

Andean Community Reduces Erosion in Disturbed Cloud Forests

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2012 - Chimbusig road cut, pre-project. Slumping of “tierra blanca” volcanic subsoils was causing road closures.



2012 - Chimbusig road cut, post-project. The minga (community work group) and EWB volunteers have installed imported and local erosion matting with native woody species, sigsig grass infiltration hedges, live-stake lechero poles, and boulder toe wall.



2017 - Chimbusig road cut, 4.5 years post-project, Enma Sacatoro in center of site. The slope now is stabilized by acacia trees over 5 m. tall, vigorous sigsig hedges, boulder toe wall, and many volunteer species.

Summary

Erosion, a world-wide problem, is caused by deforestation for crops and grazing (1) and construction of roads (2) and other infrastructure.

Engineers Without Borders (EWB) of Denver, Colorado with the communities of a mostly deforested cloud forest area in Cotopaxi Province, Ecuador used locally-available materials and native woody species to revegetate six eroded sites adjacent to roads and water supply pipelines in 2012 and 2013 (3, 4, 5, 6).

Soil stability has greatly increased in most areas of our project sites (6, 7, 8) as of monitoring in 2015 and 2017. No further slumps have closed roads. Erosion has decreased below culverts and most pipelines.

The communities continue planting efforts, having installed 7000 trees and shrubs.



2009, irrigation line from source springs. The minga was digging an improved pipeline through remnant cloud forest “tierra negra” organic soils.



2012 - Alcantarizado de Malingua, project implementation. By installing boulder structures and native plantings in erosion matting, the minga stabilized an eroding storm water runoff channel next to a house.



2016 - Malingua Pamba fill slope. Enma Sacatoro's student group installed trees and shrubs.

Erosion Control Components

- Small plastic planting bags of cloud forest trees and shrubs
- Erosion matting
- Live-stake wicker weirs
- Upside-down invasive eucalyptus stakes to secure erosion matting
- Boulder structures: toe walls, cross-vanes, plunge pools
- Planting bag donations for local nursery start-up
- Education of whole community



2013 - Erosion gully below pipeline, post-project. Live-stake wicker weirs with sigsig infiltration hedges, local mats, and native plantings stabilized downcutting. Note “tierra blanca” subsoils at the surface.



2012 - Alcantarizado de Malingua, post-project. Boulder plunge pools and cross-vanes installed below a road culver outlet to reduce scour and direct stormwater flows away from toe of banks.



2012 - Malingua Pamba high school students participated in an on-site erosion control class.

Lessons Learned

- Even with low maintenance, some native plantings grew very well.
- Stabilizing soils promoted vigorous native volunteers as well as invasive eucalyptus.
- Native pioneer species have potential for restoration planting in eroded subsoils.
- Problems remain where roadside drainage is poor, livestock grazing continues, or the surface is eroded close to bedrock.
- Include the kids.



2012 - Children of Chimbusig helped with project tasks at eroding slopes above and below the road to their homes.



Tashima (*Coriaria ruscifolia*) – could this become a pioneer restoration species on “tierra blanca” slopes?

Successful Woody Species

Kichwa Name	Scientific Name
Acacia	<i>Acacia macracantha</i>
Chilca	<i>Baccharis</i> spp.
Lechero	<i>Euphorbia laurifolia</i>
Yagual	<i>Polylepis</i> spp.

Successful Grass Transplant

Sigsig	<i>Cortaderia</i> spp.
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With follow-up maintenance, a wider variety of cloud forest species would be possible.

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