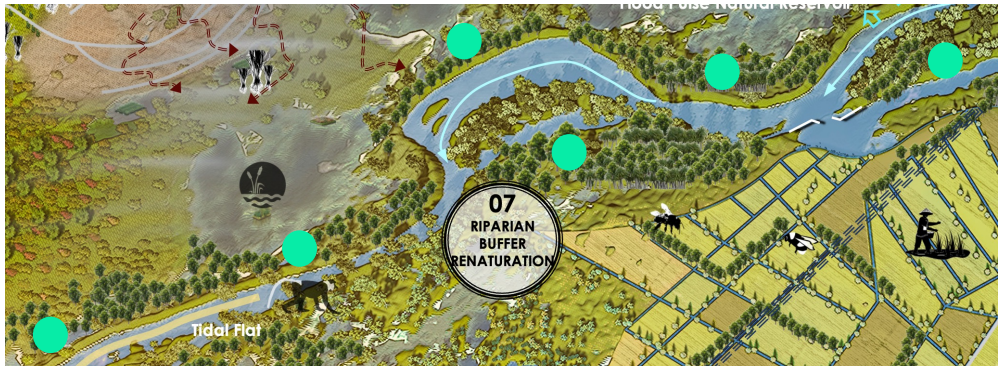
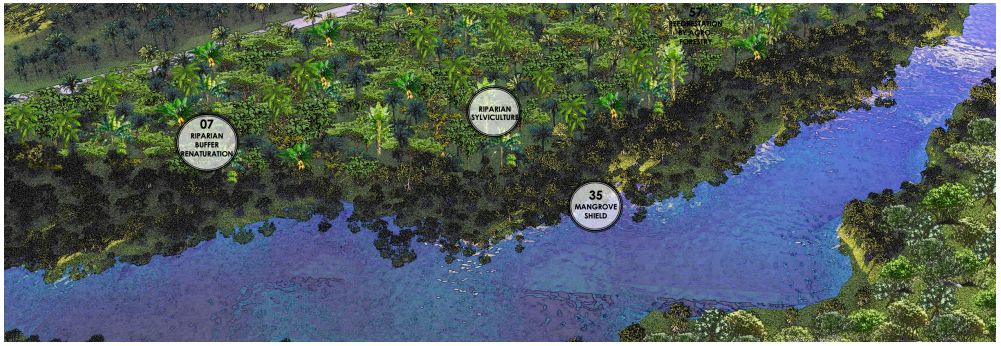
NbS-07: RIPARIAN BUFFER RENATURATION





Restoring and rehabilitating natural vegetated zones along riverbanks is essential for improving ecosystem functions and protecting water quality. These buffers, consisting of native grasses, shrubs, and trees, act as a protective barrier between the land and the river, filtering pollutants, stabilizing soil, and controlling sedimentation. Restoration efforts focus on reintroducing native plant species, enhancing biodiversity, and reestablishing the natural dynamics of riparian ecosystems that have been impacted by human activities such as urbanization, agriculture, and deforestation.

The natural input of organic materials, such as leaf litter, branches, and other debris, which fall from the riparian zone into the river contribute to nutrient cycling, provide habitat for aquatic organisms, and help filter sediments and pollutants from the water. By enhancing the health of riparian buffers, this approach reduces erosion, improves water quality, supports wildlife habitat, and fosters the overall health of river ecosystems.

LANDSCAPES SUPPORTED

EbA (ECOSYSTEM-BASED APPROACHES)

- ECOSYSTEM-BASED DISASTER RISK REDUCTION
- INTEGRATED WATER RESSOURCE MANAGEMENT
- ECOSYSTEM BASED ADAPTATION
- GREEN INFRASTRUCTURE
- ECOSYSTEM RESTORATION

MAIN PROBLEMS ADDRESSED

- SOIL EROSION
- BIODIVERSITY LOSS
- FLOOD CONTROL
- CARBON SEQUESTRATION
- AIR QUALITY IMPROVEMENT

ECOSYSTEM SERVICES AND ACTIONS

SUPPORTING

- Provide crucial habitats for a wide range of aquatic and terrestrial species.
- The natural decay of plant material in riparian buffers contributes to the cycling of nutrients, maintaining the health and productivity of both terrestrial and aquatic ecosystems.
- Help maintain ecological corridors that connect fragmented habitats.

REGULATING

- Filter nutrients, pesticides, and sediments from runoff before they enter the river.
- The root systems of riparian plants stabilize riverbanks, reducing soil erosion.
- Vegetation in riparian buffers captures and stores carbon dioxide, provides shade and regulates water temperature.

PROVISIONING

- Vegetation in riparian zones can be a source of raw materials such as timber, medicinal plants, and other forest products for local communities.
- Riparian buffers support pollinators, which are crucial for agricultural productivity and the health of wild plant species.

SOCIAL BENEFITS

- Riparian zones offer opportunities for environmental education and scientific research.
- Supports recreational activities such as fishing, kayaking, birdwatching, and hiking.

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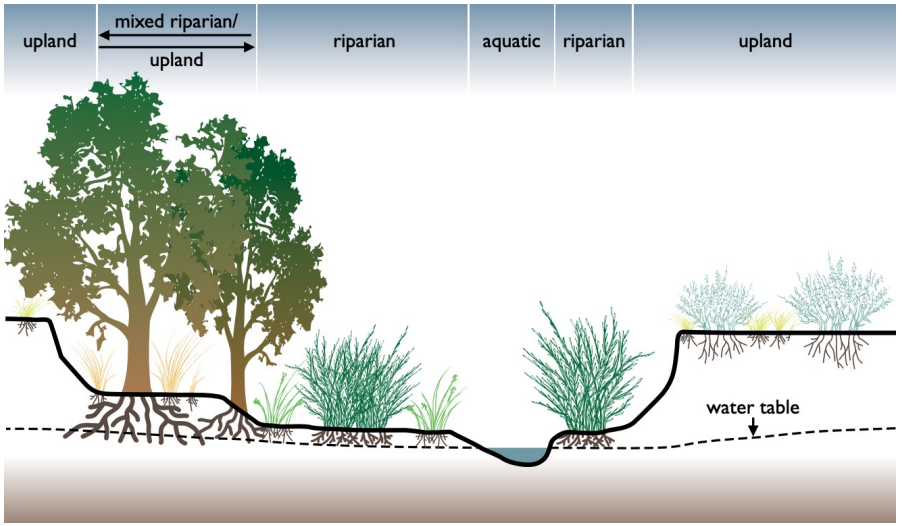
Leaf litter and fine organic material from the riparian zone are a major source of carbon entering streams.



Riparian area, transition from aquatic area to upland area.
Source : United States Department of Agriculture

PROJECT'S CHALLENGES & RISKS

- **Land Ownership and Access Issues**: Difficulty securing land for restoration, especially if it's privately owned or used for agriculture/urban development.
- **External Threats:** Ongoing urbanization, agricultural expansion, or infrastructure projects may place continuous pressure on riparian zones, preventing the restoration of natural river functions.
- **Invasive Species and Biodiversity Risks**: The presence of invasive plant species can lead to reduced biodiversity, further degradation of the riparian ecosystem.
- **High Costs:** Riparian buffer renaturation requires significant financial investment in restoration activities such as planting native vegetation, stabilizing riverbanks, and long-term monitoring.

NbS co-BENEFITS AND THEIR INDICATORS

- **Improved biodiversity**
  Species richness , abundance of native species, habitat quality index, biodiversity indices (e.g., Shannon diversity index).
- **Flood Mitigation**
  Reduction in peak discharge during flood events, floodplain area or capacity restored, frequency and severity of flood events in the area.
- **Air Quality Improvement**
  Air pollutant levels (e.g., PM2.5, NOx), tree canopy coverage,
- **Water Quality Improvement**
  Reduction in sediment concentration (mg/L), Nitrogen and phosphorus levels in water
- **Flood Risk Reduction**
  Reduction in flood frequency (flood events/year), water retention capacity of the system (m^3).

COST ANALYSIS

- **Direct Costs**
  Site preparation, planting and vegetation, erosion control measures: $20,000 - $85,000/ha
- **Indirect Costs**
  Ongoing maintenance, monitoring and evaluation, $9,000 - $23,000/year.
- **Time Horizon**
  Short-Term (1-5 years) : site preparation, planting. Long-Term (20+ years):management, adaptive strategies.
- **Direct Benefits**
  Water quality improvement, flood regulation, erosion control, biodiversity support.
- **Indirect Benefits**
  Carbon sequestration, recreational opportunities, Improved property values.
- **Risk Assessment**
  Climate risks, invasive species, funding and budgeting risks, pollution or unforeseen environmental damage.

REFERENCES:

USA, Indiana, Indianapolis, Lilly ARBOR Project (1,400 native trees along the White River to restore the riparian floodplain).
Canada, Alberta, Riparian restoration in Medicine Hat.

IMPLEMENTATION OPPORTUNITIES:

Indonesia, Upper Citarum River Basin, West Java (industrial discharge, urban waste, and deforestation along its riparian zones.)
Philippines, Metro Manila, Pasig River, (pollution from industrial, residential, and commercial sources).