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HABITAT UNITS OVERVIEW IN USACE PLANNING

Water Resources Analysis Coalition: Monthly Public Forum

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PRESENTATION OVERVIEW

- **What are Habitat Units (HUs)? & Why do we use them?**
  - USACE Planning Process
- **How are Planning Models Developed?**
  - Central Everglades Planning Project (CEPP) authorized December 2016
    - Component of CERP improve quantity, quality, timing and distribution of flows to Northern Estuaries, central Everglades, and Florida Bay.
- **How do Habitat Units inform Plan Selection?**
  - Other considerations?

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WHAT ARE HABITAT UNITS? & WHY DO WE USE THEM?

The six steps of the planning process

1. Specify Problems & Opportunities
2. Inventory & Forecast Conditions
3. Formulate Alternative Plans
4. Evaluate Effects of Alternative Plans
5. Compare Alternative Plans
6. Select Recommended Plan

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WHAT ARE HABITAT UNITS? & WHY DO WE USE THEM?

- Engineering Regulation (ER) 1105-2-100 (*Planning Guidance Notebook)* requires that ecosystem restoration planning contribute to national ecosystem restoration (NER), which is measured in terms of increases in the net quantity and/or quality of desired ecosystem resources.

- The Corps uses NER benefits as the basis to compare alternatives and select plans for ecosystem restoration projects.

- Habitat Units (Planning Models) developed to estimate ecological restoration benefits.
  - Non-monetary units
  - Project specific developed through interagency Project Delivery Team (PDT)
  - Certified by USACE National Ecosystem Restoration Planning Center of Expertise (ECO-PCX) per EC 1105-2-412 (*Planning: Assuring Quality of Planning Models*)

WHAT ARE HABITAT UNITS? & WHY DO WE USE THEM?

- A Tentatively Selected Plan (TSP) is justified by ecological restoration benefits; however a comparison of the benefits and costs of alternative plans is conducted to ensure that the TSP is cost effective.

- Habitat Units are used as input to the Cost Effectiveness Incremental Cost Analysis (CE/ICA) per ER 1105-2-100 (*Planning Guidance Notebook*) to compare the alternative plans' average annual cost against the average annual Habitat Unit estimates
  - Screens out alternative plans that are not cost effective
  - Reveals changes in cost for increasing levels of environmental output (Habitat Units)
  - Helps decision makers answer the question….."**Is it worth it**?"……"**Are the additional Habitat Unit outputs worth the costs incurred to achieve them?**"

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WHAT ARE HABITAT UNITS? & WHY DO WE USE THEM?

- Habitat Units are used across USACE aquatic ecosystem restoration projects for relative comparisons between projects.
  - Approval of projects and program funding
    - Office of Management and Budget
    - Government Performance Reporting Act

- Other considerations (Budget Criteria)
  - Habitat Scarcity
  - Special Status Species
  - Hydrologic Characteristic
  - Regional and National Significance
  - Relationship to Corps or Projects Funded by Other Agencies

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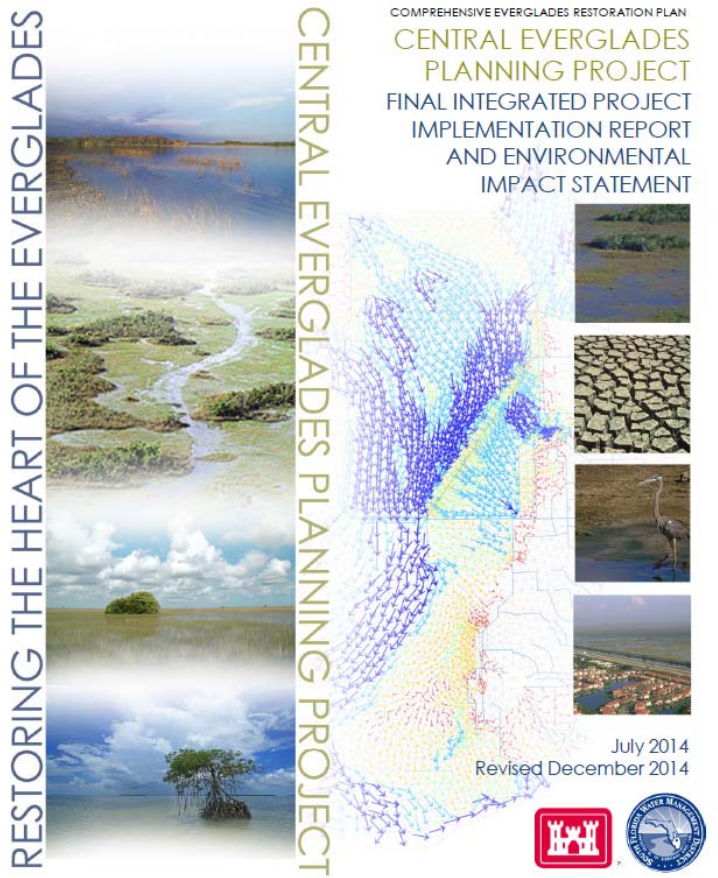
WHAT ARE HABITAT UNITS? & WHY DO WE USE THEM?



Habitat Unit Overview – Example CEPP

- Habitat Units are a metric to predict environmental benefits. Habitat Suitability Index (HSI): Measured over a geographic area (scores assigned 0 = worst and 1 = best)
  - Quantity = Acres
  - Quantity x Quality = Habitat Units
- Habitat Units are calculated using project performance measures
  - Developed through interagency PDT
  - Leverage RECOVER
- Regional hydrologic models used to calculate performance measures and estimate changes in hydrology.

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HOW ARE PLANNING MODELS DEVELOPED?

Performance Measure Overview

- Performance measures are indicators of conditions in the natural system that have been determined to be characteristic of a healthy restored ecosystem
  - Role of Conceptual Ecological Models (CEMS) in CERP

- Each performance measure should address at least one or more of the project objectives within the period of analysis.

- Performance measures are used to predict performance of alternative plans.
  - Metric
  - Target
  - Spatial Extent (Location)

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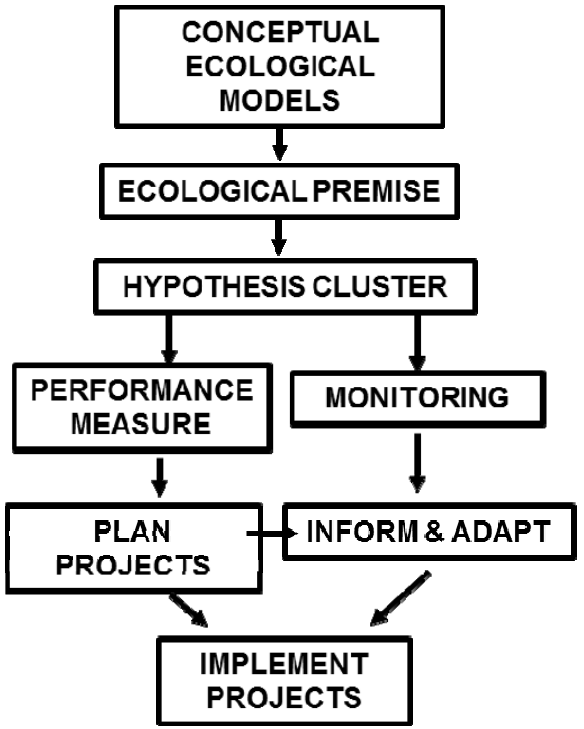
HOW ARE PLANNING MODELS DEVELOPED?

Conceptual Ecological Models

- Describe the ecological linkages between stressors and key attributes of the natural system
- Formulate hypotheses describing not only **what** system attributes are important but **why** changes occur
- Provide the framework for creating performance measures
- Habitat Units help to evaluate and compare plans to measure predicted performance not actual performance
    - Identify monitoring needs and plan the design of restoration programs and inform adaptive management

RECOVER Science Framework



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CEPP PERFORMANCE MEASURES LINKED TO PROJECT OBJECTIVES

CEPP OBJECTIVES	CEPP PERFORMANCE MEASURES					
	Salinity Envelopes Northern Estuaries	Soil Oxidation	Inundation Pattern	Sheet Flow	Slough Vegetation	Salinity in Florida Bay
1. ***Restore seasonal hydroperiods and freshwater*** *distribution* to support natural mosaic of wetland and upland habitat in the Everglades system			√	√	√	√
2. ***Improve sheetflow patterns and surface water depths and durations*** in the Everglades system in order to to reduce soil subsidence, frequency of damaging peat fires, declines of tree islands and salt water intrusion		√	√	√	√	√
3. Reduce ***high volume freshwater discharges*** from Lake Okeechobee to improve the quality of oyster and SAV habitat in the Northern Estuaries	√					
4. Reduce ***water loss*** out of the natural system to promote appropriate dry season recession rates for wildlife utilization		√	√	√	√	
5. Restore more natural **water level** responses to rainfall to promote plant and animal diversity			√		√	

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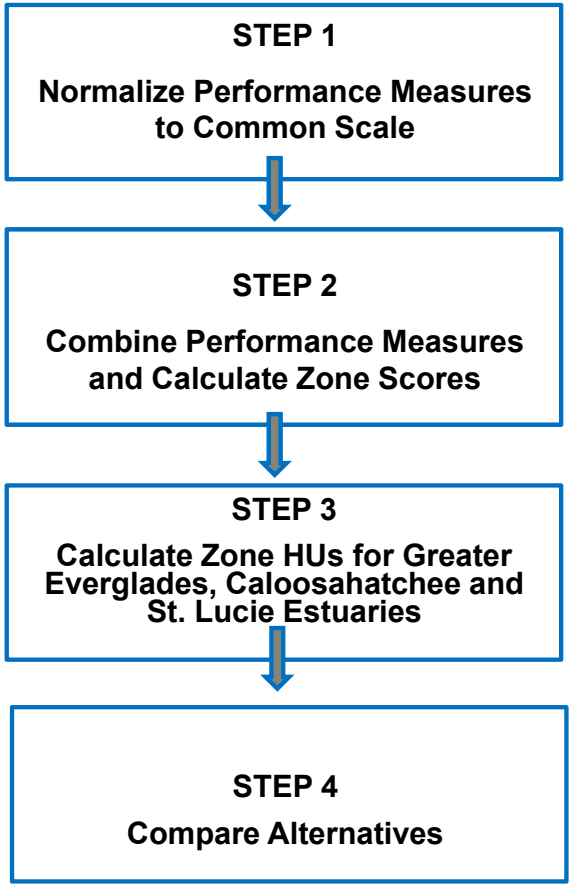
CEPP PERFORMANCE MEASURES – RECOVER APPROVED

PLANNING REGION	PERFORMANCE MEASURE	DESCRIPTION
Northern Estuaries	**Salinity Envelopes**	Measure of oyster and sea grass habitat based on frequency of flows from S-79 and S-80
Greater Everglades	**Hydrologic Surrogate for Soil Oxidation**	Measure of cumulative drought intensity to reduce exposure of peat to oxidation
	Inundation Pattern in Greater Everglades Wetlands	Measure of the number and duration of inundation events used to calculate the percent period of record of inundation
	Number and Duration of Dry Events in Shark River Slough	Measure of the number of times and mean duration in weeks that water drops below ground
	Sheet flow in the Everglades Ridge and Slough Landscape	Measure of the timing and distribution of sheet flow across the landscape.
	Slough Vegetation Suitability	Measure to evaluate the hydrologic suitability for slough vegetation
Florida Bay	**Salinity Florida Bay**	Measure of temporal-seasonal agreement between predicted salinity regimes in Florida Bay and pre-drainage salinity targets

Leverages interagency and interdisciplinary team

METHODOLOGY FOR QUANTIFYING HABITAT UNITS: EXAMPLE CEPP



Step 1: Raw performance measures sub-metrics are linearly re-scaled between 0 and 100.

Step 2: Within each zone, performance measure sub-metrics are combined for each project alternative to produce a net zone benefits score between 0 and 1. Zones facilitate review of how project benefits are spatial distributed throughout the project area.

Step 3: The 0 to 1 benefits score is then multiplied by the acreage of the zone to generate a HU value for the zone.

Step 4: Habitat Unit Lift = Alternative – Future Without Project Condition

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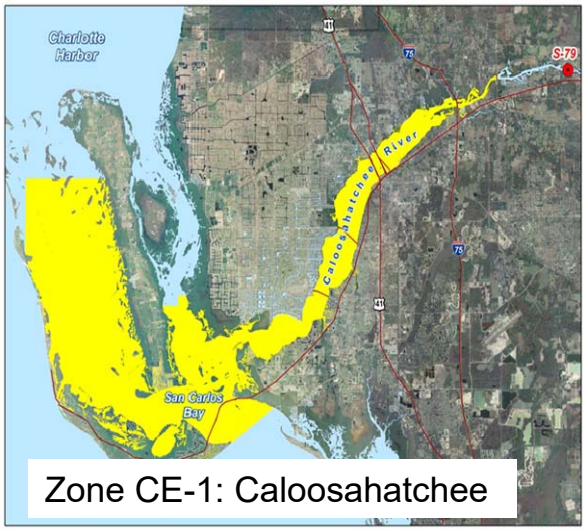
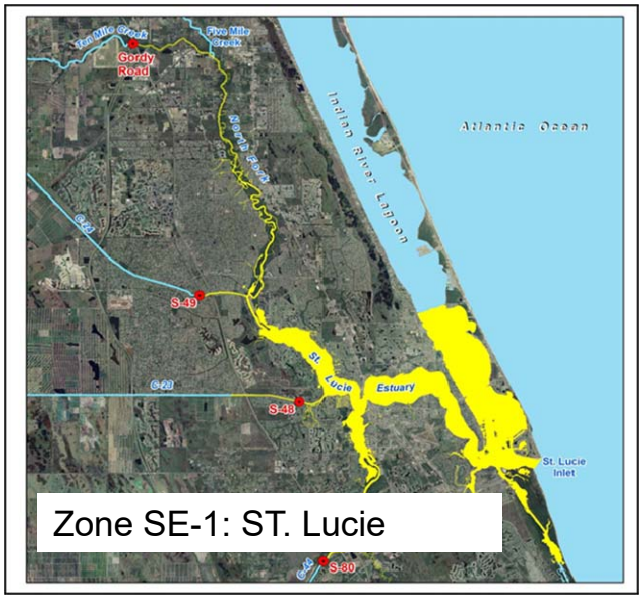
METHODOLOGY FOR QUANTIFYING HABITAT UNITS: CEPP

Northern Estuaries (Hydrologic Model: RSMBN)

- Performance measures within the Northern Estuaries were used to measure the suitability for oyster and SAV habitat based on target flows from S-79 and S-80. Zones delineated based on changes in salinity in relation to freshwater flows at structures.



Zone CE-1: Caloosahatchee



Zone SE-1: ST. Lucie

Maximum Area of Potential Benefit
CE-1: 70,979 Acres
SE-1: 14,994 Acres

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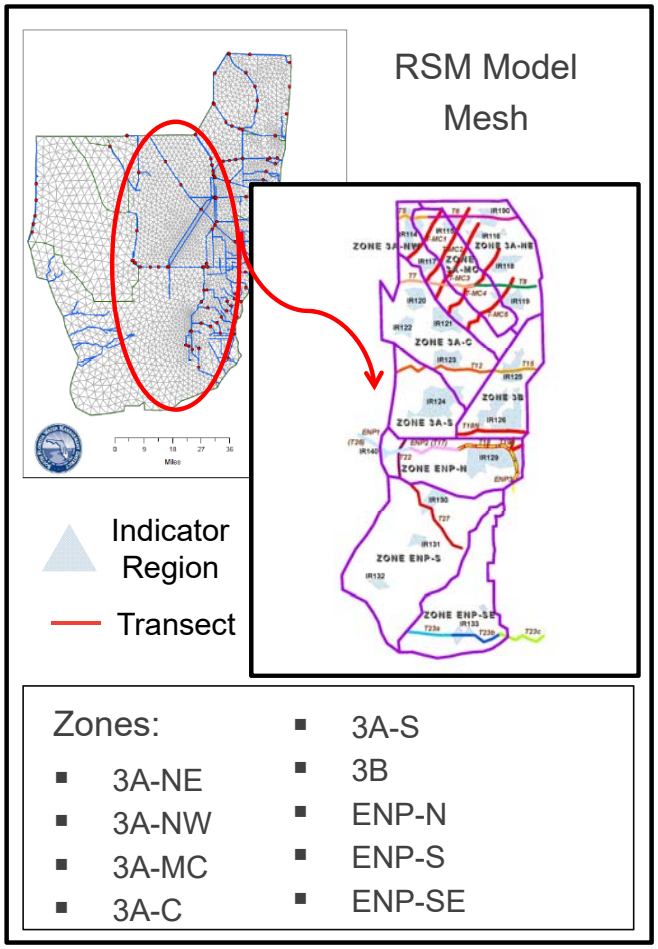
METHODOLOGY FOR QUANTIFYING HABITAT UNITS: CEPP



Central Everglades (Hydrologic Model RSMGL)

- Performance measures within the central Everglades were used to measure habitat suitability for the ridge and slough landscape.
  - Zones delineated based on differences in existing conditions.
  - Performance measures evaluated depth, distribution, duration of surface flooding (indicator regions) or timing and distribution of flows (transects).
- Maximum area of potential benefit 1,076,148 acres

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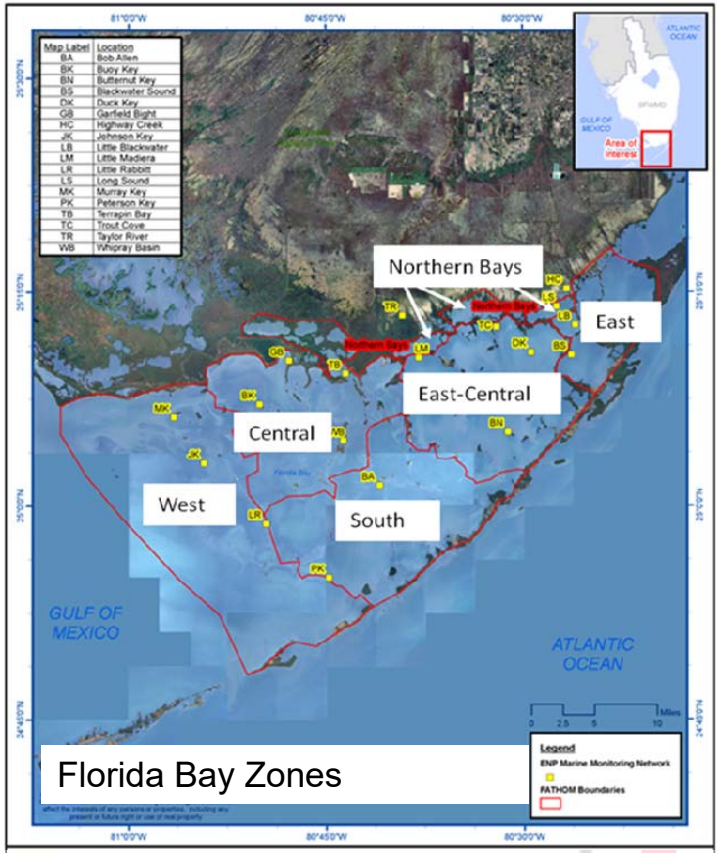
METHODOLOGY FOR QUANTIFYING HABITAT UNITS: CEPP



Florida Bay(Hydrologic Model RSMGL)

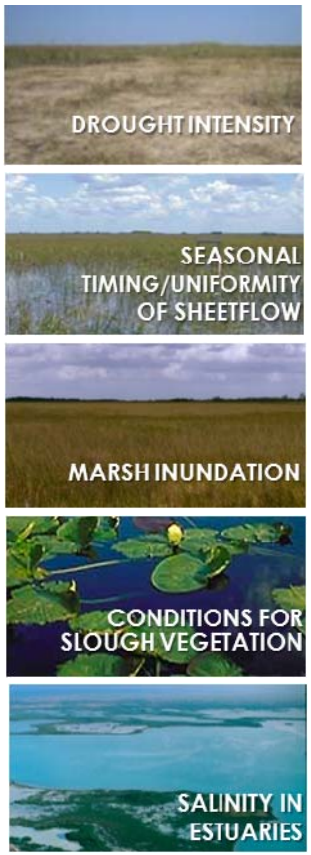
- Performance measures within Florida Bay were used to measure suitability for flora and fauna based on salinity.
  - Zones delineated based on water quality characteristics.
- Maximum area of potential benefit 476,096 acres

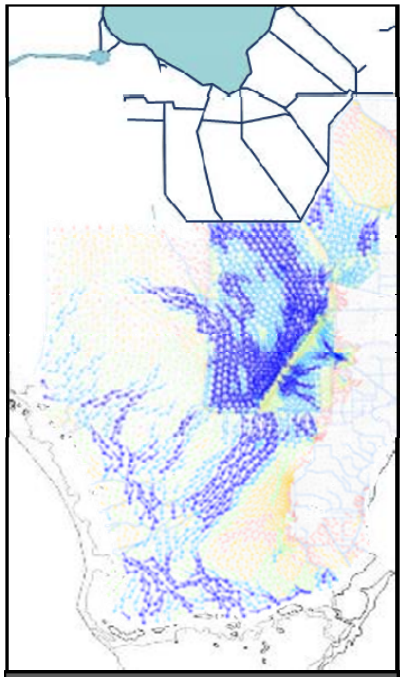
WHAT ARE HABITAT UNITS? & WHY DO WE USE THEM?

STEPS TO TSP

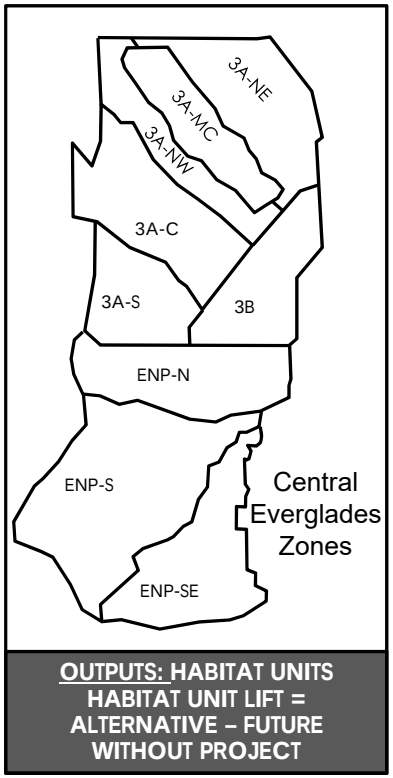
Develop Project Performance Measures → Identify Hydrologic Model Alternatives → Calculate % Target Achieved (Performance Measures) per Given Area → Evaluate Additional Environmental Effects and System wide Analysis

Developed from CEMs





OUTPUTS:
WATER DEPTHS, DURATIONS, DISTRIBUTION, TIMING



OUTPUTS: HABITAT UNITS
HABITAT UNIT LIFT = ALTERNATIVE – FUTURE WITHOUT PROJECT

- Environmental Effects
- Water Supply
- Flood Protection
- Real Estate
- Economics

Savings Clause

Habitat Units – One Piece of the Puzzle

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HOW DO HABITAT UNITS INFORM PLAN SELECTION?

- **Evaluation Accounts**
  - National Ecosystem Restoration (NER) → Habitat Units
  - Environmental Quality
  - Regional Economic Development
  - Other Social Effects

- **USACE Principles and Guidelines Criteria**
  - *Effectiveness:* extent to which an alternative alleviates problems and achieves opportunities
  - *Efficiency:* cost effectiveness/incremental cost analysis identified plans that maximize environmental benefits compared to costs
  - *Completeness:* extent to when a given alternative provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects
  - *Acceptability:* workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies

- **Risk and Uncertainty**

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QUESTIONS?