North American Terrestrial Ecosystem Carbon Monitoring Program

An Activity of the Tri-lateral North American Carbon Program (CarboNA)

UPDATED 9 AUGUST 2012

Prepared by: Richard Birdsey (USFS), Werner Kurz (CFS), Ben DeJong (ECOSUR), Rodrigo Vargas (CICESE), Fernando Paz (COLPOS), Alex Held (CSIRO), Giovanni Rum (GEO Secretariat), Douglas Muchoney (USGS),

Core Objective: *Implement an integrated observation, analysis, and forecasting program to support natural resources policy and land management decisions for North America.* This objective supports the goals of North American Carbon Program (CarboNA) and several of the special emphasis areas identified for international collaboration in North America: a) monitor and predict responses of the terrestrial ecosystem carbon cycle to biophysical controls and land management; b) estimate continental greenhouse gas budgets using data from inventories and remote sensing; c) support the development of government-level agreements on data sharing and harmonization; d) develop an approach for an integrated observation and reporting system for greenhouse gas mitigation across North America; e) identify tri-lateral mitigation strategies and opportunities for coordinated actions; and f) coordinate tri-lateral efforts to develop and deploy decision-support tools.

Specific Objectives

- Create a tri-national program to coordinate monitoring, analysis, baseline setting, greenhouse gas mitigation, and forecasting in support of Reducing Deforestation and Forest Degradation (REDD+).
- Anticipate future requirements of monitoring, analysis, reporting, and forecasting for Agriculture, Forestry, and other Land uses (AFOLU).
- Improve understanding of the socioeconomic drivers of Land-use Change (LUC) and integrate monitoring systems for socioeconomic analysis with monitoring of biological systems.
- Facilitate knowledge of terrestrial science priorities among North America, funding agencies and implementing institutions, sustainably focused on long-term objectives and needs of the program for observation, analysis, forecasting, and decision support.

Additional Benefits: The carbon monitoring program will provide the observation infrastructure necessary for sustaining biodiversity and other functions of terrestrial ecosystems.

Supporting Government Institutions and Sponsored Programs

Comisión Nacional Forestal (CONAFOR)
US Forest Service (USFS)
Canadian Forest Service (CFS)
National Aeronautics and Space Administration (NASA)
US Agency for International Development (USAID)
Group on Earth Observations – Forest Carbon Tracker (GEO-FCT)
SilvaCarbon (A US interagency program providing technical support for observation systems)

Commsion for Environmental Cooperation (Trilateral program)
National Ecological Observation Network (NEON)
Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA)
Instituto Nacional de Ecologia (INE)

Supporting Academic and Research Institutions

Colegio Postgraduados (COLPOS)
El Colegio del Frontera Sur (ECOSUR)
Centro de Investigación Cientifica y de Educación Superior de Ensenada (CISESE)
Centro de Investigación Cientifica de Yucatán (CICY)
Consejo Nacional de Ciencia y Technología (CONACYT)
Princeton University
University of Pennsylvania
University of Florida
University of Toronto
Laval University

Background – ongoing and contributing projects and programs

- CarboNA: selected active projects from the trilateral list (http://nacarbon.org/carbona/index.htm)
- CEC: North American Landcover Change project, and planned Carbon Dynamics project
- USAID/Forest Service: Sustainable Landscape program of work with Mexico
- AmeriFlux and MexFlux, and Canadian networks of microclimatological towers
- Canada/Mexico implementation of the Carbon Budget Model (CBM-CFS3)
- SilvaCarbon and GEO-FCT implementation of North-South-South collaboration
- American Icesat-GLAS Assessment of Carbon (AMIGA-Carb) project
- National Forest Inventories of the 3 countries
- Western Hemisphere network of intensive observation, validation, and demonstration sites

Key Approaches and Methods

The overall observations approach involves integrating remote sensing, field data, and terrestrial species and ecosystem dynamics models. This integrated approach will:

- Determine how to best use remote sensing for monitoring natural and human disturbances, for compiling activity data to support international reporting requirements, and to ensure compatibility with *in-situ* observations.
- Develop a multi-step process for model-data fusion to improve analysis and synthesis of observation data with models (Figure 1). This process will lead to estimates of carbon stocks and fluxes for carbon pools that are not easily observable remotely or *in situ,* for example, below-

ground carbon in roots and soil. This process also supports needs for forecasting ecosystem dynamics (next item).

- Develop consistent continental-scale methods to estimate and forecast ecosystem dynamics (e.g. growth and mortality, species composition) and nutrient cycling under scenarios of climate change and land management
- Improve data consistency among the 3 countries and establish data management and support systems including remote sensing and field plot data supported by ongoing and contributing programs
- Provide support for decision making by developing modeling frameworks for data synthesis and integration with respect to:
    - National and international reporting requirements (AFOLU)
    - Scenario analysis (e.g., for REDD+, climate change mitigation analysis)
    - Analysis of uncertainties of data, models, and future scenarios

Existing programs providing funding support for related work

- CEC: expanding the North American LULC project to carbon accounting and management, with a focus on improving capacity in Mexico
- USAID/USFS: supporting sustainable landscapes in Mexico through improved monitoring and analysis for REDD+
- USAID/SilvaCarbon: providing technical support for improving observation systems
- GEO-FCT: providing remote sensing data, analyses techniques and coordinating support for National Demonstrator countries, including Mexico
- NRCan-CFS: providing CBM-CFS3 model and technical support in its application in Canada and Mexico.
- CONACYT: supports basic and applied sciences in Mexico including investigations related to the environment

Communication strategy

- Work with existing contributing trilateral programs (e.g., CEC, North American Forestry Commission, CarbonNA)
- Engage in discussions with key bilateral programs (e.g., FS/CONAFOR, CFS and Mexico)
- Explore ways to improve Program Management level of involvement in selecting projects for funding support. For example, consider working with the Mexican agency CONACYT

Timelines

Long-term: This Program is envisioned to last for 5 years at which time a review would take place

Short-term: Establish program within 6 months

Outcomes

- Improved collaboration among scientists leading to significant advances in understanding of terrestrial ecosystem dynamics to support the goals of CarboNA, specifically:
    - To determine the temporal and regional distribution, magnitudes, and turnover of carbon pools and greenhouse gas fluxes throughout North America;
    - To understand how these affect and are affected by disturbances, societal drivers, weather variability, and climate;
    - To explore the factors shaping mitigation responses and evaluate carbon related mitigation strategies and new technologies for measuring and monitoring carbon.
- Opportunities for improved tri-lateral coordination of science funding and project implementation.
- Capacity building to support resource management and policy decisions, leading to sustainable ecosystems and services to society.
- Coordination of data and observation systems to efficiently facilitate integrated and complex analyses.
- A continental-scale vision for synthesis and forecasting of information, including improved availability and security of data following a tri-lateral data use policy.
- Institute a long-term view of the benefits from collaboration, targeted to next generation of scientists.
- Additional outputs specific to projects within this program, including development of tools in support of policy development and implementation for international programs such as REDD+.