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

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

Anne Southam, Taylor Brelsford & Jon Isaacs
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

- **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

Bowhead Whale Subsistence Sensitivity

This map was created by a project of the Alaska Bowhead Whale Commission and the U.S. National Science Foundation with the assistance of the U.S. Fish and Wildlife Service and the Bering Sea Community Science Collaborative. The map shows the seasonal migration routes and seasonal ranges of Bowhead Whales. The map also indicates areas of habitat, feeding grounds, and coastal communities.

Key:
- **Migrating Whales**: Red and green lines indicate the migration routes of Bowhead Whales.
- **Hunting Areas**: Yellow and pink areas indicate areas where Bowhead Whales are hunted.
- **Coastal Communities**: Bars and icons indicate coastal communities.

Legend:
- **Winter**: November through March
- **Spring**: March through June
- **Summer**: June through August
- **Fall**: September through November

Notes:
- This map is for educational purposes and should not be used for commercial or legal purposes.
- Map data sources: U.S. Fish and Wildlife Service, Bering Sea Community Science Collaborative, and other relevant organizations.

Map Credit:
- Map created by URS Alaska with support from the Alaska Bowhead Whale Commission and the U.S. National Science Foundation.
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
Cumulative Effects

**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

- 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

Estimated Population Size

Year

(George et al., 2004)
Whales Landed & Struck 1998-2006
Current External Stresses

- Natural mortality (disease, predation)
- Climate change (changes in sea ice)
- Disturbance from development
- 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

- 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

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Impact Component</th>
<th>Impact Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Negligible</strong></td>
</tr>
<tr>
<td>Mortality</td>
<td>Magnitude or Intensity</td>
<td>Total mortality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>assessment &lt; to $Q_{\text{low}}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$&lt;155$ /yr or 775 for 5yrs</td>
</tr>
<tr>
<td>Disturbance</td>
<td>Magnitude or Intensity</td>
<td>No measurable effects</td>
</tr>
<tr>
<td></td>
<td>Past and Present</td>
<td>Foreseeable Future</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Human-Caused Events</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsistence activities</td>
<td>▪ Harvest of marine and terrestrial mammals, fish, and birds</td>
<td>▪ Harvest of marine and terrestrial mammals, fish, and birds</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial harvest</td>
<td>▪ Commercial whaling (ended in 1931)</td>
<td>▪ None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil and gas activities</td>
<td>▪ Seismic Exploration</td>
<td>▪ Seismic exploration</td>
</tr>
<tr>
<td></td>
<td>▪ Offshore drilling and production</td>
<td>▪ Offshore drilling and production</td>
</tr>
<tr>
<td></td>
<td>▪ Industrial noise</td>
<td>▪ Industrial noise</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Natural Events</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate variability</td>
<td>▪ Climate change</td>
<td>▪ Climate change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td>▪ Predation</td>
<td>▪ Predation</td>
</tr>
<tr>
<td></td>
<td>▪ Disease and parasites</td>
<td>▪ Disease and parasites</td>
</tr>
</tbody>
</table>
### Alaska

#### Indicator Past/Present Action
- **Mortality**: Commercial harvest 1848-1931, Subsistence (ongoing)
- **Disturbance**: Offshore oil and gas (since 1970s)

#### Direct/Indirect Effects

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Preferred Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mortality</strong></td>
<td>Negligible at population level</td>
</tr>
<tr>
<td><strong>Disturbance</strong></td>
<td>Minor in magnitude, extent and duration</td>
</tr>
</tbody>
</table>

#### Persistent Past Effect

#### Cumulative Effects

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Past/Present Action</th>
<th>Future</th>
<th>Direct/Indirect Effect</th>
<th>Cumulative Effect on Whale Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mortality</strong></td>
<td>Commercial harvest (1848-1931) Subsistence harvest</td>
<td>Subsistence harvest</td>
<td>Negligible at population level</td>
<td>Action contributes negligible amount of mortality. Cumulative effect <strong>negligible at population level</strong>.</td>
</tr>
<tr>
<td><strong>Disturbance</strong></td>
<td>Oil and gas activities Vessel traffic</td>
<td>Oil and gas activities Vessel traffic</td>
<td>Minor in magnitude, extent and duration.</td>
<td>Action contributes minor amount of disturbance. Cumulative effect is <strong>minor at population level</strong>.</td>
</tr>
</tbody>
</table>

**URS Alaska**
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
  ✓ 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
Draft EIS Available Online

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

Acknowledgements

Kim Sheldon, Alaska Fisheries Science Center
Steven K. Davis, NOAA Fisheries
URS EIS Team

Photo Credits

National Marine Mammal Laboratory, NOAA Fisheries
Alaska Division of Tourism
Tom Dew, NPS
Nicole Grewe
Joan Kluwe
Angsar Walk