Multi-year sea ice
First year sea ice
2007 Sea Ice
Summer Climatic Ice Edge
Winter
Nautical Miles
0 100 200
0 200 400
Kilometers
THE ARCTIC IS WARMING FASTER THAN ANYWHERE ELSE
Recent (2005-2007) Central Arctic Fall Temperature Anomalies Greater Than +6° C

Annual Sea Ice Minimum

- Graph showing the annual sea ice minimum from 1980 to 2008.
- The previous record is marked in 2007.
- The year 2008 is marked with a question mark, indicating uncertainty or a new record.
ALBEDO FEEDBACK

ICE/OCEAN CONTRAST IN REFLECTIVITY

OPENING OF THE ICE PACK ALLOWS SOLAR HEAT TO WARM THE OCEAN
What about Summer 2008?

MULTI-YEAR ICE AMOUNTS

March 2007

March 2008

Age of ice

OW 1 2 3 4 5 6+
THE SUMMER ARCTIC ICE PACK IS MELTING AT A RATE THAT EXCEEDS MOST EXPECTATIONS

WHY SO FAST?

Anthropogenic + Unusual Climate Patterns + Ice/ocean Feedbacks = NEW STATE
Difficult to return to 1980s
We are on a faster track for sea ice loss than “Mean” model projections.
Sea ice reduction is expected to increase pelagic production at the expense of the benthic ecosystem.
Arctic Ecosystem: Ice micro-algae, mostly diatoms, grow in the ice and at the ice-water interface in the spring
Sub-Arctic Ecosystem: Shift from benthos-rich ecosystem to pelagic-dominated ecosystem in the Bering Sea

Walleye Pollock northward expansion

Increased Gray Whale calf production
The charismatic losers: Walrus Calves get separated from their mothers; Haul-outs are on land

Walrus calf  Carin Ashjian, 2004

Clam food
Climate Contributor to Endangered Species Act Responses on Polar Bears (2007) and Ribbon Seals (2008)

US Arctic Research Commission Transportation Report
Products

Annual Arctic Reportcard

September Sea Ice Outlook

North Pole Webcam
SUMMARY

Arctic Climate in the Last Decade is Unique Compared to 20th Century

40% sea ice loss in summer 2007, 2008?; other climate indicators

Causes: Anthropogenic + Unusual Climate patterns + Ice/ocean feedbacks = NEW STATE

Biology: Large Responses

Relevance:
Arctic is Changing!

Performance/Quality:
International Leadership-Outlook, Arctic Council, ESSAS, Publications, Invited Presentations

Transitions:
Reportcard, Endangered Species, Transportation, N. Pacific Fisheries Council, Alaska Groups

Future:
Stay the course
Biological Impacts
5th IPCC Report