Overview of the Forest Genetic Resources Working Group

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- Mission and operating strategy
- Accomplishments
- Current activities
- Climate change and genetics

24th Session of the
North American Forest Commission
June 9-13, 2008
San Juan, Puerto Rico

Forest Genetic Resources Working Group

Mission: to encourage and promote conservation of forest genetic resources

Objectives:

1. To promote the ***collection, exchange, and dissemination of information*** about forest genetic resources
2. To promote cooperation and coordinate programs of ***research, conservation, training, and exchange*** among the countries of North America
3. To facilitate the ***exchange of forest genetic resources*** for purposes of conservation or research

Forest Genetic Resources Working Group

Sierra de Manantlán Biosphere Reserve, Jalisco, 2005

Ancient Bristlecone Pine Forest, Inyo NF, California, 2001

Membership

Jean Beaulieu
Barry Jaquish
Judy Loo

Kurt Johnsen
Tom Ledig
Brad St.Clair

Javier López Upton
Cuauhtémoc Sáenz Romero
Jesús Vargas Hernández

Operating Strategy

- Meetings every 12-18 months
- Identify tasks relevant to our objectives and assign a task force
- National reports to summarize forest genetic activities in each nation
- Occasionally make recommendations to BOA and agencies

The group has participated in efforts to conserve a unique variety of Monterey pine on Guadalupe Island, Mexico

Accomplishments

Information exchange

- Since 1965, promoted exchange of information among FGRWG members and observers through 31 meetings and study tours
- Organized several scientific meetings including:
  - International Workshop on North American Temperate Forest Genetic Resources, Berkeley, California, 1995
  - North American Forest Biology Workshop, Mérida, Yucatán, 2000
  - Symposium in memory of Dr. Basilio Bermejo Velázquez on "Use and Conservation of Forest Genetic Resources", Jalapa, Veracruz, 2002
  - "Silviculture and the Conservation of Genetic Resources for Sustainable Forest Management", XII World Forestry Congress, Québec, Québec, 2003
  - Symposium on "Potential Effects of Global Warming on Silviculture and Genetic Resources", Morelia, Michoacán, 2004

Accomplishments

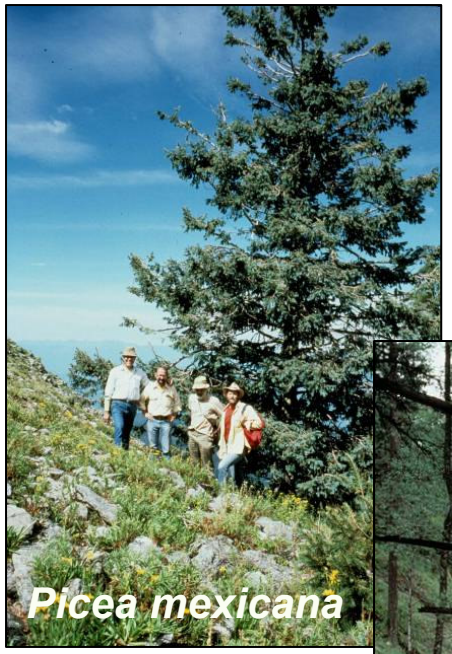
Training and promoting scientific exchange

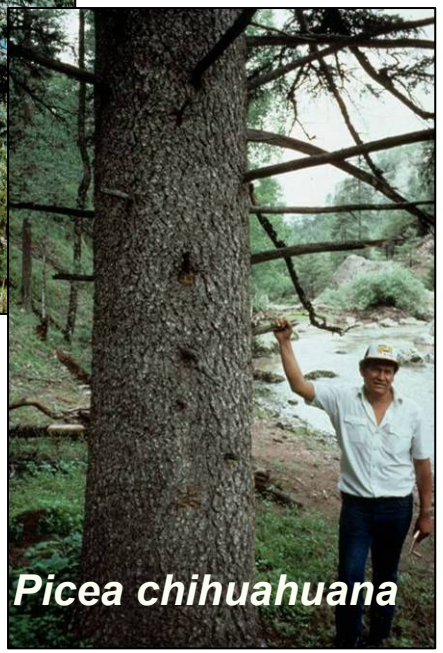
- World Directory of Forest Geneticists and Tree Breeders (1965, 1977, 1998)
- "North American Directory of Forest Geneticists Interested in Providing Study or Training Opportunities in Forest Genetics or Related Disciplines" (on web site)
- "Manejo de Recursos Genéticos Forestales" (2nd edition)
- Training opportunities for 11 Mexican scientists and students at research facilities in the United States and Canada during past 12 years
- Training course for managers on "Seed Management and Forest Plant Production for Conservation and Genetic Improvement", Guzmán, Jalisco, 2006
- Since 1999, ongoing lecture series on Conservation Genetics at the Colegio de Postgraduados and Universidad Autónoma Chapingo

Accomplishments

Research

- Conducted genetic surveys of several Mexican conifers including *Picea chihuahuana, Picea martinezii, Picea mexicana, Pinus ayacahuite, Pinus strobiformis, Pinus maximartinesii,* and *Pinus pinceana*
- Since 1997, results of 13 collaborative research projects published in scientific journals


Picea mexicana


Picea chihuahuana

Current Activities

- 12 active tasks (see web site)
  - Translate conservation genetics lectures into Spanish
  - Create bibliography of Mexican dissertations on genetics, ecology, and biogeography
  - Studies of genetic structure, evolutionary history, and systematics of various Mexican pines and Douglas-fir as an aid for conservation and utilization
  - Recommendations for conservation of spruce taxa in Mexico
  - Seed collections of Coulter pine for conservation and research
  - Literature review to rate vulnerability of forest genetic resources to climate change
  - Develop guidelines for assisted migration as a management option for adapting to climate change

Climate Change and Genetics

1. Species and populations are adapted to their environments – "local is best"
2. Has led to delineation of seed zones, but current seed zones largely irrelevant to future climates
3. Need guidelines for seed source movement given projected climate change ("assisted migration")
4. Genetic conservation becomes more important with climate change
5. Value of long-term genetic tests
6. Species and populations differ in their vulnerabilities to climate change due to differences in genetic structure, ability to adapt in place, gene flow, and migration rates

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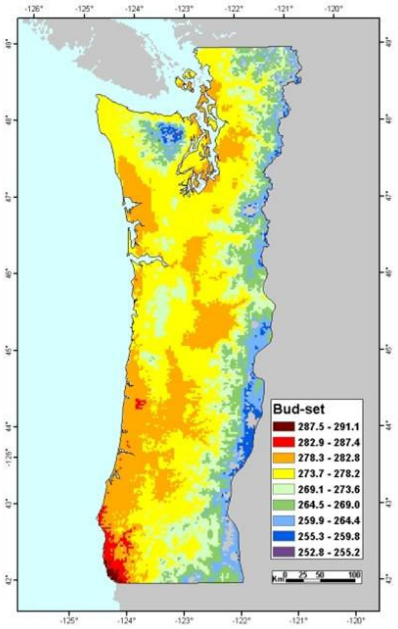
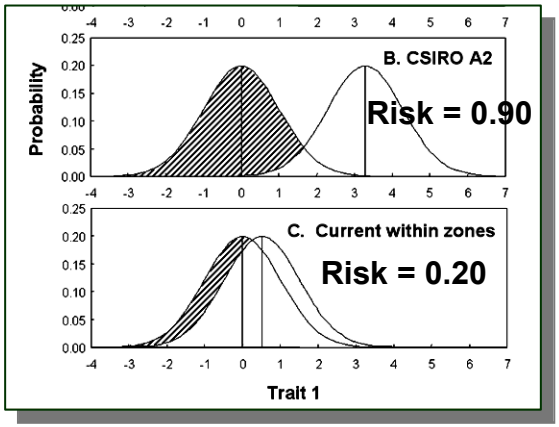
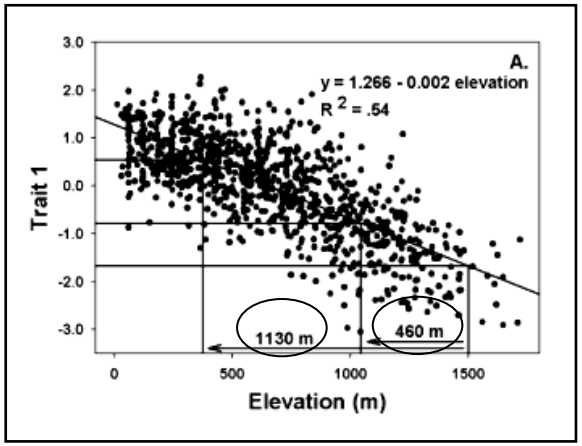
Example with Douglas-fir

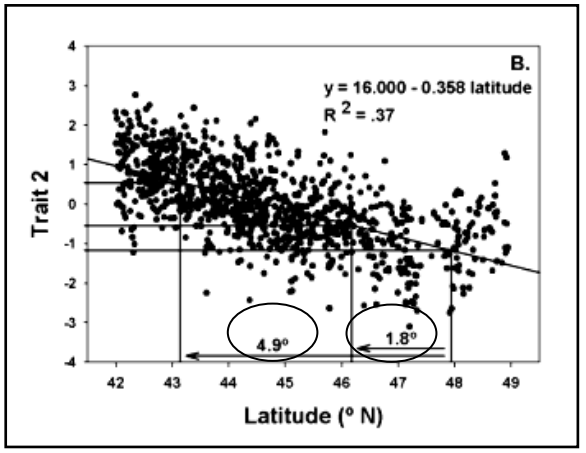


Genetic variation in bud-set



Risk of maladaptation from climate change





Seed movement guidelines for climate change

St.Clair and Howe. 2007. Genetic maladaptation of coastal Douglas-fir seedlings to future climates. Global Change Biology 13: 1441-1454.

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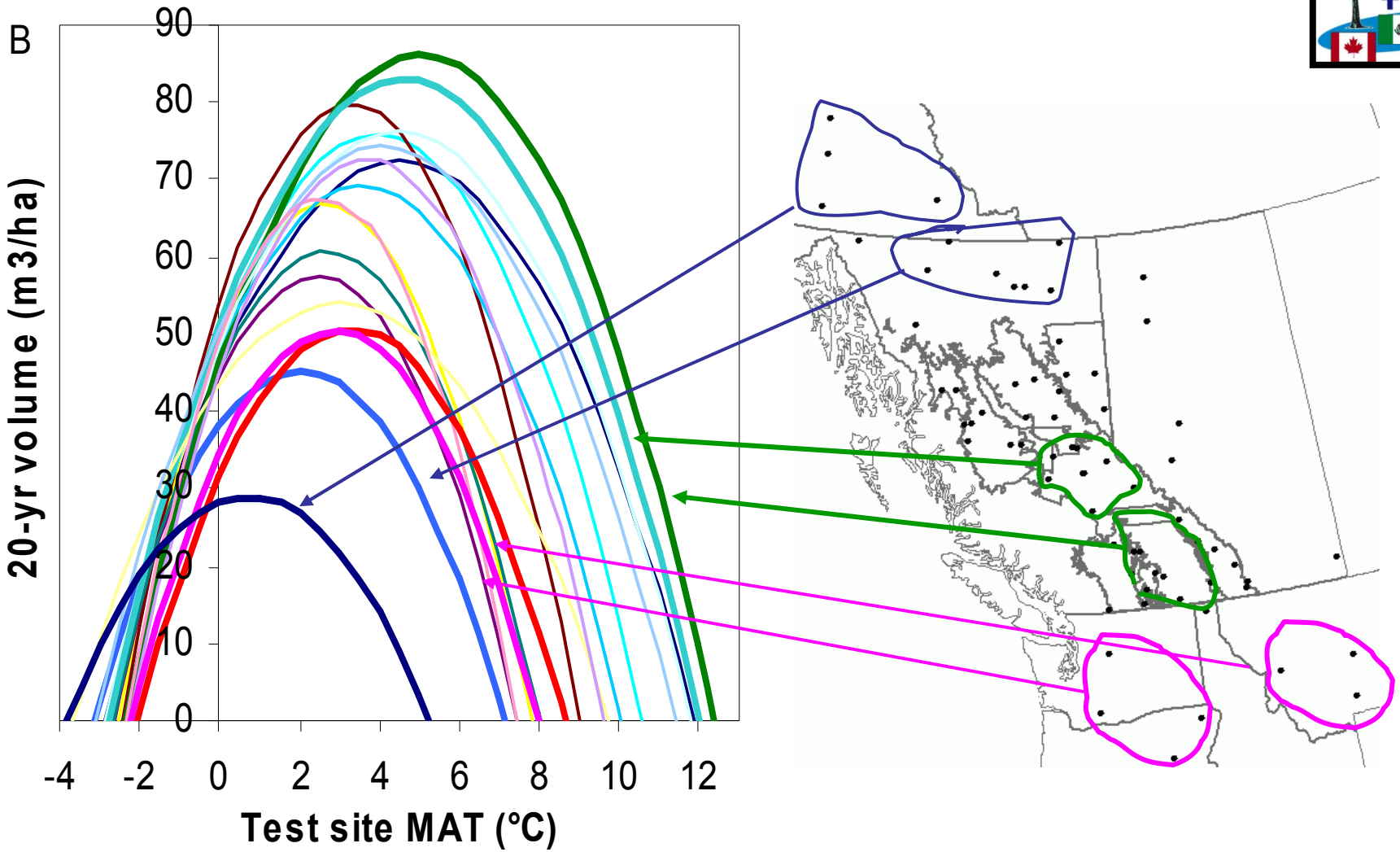

Variation in response of lodgepole pine populations to climate

from Wang et al. 2006. Global Change Biology

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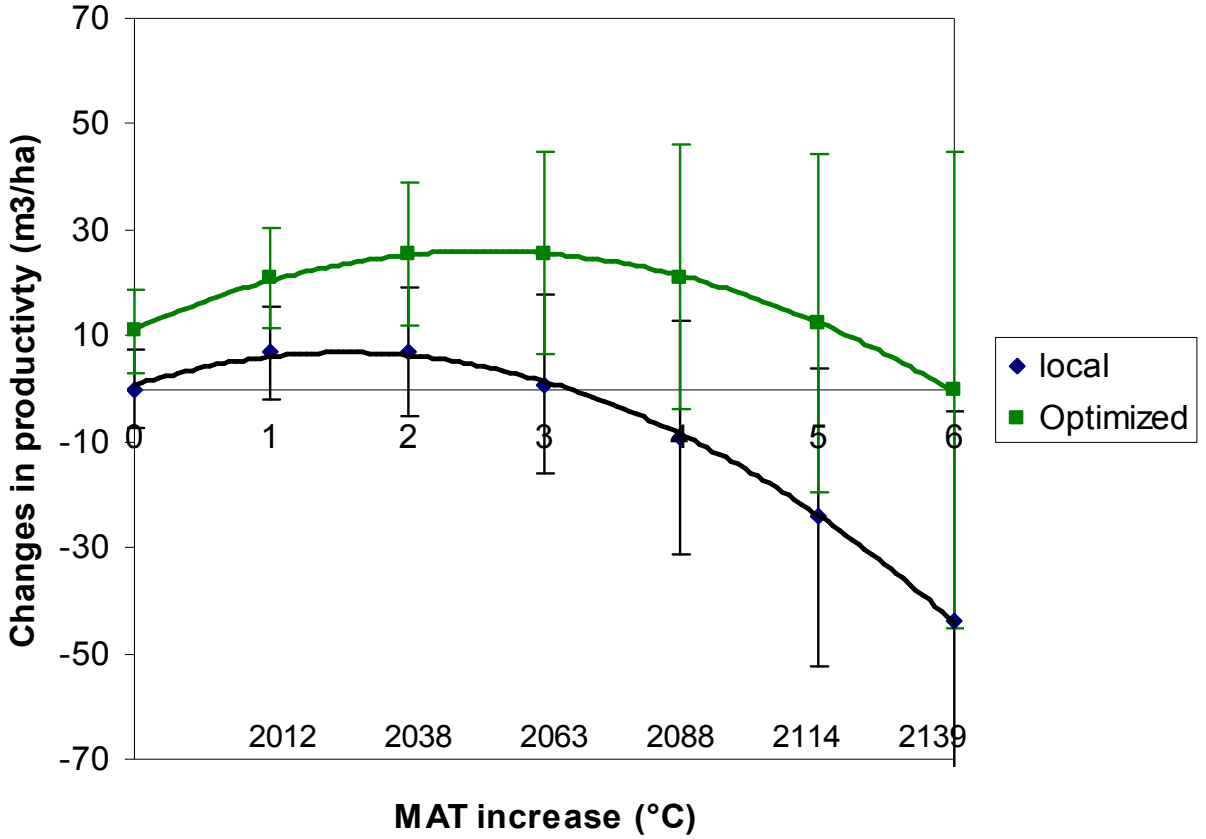
Climate change impacts on lodgepole pine productivity with and without assisted migration



from Wang et al. 2006. Global Change Biology

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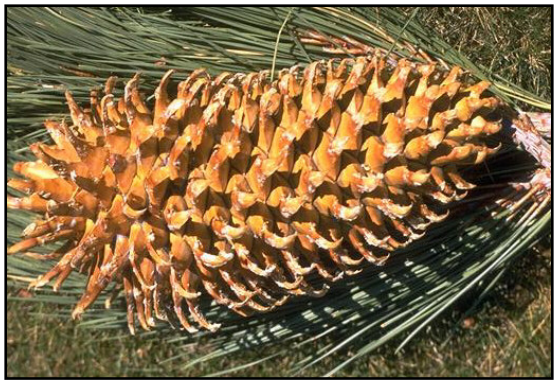
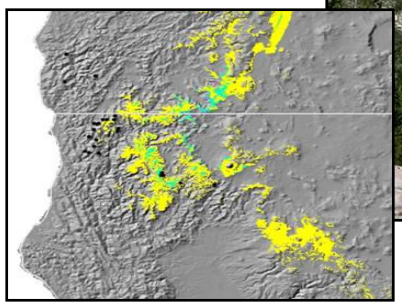
Conservation of genetic diversity will be critical to responding to climate change

Seed Banks

Conservation Plantings



Coulter pine



Brewer spruce

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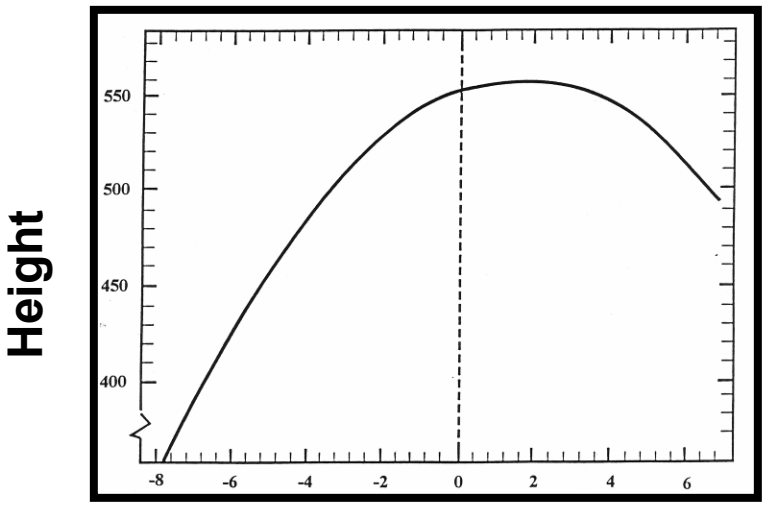
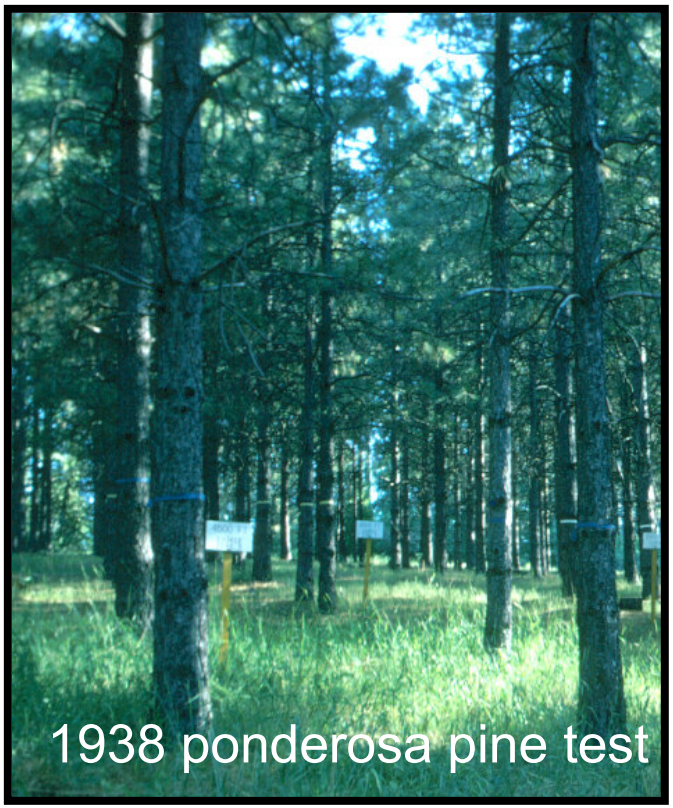
Long-term tests are important for modeling adaptive responses and for conserving genetic resources





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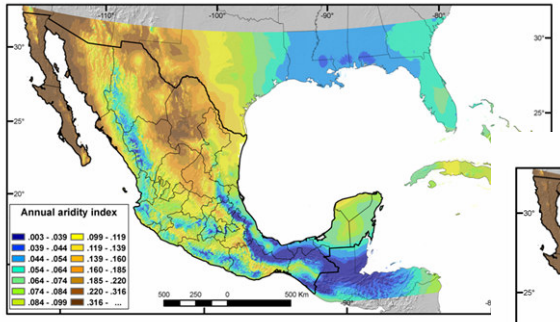
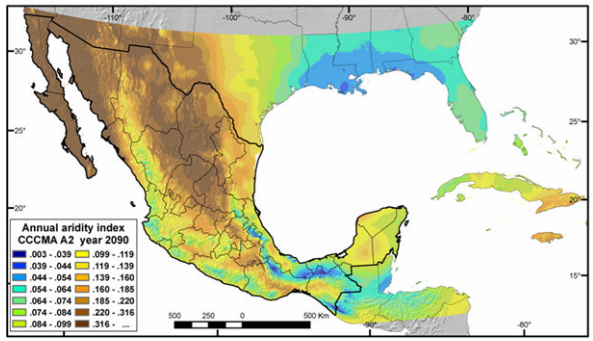
Tasks associated with climate change:

- Task 51: Literature review to rate vulnerability of forest genetic resources to climate change
- Task 54: Develop guidelines for assisted migration as a management option for adapting to climate change
- Other tasks associated with genetic conservation

Pinus hartwegii tested in present (13 oC) and future (17 oC) climate scenarios, Centre de Foresterie des Laurentides, Quebec, Canada (Sáenz Romero & Beaulieu)





Current and future climates (2090) for evaluating assisted migration in Mexico (Sáenz Romero & Beaulieu in collaboration with Rehfeldt)

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What are the effects of warmer climates on bud-burst? Earlier or later?

Summary

- Successful working group – proceedings, training sessions, study tours, peer-reviewed research
- Secrets to success
  - continuity
  - compatibility/collegiality
  - cooperators
  - communications
- Continued success expected in our new and ongoing tasks