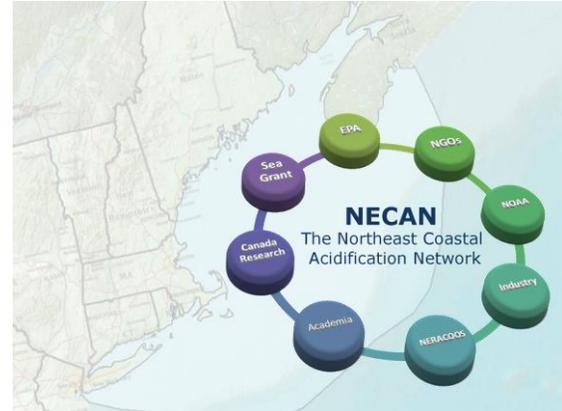


NECAN Implementation Plan

This implementation plan documents the goals and objectives for the Northeast Coastal Acidification Network (NECAN), achievements to date and specific strategies and activities to address the NECAN goals in the near future (5 years).

What is NECAN?

The Northeast Coastal Acidification Network (NECAN) is the leading organization for the synthesis and dissemination of regional acidification data and information. NECAN's mission is to provide rigorous and balanced scientific information to decision makers and user groups regarding the current state of knowledge of coastal acidification and its potential environmental and socio-economic impacts to the northeast region. NECAN also serves as a conduit through which these groups can provide guidance for regional research and monitoring. Established under the Northeastern Regional Association of Coastal and Ocean Observing Systems (NERACOOS), NECAN is a partnership among government agencies, industry and the scientific community. The NECAN region encompasses the coastal ocean from the high-water line out to the shelf-break from Long Island Sound to the Scotian Shelf.



NECAN's Vision: A NECAN region that is prepared to address and adapt to Ocean and Coastal Acidification (OCA). NECAN is an active voice in expressing potential impacts and solutions to the region.

NECAN's Goals:

- NECAN provides greater awareness of regional impacts of OCA that is translated into coordinated efforts to monitor, research, and mitigate the effects of OCA.
- NECAN is a model for other coordinated and effective attempts to address OCA on a regional scale.
- NECAN is an authoritative source of information on OCA and its impacts - ecological, economic and societal.
- NECAN works collaboratively, through working groups, to bring together resources on OCA to the diverse audiences in the region.

NECAN's Role:

- *Review and assess* the most recent scientific, technical and socio-economic information relevant to the economically important marine organisms potentially impacted by OCA.
- *Communicate* critical knowledge gaps identified by stakeholders to relevant state and federal agencies.
- *Coordinate* and set regional priorities for monitoring and research designed to further our understanding of OCA impacts.
- *Respond* to user and stakeholder needs in the region.

While the work of the organization is policy-relevant, it is intended as policy-neutral and not policy-prescriptive. NECAN will not develop policy goals or be a political advocacy organization (although it may be called upon to provide information that leads to policy deliberations). NECAN will also not be a data repository in itself, but may provide links to other relevant data sources. Nor will NECAN provide primary funding for monitoring or research, but will help to coordinate activities funded through other sources.

Background on ocean and coastal acidification

Global oceans are acidifying concurrent with rising atmospheric CO₂ at rates likely unprecedented in earth's history. Chemical changes in seawater as a result of the uptake of CO₂ include increasing concentrations of dissolved inorganic carbon (DIC), the production of carbonic acid (lowering of pH), an increase in the partial pressure of CO_{2,sw} (pCO_{2,sw}), and a decrease in the availability of carbonate ion. Nearshore waters are strongly influenced by the supply of varying amounts of DIC, total alkalinity (TA), dissolved and particulate organic carbon, and nutrients from riverine and estuarine sources which all significantly alter the local carbonate chemistry of the receiving water mass. Coastal acidification generally exhibits higher frequency variability relative to ocean acidification (except in cases of episodic upwelling) resulting in short-term episodic events measured on sub-annual or even sub-daily time-scales. However, long-term changes in nutrient loading and/or precipitation may also impart long-term secular changes in coastal acidification rates.

In the Northeastern US and Maritime Canada, significant freshwater input to the region yields coastal waters with a reduced buffering capacity making them uniquely vulnerable to coastal acidification relative to other regions. Nutrient loading from land-based sources promotes organic matter production that can subsequently result in intense respiration and drive up local CO₂ concentrations (Gledhill et al., 2016). The Northeast may be particularly susceptible to OCA due to the region's social and economic dependence on calcifying organisms such as clams, oysters, mussels and lobsters. We have a long history of connection with our coastal ocean, especially as a source of food.

Much uncertainty remains regarding the biological effects of ocean acidification and how it will interact with other global aspects of a changing ocean to alter marine ecosystems.

Furthermore, marine life stages most sensitive to OA (e.g., shellfish larvae) commonly reside in complex coastal waters which can exhibit enhanced coastal acidification (Gledhill et al., 2016).

Among the many industries that could be affected by ocean and coastal acidification are commercial fishing, shellfish harvesting, aquaculture, and seafood distribution. People operating businesses in those industries need objective information to help them prepare for and respond to the impacts. Policymakers and resource managers are beginning to address ocean and coastal acidification, and they require high-quality scientific information for decision-making. In turn, the scientific community needs input from stakeholders and decision-makers to design effective monitoring and research strategies for the region. NECAN is needed to provide an ongoing regional forum for the synthesis of the latest scientist, stakeholder and participant observations and needs.

NECAN Functions

NECAN has several objectives, which are outlined in this implementation plan. These include objectives for monitoring, research, communication and engagement, and regional coordination.

Monitoring. NECAN will foster coordination and recommend priorities for regional monitoring. Monitoring will help to identify important geographic areas at risk from OCA in U.S. and Canadian waters off the Northeast Atlantic coast. It can also highlight the role of coastal sources of carbon or nutrient enrichment which exacerbate global ocean acidification trends in regional coastal waters.

NECAN accomplishments:

- NECAN has created an inventory of existing monitoring capabilities (Gledhill et al., 2016).
- NECAN has fostered enhanced monitoring by partners in the region.

Future actions by NECAN:

1. Develop Practical Guidance for future and existing programs to assist with improving their practices and infrastructure. 2017.
2. Assist in augmenting existing programs to expand efforts to include OCA. Ongoing.
3. The monitoring inventory will be maintained and updated as new monitoring efforts are initiated, and the inventory will be made available on the NECAN website (necan.org). Ongoing.
4. Understand what OCA monitoring is required. Ongoing.

- a. Needs Assessment: based on stakeholder concerns expressed through initial workshops, NECAN will develop a high-level plan to evaluate what OCA monitoring requirements are to characterize OCA in the region. 2017.
 - b. Gap Analysis: NECAN will initiate a collaborative effort to identify, prioritize and address gaps in monitoring. 2017.
5. NECAN will provide a portal to access regional OCA data. 2017, dependent on funding.
6. NECAN will develop a strategy to engage citizens and industry in monitoring. 2018, dependent on funding.

Research. NECAN is not a research organization, nor does it provide research funds directly. However, NECAN will provide guidance and direction on research and observations as well as provide the latest research results in accessible formats.

NECAN accomplishments:

- NECAN hosted 16 webinars detailing the science behind OCA. These are archived on the NECAN website (necan.org).
- NECAN convened a state of the science workshop to summarize the latest findings and develop initial research priorities. These priorities were used by Sea Grant in a 2015 call for proposals.
- NECAN has written a scientific synthesis (Gledhill et al, 2015) and white paper (Gledhill et al, 2016) summarizing regional research results.

Future actions by NECAN:

1. Continue state-of-the-science webinar series as new results become available. Ongoing.
2. Maintain and update reference library on NECAN website. Ongoing.
3. Foster the development of a regional OCA model that integrates physical, hydrological, biological processes for hindcasting and forecasting. 2017-2018, dependent on funding.
4. NECAN will host periodic workshops/symposia and meetings to assess the state of the science and prioritize future research needs. 2017, dependent on funding.
 - a. Use these meetings to collate recent research results and active researchers
 - b. Panel discussion for upcoming research needs
5. NECAN will host a wiki page of regional research expertise. 2017.
6. Assist national efforts for research on the development of needed sensors for monitoring OCA. Ongoing.
7. Use research results to develop and promote adaptation and mitigation strategies. 2017.
8. Keep current with research advancements and provide recommendations on research priorities to funding agencies. Ongoing.
9. Link from NECAN website to national reports on research best practices. Ongoing.

Communication and Engagement. NECAN seeks to provide regional OCA information, raise awareness of key issues related to OCA and convene stakeholder workshops to document regional information needs

NECAN accomplishments:

- Convened six stakeholder workshops from Connecticut to Nova Scotia. These workshops provided localized information on OCA and engaged stakeholders on their observations and concerns. Results from the stakeholder workshops were synthesized and provided on the NECAN website
- Developed new user-friendly website
- Wrote 4-pager document introducing NECAN and other translation materials
- Maintained e-mail list and monthly newsletter
- Supported accessible video describing OCA and regional impacts
- Outreach to the scientific community about NECAN activities and objectives through posters and presentations at national meetings
- Provided information on the NECAN process to other developing coastal acidification networks
- Generated simplified “cartoon” on coastal acidification processes in the Northeast region

Future actions by NECAN:

1. NECAN will maintain a website as a resource portal for OCA in the region. Ongoing.
2. Continue to generate information products useful to stakeholders (Newsletters, “Breaking news” items (website, Twitter, Facebook, etc.)). Ongoing.
3. Develop and serve visualizations of monitoring and model results to allow people to assess the state of OCA in the region. Ongoing.
4. Develop and maintain web-based interactive conceptual model to allow comparisons to other regions. 2017-2018, dependent on funding.
5. Maintain reference library on NECAN website by incorporating new publications. Ongoing.
6. Generate information materials specific to policymakers and industry groups. Ongoing.
 - a. Directly link to economic impacts
7. Organize workshops and outreach activities. Ongoing. Dependent on funding.
 - a. Assess needs of geographic sub-regions, industries and/or economic sectors
 - b. Educator outreach
 - c. Science outreach and symposia
 - d. Training for monitoring, based on the Practical Guidance Document
8. Continue to produce synthesis materials describing regional OA drivers and effects including ongoing syntheses of Stakeholder needs. Ongoing.
9. Identify or provide information to support federal (EPA, NOAA) assessments and state commissions. Ongoing.
10. Coordinate local expertise to address stakeholder concerns. Depending on future funding, this may include:

- a. “Geek squad” to provide local expertise and assistance. Ongoing, dependent on funding.
- b. “Ask a scientist” option on website. 2017.

Regional Coordination is needed to foster dialog among interest groups, industry, agencies, researchers and local communities. Better coordination will promote collaboration and efficiency and ensure that the objectives above can be achieved.

NECAN accomplishments:

- All of the above: monitoring, research, stakeholder engagement
- Initiating working groups specific to research, industry, policy, communication and outreach

Future actions for NECAN:

1. Utilize website as a regional hub for all of the NECAN objectives. Ongoing.
2. Continue to support steering committee and working groups.
3. Develop forward-looking 5-year NECAN regional coordination plan. 2017.
 - a. Assess roles and membership of NECAN steering committee and working groups.
 - b. Enhance logistical and technical support for NECAN, identify full operating costs for:
 - i. NECAN Coordination
 - ii. PR/marketing and communications
 - iii. Data management
 - c. Identify key partnerships
4. Annual review of implementation plan and actions. Ongoing.
5. Coordinate with state and regional efforts (e.g. ISMN, MOCA, NROC, RARGOM, MACAN, etc...). Ongoing.

Summary

NECAN has made significant progress in the short time it has been in existence. In order to continue this progress, it is time to accomplish the specific actions detailed above to ensure that the NECAN region is prepared to address and adapt to Ocean and Coastal Acidification (OCA).

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