

LTERR Mountain Initiative: Resilience and Sustainability of Complex Mountain Landscapes



**Organizations: US LTER, ILTER, MRI,
LTER Europe, GBMA, and CML RCN**

Primary Objective and Outcome

- To address the issues of vulnerability, resilience, and sustainability of natural and human systems in complex mountain landscapes.
- LTER and out-of-networks cross-site collaborations and global initiatives





A HIGH MOUNTAIN LTER NETWORK

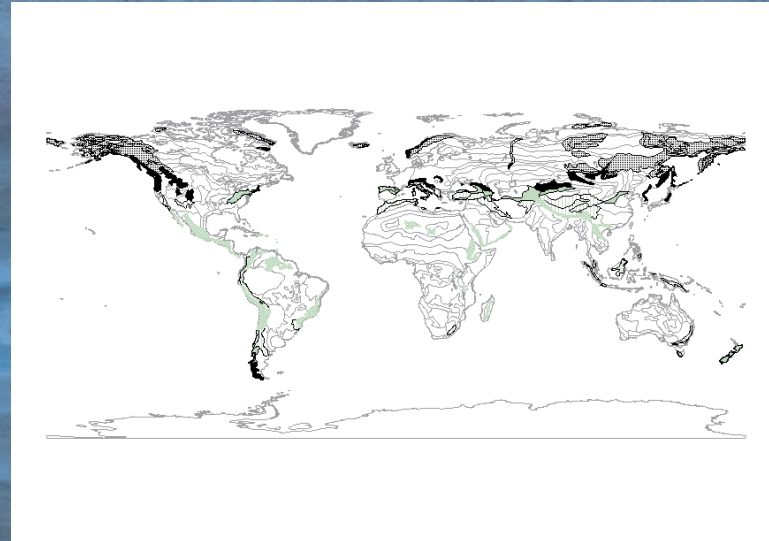
Laszlo Nagy, Eva Spehn, Mark Williams, Francisco Bonet,
Patrick Bourgeron

<http://gmba.unibas.ch/mountainLTER/mountainLTER.htm>

THE DIVERSITY OF MOUNTAINS (ENVIRONMENTAL CONTRASTS / GRADIENTS) – THE NEED FOR A NETWORK OF SITES



- Temperature seasonality
 - Aseasonal -> seasonal
- Precipitation
 - Arid -> perhumid
- Land use history
 - None -> long / intensive
- Geological history
 - bedrock (Ca vs. Si)
- Glaciation history
 - (+ / -)



Consequence: differences in ecosystem structure and functioning

<http://gmba.unibas.ch/mountainLTER/mountainLTER.htm>

HIGH MOUNTAIN LTERS

- Worldwide network, administered by GMBA
- Identify and involve suitable candidate sites (history of research, complementarity)
- Initial synthesis of the current state-of-the-art – ***'Monographs in Alpine Long-term Ecological Research'***, a series to be published in *Plant Ecology & Diversity* – first issue: *Niwot Ridge 1995-2010* (eds. Williams M., Bowman W., Bourgeron P.)



ACTIVITIES 2010-2012



- Session at GMBA Science Conference 2010 - (*LTERs in the Alpine and their influence on biodiversity research*)
- Meeting of International working group on mountain LTER sites, Lautaret 2011 - GMBA portal established: <http://gmba.unibas.ch/mountainLTER/mountainLTER.htm>
- Estes Park, Colorado, LTER ASM 2012 – WG session on ‘Resilience and sustainability of complex mountain landscapes’: Work group established on ‘Classification of mountain ranges’

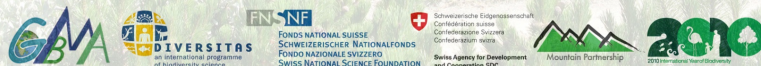
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LTERs IN THE ALPINE AND THEIR INFLUENCE ON BIODIVERSITY RESEARCH



GMBA-DIVERSITAS conference • Chandolin, 27.–30. 7. 10

Functional significance of mountain biodiversity



Chandolin, 2010

- NWT LTER as a prototype for understanding the controls on alpine biodiversity: the challenge of converting long term monitoring into science (Williams M.)
- Converting field data into knowledge: towards adaptive management in Sierra Nevada LTER site (Bonet F.)
- LTER in the Austrian Central Alps: scientific relevance and outlook (Erschbamer B.)

<http://gmba.unibas.ch/mountainLTER/mountainLTER.htm>



Global Network of alpine LTER sites



Lautaret, 2011



Nucleus of core sites to use common protocols to ensure comparability of data

GMBA provides the framework and coordination

Niwot Ridge, Rocky Mountains USA
Sierra Nevada, Spain
Aosta valley, Italy
Lautaret, Grenoble, France
Tyrol, Austria
Furka region, Switzerland

GMBA aims to:

- explore and explain the great biological richness of the mountains of the world
- increase the amount and quality of high quality geo-referenced data on mountain biodiversity
- provide input to policy makers and stakeholders for the conservation and sustainable use of mountain biodiversity

NEXT STEPS

- Posting on the GMBA LTER webportal list of recommended common protocols
- Posting of a background document
- Putting out to consultation the system of proposed classification of mountains for site selection and comparative research planning
- Establishment of a mountain database, following the consolidation of the classification system
- Next group meeting: **Mountains Under Watch - 2013**



**MOUNTAINS UNDER WATCH 2013 -
CONFERENCE, FEBRUARY 20-21, 2013,
AOSTA VALLEY, ITALY**

<http://www.muw2013.it/>

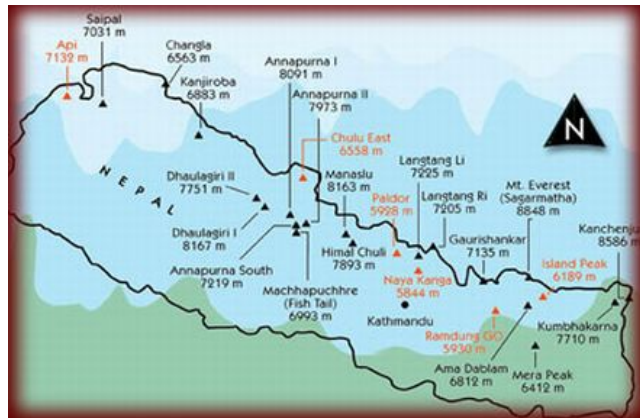
The specific goal of the conference is to share experiences, methods and strategies for long term observations and monitoring of the climate change effects on different alpine environments ranging from the cryosphere to the biosphere.

HIGH ASIA WATER SECURITY

- The question: Are rivers that sustain more than 2 billion people fed primarily by water from rainfall, by seasonal snowmelt or by the glaciers that are vulnerable to climate change?
- \$5,400,000 from USAID
- Capacity building in 9 countries: could be basis for establishing mountain LTERs in this area
- ICIMOD collaboration



LANGTANG VALLEY



- PEER award
- Joint USAID-NSF program
- Rijan Kayastha at Kathmandu University
- http://sites.nationalacademies.org/PGA/dsc/PEER/PGA_069232

DATA SOURCES

- world vegetation cover map, vector (Fedorova and Volkova 1990; Fedorova et al. 1993)
- 1-km DEM (GLOBE Task Team and others 1999)
- mean annual precipitation and
- mean monthly temperature maps at c. 50-km
- the GLC2000 global land cover land cover map (European Commission Joint Research Centre 2003) at c. 1-km resolution.



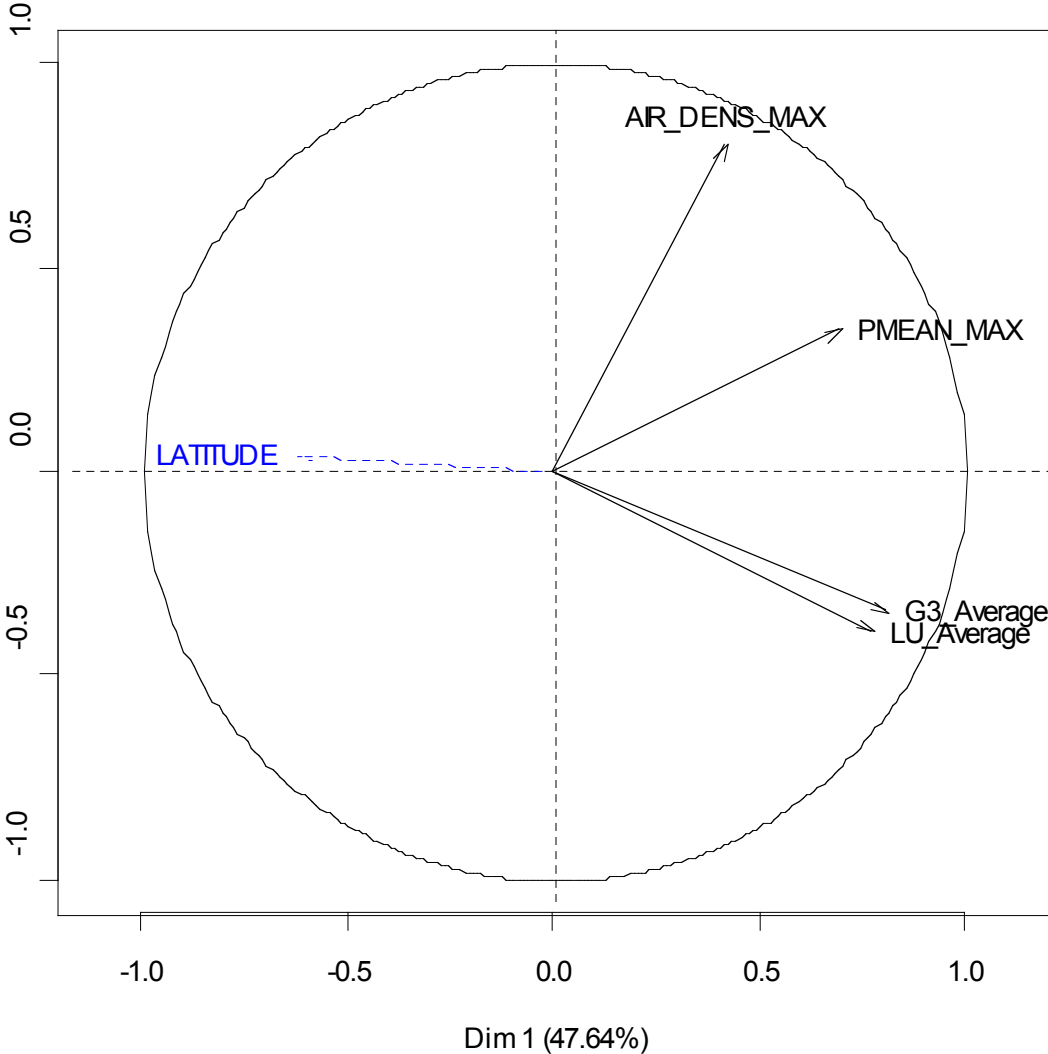
PARAMETERS

- Lat-long
- air density class
- altitude class
- mean annual minimum and maximum precipitation
- land use intensity (average value per mountain area)
- seasonality.

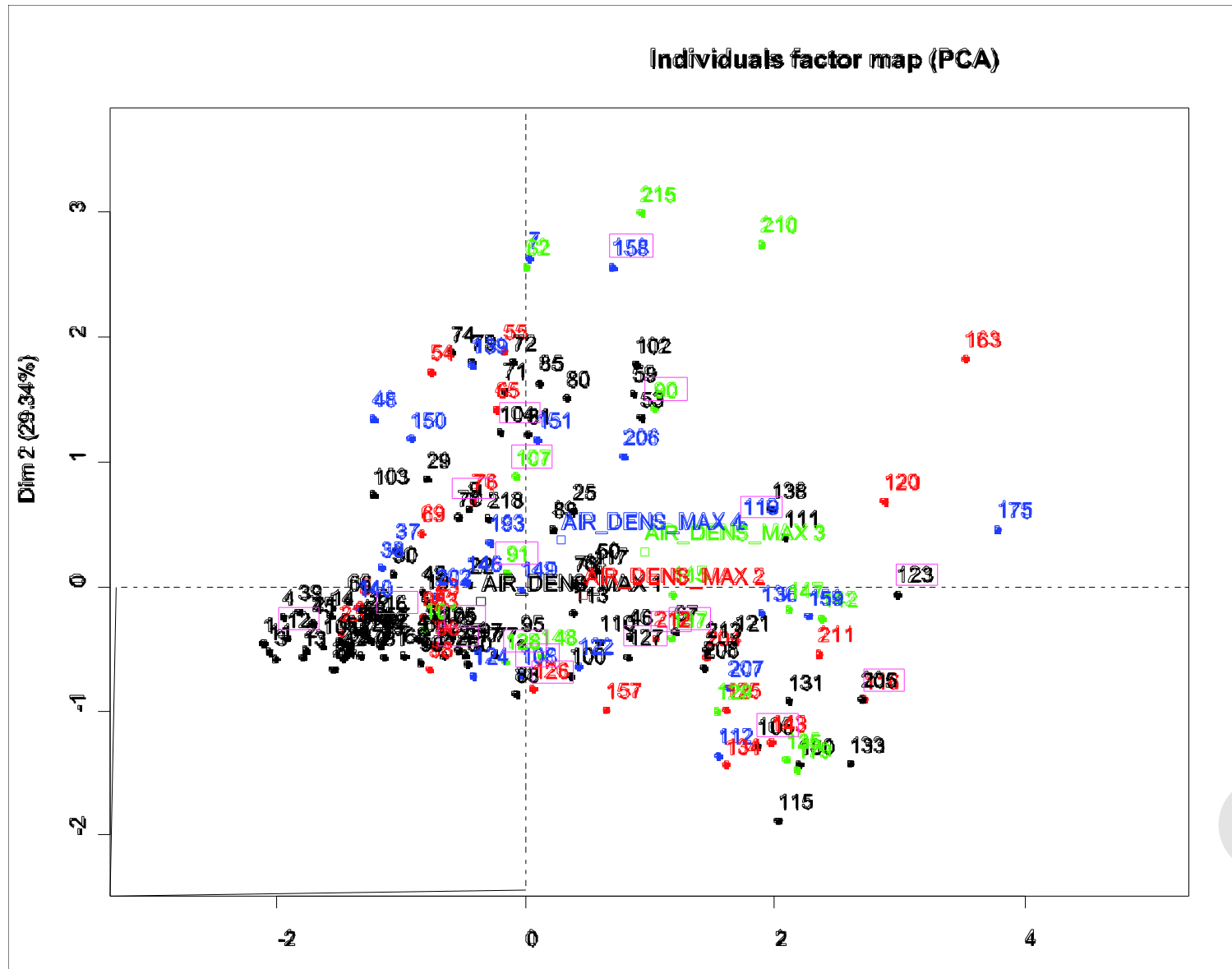


ATTRIBUTES OF MOUNTAINS

Variables factor map (PCA)



PCA AXES OF MOUNTAIN RANGES



The Mountain Research Initiative

<http://mri.scnatweb.ch>

- Workshop: Building Resilience of Mountain Social-Ecological Systems to Global Change (leads: Julia Klein, Colorado State University; Anne Nolin, Oregon State University)
- Workshop: ecosystem services from mountains (S. Lavorel)

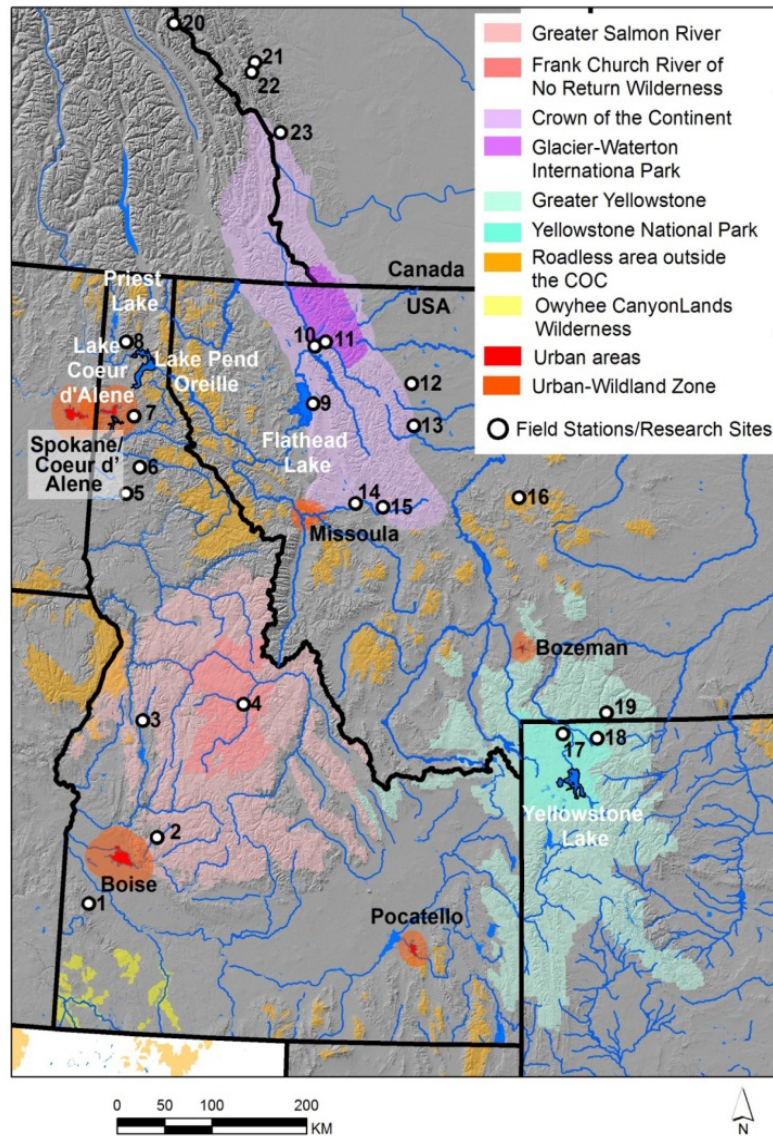
The main objectives of the Complex Mountain Landscapes RCN (J. Gosz, PI) model development are threefold:

1) Facilitate coordination, integration, and syntheses for existing programs and studies regionally and internationally;

2) Design collaborative interactive research, education, and governance projects with partners for the region and with other regions of the world; and

3) Create partnerships linking new informatics to produce linked, scalable models and methods that will help inform management decisions and better link non-governmental and governmental constituents who affect the resilience of these mountain systems.

Complex Rocky Mountain Landscapes RCN



Benchmark Ecosystems:

Crown of the Continent
Greater Salmon River
Greater Yellowstone-Teton

Participating Field Research Sites:

1. Reynolds Creek Experimental Watershed (US Agricultural Research Service)
2. Boise Basin Experimental Forest (US Forest Service)
3. McCall Field Campus (Univ. of Idaho)
4. Taylor Wilderness Research Station and Big Creek (Univ. of Idaho with US Forest Service)
5. Univ. of Idaho Experimental Forests (Univ. of Idaho)
6. Mica Creek Experimental Watershed (Potlatch Corp with Univ. of Idaho)
7. Deception Creek Experimental Forest (US Forest Service)
8. Priest River Experimental Forest (US Forest Service)
9. Flathead Lake Biological Station (Univ. of Montana)
10. Coram Experimental Forest (US Forest Service)
11. Nyack Floodplain Research Area (Flathead Lake Biological Station)
12. Roosevelt Ranch (Boone and Crocket Club with The Univ. of Montana)
13. Pine Butte Swamp Preserve (The Nature Conservancy)
14. Lubrecht Experimental Forest (The Univ. of Montana)
15. Bandy Ranch (The Univ. of Montana)
16. Tenderfoot Creek Experimental Forest (US Forest Service)
17. Blacktail Creek (NEON Core Site with Yellowstone National Park)
18. Lamar Valley (Yellowstone Ecological Research Center with Yellowstone National Park)
19. Cooke City Field Station (Yellowstone Ecological Research Center)
20. Lake O'Hara Research Watershed
21. Barrier Lake Field Station
22. Marmot Creek Research Watershed
23. R.B. Miller Field Station

Workshop at ASM 2012 (LTER, ILTER, Mountain LTER, and the CLM RCN)

<http://asm2012.lternet.edu/working-groups/resilience-and-sustainability-complex-mountain-landscapes>

Key research topics identified:

- Characterization of the global range of variability in mountain systems, including the elevation gradient: gradient analysis, classification, boundaries
- Characterization of the services (economic and otherwise) provided by mountain systems: global distribution, model(s)
- Land use
- Ecological legacies: imprints of legacies on system dynamics
- Atmospheric deposition
- Change in species distribution

From now on

- The Mountain ILTER is expanding: other countries interested in the venture
- Partnerships are at the core the enterprise: ILTER, US LTER, RCN, GBMA, Diversitas, etc.
- Product oriented: databases, publications
- Research oriented: proposals
- A model for other theme based initiatives