A Systematic Approach to Cumulative Effects Analysis for Western Arctic Bowhead Whales

Examples from the 2007 Draft Bowhead Whale Subsistence Harvest Environmental Impact Statement

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Background

- Inupiat Eskimos of Alaska have harvested bowhead whales for thousands of years
- Bowheads are protected under Marine Mammal Protection Action and the Endangered Species Act
- International Whaling Commission (IWC) must sanction Alaska Native harvest of bowheads
- U.S. implements the IWC quota under the Whaling Convention Act
- IWC approved subsistence harvest of 255 whales in 5 years and no more than 67 strikes annually

(less than 1% of the Western Arctic stock)

Purpose and Need



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- NOAA Fisheries authorization of bowhead subsistence harvest for 2008-2012
- Purpose
 - Manage subsistence and conservation of whales as required by law

Need

 Recognize the cultural and nutritional needs of Native culture

Project Area



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Cumulative Effects

What are cumulative effects?

- Once direct/indirect effects of the harvest are analyzed...
- Incremental impact of a proposed action when added to past, present and reasonably foreseeable future actions (40 CFR 1508.8)
- Cumulative effects can be:
 - ✓ Countervailing

multiple factors combined = less impact than sum of parts

✓ Synergistic

multiple factors combined = more impact than sum of parts

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Principles of Cumulative Effects Assessment

- Proposed Action + Past + Present + Reasonably Foreseeable Future
- Set assessment boundaries in time and space
- Develop resource-specific criteria for analysis
- Set framework for analysis in relation to life cycle, extent, or carrying capacity of the resource, ecosystem, or human community

Step-By-Step Process

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- Identify issues and resources
- Establish geographic and temporal scope
- Define environmental baseline
- Identify current external stresses
- Identify cause and effect relationships between resources and proposed action
- Determine magnitude and significance of cumulative effect
- Modify action to avoid, minimize or mitigate impacts

The environmental baseline sets the context for analysis.

Describes historical trends leading to current state of environment

✓ Is the population increasing or decreasing?
 ✓ Population 10,500 whales

✓ Annual rate of increase of 3.4% (1978 - 2001)

Identifies past actions
 ✓Commercial whaling (1848 – 1931)
 ✓Subsistence harvest (ongoing)

Population 1978-2001



(George et al., 2004)

Whales Landed & Struck 1998-2006



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Current External Stresses

Disturbance from development

Climate change

Natural mortality

(disease, predation)

(changes in sea ice)

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Entanglement in fishing gear

Identifying Reasonably Foreseeable Future Actions

- Develop a process for screening what actions are considered reasonably foreseeable
- Are there proposed projects with obligated funds, plans, or permits?
- Eliminate speculative future actions



Relevant Future Actions





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- Subsistence activities
- Oil and gas activities
- Industrial pollutants
- Commercial fisheries
- Vessel traffic
- Other economic development
- Scientific research
- Climate change
- Natural mortality

Resource-Specific Criteria

- Life history
- Carrying capacity
- Distribution
- Sensitivities



- Unique "indicators" (mortality, disturbance)
- Unique significance criteria

Significance Criteria

- Provide basis for measuring relative impacts, and must be:
 - ✓ Precise and definable along a scale
 - ✓ Quantitative or qualitative
 - ✓ Reasonable and justifiable, not arbitrary
 - Applied consistently across all resources
- May be based on a biological, regulatory or legal threshold

Significance Criteria

		Impact Level				
Indicator	Impact Component	Negligible	Minor	Moderate	Major	
Mortality	Magnitude or Intensity	Total mortality assessment	Total mortality assessment between	Total mortality assessment between	Total mortality assessment	
		\leq to Q_{low}	\mathbf{Q}_{low} and \mathbf{Q}_{best}	Q_{best} and Q_{high}	≥ Q _{high}	
			155 – 257/yr	257 – 412/yr	> 412 /yr	
		<155 /yr or 775 for 5yrs	or 775 – 1285 for 5yrs	or 1285 – 2060 for 5yrs	or 2,060 for 5yrs	
Disturbance	Magnitude or Intensity	No measurable effects	Disturbance effects but distribution similar to baseline	Noticeable change in localized distribution	Enough to cause shift in regional distribution	



Past, Present, Future Links

	Past and Present	Foreseeable Future					
Human-Caused Events							
Subsistence activities	 Harvest of marine and terrestrial mammals, fish, and birds 	 Harvest of marine and terrestrial mammals, fish, and birds 					
Commercial harvest	 Commercial whaling (ended in 1931) 	■None					
Oil and gas activities	 Seismic Exploration Offshore drilling and production Industrial noise 	 Seismic exploration Offshore drilling and production Industrial noise 					
Natural Events							
Climate variability	 Climate change 	 Climate change 					
Mortality	PredationDisease and parasites	PredationDisease and parasites					
TRS							

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Past	Effects			and and a	
Indicator	Past Events/Actions		Porcistont Past		
Mortality	Commercial harvest 1848 Subsistence (ongoing)	3 -1931 →	Effect		
Disturbance	Offshore oil and Gas (since 1970s)				
D	irect/Indirect Effects				
Indicator	Preferred Alternative				
Mortality	Negligible at population level				
Disturbance	Minor in magnitude, e				
Ļ	↓ ·			Cumulative Effects	
Indicator	Past/Present Action	Future	Direct/Indirect Effect	Cumulative Effect on Whale Stock	
Mortality	Commercial harvest (1848-1931) Subsistence harvest	Subsistence harvest	Negligible at population level	Action contributes negligible amount of mortality. Cumulative effect negligible at population level.	
Disturbance	Oil and gas activities	Oil and gas activities Vessel traffic	Minor in magnitude, extent and duration.	Action contributes minor amount of disturbance. Cumulative effect is minor at population level.	

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Challenges and Controversy

- Information from other environmental reviews
 challenged in court
- Emphasis on "relative contribution" of action to cumulative effect
 - ✓ Does it downplay the cumulative effect?
 - What is the obligation to mitigate relative contribution?
- Climate change is a driving force we cannot control
 Resource managers are being asked to respond to climate change
- Vulnerable to legal challenge

Conclusions

• Rigorous evaluation of impacts with many variables

✓ Step-wise process prevents "missing a step"

• Tools to emphasize the real issues

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 Tables and matrices enable visual comparison of impacts and alternatives

 Satisfying legal requirements in a timely manner without wasting money

 Minimize legal vulnerability by using consistent approach that follows regulatory requirements

 Balance reasonable disclosure with avoiding speculation

Acknowledgements and Photo Credits

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Draft EIS Available Online

http://www.fakr.noaa.gov/protectedresources/whales/bowhead/deis/default.htm

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