



2004 EPA STAR Graduate Fellowship Conference Next Generation Scientists—Next Opportunities

Effects of land-use & management practices on stream ecosystems in the Andean Amazon, Perú

Environmental Issues

Land use change and Aquatic resources

In the Peruvian Andean Amazon, widespread conversion of forested land to agricultural land is altering aquatic ecosystems. The goal of my research is to investigate how land-cover change and different land management practices affect water quality and stream ecosystems within an Amazon headwater basin. Changes in stream ecosystems can have substantial effects on aquatic resources for both human uses and ecosystem processes.

Issues in the Chontabamba watershed

Human Health Impacts

Discharges of untreated human and animal waste can carry pathogens that cause water-borne diseases such as cholera, amoebic dysentery and skin diseases.

Economic Impacts

Land-cover change in many mountainous watersheds of the world has increased frequency and intensity of floods and landslides. These disturbances have caused considerable damage to the infrastructure of communities resulting in large economic costs. Water treatment costs also rise with increasing watershed deterioration.

Ecosystem Impacts

Stream ecosystems in the region currently are experiencing losses of habitat, degraded water quality, geomorphic instability, and increased vulnerability to extreme climate events.

Land Management Practices

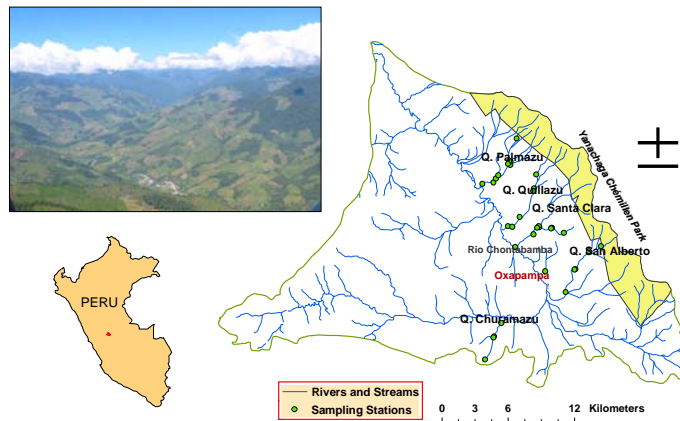
Due to land scarcity in the valley, farmers resort to ranching and cultivating crops on steep slopes on sub-optimal lands. Land management practices tend to rely heavily on the use of pesticides and fertilizers. Because of the poor soil types in the Andes and land management practices, developed land is frequently degraded and then abandoned. This pattern of land use contributes to the overall watershed degradation.

Research Objectives

Determine the following:

1. Biophysical characteristics of the Chontabamba basin (land use, land cover, towns, roads, topography, geology, vegetation, climate)
2. Physical, chemical and biological conditions of stream and river reaches
3. Relationships between catchment characteristics and stream condition across a range of temporal and spatial scales
4. Relationships between land management practices and stream condition
5. Improved land management strategies to reduce negative impacts.

Chontabamba Basin, Perú



Scientific Approach

- Combined analyses of remote sensing data, field surveys, water sampling, human surveys and laboratory analyses will be used to address research objectives
- Biophysical characteristics of the study area will be determined from Landsat images (ETM+) and a digital elevation model.
- Derived land cover and land use data will be verified using ground-control points.
- Stream condition will be assessed using a modified version of EPA's Rapid Bioassessment Protocols.
- Water samples will be analyzed for pH, temperature, conductivity, DO, concentrations of nutrients, TSS, and DOC.
- Land owners will be interviewed for information regarding land management, land use and land history.
- Data will be analyzed statistically within a Geographic Information System to determine relationships between stream condition, physical characteristics and land management.

Impacts

•Local benefits

- ⇒ Identification of improved land management strategies to minimize negative impacts to local aquatic resources.
- ⇒ Increase public awareness and environmental education in the affected communities.

•National and Global benefits

- ⇒ Add to the understanding of watershed science in a critical yet poorly studied region that is undergoing rapid change and facing issues representative of many developing nations worldwide.

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