

# Regeneration of tropical montane forests in burned sites in the bolivian Andes

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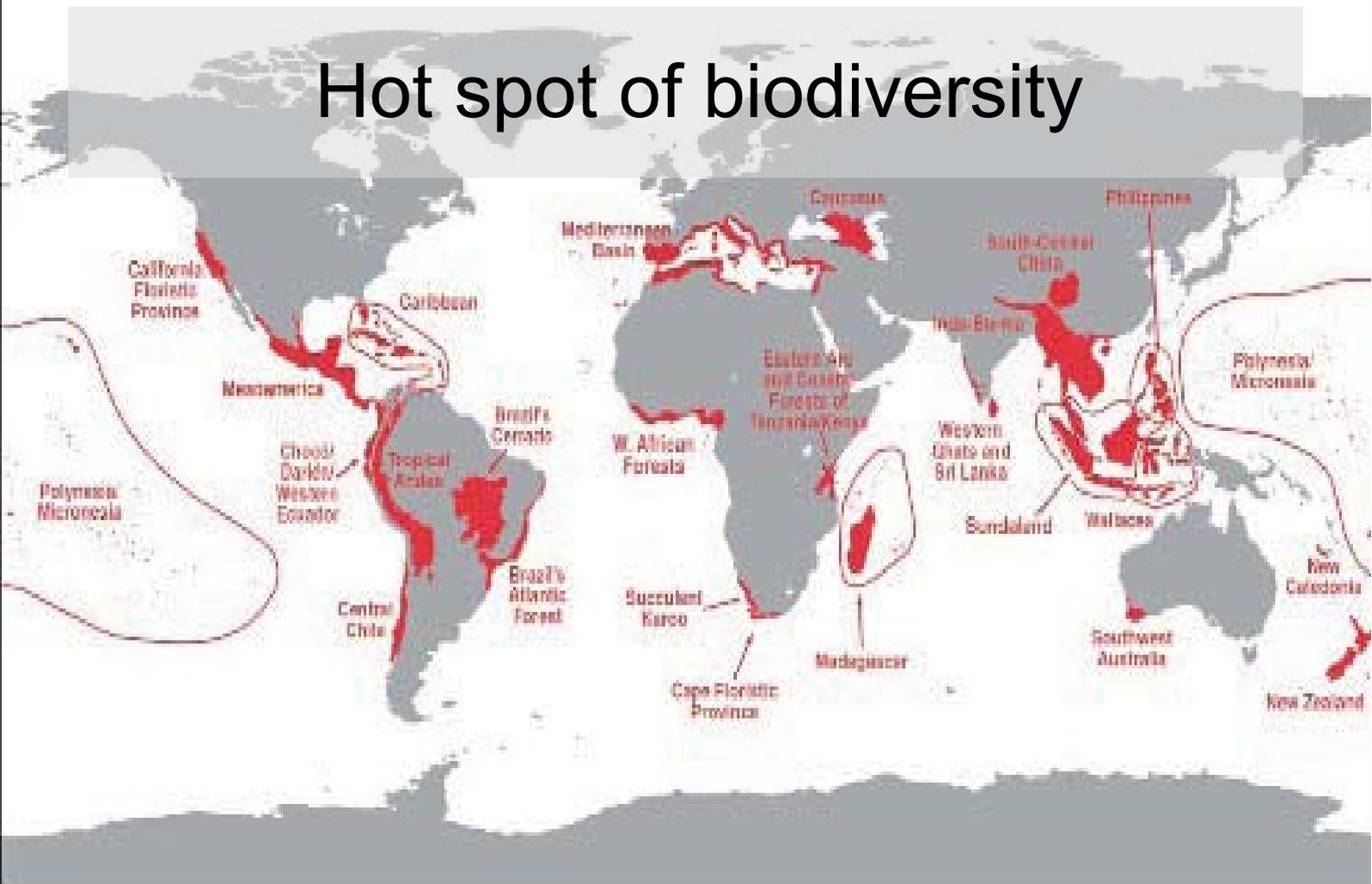
# Participants - Supervisor

- Isabell Hensen (MLU Halle-Wittenberg)
- Matthias Schleuning (Biodiversity and Climate Research Centre (BiK-F), Frankfurt am Main)
- Stephan G. Beck (Herbario Nacional de Bolivia La Paz, Bolivia)
- Emilia G. Estigarribia (Instituto de Ecologia, UMSA La Paz, Bolivia)
- Daniel Renison (Universidad Nacional de Cordoba, Argentina)

# Participants - Ph.D.students

- Silvia C. Gallegos Ayala (La Paz, Bolivia)
- Francisco V. Saavedra Agramont (La Paz, Bolivia)
- Amira E. Apaza Quevedo (La Paz, Bolivia)
- Denis Lippok (MLU Halle-Wittenberg)

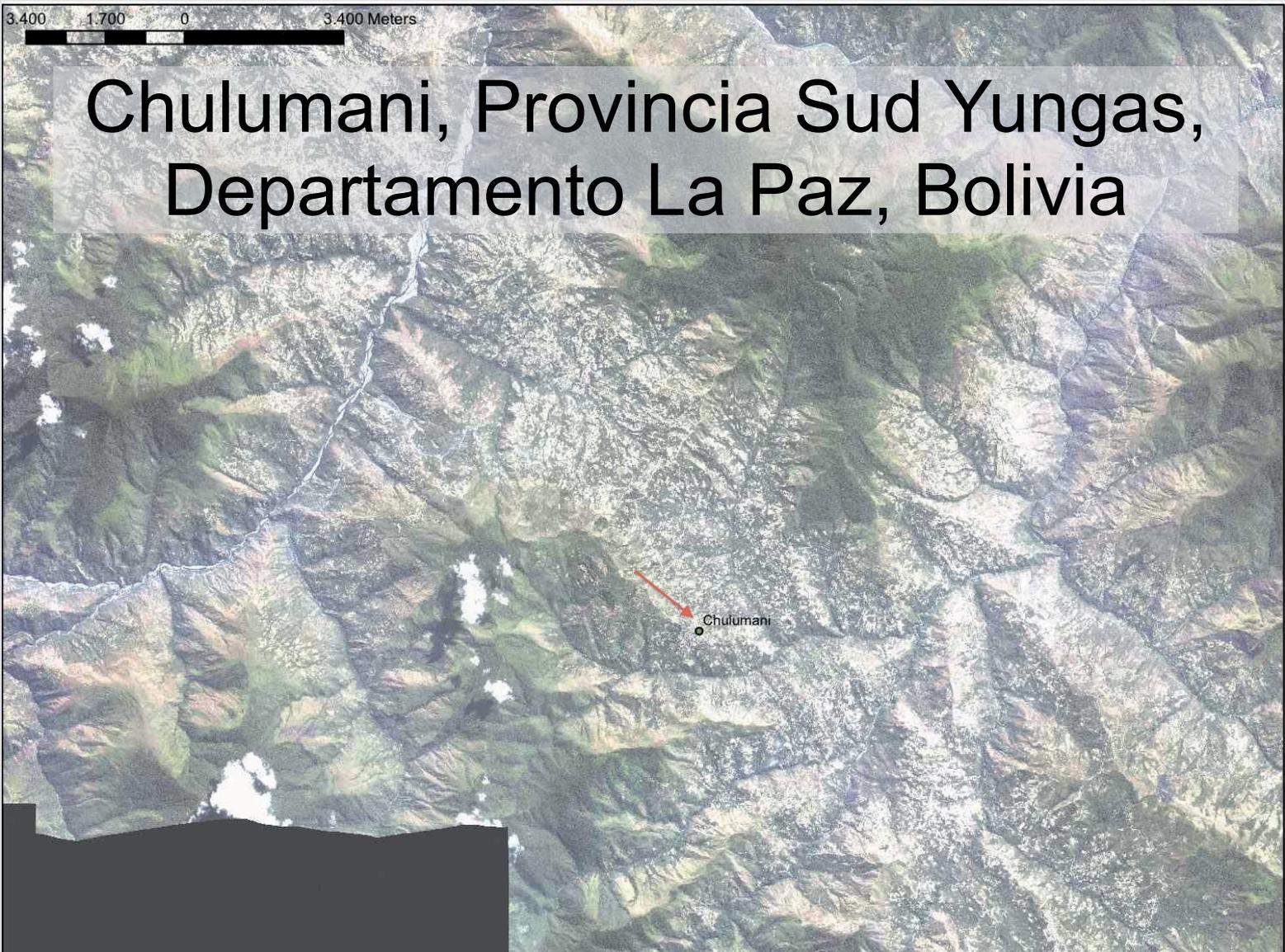
# Hot spot of biodiversity



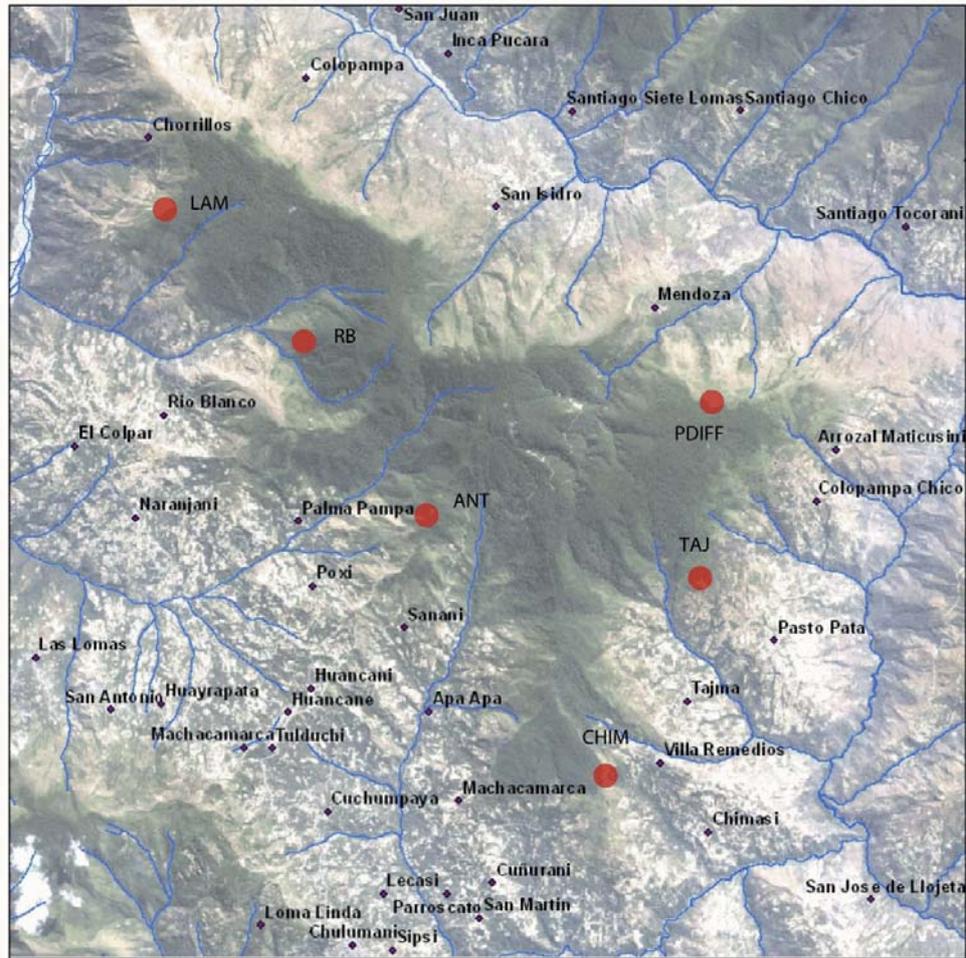
Mysters et al. 2000, „Biodiversity hotspots for conservation priorities“. Nature 403 (6772): 853-858.

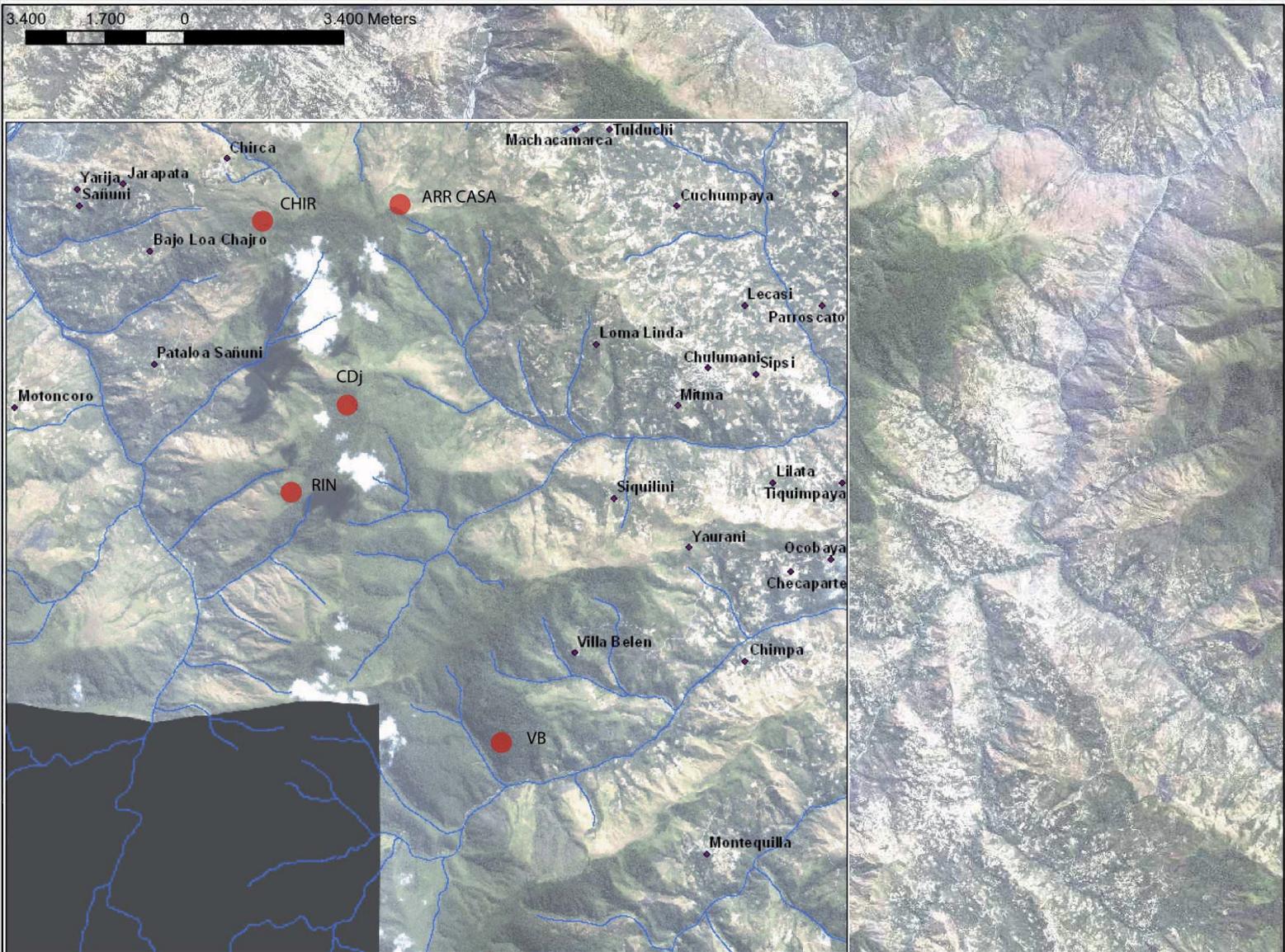
3.400 1.700 0 3.400 Meters

# Chulumani, Provincia Sud Yungas, Departamento La Paz, Bolivia

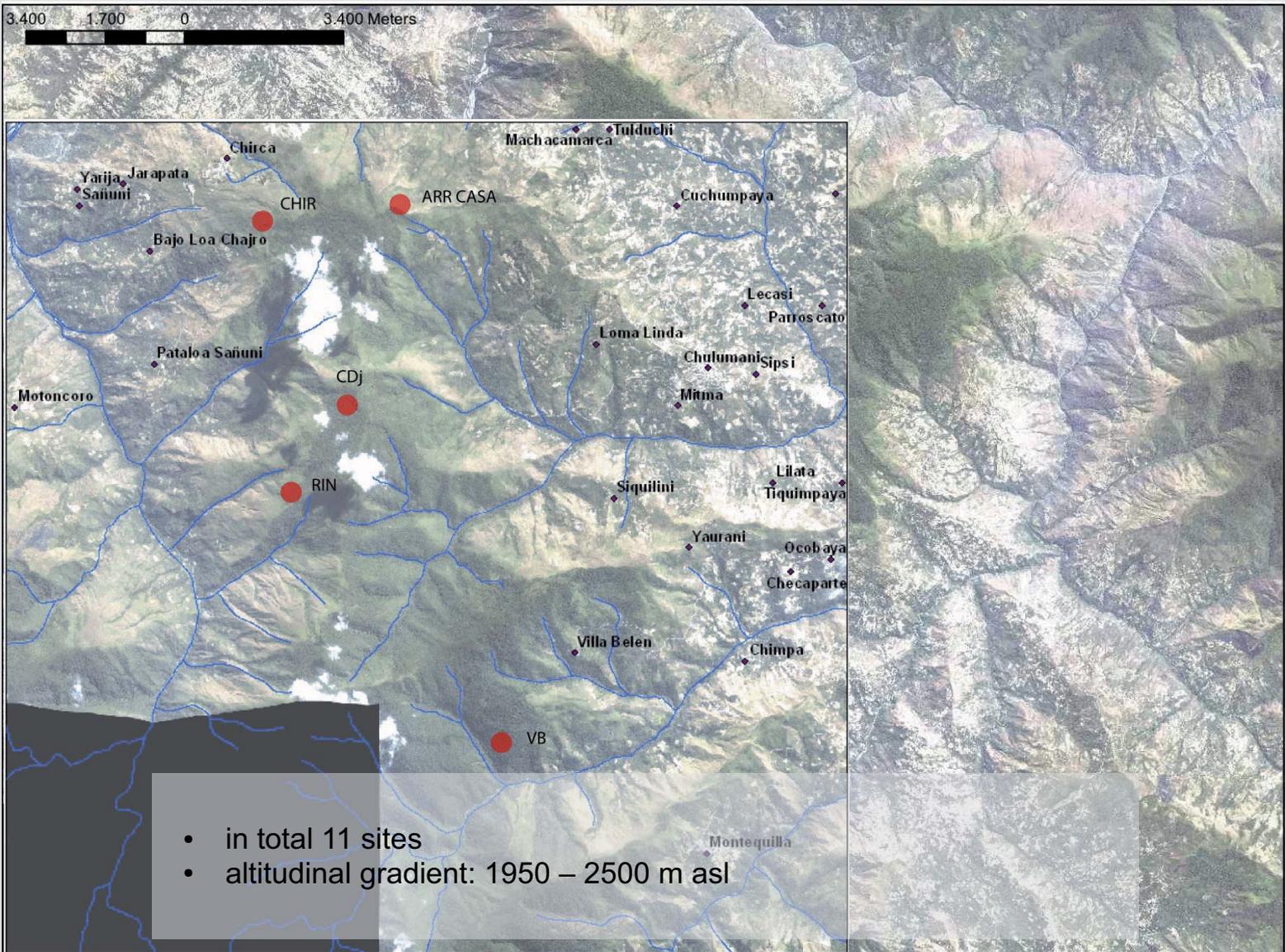


3.400 1.700 0 3.400 Meters





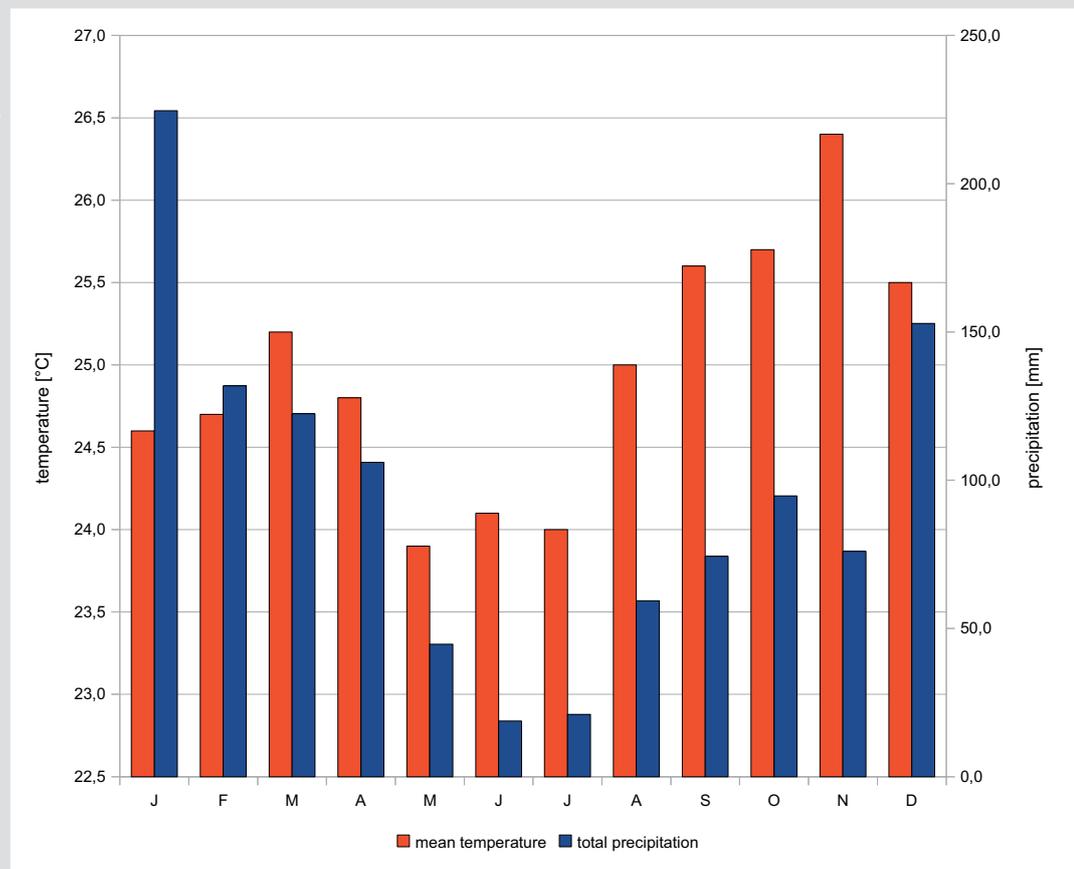
3.400 1.700 0 3.400 Meters



- in total 11 sites
- altitudinal gradient: 1950 – 2500 m asl

# Climate

- mean annual temperature = 18.8 °C
- mean annual precipitation = 1152 mm
- “dry season” from may till november



dates from climatic station in Irupana (1946 m asl), provided by SENAEMI, La Paz, Bolivia

# Deforestation of Tropical Montane Forests



# Conversion of Tropical Montane Forest...

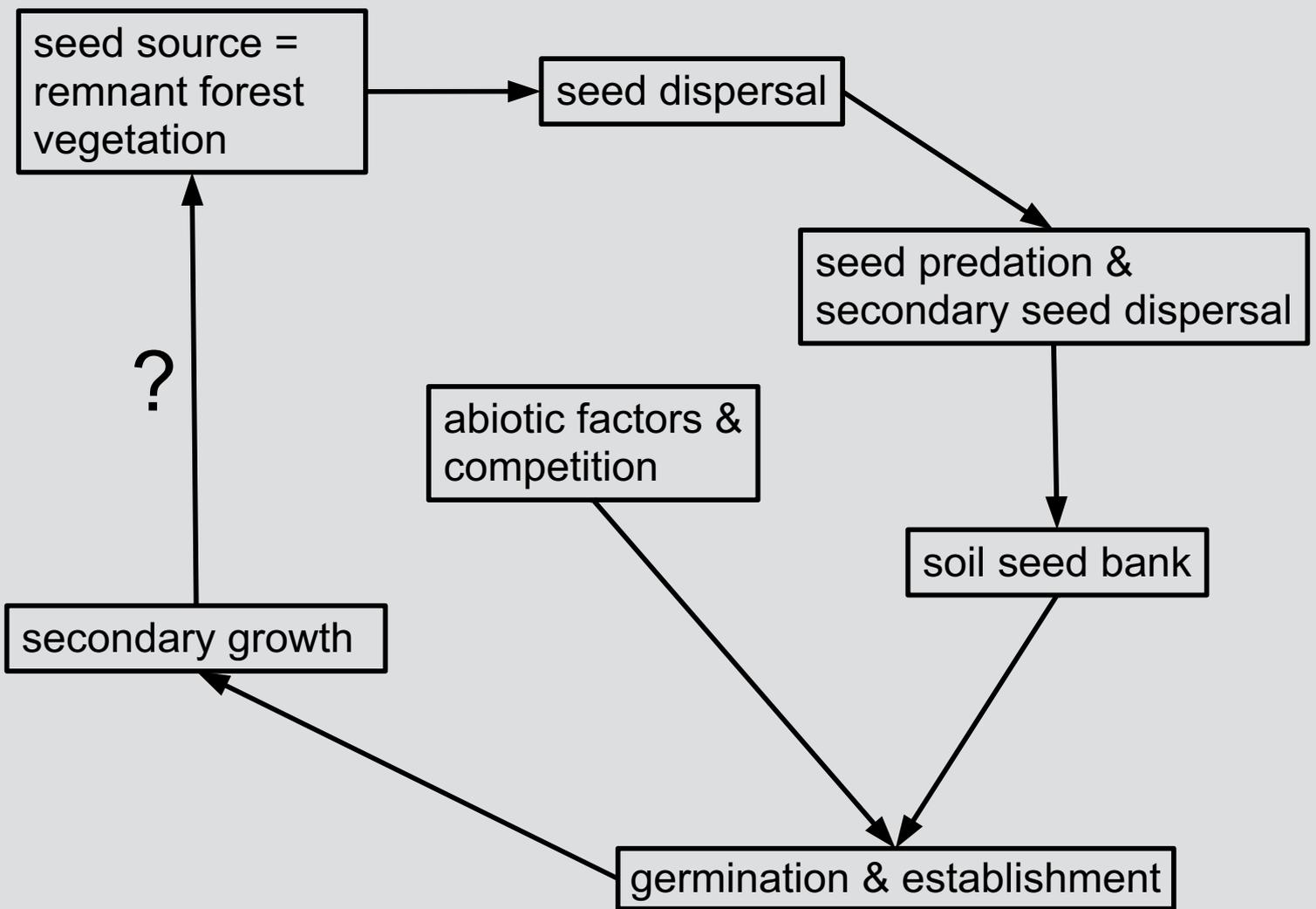


... into Secondary Growth



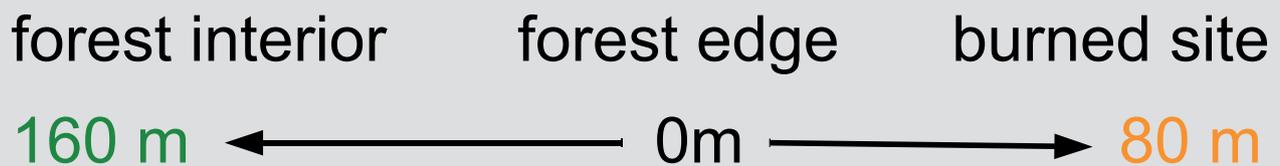
# Secondary Succession & Important Factors

- dispersal limitation
  - missing seed sources and / or missing dispersal vectors
- competition limitation
  - competition with grasses and / or ferns
- abiotic limitation
  - soils
  - micro climate



# Investigation Structure

- comparison forest interior - forest edge - secondary growth
- distance transect perpendicular to forest edge



# Forest Vegetation

- 6 sites = 23 plots
- 400 sqm, all free standing woody plants dbh  $\geq$  2.5 cm
- factors:
  - altitude
  - edge – interior
  - topography: gorges vs. ridges, different inclinations

# Functional Traits

- functional traits of forest species:
  - specific leaf area
  - C & N content
  - density of stomata

# Interaction Plant – Disperser

- forest interior and edge
- 100 x 20 m
- observations from sunrise till midday
- functional traits of fruits - seeds (length, diameter, fresh weight, dry weight...)

# Seed Dispersal

- distance gradient
- seed traps
- treatment: perches

# Seed Traps



# Seed Predation & Secondary Seed Dispersal

- *offer of 1 species*
- *Clusia cf. sphaerocarpa*
- 3 distances: forest interior, edge & burned site
- 1 treatments: rodent exclosure

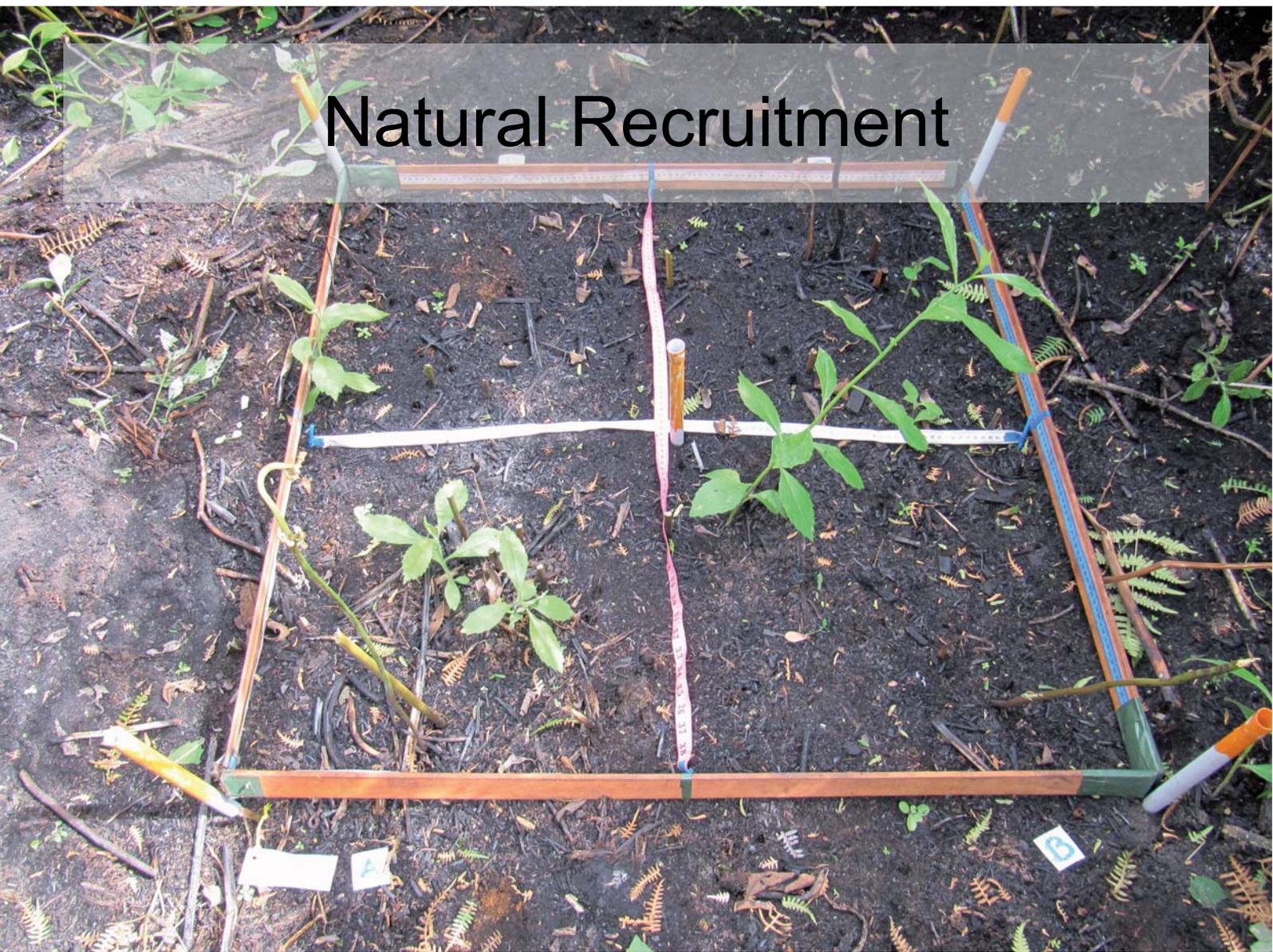
# Soil Seed Bank

- 6 sites = 24 samples
- 4 distances: forest interior, edge, 20 m & 80 m to forest edge
- compound soil samples
- fractionation by sieving and examining by microscope

# Natural Recruitment

- distance transect
- 1 sqm plots, all plants height  $\leq$  1m
- 2 treatments: weeding & perches
- repeated measurements

# Natural Recruitment



# Germination

- sowing of 2 species
- *Clusia cf. lechleri* & *Cedrela odorata*
- 3 distances: forest interior, edge & burned site
- 2 treatments: weeding & litter layer removal
- repeated measurements

# Post Fire Succession

- 7 sites = 14 plots
- 2 distance to forest edge (20 & 80 m)
- plots burned at the end of dry season 2010
  
- all woody plants height  $\geq 20$  cm
- fern abundance
- 2 repeated measurements: 3 & 12 month after

# Recently Burned



3 Month after Burning



# Secondary Growth

- 8 sites = 16 plots
- 2 distance to forest edge (20 & 80 m)
- 100 sqm, all free standing woody plants height  $\geq 1$  m
- 2 distance to forest edge (20 & 80 m)

# Environmental Factors

- GPS coordinates
- altitude
- inclination
- exposition
- soil properties (pH, EC, P, cations, C / N, texture)
- micro climate (temperature, relative humidity)

# General Problems

- “loss” of sites due to fires
- removal of installations
- determination of site age and land use history

# Acknowledgement

- DFG
- Herbario Nacional de Bolivia, La Paz (LPB)
- SEHMANI

Thank you for your attention

