The Cordillera Forest Dynamics Network (CORFOR)

CORFOR is a network of scientists and institutions, focussed on understanding forest responses to global changes in mountainous ecosystems along the American Cordillera.

Background

How climate change affects forests is still strongly debated (Phillips et al. 2004, Wright 2005, van Mantgem and Stephenson 2007, Chave et al. 2008). The Cordillera Forest Dynamics Network (CORFOR) will provide key data to answer that question for the mountain backbone of the Americas.

CORFOR was born in Argentina in 2006 as a working group of the larger America Cordillera Transect for global change research. CORFOR is a collaborative group of scientist who maintain hundreds of Permanent Forest Plots (PFP) monitoring thousands of individual trees. These plots cover a wide latitudinal range from temperate to tropical forests, and provide an opportunity for detecting patterns of change at large scales. Mountain systems also are characterized by steep environmental variation over very short distances, offering an opportunity to develop ecological experiments over small spatial scales as well. Empirical and theoretical results from CORFOR, covering studies on forest maintenance and functioning from local to continental scales, will shed new light on forest responses to climate change and other global changes. This information is of tremendous value to policy makers, land managers, environmental agencies and stakeholders all over the world.

Objectives of the network

- Improving the understanding of tree species dynamics and distribution, carbon fluxes, and other environmental services such as water supply and regulation provided by forested mountain ecosystems.
- Improving the mechanistic understanding of forest responses to global changes (in particularly to climate change), and therefore our capability of forecasting and modeling expected future changes in terms of composition and function (Stephenson and Duque 2008).

CORFOR membership

CORFOR held its first workshop in June 2008 as part of the MTNCLIM 2008 meeting held in Silverton, Colorado, USA. Twelve people attended the CORFOR workshop representing eight institutions in five countries, and consisting a quorum for the establishment of basic principles for CORFOR operation. CORFOR does not intend to be the data manager for other research teams. Rather, it provides metadata about CORFOR plot networks through its webpage (www.corfor.com). The first step of a member is to supply appropriate metadata. We encourage all those interested in joining the CORFOR initiative to meet the following minimum and desirable criteria:

(a) Scientists conducting monitoring agree to their work being included in the metadata directory and are willing to share data with other members of the network.

(b) The people or institutions conducting monitoring are dedicated to seeing it continue in the future.

(c) The monitoring is conducted in the

Figure 1: View of a tree within a plot in the colombian Andean mountains (photo by Alvaro Duque)

Topic	Person/Institution	Other partners	Location	No. of plots
Old-growth forest dynamics	Lori Daniels, University of British Columbia		Coastal Range of south-western British Columbia, Canada	7 0.49-ha plots
Patterns of forest dynamics in space and time	Nate Stephenson, USGS Western Ecological Research Center	Many other partners	Central and southern Sierra Nevada of California, USA	28 1-ha plots
Diversity and dynamics of lower montane forests	James Dalling, University of Illinois at Urbana-Champaign	Pedro Caballero, Arturo Morris Universidad Autónoma de Chiriqui (UNACHI)	Continental Divide, Western Panama	6 1-ha plots
Red de de monitoreo bosques Colombia	Esteban Alvarez, /Interconexión Eléctrica S.A. ISA	Alvaro Cogollo /Jardín Botánico de Medellín JBMED	Mountain ranges of Colombia	18 1-ha plots
Forest dynamics	Julieta Carilla,Universidad Nacional de Tucumán	Agustina Malizia UNT	NW Argentina	12 1-ha and 10 0.24-ha plots

Table 1 provides a brief summary of the current interests and data of some of the members of CORFOR.

mountainous American Cordillera. While the foothills of the Andes would be included, the broad flatlands of the Amazon basin would not.

(d) The monitoring tracks individually-identified trees. Rationale: To make our task manageable, we propose that we limit our directory to plot-based monitoring of individually-identified trees, because these are the studies that will give us both (a) change detection, and (b) the information needed to develop a mechanistic understanding of forest responses to environmental changes thereby improving our ability to predict future changes.

e) Within a defined area (plot or subplot), all trees greater than the minimum dbh (diameter at breast height, that is, 1.3 or 1.4 m from the soil surface) are sampled. Rationale: Both change detection and development of a mechanistic understanding of forest dynamics are best served by sampling all trees including less common species, suppressed trees, damaged trees, etc..

(f) Recommended minimum dbh to be sampled is 1 cm. However, inventories focusing on a minimum dbh up to 30 cm could be included. Rationale: Small trees are usually both the most abundant and the most dynamic, and represent the possible future of a forest. Projection of possible future stand conditions requires an understanding of all age and size classes of trees.

(g) The monitoring records tree recruitment, death, and growth (at dbh). Rationale: Information on all of these measures is needed to develop a mechanistic understanding of forest dynamics.

(h) Ideally, more than 500 individual trees are monitored. A minimum plot-area of 0.25 ha (50 x 50 m) is desirable. However, existing plot networks based on 0.1 ha plots are also included. Rationale: Large samples are needed for change detection and development of mechanistic understanding.

(i) The interval between censuses is <10 years (preferably from 1 to 5 years). Rationale: Long intervals between censuses are associated with a number of problems, perhaps most notably including bias in estimating demographic rates, losses of tree tags, and reduced ability to assign observed changes to specific environmental events (see, for example, Sheil 1995, For. Ecol. Manage. 77:11-34).

Topics for exploration and analysis

In the second part of the workshop, participants defined priority topics. In order to build CORFOR on a scientific basis we aim at writing one or more papers to be submitted to peer reviewed journals in the coming year. In this first stage of the network large scale patterns will be our main interest. Our current data will enable us to compare processes and patterns among temperate forest of North America, subtropical forests in Argentina, and tropical forests in Colombia and Panamá.

The main subjects being explored are:

1. Changes in species turnover at different latitudes.
2. Mortality and recruitment along elevation gradients at different latitudes.
3. Large-scale comparison of disturbance and mortality.
4. Growth rates and biomass dynamics.
5. Point pattern analysis of dead trees using stem maps.

Future Activities

CORFOR members will have a conference call in January to present the preliminary advances on each one of the subjects described above. Then, a second workshop supported by the Mountain Research Initiative (MRI) will be potentially organized later in 2009 at the University of British Columbia, Canada, to work on final contents and writing of the manuscripts which will then be submitted to peer-reviewed journals. We hope that with this launch CORFOR will make a major contribution to global discussions about forest ecology and climate change. All researchers running permanent plots in the mountains of America are very welcome to join us.

Figure 2: Field workers in an Andean plot (photo by Alvaro Duque)

Contact

If you want to join the network please go to the CORFOR website http://www.corfor.com or contact Nate Stephenson (nstephenson@usgs.gov) or Álvaro Duque (ajduque@unal.edu.co).

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