</b>	Find senior decisionmakers in the DoD with mindsets focused on expansion, utilization, and openness to nature as a solution to installation resilience challenges.	<ul style="list-style-type: none"> <li>● Identify potential senior-level champions (Congress, DoD, etc.)</li> <li>● Leverage champions as advocates for NBS policy, funding, and culture changes</li> </ul>
<b>C2) Installation leadership champions to support NBS solutions</b>	Managing culture, mindsets, and approach needs to be considered at the individual installation level, where individual installation commanders and Department of Public Works have large influence over what happens inside the fence line.	<ul style="list-style-type: none"> <li>● Define messages that will resonate with individual installation leadership</li> <li>● Execute strategic communications around DoD installation case studies</li> <li>● Identify willing installations for NBS pilots for EWN R&amp;D and pilot projects</li> </ul>
<b>C3) DoD stakeholder champions to effect design and implementation</b>	Most senior DoD decision makers are unfamiliar with NBS and may consider them as "nice to haves" rather than providing critical support to installation resilience and personnel well-being. Directed efforts to increase awareness and educate key stakeholders regarding NBS would increase consideration of those solutions.	<ul style="list-style-type: none"> <li>● Identify key stakeholders who can impact near-term implementations of NBS</li> <li>● Perform outreach to stakeholders to determine needs and collaboration opportunities</li> <li>● Execute strategic communications campaign around DoD case studies</li> </ul>
<b>C4) Future generation practitioners educated on NBS</b>	NBS need to be exposed and contextualized to the next generation of installation planners, engineers, and managers. Training courses or seminars targeted at education of DoD practitioners will influence future builds and projects.	<ul style="list-style-type: none"> <li>● Identify learning requirements for baseline understanding of NBS</li> <li>● Partner with Service academies and other education opportunities to incorporate NBS-focused training</li> <li>● Formalize and extend NBS education to certifications and degrees</li> </ul>
<b>C5) NBS viewed as effective for mission assurance and installation resilience</b>	NBS may currently be perceived as requirements that must be met rather than tools that can harness natural capabilities to enhance mission resilience.	<ul style="list-style-type: none"> <li>● Identify key audience as leverage points for adoption of NBS on DoD installations</li> <li>● Shift messaging to focus on nature's ability to provide resilience and tie directly to mission assurance; emphasize direct benefits</li> </ul>

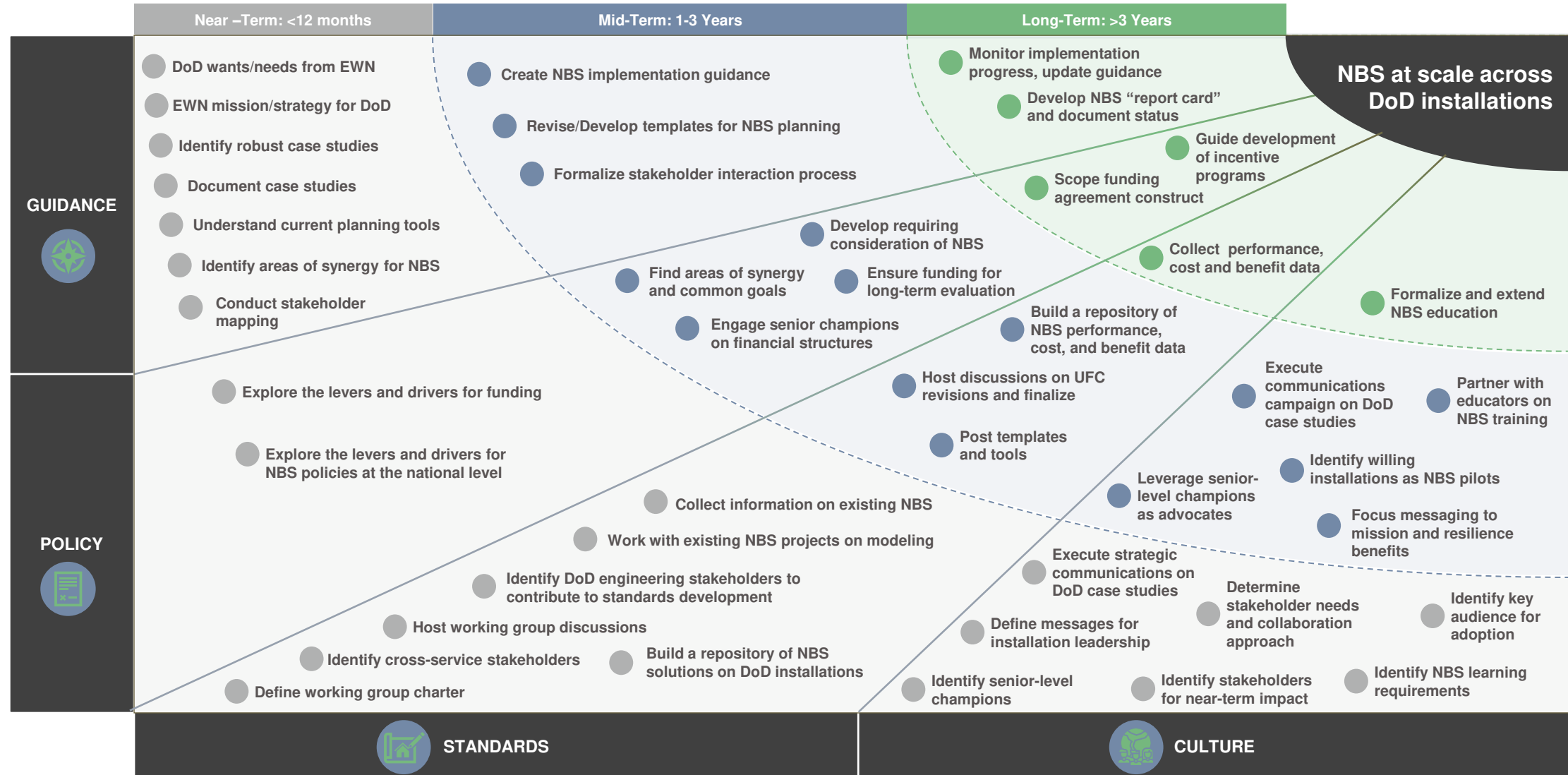
● NEAR-TERM ● MID-TERM ● LONG-TERM

The background of the slide is a dark gray wireframe illustration. The upper portion shows a city skyline with various rectangular buildings of different heights. The lower portion depicts a rugged, mountainous terrain with a grid-like mesh overlaying the landscape. The overall aesthetic is technical and digital.





# Section 5

## Developing an Action Plan

# The Path to Scaling NBS



# Summary Impactful Actions

Effort	Near-term	Long-term
 <b>Guidance</b>	Develop tools and templates to assist in implementation for DoD practitioners	Facilitate pilot project expansion and growth using those tools and templates
 <b>Policy</b>	Identify and engage with influential targets across DoD, Capitol Hill, and on individual installations	Influence DoD policy that requires or mandates consideration or inclusion of NBS in installation planning and design. Influence creation of dedicated resilience funding lines for NBS on DoD installations
 <b>Standards</b>	Facilitate NBS standards and UFC development for use by DoD practitioners	Refine standards, UFC, and associated templates with additional NBS performance data and understanding over time
 <b>Culture</b>	Develop strategic engagement materials that highlight current successes to demonstrate ROI based on current knowledge and understanding	Develop the business case for NBS featuring integrated cost-benefit models that include value of co-benefits and avoided/averted loss value when utilizing NBS

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# Section 6

## Appendices



# Live in the Future Breakout - Initial Summary Findings

## Opportunities

- **Nature doesn't see boundaries** – There are opportunities to take regional approaches to solution design and implementation across DoD to overcome boundaries and silos.
- **Natural and built infrastructure synthesis** – With changing installations landscapes, there are opportunities to unite natural and built infrastructure approaches.
- **Awareness and education** – Creation of more awareness and education around DoD successes.

## Value

- **Collective value of natural infrastructure**– The future requires the ability to quantify the value of ecosystem services, to include historically unquantified elements.
- **Quantify the value of avoided losses** – Being able to quantify the value of avoided losses in addition to added value can present more comprehensive value proposition.
- **Installations as proving grounds for natural solutions, not barriers** - Installations are a great place to test novel NBS. Installations can be a proving ground for NBS

## Challenges

- **Aware, aligned, and supportive leadership** – The future presents challenges of aligning and gaining support of the broad, necessary stakeholders across DoD.
- **Policy and funding alignment** – Ensuring there is future alignment across services and with DoD priorities.
- **Scale of the challenge** – The scale of the challenge can be complex, given the many intersecting variables, policies, stakeholders, and cultures and attitudes that populate the future landscape.

# Live in the Future Breakout Session – Raw Output



## Naval Air Station Curry Gulf Coast, US



A coastal naval air installation challenged by rising sea levels and more frequent climate extreme weather events, to include hurricanes and storm surge.

Different than today?	Flexibility/Resilience?	Opportunities?	Value?	Challenges or hurdles?	Threats?
<p>Consistent integrations - Incorporating resilience into structured planning, dedicated climate section</p> <p>Alignment between cross-department plans needed</p> <p>Coordination with local authorities</p> <p>Two-way communication between local community and installation</p> <p>Historical study to understand local community and environment (e.g. coast line)</p>	<p>Sea-level rise impacts and opportunities to relocate, and long-term planning benefit environmental and mission needs</p> <p>Minimal O&amp;M costs and self-sustaining quality allows for long-term flexibility/resilience</p> <p>Genuine "adaptation" means there must be continuing attention given to conditions, the future, and adjusting, then linking that to budgeting etc. There are no "build and walk away" solutions. This will be a business process challenge.</p>	<p>Public education &amp; awareness</p> <p>Addressing encroachment and risk assessment outside the base. Additional place of refuge</p> <p>Having a handful of examples that a cost/value out and are cases that people can refer to to draw on</p>	<p>Long-term ability to generate economic resilience/value/savings</p> <p>Co2</p> <p>Alignment to mission (i.e. planes falling out of sky)</p> <p>Endangered species</p> <p>Keeping the current infrastructure working (i.e. flooded roads and getting people to their jobs)</p> <p>Recreational opportunities (jobs) to soldiers families</p> <p>O&amp;M cost of potential damage to infrastructure/deferred costs</p> <p>Avoided disaster recovery costs</p> <p>Ecosystem services (i.e. pollinator, bio diversity, CO2 sequestration)</p> <p>Reputation as good stewards of the environment</p> <p>how do we put a value of not having something. The loss of the natural environment vs real-estate/development</p>	<p>Justifying nature-based solutions... with a current benefits cost analysis over time (longterm vs short-term benefits)</p> <p>Working wetlands around air fields</p> <p>Alignment across departments &amp; other stakeholders</p> <p>Who shoulders the risk?/ ownership</p> <p>Government's slow speed</p> <p>Expertise on the base/ current processes of selecting the right people to do the work</p> <p>Misconception of safety/security (feel safe behind a wall vs mangrove)</p>	<p>Invasive and non-native species will likely still be a threat to use of NNBF</p> <p>Loss of sediment</p> <p>Storm event is bigger than we plan for</p> <p>Uncertainty of the future climate conditions</p>

## Breakout Sessions

To help participants determine actions to take today, the workshop began by immersing them in three future scenarios that featured NBS on installations in 2050.

Participants then brainstormed what enablers might be necessary to achieve the future scenarios, and what actions they might take today to get there.

Breakout participants were asked to brainstorm ideas that addressed each question or prompt at the top of each column on this virtual whiteboard. The notes on the whiteboard are the raw output from the breakout session

# Live in the Future Breakout Session – Raw Output



## Fort Allen Midwest, US

A large midwestern US Army installation with a large maneuver and training footprint. This installation is increasingly susceptible to drought and subsequent impacts.



Different than today?	Flexibility/ Resilience?	Opportunities?	Value?	Challenges or hurdles?	Threats?
<p>there is more interest and support from DoD</p> <p>local communities are also involved</p> <p>Prime power comes from fusion</p> <p>Vehicles are powered by hydrogen and electricity</p> <p>Coordination with support community will be even more important: water use and fire control</p> <p>Use of training areas as natural areas to support PTSD</p> <p>EWN can enhance the training opportunities to expand the landscape</p> <p>MBTs no longer exist</p> <p>Increase in wildfire expected; faster, longer ranging, wider dispersion of vehicle and weapon systems; no longer have a static range, but manipulated much more remotely</p> <p>higher number of wildfires in training areas</p> <p>directed energy weapons...no projectiles...</p> <p>All warfighting platforms are unmanned</p> <p>water is produced on site</p> <p>forests are planted to mitigate desertification and promote cloud formation</p> <p>Waste water produced power and fertilizer</p> <p>species composition on training areas changing due to altered weather patterns - forest to grasslands for example.</p> <p>land use and land cover are managed to minimize risk while maximizing carbon sequestration</p>	<p>Self-sustaining whole environment solutions</p>	<p>solutions for droughts for coastal locations</p> <p>training land management vs. grass land; manipulate how the lands are being utilized</p> <p>already seeing changes in Midwestern agricultural practices - construction of ponds to hold off flood water; already seeing revolutions</p> <p>dealing with novel ecosystems in general;</p> <p>mindful of wetlands; how do we monitor</p> <p>Grass trees sequester more carbon than trees - use training ranges to increase carbon sequestration</p> <p>I was fascinated during my tour in Afghanistan, how well farmers there were able to irrigate vast desert areas through subterranean irrigation...was typing this as Dan made same point: its an ancient practice...why can we not adopt and modernize for the future</p> <p>Need real integrated water resources management across base, surrounding communities, and basin - need collaborative planning / modeling / decision making for climate resilient water infrastructure across overlapping jurisdictions - designed via multi-hazard stress tests</p> <p>communities and installations together looking at holistic solutions; understand needs of surrounding community; better at managing the whole system</p> <p>Novel ecosystems allow for opportunity to test EWN solutions</p> <p>using training lands to sequester carbon; land management; we can sequester and monitor to help us achieve net zero emissions sooner</p> <p>opportunities to allow these bases to start evolving now to start reorganizing</p>	<p>Start now to prepare for what's needed in future</p> <p>South Carolina has a review of installation &amp; community impact as an ecosystem planning effort</p>	<p>water rights and policies being set forth by DoD; we should be involved in setting the policies and help identify what the goals are</p> <p>It will be challenging to manage fuel loads on training lands via controlled burning as drought increases. Want to avoid uncontrolled wildfires, which can burn hot enough to release carbon sequestered in the soils; uncontrolled wildfires burn more fuel;</p> <p>Agree - risk for high temp wildfires and soil sterilization</p> <p>Limited capacity to draw down water</p> <p>Need to get firemanagement / control burn solutions in place to ensure fires don't burn hot enough to release carbon</p> <p>External communities impact and ensuring solutions are holistically designed</p>	

## Breakout Sessions

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# Live in the Future Breakout Session – Raw Output



## Prince Air Force Base Rocky Mountains, US

A mountainous USAF installation facing increased impacts from frequent wildfires that threaten flight operations, maintenance, and testing of key R&D systems.



### Breakout Sessions

To help participants determine actions to take today, the workshop began by immersing them in three future scenarios that featured NBS on installations in 2050. Participants then brainstormed what enablers might be necessary to achieve the future scenarios, and what actions they might take today to get there.

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Different than today?	Flexibility/Resilience?	Opportunities?	Value?	Challenges or hurdles?	Threats?
<p>Drier conditions initially</p> <p>high technology (drones, space based, AI) to understand geology &amp; vulnerabilities</p> <p>natural resources solutions</p> <p>Comprehensive specific picture and processes for space based sensors - understanding</p> <p>What might not be a bright idea today, may not be a bright idea tomorrow! - What will their future conditions look like?</p> <p>Understanding the evolution of native species and what to invest in</p> <p>Used EWN as the primary strategy for external land management</p>	<p>integrated built environment that allows natural and other resources to work together</p> <p>indigenous climates - solutions based on; more than land management-- also how you place/define buildings</p> <p>assessment of natural biology to mimic solutions -- emulate nature to greatest extent for resilience</p> <p>shade/daylight/heat reduction</p>	<p>Manage surface water - "slow store/infiltrate"</p> <p>Opportunities to recharge and reuse groundwater to create water buffers</p> <p>Fuel reduction partnerships with surrounding lands</p> <p>Multi funded fuel management program on the landscape scale</p> <p>fire: impact on neighbors that impact installation. Vegetation impacts. Other land owners can negatively impact installation itself-- work with your neighbors to understand tools and lessen impacts. Fund opportunities on non-DoD land</p> <p>Value in est of natural water storage features that could address future mission needs and drought resistance (part of ecosystem planning)</p>	<p>Promote snowpack</p> <p>maximize resilience against climate threats - give greatest protection for mission</p> <p>cultural resource: value: tribes/historic stakeholders that have interests in military owned land</p> <p>key civilian supporting infrastructure also needs to be resilient.</p> <p>economic value: negative impacts on community if an installation is closed/relocated. They provide value by being a long-duration stable installation for jobs, restaurants, hotels etc.</p> <p>inter-disciplinary team to plan/execute projects with local community. Institutionalize organizational change to be able to make a living plan and continue it.</p> <p>Desires of installation being discussed externally makes it more likely to get buy-in for other military decisions/actions if community feels they have visibility/understanding. Allow DoD to be seen as a reasonable player, what are the metrics of success? they may not be tangible.</p> <p>collaborations -- understand desires of other groups to fit their efforts into DoD. Sometimes NOT being the lead organization can be an advantage. Social/cultural environment to fir DoD desires around theirs - more effective for community buy-in. Change the nature of power.</p> <p>DoD-State-Local-NGO partnerships to look at natural resources outside DoD installations. Landscape scale level of actions to look at things that can adversely impact DoD installations</p>	<p>Need to look at what others are doing as well in surrounding jurisdictions</p> <p>Addressing threats that we haven't seen previously... drought of past may not be the problem of the future - need constant vulnerability analysis</p> <p>embrace/understand integrated natural resource management plan -- tool to help shape resiliency. Engage different departments within military installation. Make sure in-ramps in future clearly articulate/analyze impacts of climate change into future. Living document -- reviewer/updated annually</p> <p>ecosystem level scale planning -- funding lines -- why are their disparate funding lines? Should there be a single funding line allocated to grey AND green? Current natural resources funding are slim. Needs DoD internal look at funding allocations</p>	<p>storm water - permeable surfaces - water table - all come with a properly functioning ecosystem. Enhance that makes ecosystem more resilient to things like bugs that create "kindling" by killing vegetation</p> <p>maintenance as long-term threat: system for maintenance needed. Must dedicate resources to do things properly now and in the future.</p> <p>what happens outside the fenceline impacts inside the fenceline more than people realize -</p>



# Making the Future a Reality Breakout - Initial Summary Findings

Partnerships	Enablers	Standards	Culture
<ul style="list-style-type: none"> <li>• <b>Regional partnership forums</b> – Bringing to bear regional forums for collaboration with local stakeholder groups.</li> <li>• <b>Establish stakeholder groups inside and outside the fence line</b> – Identify the champions and key players in partner ecosystems.</li> <li>• <b>Leverage existing interagency partners</b> – Finding willing partners to continue to engage with</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Integrated installation natural resource planning</b> – Conduct joint planning efforts with local communities and across the Department.</li> <li>• <b>Near irrefutable case studies that illustrate proof of efficacy</b> – Develop bank of case studies that quantitatively prove solution efficacy.</li> <li>• <b>Step by step guidance</b> – Develop how-to guides based off past successes (Tyndall AFB).</li> <li>• <b>Policy enablers</b> - encourage NBS implementation and funding.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>NBS specific UFC required</b> - A unified facilities criteria specifically addressing natural features is needed.</li> <li>• <b>Continuous monitoring mechanisms</b> – Creation of efforts to collect performance metrics over long timescales for all infrastructure systems, including NBS.</li> <li>• <b>Cost-benefit analysis improvements</b> – Cultivate new ways to quantify benefits, to include loss avoidance calculus and habitat restoration.</li> <li>• <b>Common repository</b> of NBS and performance data.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Continue to get in front of decision makers to change mindsets</b> – Recognizing the key pulse points across the department and continuing to brief at energy, environment, and infrastructure events.</li> <li>• <b>Strategically marketing solution efficacy</b> – Conduct strategic marketing efforts around identifying solution efficacy. Create messaging that illustrates data and end results.</li> <li>• <b>Changing mentality of installation leadership</b> – Pursuing a change in attitudes around installation resilience and natural infrastructure.</li> </ul>



The diagram illustrates a timeline starting from 'TODAY' on the left and moving towards a 'FUTURE STATE' on the right. A horizontal line represents the timeline, with several overlapping circles above it. A green bar highlights the transition period between the current state and the future state. The 'FUTURE STATE' is represented by a globe icon, with two smaller circular images branching off to the right, showing a landscape and a building.



Partnerships?	Enablers from the EWN initiative?	Enablers across USG Broader DoD?	Local communities?	Standards?	Financial or investment priorities?	Culture and Attitudes?
<p>Military piloted an approach that was embraced by local govt community to expand it - regional partnerships early on</p> <p>Plan for wider natural infrastructure for the base</p> <p>strike / bird planning pupps to ensure safety 1st and foremost the concern is addressed</p> <p>Involved business and eco-tourism, those in the work and those that benefited from the work</p> <p>Advocate: is there any pushback given is Aristation on the bird / bird strike safety due. How do we develop solutions that welcome back wildlife, how is that impact understood and forecasted requires multi-science/domain expertise when planning</p> <p>Not just bird, but all wildlife, deer, rabbits, and others</p> <p>Some airplanes have different approaches to handling RDT - reinforces the multi-expertise requirement in planning</p> <p>NFWF - partnering with NOAA as federal agency to understand circumstances</p> <p>Restoration of wetlands protective services, but have to consider the 3rd order impact</p> <p>Create more species and regulatory burdens that are created and the fear of impact</p>	<p>Statistical / Big Data analytics to improve decision making - take pilot programs and show/demonstrate to DoD and others the cost effectiveness of these measures being taken. It is good for resilience, environment, and is cost effective</p> <p>In addition to policy enhancements, but tying EWN project evaluation metrics with a mission dependency index and life cycle cost analysis.</p> <p>Funding 20-30 projects and getting the proof points that have the co-benefit and demonstrates where good things are happening. Intuitively the story hits, but the data demonstrates the need for these decisions to get away from "grey infrastructure first"</p> <p>Need more penetration across DoD &amp; decision makers</p> <p>Second the need for data demonstrating the efficacy of nature-based measures.</p> <p>Draw out what the issues are and then asking EWN to get to the solutions - bash hazards and practical solutions</p> <p>A lot of ideas kicked around for NBS after Michael for those that didn't know about the EWN Program - Todd &amp; team brought credibility to the effort and elevated the value, bringing science to the process and enabled the process to move forward</p> <p>Would be helpful if EWN would develop a compendium of best practices for different geographies and mission areas, especially any lessons learned to deal with unintended consequences</p>	<p>Natural and Grey infrastructure come out of separate funding buckets, we need more integration and acknowledgement that both are infrastructure solutions - this is required to achieve scale</p>	<p>Local communities?</p>	<p>Pulling together cheat sheet of ecosystem services benefits so that installations can have information at fingertips to pull together cost-benefit analysis and the justifications for these types of projects</p> <p>Better synch federal govt R&amp;D and funding across the government - spending R&amp;D money they have to solve specific needs of the group for advanced solutions</p> <p>need policy requiring this to be considered in cases A, B, C. Need a vision, recommended strategies and actions required. Need regional commander, installation CO and PWO buy-in (at a NAS)</p> <p>Green infrastructure in the city form built what's happening is the workforce must be available to maintain that green solutions.</p> <p>Materials that define the solutions and how the building standards could be applied</p> <p>Diversifying "team" composition is a key to more integrative solutions. This means making traditional "silo" more porous and supporting the communication needed for different disciplines to sit with each other about these types of solutions.</p> <p>Breakdown silos where the expertise sits</p> <p>Need people involved (bird) to help them understand the problem and see and go on their own. Manage the people live in the local ecology</p> <p>It is essential to having a mission and vision. They want to include that in the future to provide support for the installation and maintenance of nature-based solutions</p> <p>Engineers could be a lot of help for not considering natural infrastructure opportunities. But we also need to consider these natural resources and environmental professionals are considering the engineering functions and personnel relevant to their mission.</p> <p>Regulatory standard from partnering agencies that provide assurance to installations, that they will not incur additional regulatory burden by implementing projects by accepting an integrated / linked decision. It's being done installation by installation - need a programmatic approach</p> <p>Environment agencies are driven by government that is controlled by engineering, that means the approach is projects is not where we have to do - all building related highest design has to be where government projects. They need expertise in engineering, engineering, and environmental science. Perhaps because ships on the base and use a permit number, look at the right way to build to create solutions. The request how we consider and set standards.</p> <p>Standards are used as a hammer for the design - the designer must know what they mean and how they get implemented. Most effective way would be to have workshops and training not just for the designers but for the broader Center of Expertise that are required. This training must be mandated.</p>	<p>Absent policy (like State of VA has), Navy/DOD Need to be able to answer question to a REGCOM of 'how does EWN help me launch FY18s off the runway (when needed, consistently,</p> <p>DOD exists to deliver on mission. Planners and designers need clear understanding &amp; awareness, but more importantly clear tie of EWN to mission accomplishment. In a world where we spend our time trying to figure out what needed maintenance to defer and not fund, only things that accomplish mission at better costs are above the line.</p> <p>Identify how to gain efficiencies or do things differently that create new value - this is built on through the data that is being developed through implementation of the solutions. We need the data to get it back to the leadership and decision makers - These are not crazy ideas, they are cost effective and great for the environment and the mission resilience</p> <p>Must have the funding for this training to ensure people get the training</p>	<p>Depends on who is in the shops on the base and whether or not they know the resources exist and are they willing to go get those resources - and want to get the support</p> <p>Take the discussion global to hear how other cultures/disciplines/perspectives allow us to view and solve our problem sets</p> <p>Tie in host nation standards to EWN solutions, who do we connect &amp; pull in on this effort</p> <p>Navy and tri-service is sponsoring a design criteria effort for EWN in FY22</p> <p>Change mindset of where this fits in - this is very important</p> <p>Derive mission value, learn how to develop mission-relevant business/value case for NBS</p> <p>Part of changing the view about nature-based measures from nice to have to mission essential, is to demonstrate the efficacy through RDT&amp;E and show the monetary and mission benefits.</p>

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# Making the Future a Reality Breakout Session– Raw Output



Fort Allen  
Midwest, US

A large midwestern US Army installation with a large maneuver and training footprint. This installation is increasingly susceptible to drought and subsequent impacts.



Partnerships?	Enablers from the EWN initiative?	Enablers across USG Broader DoD?	Local communities?	Standards?	Financial or investment priorities?	Culture and Attitudes?
<p>natural resource conservation services; partner experts who have experience in agriculture, national forest service etc.</p> <p>host of former legacy and partners under NEPA that we can partner with; organizations that understand how land is being used</p> <p>Cities, counties, states as partners for development of mutual resilience</p> <p>rich DOD history of ongoing relationships: DOD partnerships with other agencies (RCS, FWS, FEMA); interagency agreements between DOD and these other agencies; agreements with local and state authorities (already being implemented successfully in NJ); lots of authority but not a lot of knowledge</p> <p>Public and private organizations who have authorities for land and project development beyond DoD's authorities, e.g., NOAA and USFWS refuges and reserves.</p> <p>understand what money can be spent on federal/non-federal lands. How are you attracting investments and grants?</p> <p>working with local planning committee; sit-down conversations; discuss planned activities that may impact sand migration/movement;</p> <p>private sector landowner relationships/ partnerships</p>	<p>importance of documenting and sharing experiences across organization; networking of ideas; facilitation</p> <p>bring resources to help quantify/validate what is going on</p> <p>opps for training through webinars/in person sessions;</p> <p>bring resources to training sessions with access; create an expectation among this incoming leadership</p> <p>add some of these reqs into contracts</p> <p>too many silos; have briefings and demonstrations of how this will benefit base; bring that to the regional level; up the chain of command</p> <p>make a compelling business case --&gt; maintenance of specific strategies on base</p> <p>training, training, training (i.e. Master Planning Academy); need to train COBs who are administering contracting support</p> <p>follow-up with congressional authorities; lag in implementation by DoD</p> <p>policy; train planners to give them ideas on how to partner with local community, etc.; incorporate everything into the master planning and 1391</p> <p>Perhaps the EWN solutions to Net Zero emissions project would be helpful; brand EWN as a way to achieve carbon reduction and create carbon sinks to offset savings mandates.</p> <p>decision-making matrix; involve nature-based solutions into the master planning;</p> <p>use EWN as a natural way of reaching resilience and as a way to offset carbon credits</p>	<p>Climate Adaptation Plan (CAP);</p> <p>agencies doing lands management</p> <p>looking at EWN solutions, first, before other (grey, green) solutions. Guidance at the DOD level to change how solutions are developed</p> <p>train project programmers on the value of EWN and how to present these types of solutions in their 1391s</p>	<p>- IICEP - Intergovernmental and Interagency Coordination for Environmental Planning model; encourage local gov'ts and other foreign agencies to work together</p> <p>working with indigenous people; strengthening relationships</p> <p>community planners on bases and training them to go out and engage with the wider community</p> <p>community/ liaison planners training</p> <p>tie EWN to people; connecting it with the ability for people to be happy/healthy</p>	<p>For the standards - make a specific UFC for EWN principles and applications</p> <p>give bases credit for establishing sustainable sites</p> <p>create a whole new land management directive that uses EWN principles first before traditional high cost landscape maintenance solutions.</p> <p>compilation all best practices into one list and filtering through to see which ones are helpful/more applicable</p>	<p>understand what money can be spent on federal/non-federal lands. How are you attracting investments and grants?</p> <p>create a decision making support tool box for the planners and train them on how to use each tool like NEBA, MODA, LCCA and CB analysis.</p> <p>Incentivize Installation Planners to develop Climate Resiliency projects by proving extra "points" in the ranking criteria for MILCON programming for these projects.</p> <p>need more funding (either from the gov't or outside grants, etc)</p> <p>congress is looking to dump \$4 trillion; DoD to take advantage of that</p>	<p>create some high level recognition across the DoD that highlight and celebrate and reward installation that make early wins with this initiative.</p> <p>encourage reward and celebrate installations who commission and conduct inside the fence on volunteer programs to install EWN solutions on their bases.</p> <p>highlight installations and use them as an example for others; positive reinforcement; celebrating achievements</p> <p>demystify EWN; strategic "marketing"</p> <p>"EWN benefitting installations"</p> <p>leaders should model behaviors that others can follow in installation management; create motivation instead of just creating incentives</p> <p>Training and awareness may be helpful to help change culture so nature based solutions are taken seriously vs. gray solutions. Also, examples of other bases will help other bases learn what others have done that would be successful.</p> <p>use gray opportunities to showcase green opportunities</p>

## Breakout Sessions

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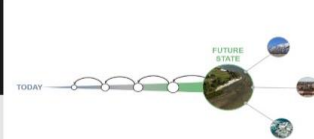
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# Making the Future a Reality Breakout Session– Raw Output



Prince Air Force Base  
Rocky Mountains, US

A mountainous USAF installation facing increased impacts from frequent wildfires that threaten flight operations, maintenance, and testing of key R&D systems.



Partnerships?	Enablers from the EWN initiative?	Enablers across USG Broader DoD?	Local communities?	Standards?	Financial or investment priorities?	Culture and Attitudes?
<p>Utah &amp; US Forest Services</p> <p>Arbor Day foundation</p> <p>DPW BLM</p> <p>Western Regional Partnership for Planning Sustainability - focused on conservation &amp; facilities</p> <p>Forest Service, BLM, USFS Wildlife system, other large public land managers where actions taken affect the "downstream" lands and facilities.</p> <p>FEMA and HUD - The FEMA Building Resilient Infrastructure and Communities (BRIC) Program</p> <p>State resilience offices &amp; officers</p> <p>Surrounding municipalities &amp; regional planning entities</p> <p>Tri services meetings - to communicate across agencies</p> <p>Native American Tribal Organizations</p> <p>NOAA Drought program NIDIS</p> <p>Western Water Assessment</p> <p>Base commander</p> <p>US Group for Earth Monitoring</p> <p>University partners</p> <p>state hazard mitigation offices involvement</p> <p>state fish and game and USFWS regional office as partners.</p> <p>National Environmental Foundation</p>	<p>Studies on the cost of NOT doing something</p> <p>Overwhelming, near-irrefutable evidence that EWN features have similar lifecycle costs to traditional engineered solutions.</p> <p>Integrated natural resource plan required for base</p> <p>Products integrated with acquisition methodology (Energy W Installation Group) - blend into AoA process</p> <p>changing minds can be eased by taking those decision makers to locations that have piloted similar efforts, literally showing them the results of what have been done elsewhere that can meet their specific needs.</p>	<p>Installation Development Plan</p> <p>Redefine integrity metrics</p> <p>Change grading metrics for commanders that are translated into mission assurance</p> <p>Incorporate into mission assurance programs</p>	<p>Tools from Office of Local Defense Community Cooperation (OLDDC) Military Installation Resilience Reviews</p> <p>CLEOs Conservation Law Enforcement Offrs</p> <p>Underserved portions of local community (non-profits)</p> <p>Youth groups / boy scouts</p> <p>Arbor &amp; Earth Day Activities</p> <p>Military conservation corps (active duty) - Chief Petty Officers &amp; Navy Sub League</p> <p>Forest management orgs</p> <p>Navy divers do a significant amount of coral reef monitoring in HI, Guam and CNMI</p> <p>The General Landscapes Partnership is a coalition of federal agencies, state and local governments, and non-profit organizations that work with private landowners to address and coordinate land management practices around military installations and regions. Joint Base Lewis-McChord, which has joint resources in a designated General Landscapes Partnership.</p> <p>National Military Fish &amp; Wildlife Association has cert for practitioners &amp; annual training mtg</p> <p>State / watershed planning tools</p> <p>American Society of Landscape Architects</p> <p>Incorporate into NDAA</p> <p>Conservation Training Program for military cycling out for certs</p> <p>Collaborative modeling - engage groups so they feel involved and have voice</p>	<p>ASTM / ASCE - those affecting on/off base that reflect climate change &amp; non-stationary standards</p> <p>Definition around whose standards we're following</p> <p>ASCE, NFPA standards brought together - codes that span built &amp; natural enviro</p> <p>Move from siloed &gt; fiscal allocation approach of what budgets tied to. Look at USG investment on how to impact multiple missions simultaneously</p> <p>Following up on post-action monitoring and its benefits of gaining more understanding, setting goals and objectives under the auspice of adaptive management requires monitoring to determine if our goals or objectives are met, and if they aren't, adjusting our actions to achieve those goals and objectives.</p> <p>Require more flexibility to contract with local landowners that won't require a fee</p>	<p>President Budget funding lines</p> <p>Measurement of carbon seq impacts of construction options should be required</p> <p>Title 10 USC 29-12 - mechanism to get budgetary line item for benefits to leverage savings back to installation</p> <p>Pre-design data collection geared for eng practices (interd group)</p> <p>Cost savings of addressing climate risk - robust analysis</p> <p>Compliance for Energy Savings Contracts, Title 10 USC 29-13. Incorporate into ESTCP</p> <p>SERDP ESTCP programs have funding lines that may need tweaks to leverage</p> <p>DoD Legacy Program on regional ecosystem wide approaches</p> <p>Invest in monitoring capabilities to understand how the approaches self repair &amp; adjust over long periods</p>	<p>Culture - mindset switch from investment in mission assurance, not compliance</p> <p>Integration into planning (NLRAMPs, Master Plans), not just by reference</p> <p>Change minds of decision makers for what is a viable technology</p> <p>Present at Energy Exchange to break down barriers &amp; holistic view</p> <p>Understand what does/not work via small scale pilots</p> <p>Get away from GIS assessment and on the ground works</p> <p>Resilience functions siloed - must be coordinated at facility. Think about resilience across it!</p> <p>Translate resilience to mission criticality</p> <p>Between now and 50 years in the future, general public attitude will have changed to expect and mandate that all public investment will be undertaken through a lens of resilience for both human communities and the environment. It will no longer be acceptable for those issues to be a marginal consideration, but a core component of all USG expenditure</p>

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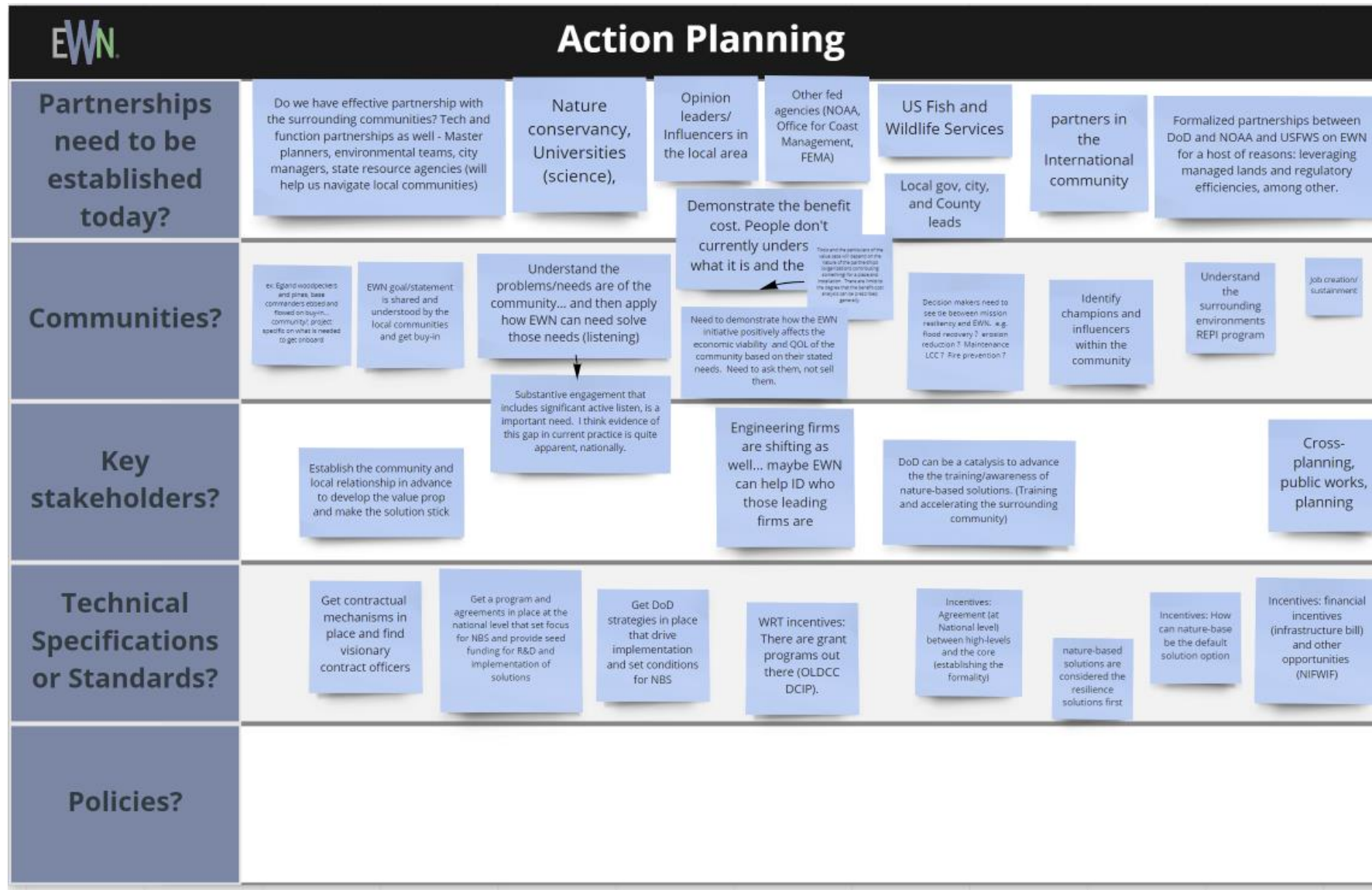
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# Action Planning Breakout - Initial Summary Findings

Immediate Next Steps	Quick Wins	Long Climbs	Critical Partners
<ul style="list-style-type: none"> <li>• <b>Continued Engagement with the DoD Community</b> – Leverage partnerships forged at the workshop to continue this work.</li> <li>• <b>Engage Congressional Leaders to Impact Regionality</b> – Begin engaging Congress to bring awareness to regional impacts.</li> <li>• <b>Share new DoD Installations Book</b> – Execute marketing around EWN Installations Book to bring awareness.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Identifying and Establishing Regional Stakeholder Groups</b> – Seek out regional stakeholder pockets around key installations.</li> <li>• <b>Identify Installations most Impacted by Climate Change</b> – Begin engagement with installation commanders and DPWs.</li> <li>• <b>Conduct data gathering efforts to support communications</b> – Find more performance data to share broadly.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>EWN Manual of Practice and UFC guidance</b> – Enhancing the toolbox of engineers, planners, and designers.</li> <li>• <b>Contracting Guidance and SOWs Specifically Tailored to NBS Requirements</b> – Create specific guidance for project requirements.</li> <li>• <b>Sufficiently Funded Monitoring and Evaluation to Build Knowledge Base</b> – Create programs to monitor performance and collect data</li> </ul>	<ul style="list-style-type: none"> <li>• <b>DoD Leadership Champions</b></li> <li>• <b>Installation Leadership</b></li> <li>• <b>Interagency collaboration with FEMA, HUD, NOAA, and Other Federal Partners</b></li> <li>• <b>Regional and Local Community Players in and around Target Installations</b></li> <li>• <b>Regional and national environmental protection organizations</b></li> </ul>

# Action Planning Breakout Session– Raw Output



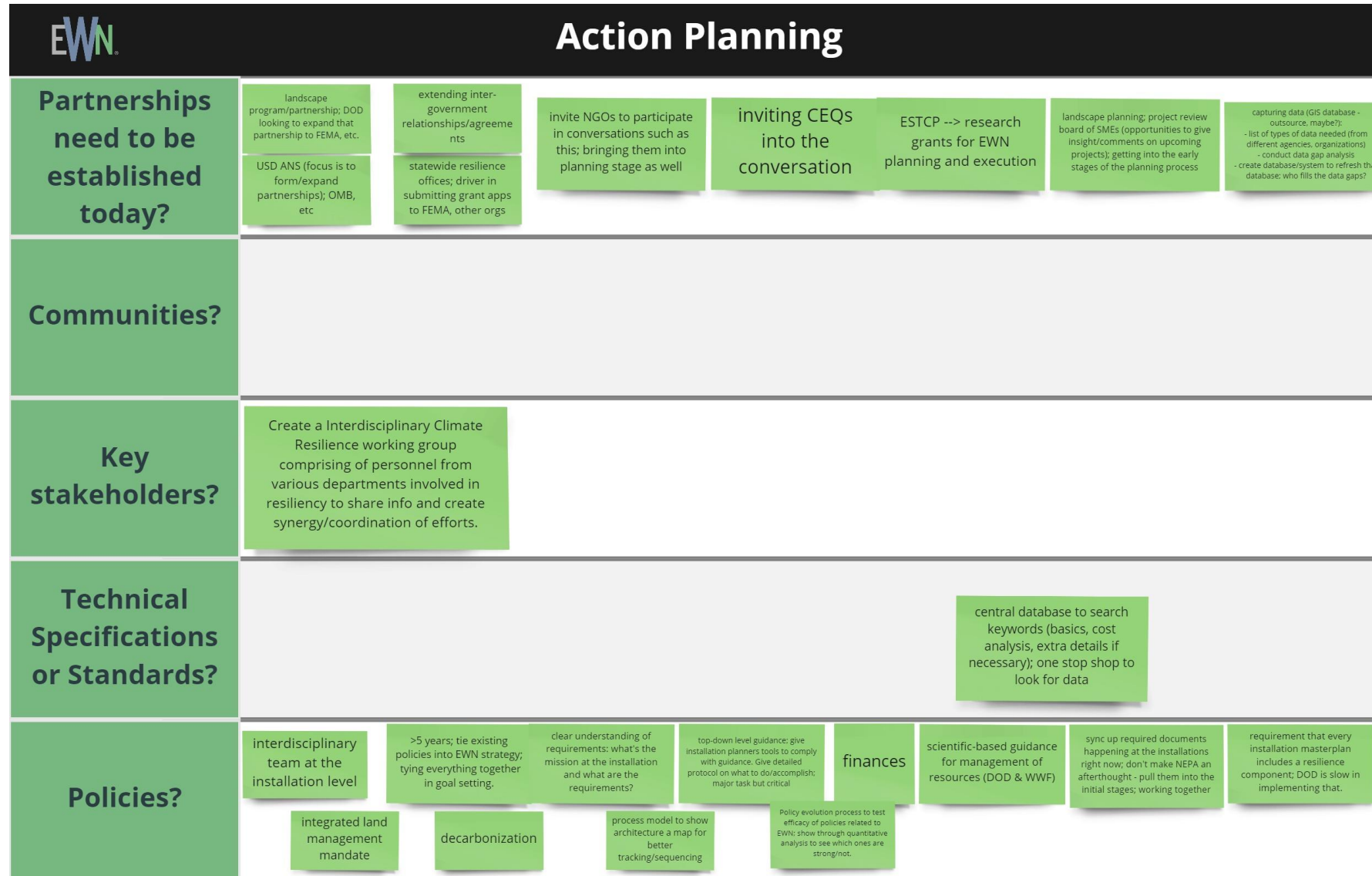
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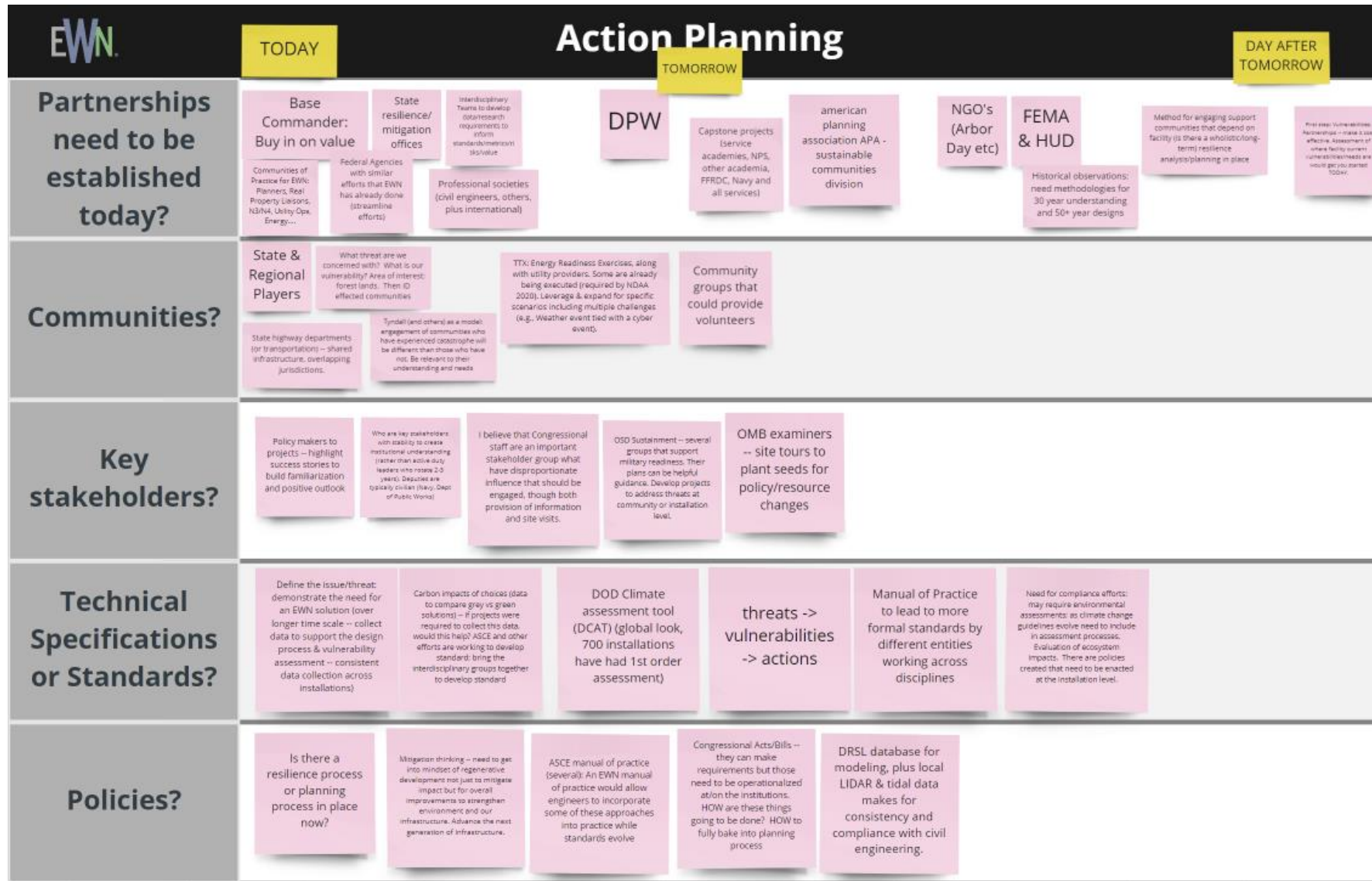
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