



## ASWM Energy Project Cumulative Adverse Effects

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# Webinar Overview

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- ▶ Project objectives
- ▶ Overview: Cumulative adverse effects (CAE)
- ▶ Assessment: A process for assessing cumulative adverse effects of pipelines on wetlands
- ▶ Questions/feedback



# Project Objective

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- ▶ Provide a literature review on framing, assessing, and managing cumulative adverse effects of natural gas transmission pipelines on wetlands
- ▶ Provide an approach to consider cumulative adverse effects under NEPA when conditioning pipeline permits
- ▶ Provide an actionable guidance document to support management decisions

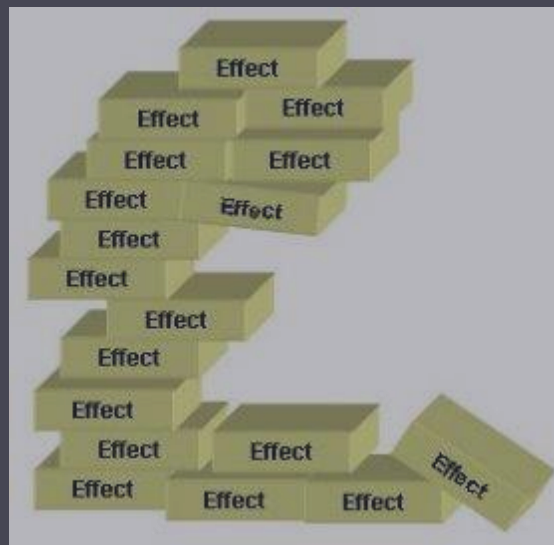


# Project Process

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- ▶ Association of State Wetland Managers developed “Cumulative Effects” sub-workgroup
  - ▶ Comprised of state, federal, and tribal representatives
- ▶ Members responded to a survey focused on defining adverse effects, hazards, and vulnerable wetlands
- ▶ Several working calls discussing aspects of framing
- ▶ Presentation to the group of the basic process
- ▶ Development of a white paper
- ▶ Overall results presented in the webinar





# Cumulative Adverse Effects (CAE)

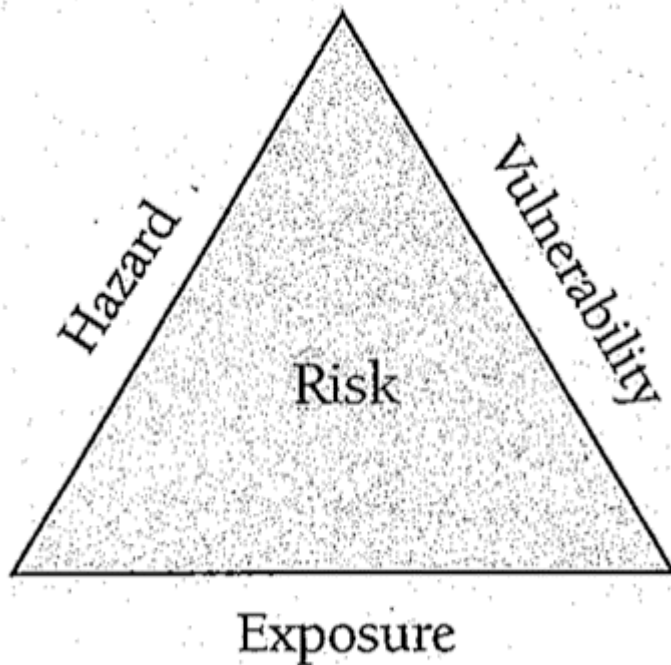
Background and Overview

# Why do we care?

- ▶ **Legal:** Legal requirement to include cumulative effects in environmental assessments in the U.S., Canada, U.K., E.U.
- ▶ **Ecological:** Ecologically it is the accumulation of all anthropogenic actions over time and space
- ▶ **Pipelines and wetlands:** While the effects of one project maybe insignificant, those cumulatively from multiple projects will lead to significant loss or conversion of wetlands



# What are Adverse Effects?



- ▶ **Hazards:** physical changes to the environment from pipelines
- ▶ **Vulnerability:** documented wetland sensitivity to hazards
- ▶ **Exposure:** present of wetland in a development area
- ▶ **Wetland adverse effects:**
  - ▶ Direct: Loss of wetland function and conversion
  - ▶ Indirect: Degraded water quality and modified hydrology

# What is cumulative adverse effects?

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- ▶ NEPA Definition: “Cumulative impact” is the impact on the environment which results from the **incremental impact of the action when added to other past, present, and reasonably foreseeable future actions** (40 CFR §1508.7)
- ▶ Cumulative adverse effects (CAE) is a **process** through which adverse effects accumulate
- ▶ CAE assessments are inconsistent partly because of a lack of clear framing





# What Type of Risk is CAE

## ▶ **Risk type**

- ▶ NOT Simple: Basic cause and effect
- ▶ IS Systemic
  - ▶ Complex: Cause and effects relationships multifaceted
  - ▶ Uncertain: Limits and absence of scientific knowledge
  - ▶ Ambiguous: Different perspectives



# How and why do we assess cumulative adverse effects?

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## ▶ Why assess CAE?

- ▶ Support conservation measures to avoid, minimize, and compensate for adverse effects
  - ▶ Cumulative adverse effects are reduced by minimizing adverse effects of each project

## ▶ How to assess?

- ▶ Must narrow the scope to have a meaningful assessment

## ▶ Risk governance process

- ▶ **Framing** the risk in order to assess
- ▶ **Assess** the risk in order to evaluate
- ▶ **Evaluate** the risk in order to manage
- ▶ **Manage** the risk



# Governing Cumulative Adverse Effects

- **Select** Take conservation measures to avoid, minimize and compensate for adverse effects

Manage  
(How are effects reduced?)

- **Identify** direct and indirect effects
- **Identify** hazards
- **Identify** vulnerable receptors

Frame  
(What are the types of effects from pipelines?)

- **Evaluate** the significance of the cumulative adverse effects based upon the severity of the hazard, exposure, and vulnerability

Evaluate  
(How significant are the effects?)

- **Determine** Hazard Severity
- **Determine** Exposure Severity
- **Determine** Vulnerability Severity

Assess  
(What wetlands are affected?)

# Homotypic Stressors of Pipeline Development

# Heterotypic

**ID Hazard**



Pipeline Construction



Pipeline Support Infrastructure Construction



Pipeline Maintenance



Other anthropogenic stressors

- Other construction
- Roadways
- Agriculture

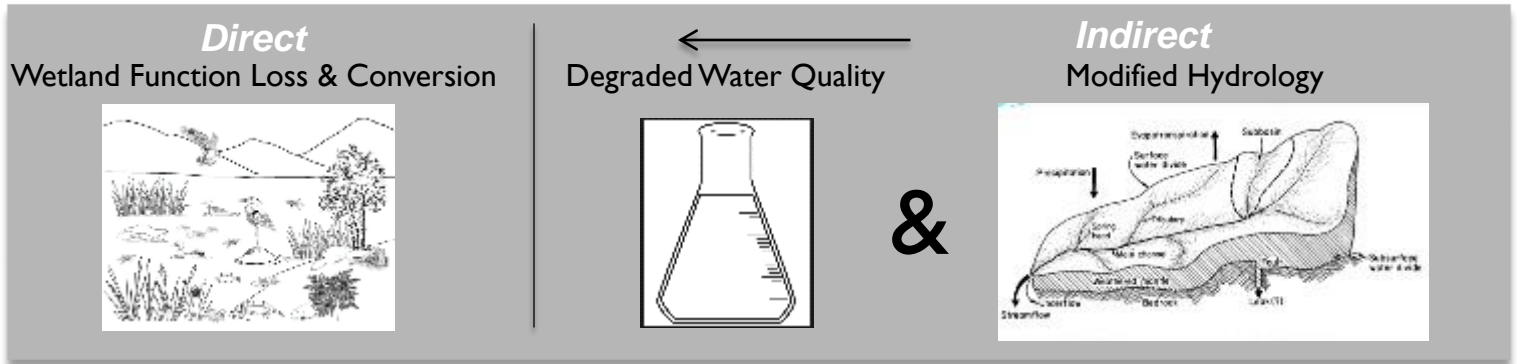
**ID Adverse Effects Pathways**



**Assess Exposure**



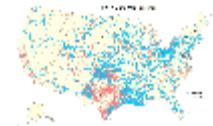
**ID Vulnerable Wetlands**



Temporal



Spatial



**Determine Cumulative Effects Pathways**

*Additive* ( $CAE = a + b$ )

*Synergistic* ( $CAE > a + b$ )

*Countervailing* ( $CAE < a + b$ )

Wetland Function Loss & Conversion

Wetland Function Loss & Conversion

**Evaluate Cumulative Adverse Effects**



## Assessing the CAE of Pipeline Development on Wetlands

# Framing (scoping)

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- ▶ Hazard Scope: Homotypic, i.e., pipelines only
- ▶ Receptor Scope: Freshwater wetlands as defined by NWI
- ▶ Primary Adverse Effects: Direct and indirect will be project specific
  
- ▶ Spatial boundaries
  - ▶ Political boundaries: Individual states
  - ▶ Watershed boundaries: HUC 6 & 8 watersheds
  - ▶ Pipeline buffer: 300 feet on either side of the central line of the pipeline
  
- ▶ Temporal boundaries
  - ▶ Past: Number of pipelines operating within the HUC watershed defined in the spatial scope
  - ▶ Present: Number of pipelines currently being permitted within the watershed
  - ▶ Future: Number of pipelines planned within the watershed



# Qualitatively Assess CAE

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- ▶ Determine hazard severity: How extensive is the project?
  - ▶ Identify adverse effects: What are the anticipated direct and indirect effects
- ▶ Determine *spatial* exposure severity: How many wetland are exposed and will be converted and/or will loose functionality?
- ▶ Determine *temporal* exposure severity: How does the proposed pipeline incrementally contribute to adverse effects from past, present, and anticipated development?
- ▶ Determine vulnerability severity: How significant (i.e., high quality) are the wetlands that are be exposed?
- ▶ **Evaluate Cumulative Adverse Effects:**
  - ▶ **What is the significance**



# Assessment Output

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## ▶ Development of a simple risk index

Project #	Hazard	Spatial Exposure	Temporal Exposure	Vulnerable Wetlands	CAE Index
1	0 - 5	0 - 5	0 - 5	0 - 5	0 - 1

## ▶ Index can then be mapped to categories

CAE Risk Level	CAE Index Value
Negligible	0 – 0.2
Minor	0.2 – 0.4
Moderate	0.4 – 0.6
Major	0.6 – 1.0





# Determine Hazard Severity

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- ▶ **How extensive is the project?**
  - ▶ How many miles is the planned pipeline?
  - ▶ How many support structures are planned?
- ▶ **What are the anticipated adverse effects?**
  - ▶ Direct
    - Is wetland loss and conversion expected?
  - ▶ Indirect
    - Are hydrological changes expected?
    - Is water quality degraded?

Make qualitative hazard severity determination: Scale 0 (negligible) - 5 (high) = **2**

Hazard	Number
Pipeline	10 km
Auxiliary structure A	1 structure
Auxiliary structure B	1 structure

# Assessment Matrix

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Project	Hazard	Spatial Exposure	Temporal Exposure	Vulnerable Wetlands	CAE*
1	2				

\* CAE = Cumulative Adverse Effects



# Determine Spatial Exposure Severity

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- ▶ **How many wetlands are being exposed?**
  - ▶ How many NWI wetlands within the study area (300 feet of the central line of the pipeline)?
- ▶ **How many wetlands within the watershed are exposed?**
  - ▶ How many HUC 8 watersheds will the pipeline pass through?
  - ▶ How many NWI wetlands are in each HUC 8 watershed?
- ▶ **Make qualitative spatial exposure determination:**
  - ▶ Scale 0 (negligible) - 5 (high) = **4**

<b>Wetlands</b>	<b>Number</b>	<b>Area (km<sup>2</sup>)</b>
Within project area	17	1.2
HUC 8	77	8,563
Percent of wetlands within watershed exposed	22%	< 0.001

# Assessment Matrix

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Project	Hazard	Spatial Exposure	Temporal Exposure	Vulnerable Wetlands	CAE
1	2	4			



# Determine Temporal Exposure Severity

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- ▶ **How does the proposed pipeline incrementally contribute to adverse effects from past, present, and anticipated development?**
  - ▶ Past: How many pipelines currently are operational within the watershed?
  - ▶ Present: How many pipelines are currently being permitted within the watershed?
  - ▶ Future: How many pipelines are planned within the watershed?
- ▶ **Make qualitative temporal exposure determination:**
  - ▶ Scale 0 (negligible) - 5 (high) = **I**



# Assessment Matrix

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Project	Hazard	Spatial Exposure	Temporal Exposure	Vulnerable Wetlands	CAE
1	2	4	1		



# Determine Vulnerability Severity

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- ▶ **How significant are the wetlands being exposed?**
  - ▶ What are the wetland types exposed to the project?
  - ▶ What is the conservation status of each wetland type?
  - ▶ What is the status of the wetlands within the HUC 8 watershed?
- ▶ **Make qualitative vulnerability determination: Scale I (low) - 5 (high) = 5**

NWI Type	Cons Status	# Project	Area Project (km <sup>2</sup> )	# HUC	Area HUC (km <sup>2</sup> )	% Exposed	% Area Exposed
Emergent	Low	2	0.1	45	10		
Scrub-shrub	Moderate	5	0.4	1,289	56		
Forests	High	1	0.2	234	34		

# Assessment Matrix

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Project	Hazard	Spatial Exposure	Temporal Exposure	Vulnerable Wetlands	CAE
1	2	4	1	5	





# Assessment Matrix & Index

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- ▶ Simple sum: Hazard + S. Exposure + T. Exposure + Vul. = 12/20 = 0.6 CAE index
- ▶ Weighted: Hazard + S. Exposure + T. Exposure + (Vul. x 5) = 32/40 = 0.8 CAE index
- ▶ Scale:
  - ▶ Negligible = 0-0.2; Low = 0.2-0.4; Medium = 0.4-0.6; High = 0.6 <

Project	Hazard	Spatial Exposure	Temporal Exposure	Vulnerable Wetlands	CAE Index
1	2	4	1	5	0.6-0.8

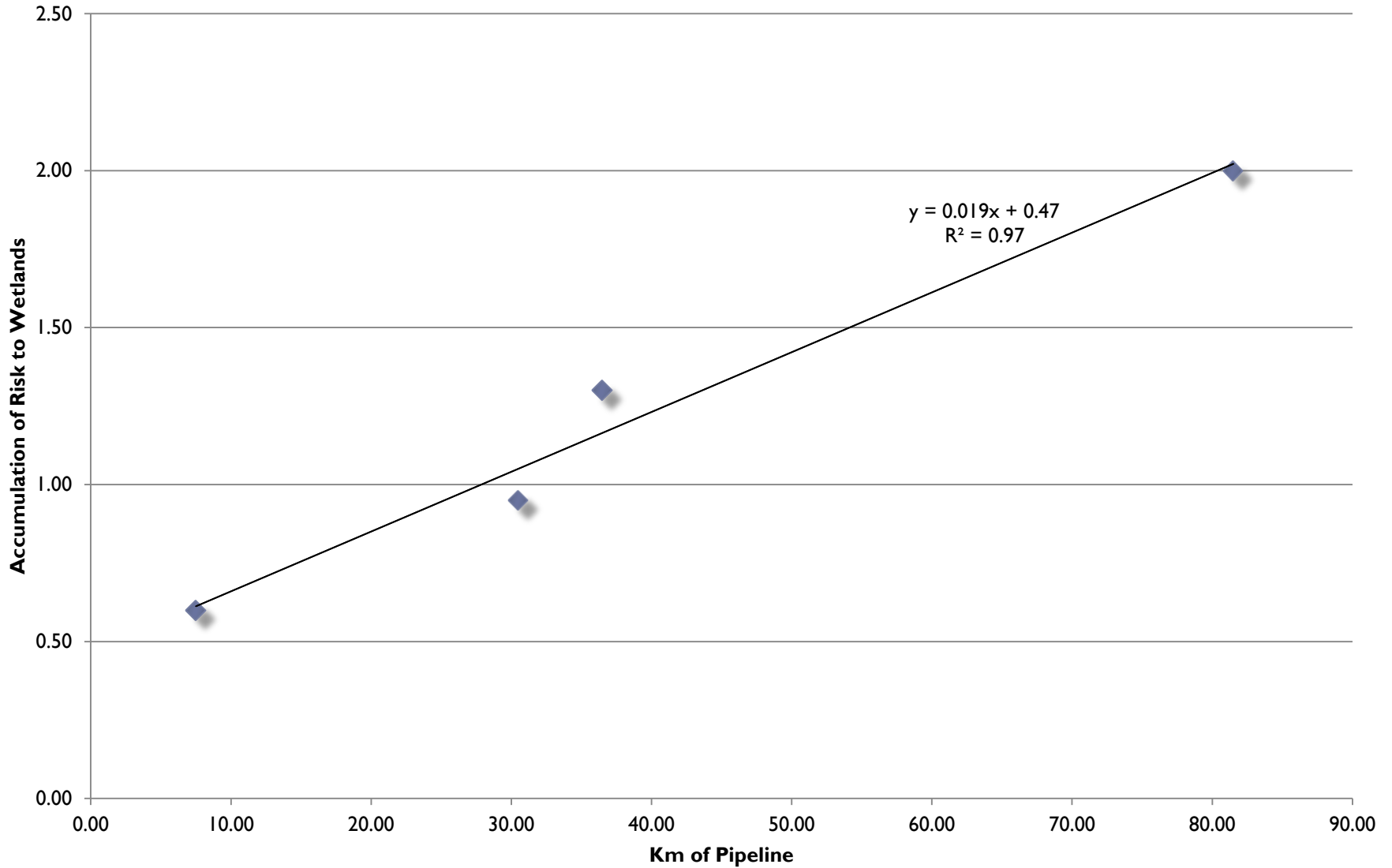
# Maine State Assessment Matrix

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Project	Km of Pipeline	Cumulative Sum of Development	CAE Index	Cumulative Sum of Risk
1	7.5	7.50	0.6	0.6
2	23	30.50	0.35	0.95
3	6	36.50	0.35	1.3
4	45	81.50	0.7	2



# Cumulative Adverse Effects of Pipelines on Wetlands in Maine



# Evaluate and Manage

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## ▶ Evaluate

- ▶ Based upon the assessment how significant are the cumulative adverse effects

## ▶ Manage

- ▶ What conservation measures or management actions should be taken to reduce cumulative adverse effects
- ▶ Inform selection of BMPs based upon CAE assessment





Thank you!

Questions, Comments?