

- Arctic coastal change & community-based observations
- Findings from a literature review & survey
- Illustrating key aspects of findings in Alaska case study
- Conclusions

Community-based observations help interface Indigenous and local knowledge, scientific research, and education in response to rapid Arctic coastal change

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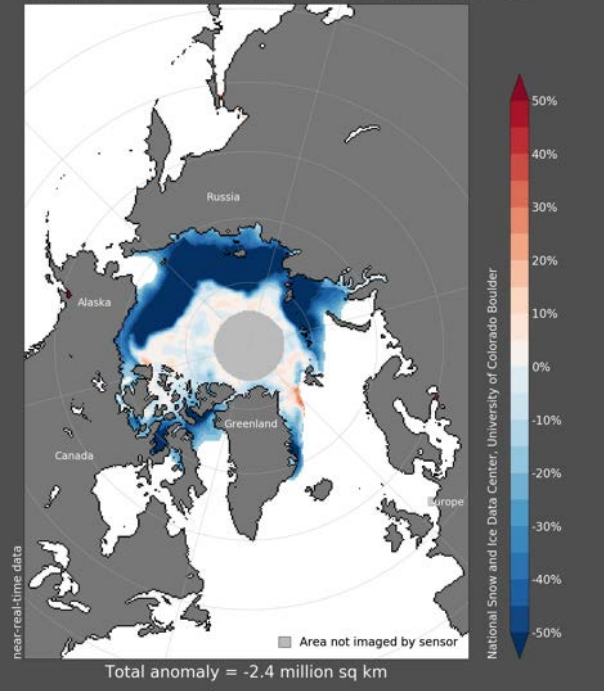


Key points

- Coastal sea-ice environments subject to most rapid change anywhere in Arctic
- Implications for coastal communities, food security, infrastructure & ecosystems
- Responses to such rapid change most effective when informed by local observations embedded in Indigenous & local knowledge
- Community-based observations create an interface for knowledge, scientific research, & (in)formal education to co-develop meaningful responses



Sea Ice Concentration Anomalies, Oct 2019



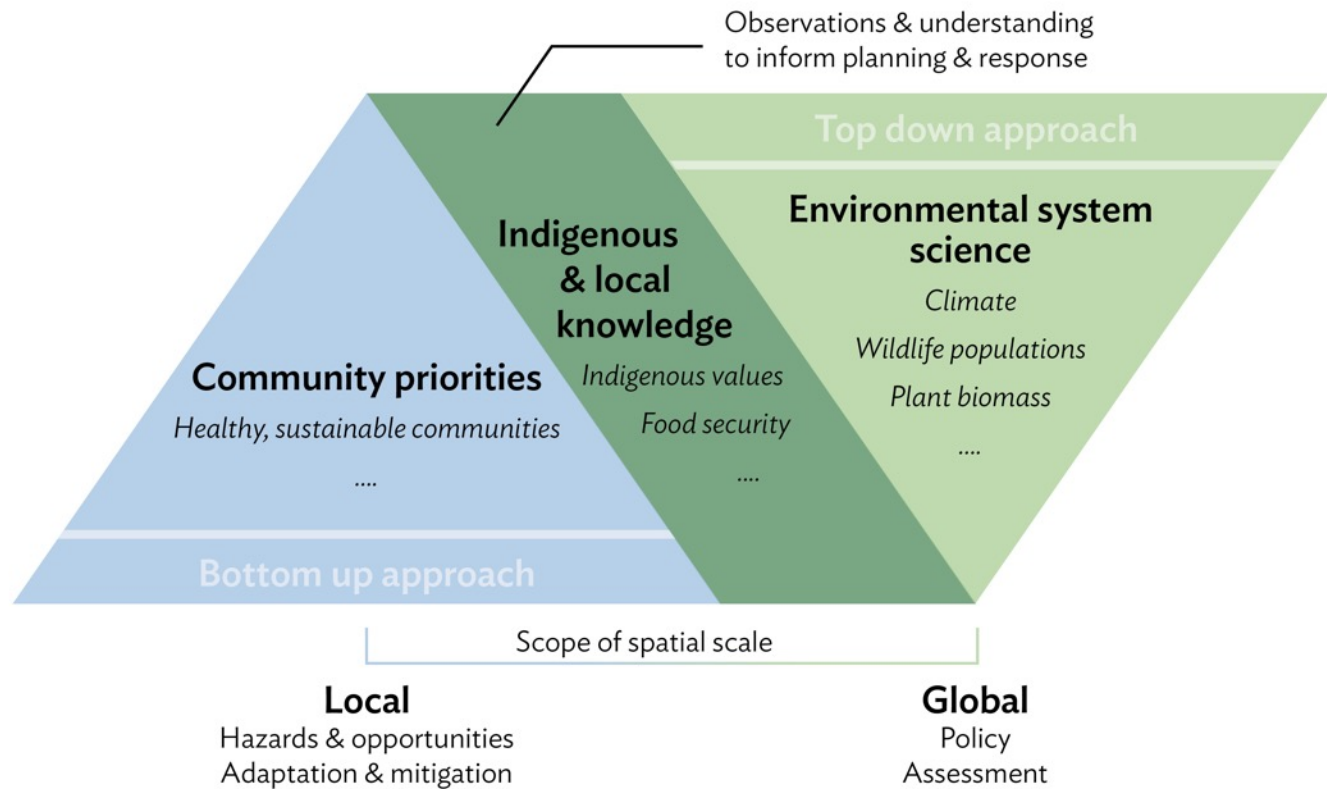
- Rapid loss of summer and fall sea ice exposes coastal communities & increases risk
- Recent losses of winter sea ice amplify impacts & contribute to ecosystem restructuring
- Community-based observations and Indigenous & local knowledge put change into perspective & point to response action

Arctic Extent Oct Anomaly Trend (1979 to 2018) based on 1981 to 2010 Extent Average
Extent average = 8.3 mil sq km; Trend slope = $-9.4 \pm 1.7\%$ per decade; Significant to 95%



Key points

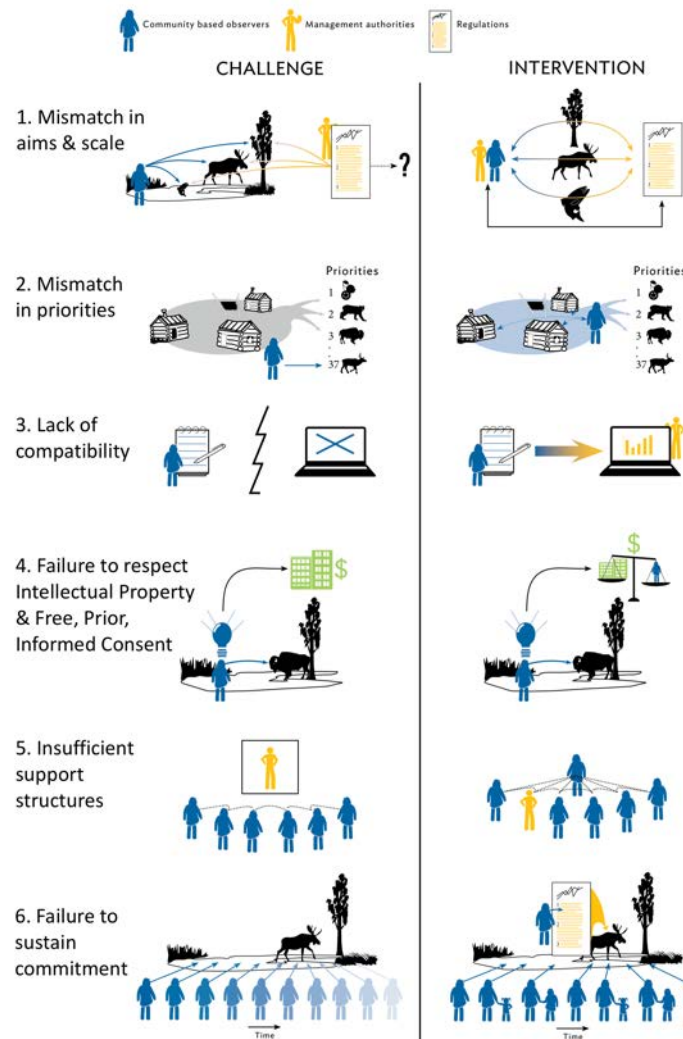
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- Community-driven observations and Indigenous & local knowledge form an interface between local-scale action-focused monitoring and international observing frameworks

Key points

- *Community-based monitoring analyzed through literature review of 128 projects globally and analysis of survey data for 30 Arctic efforts (Eicken et al., BioScience, in review)*
- *Research points to six key principles and interventions that aid effective monitoring, co-production & actionable science*
- *These include matching observing program & community priorities, creating sufficient organizational support structures, ensuring sustained community commitment*

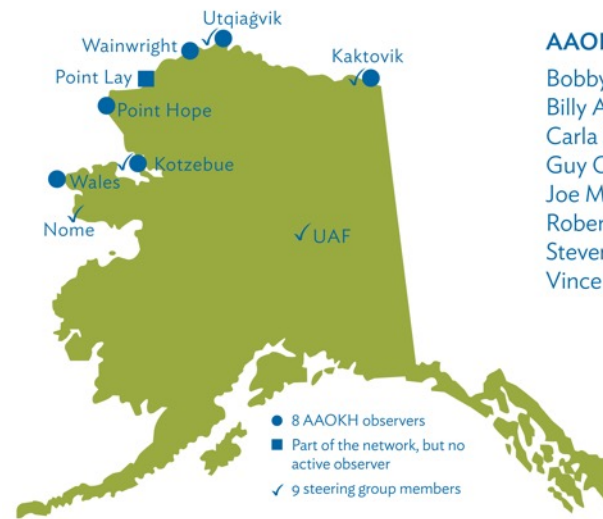


Key interventions to address challenges:

- Develop best practices for government agencies to incorporate community-based monitoring (CBM) into decision-making [1]
- Emphasize community engagement in academic assessment & promotion [1]
- Involve community representatives & CBM programs in observing system design & implementation [1,2]
- Raise funding agency awareness of co-production support mechanisms [2]
- Clarify data ownership & data use rights, develop model agreements drawing on Indigenist data management concepts [3,4]
- Include program sustainability in CBM design from outset, recognize importance of trust & capacity [5,6]
- Provide incentives for community member involvement similar to those for scientists, e.g. salary, recognition as co-authors [6]
- Include youth in monitoring process to build future monitoring capacity and sustain interest across generations [6]

Key points

- *Alaska Arctic Observatory & Knowledge Hub (A-OK) illustrates sharing of knowledge & tools around observations by Inupiat ice & marine ecosystem experts*
- *Collaboration with sea-ice geophysicists & marine biologists to track change in ice use & coastal environment*
- *Co-development of an observing framework & observations database provides an interface for exchange & an education resource*



AAOKH observers

Bobby Schaeffer, Kotzebue
Billy Adams, Utqiagvik
Carla SimsKayotuk, Kaktovik
Guy Omnik, Point Hope
Joe Mello Leavitt, Utqiagvik
Robert Tokeinna Jr, Wales
Steven Patkotak, Wainwright
Vince Schaeffer, Kotzebue



Practices implemented in A-OK:

- Involve community representatives & CBM programs in observing system design & implementation
 - Clarify data ownership & data use rights, develop model agreements drawing on Indigenist data management concepts
 - Provide incentives for community member involvement similar to those for scientists, e.g. salary, recognition as co-authors
 - Include youth in monitoring process to build future monitoring capacity and sustain interest across generations
- [Shown in light grey: Not implemented yet]

Key points

- Alaska Arctic Observatory & Knowledge Hub (A-OK) illustrates sharing of knowledge & tools around observations by Iñupiat ice & marine ecosystem experts
- Collaboration with sea-ice geophysicists & marine biologists to track change in ice use & coastal environment
- Co-development of an observing framework & observations database provides an interface for exchange & an education resource



What do the observations say?

AAOKH observations focus on sea ice, wildlife and coastal waters. They contribute to, and are stored in, a National Science Foundation-funded Exchange for Local Observations & Knowledge of the Arctic database (eloka-arctic.org/izonet). Since 2016, AAOKH observers have contributed nearly 3,000 community-based observations. These are combined with the historic Seasonal Ice Zone Observing Network database (2006–2016) for a total of over 7,500 local observations.

Fall themes

- Warm air & ocean
- Late freeze-up
- Open water, big waves
- Strong winds
- Shoreline erosion
- Longer whaling

Winter themes

- Cold temperatures
- Thick sea ice
- Low quality ice

Wainwright



Wainwright

October–November "Late fall freeze-up of ocean, warm weather and strong swells."

November 25, 2019 "Early fall weather in November and slush on ocean."

Steven Patkotak, AAOKH observer

Point Hope



Point Hope

October 4, 2019 "40°F. Rain all night and morning. Here's a picture from 2011 on today's date. I had my net under the ice. Look like the ice was almost 4 inches. From that date till now freeze-up is later and later."



October 25, 2019 "North beach swells 15–20 feet... Past two years the waves took two ice cellars."

November 26, 2019 "Strong winds last night, wind gust to 60+ mph. Old buildings blowing away, peoples roofing blew off last night. South side beach filled with slush."

January 30, 2020 "19°F, north 15–20 mph. Clear skies 10 mile visibility. North side [ice] almost 2 feet thick. South side thicker in most places because more ice layer build up."

Guy Omnik, AAOKH observer

Wales



Wales

March 21, 2020 "Breezy southerly winds at about 15 mph at about 10–15°F... the ice grew substantially from my last pictures in February. The ice froze, broken off, refrozen to have this jagged ice edge with over flow recently where the ice meets the land."

Robert Tokeinna Jr., Sea Ice for Walrus Outlook, an AAOKH partner organization

arctic-aok.org

- Evolution of partnership: Focus on tracking & understanding changing ice conditions & ice use → Local responses to changing conditions (ice trail mapping, hazard assessment & communication, ecosystem change)

Key points

- Social media (in particular Facebook) as most effective means for communication across A-OK communities, assessment of trends & hazards from observations
- A-OK website (arctic-aok.org) mostly used as repository & to access detailed observations & data sets

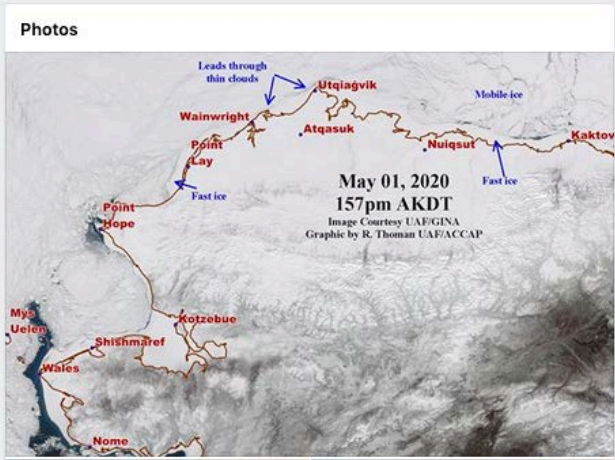


Alaska Arctic Observatory and Knowledge Hub
@ArcticAOK

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Contact Alaska Arctic Observatory and Knowledge Hub on Messenger

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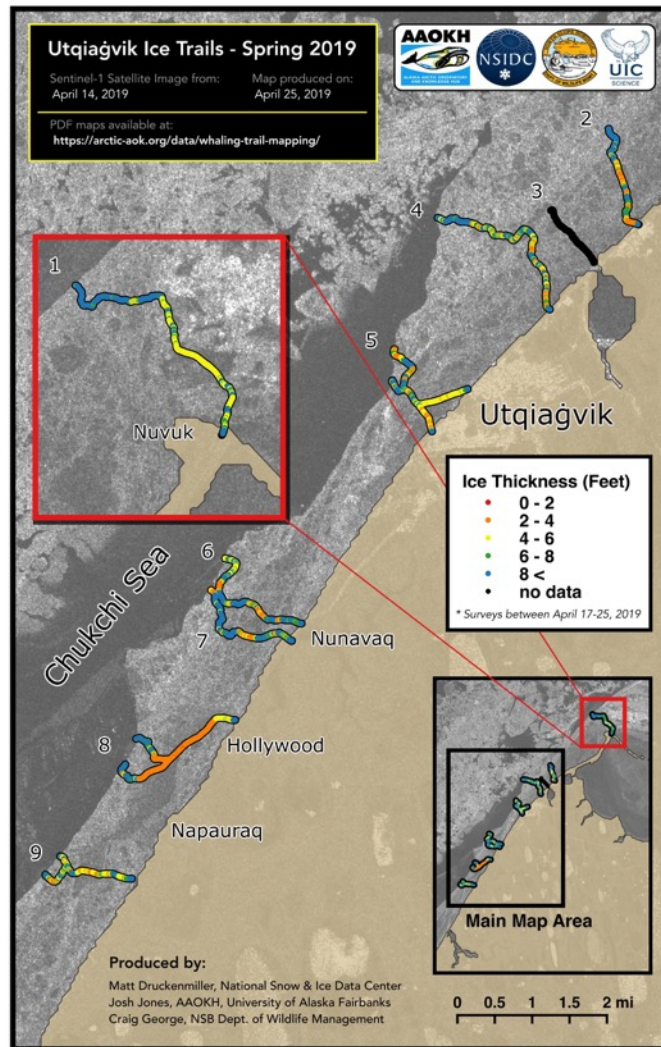
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Page created - July 12, 2016

Key points

- A-OK knowledge hub combines Iñupiaq sea-ice & environmental knowledge, daily observations, ice-trail surveys, satellite & coastal radar imagery to provide integral picture of coastal environment
- Most utilized & highly valued information products related to ice use & hazards

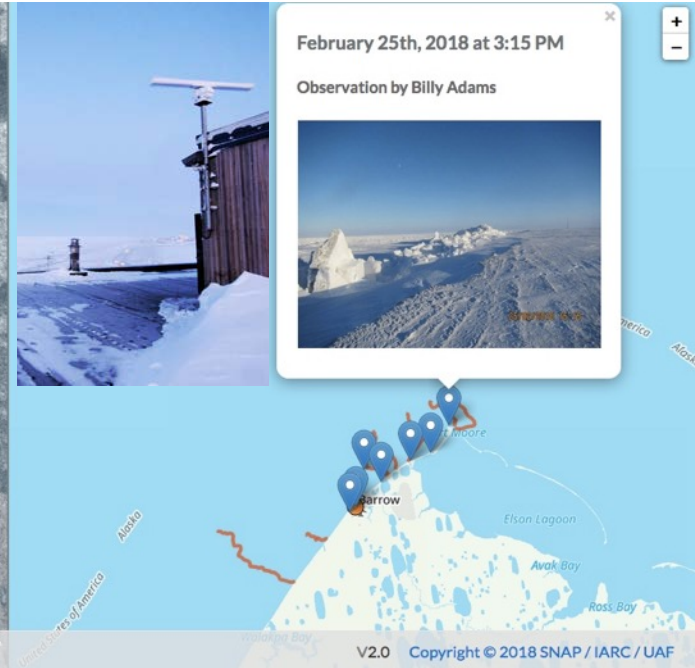
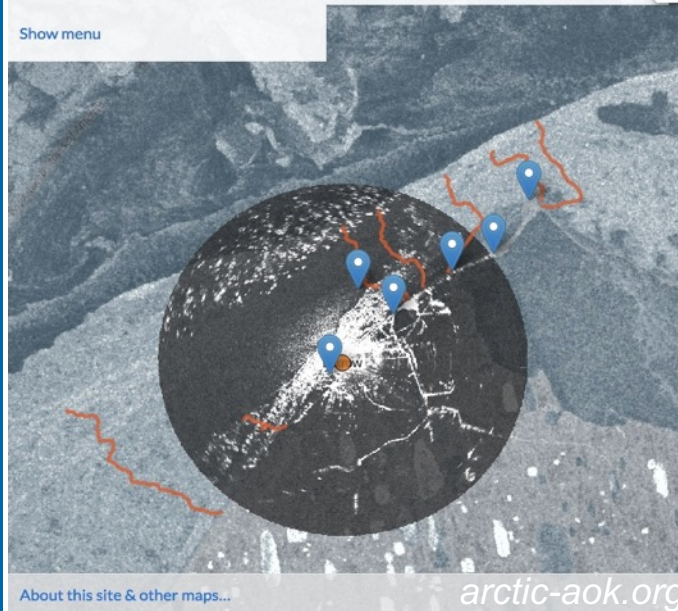


- Spring ice trail surveys conducted for over a decade (location, thickness) as important community resource
- Trail surveys also provide insight into adaptation to changing ice regime & changes in coastal sea-ice mass balance

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Alaska Arctic Observatory & Knowledge Hub

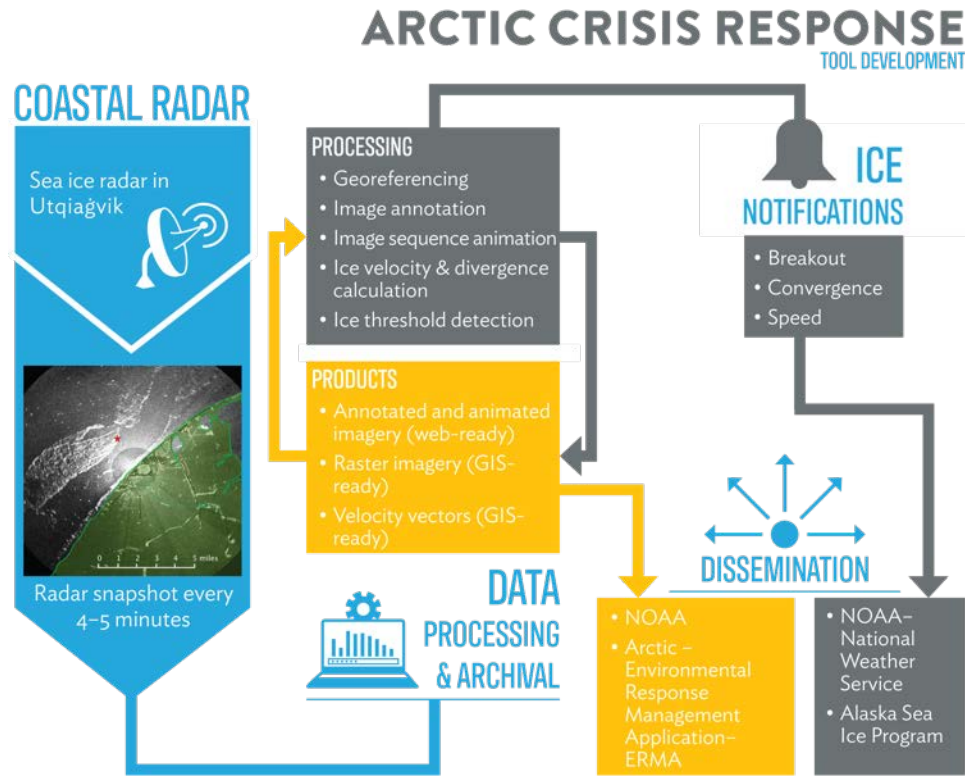


- Daily observations of ice conditions, coastal environment & coastal marine ecosystem by Iñupiaq knowledgeholders
- Observations informed & guided by use of ice & coastal environments
- In context of adaptation & decision-making near-realtime & subseasonal scale information products building on collaboration of greatest value
- Long-term observing record & observations database less utilized; value in education & knowledge preservation for each community



Key points

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- Most utilized & highly valued information products related to ice use & hazards
- Transition to operational information products next — but more challenging — step



- Hypothetical framework for ice & coastal marine hazard assessment drawing on expert observations & coastal radar
- Hazard assessment & communication scheme developed through guidance by community emergency responders & agency personnel (Kettle et al., 2019, Polar Geogr., DOI: 10.1080/1088937X.2019.1707318)

Thanks & Conclusions

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- CBM efforts fill pressing information needs, support desired management outcomes, enhance efficiency & sustainability of observing efforts, and reduce response times to adapt to a rapidly changing Arctic
- For CBM to inform planning, prediction & response requires continuity, focus on key variables & desired outcomes, as well as the capacity to sustain & adapt observations in rapidly changing settings
- Projects such as A-OK can serve as proving grounds to develop best practices & effective approaches
- Challenges that need to be addressed:
 - Program sustainability
 - Incorporation of CBM-derived information into government agency decision-making
 - Community engagement in academic assessment & promotion

