

Ecological Restoration of Degraded Landscapes-Concept & Applications

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President

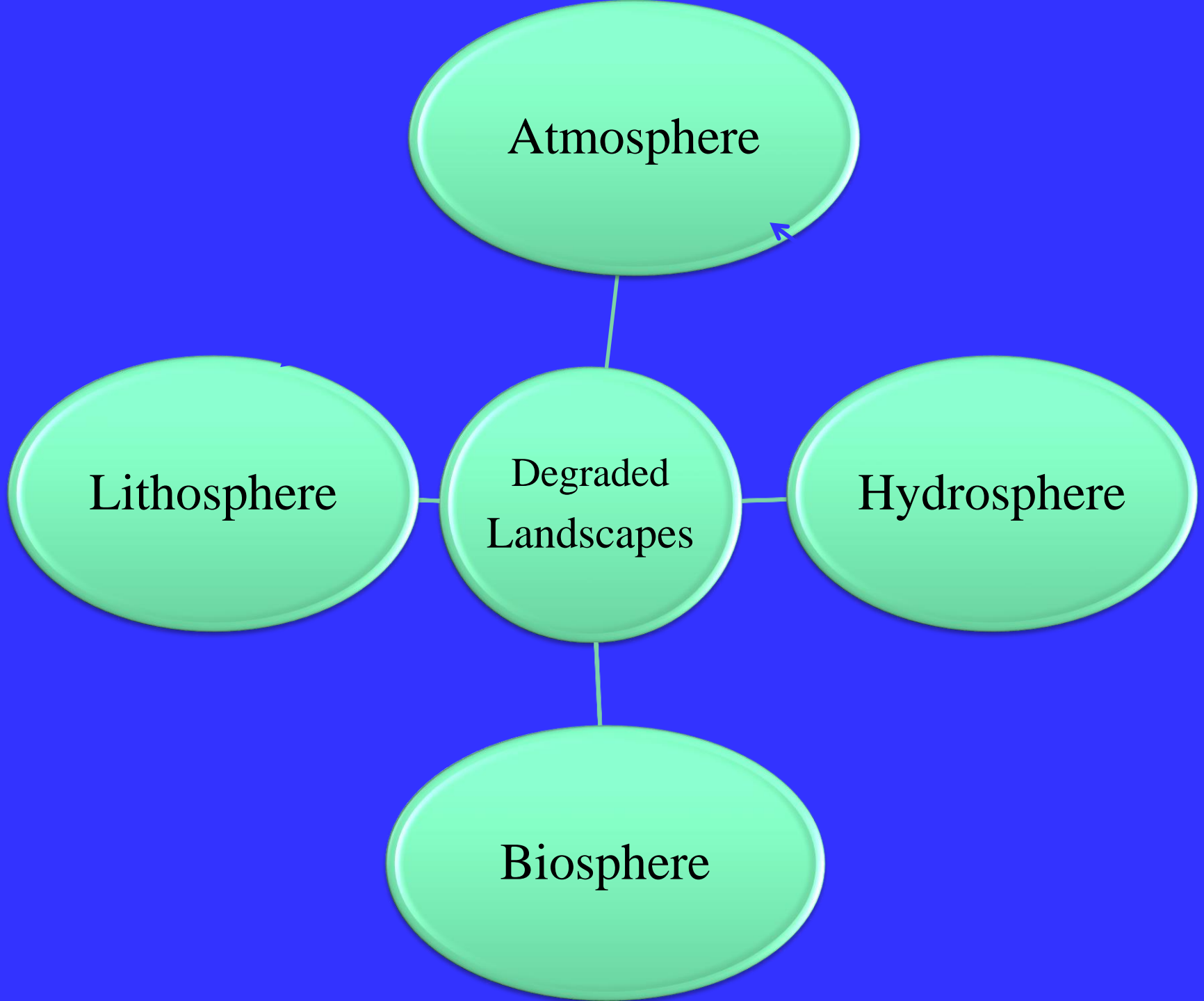
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Landscape alteration

Vegetation Removal

Top soil Removal

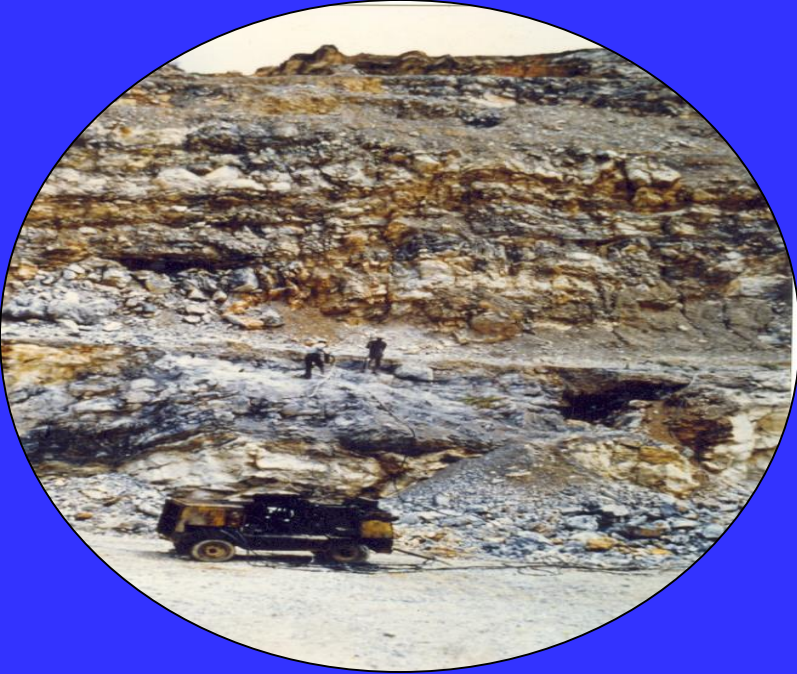
Air & Noise Pollution

Water quality & Quantity

Altered socioeconomic status of people

Floral and faunal population



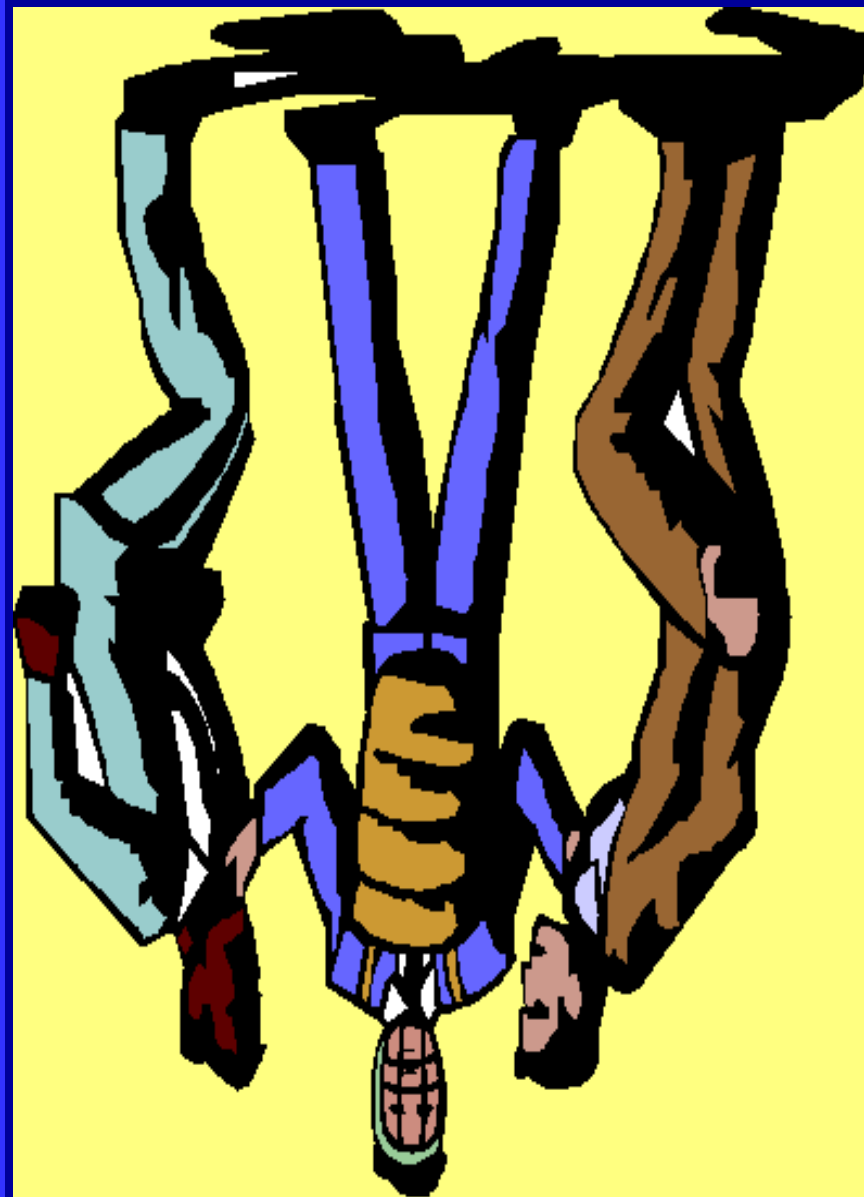


Post Mining Scenarios



**Can
these systems
function ?**

Certainly Not!



Rehabilitation –return to a form and productivity in conformity with prior landuse plan

Restoration -return to original, normal or unimpaired condition



Forest ecosystem

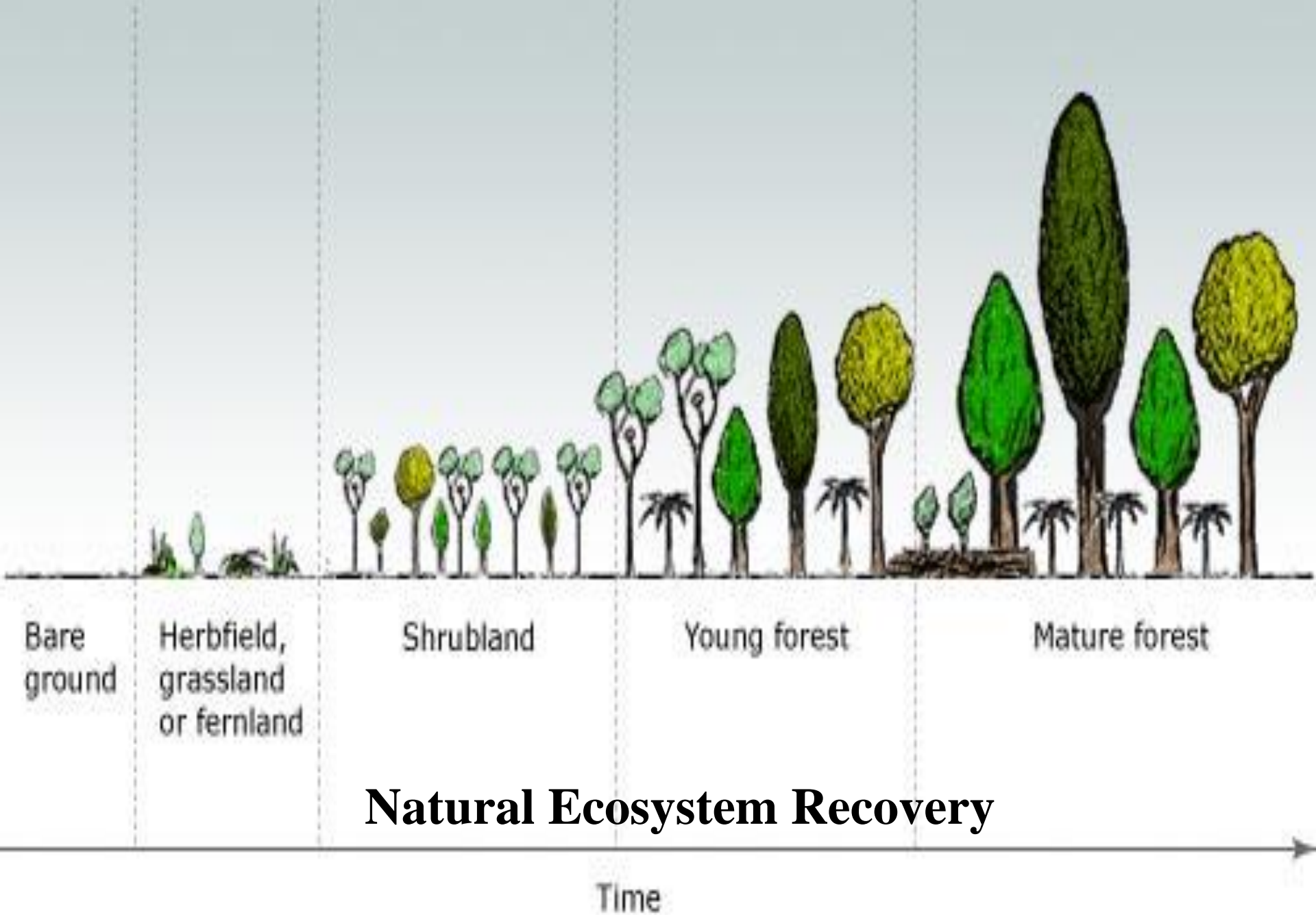
A natural woodland unit consisting of all plants, animals and micro-organisms (Biotic components) in that area functioning together with all of the non-living physical (abiotic) factors of the environment.

Conventional forestry practices to restore these areas end up with tree planting programmes, that too in most cases of exotic tree species like *Eucalyptus* spp., *Acacia auriculiformis*, *Cassia siamea*, *Cupressus* spp., *Pinus* spp., etc. in pits filled with good soil (collected from nearby forest areas) and added fertilizer-another mining operation



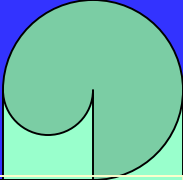
No Ecosystem Recovery





Effects of Deforestations:

- Destruction of species habitats → Extinction of species
- Loss of Bio-diversity
- Reduction of vegetation → Soil erosion
- Loss of soil fertility → Loss of mineral nutrients
- Landslides
- Destroys Oxygen cycle
- Pollution + Global warming
- Less forest products → Quality of our life



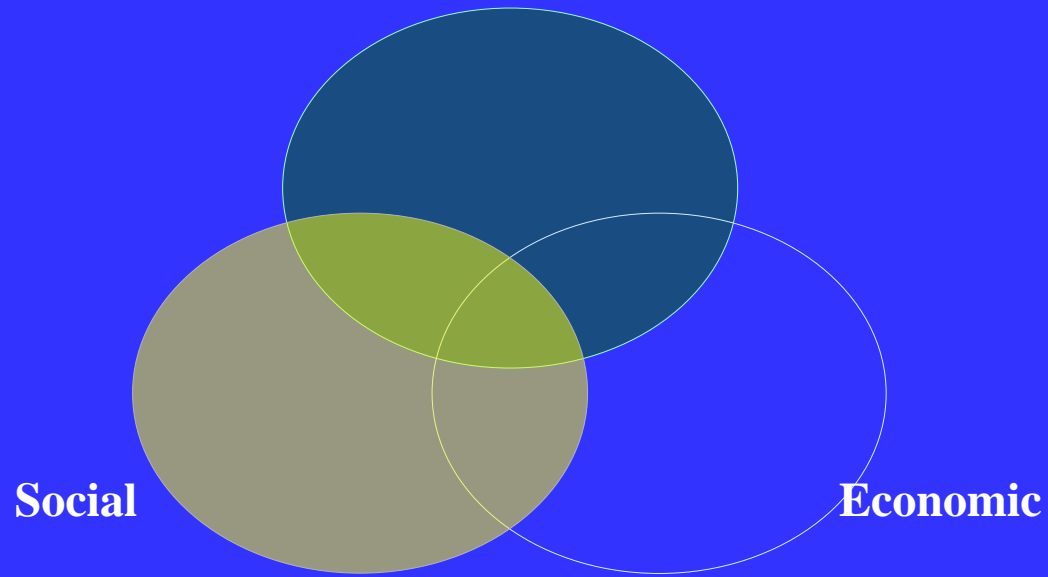
Ecorestoration is the process of short-circuiting the process of natural recovery of degraded ecosystems through ecological interventions to

- **restore the derelict landscape**
- **ameliorate the substrate**
- **conserve the biodiversity**
- **restore the ecological processes**
- **provide the fuel, fodder and other NWFP,s to the local people**

Why Eco restoration ?

◆ no input of external resources viz., soil (mined from other areas), fertilizer, irrigation required

◆ ecologically, economically & socially acceptable



Goals and Objectives

1. To restore highly degraded but localized sites
2. To improve productive capability of degraded lands based on their land capability
- 3 .To enhance conservation values of landscapes

1. The National Mission for a Green India for enhancing quality of forest cover and improving ecosystem services from 4.9 million hectares (mha) of predominantly forest lands, including 1.5 mha of moderately dense forest cover, 3 mha of open forest cover, 0.4 mha of degraded grass lands.
2. Eco-restoration/afforestation to increase forest cover and eco system services from 1.8 m ha forest/non forest lands, including scrub lands, shifting cultivation areas, abandoned mining areas, ravine lands, mangroves and sea-buckthorn areas.
3. Enhancing tree cover in 0.2 mha Urban and Peri-Urban areas (including institutional lands)

To achieve these goals, formulation of an effective restoration programme is necessary after assessment of –

- Major causes of degradation
- Biological potential of the site based on assessment of the extent of disturbance to biotic components
- Degree of alteration in the physical and chemical composition of strata
- Quantitative and qualitative changes in the hydrological potential of the site
- Limiting factors for establishment, growth, & diversity of recovering vegetation.
- Quantification of socioeconomic impacts

Plant species most appropriate for the development of sustainable ecological system –

- Fast growing and of primary colonizing nature**
- that will set the disturbed nutrient cycling process, productivity & regulation of water regime**
- That will ensure rebuilding the damaged wild faunal habitat**
- That will ameliorate the substratum and rebuild the organic matter**
- That can serve the requirements of local population**

Short Term Plan

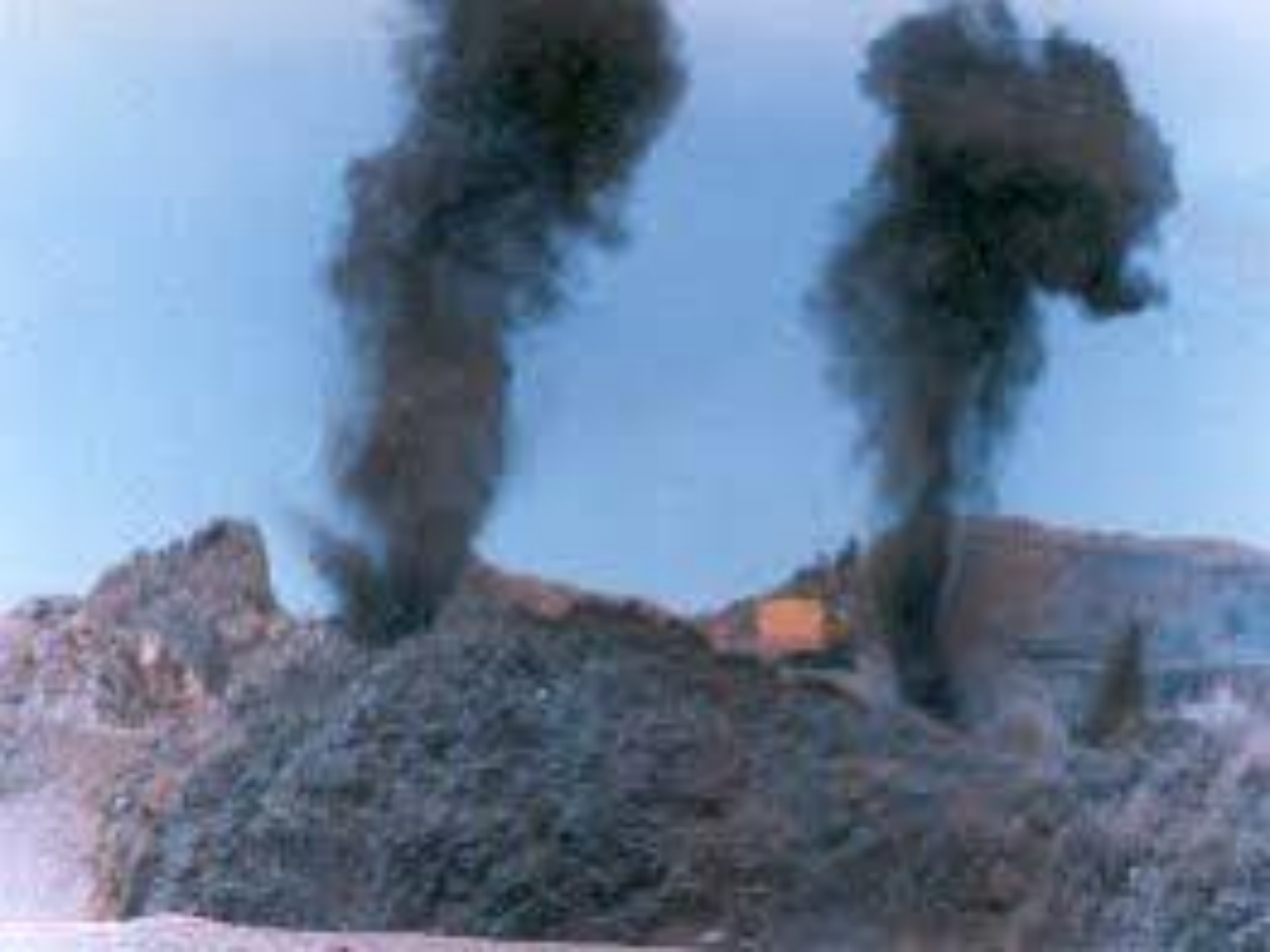
- Development and conservation of soil and *in-situ* moisture through ecological restoration interventions ;
- Restoration/ Regeneration of degraded lands including forests and adjoining areas on an ecological basis;
- Intensification of the availability of fuel wood, fodder, grasses and other forest usufructs from the restored areas;
- Securing people's participation in planning and restoration efforts in the surrounding villages to ensure sustainability).

Long Term Plan

- Ecological restoration and environmental conservation;
- Protection and conservation of natural resources for local populace ;
- Checking land degradation, deforestation and loss of biodiversity;
- Improve microenvironment of the degraded landscapes;
- Capacity building of all the stakeholders

Some Case Studies





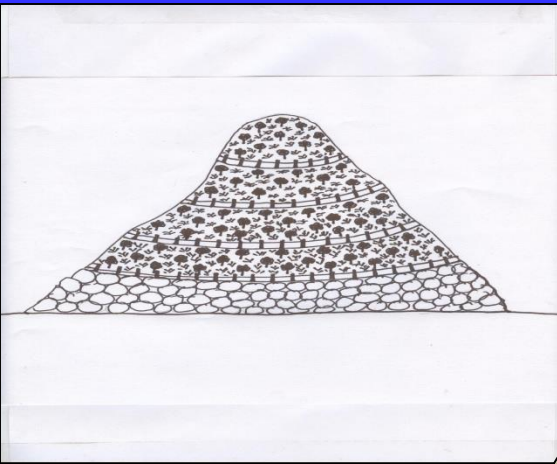


2011/03/05

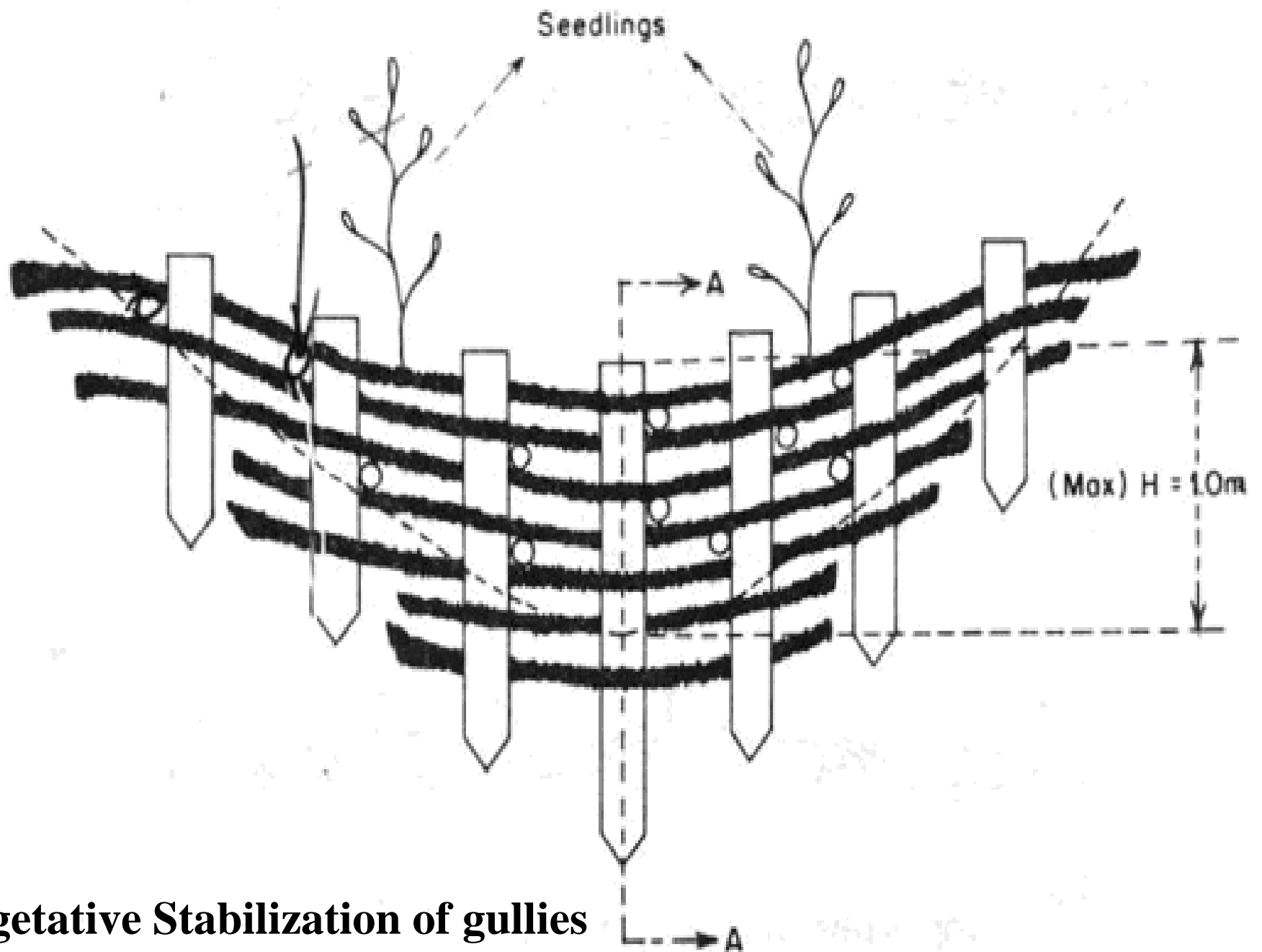


2011/03/05

Site preparation







Vegetative Stabilization of gullies

Phosphate Mine in Doon Valley

Pre-restoration

Series of Check Dams

**Followed by Seeding
(after 1 yr.)**







Regeneration of Forest Ecosystem

Species Richness after 10 yrs. 45

After 25 years >69

Litter Production 1.4 t/ha

**Biomass Production
(Above ground) 4.4 t/ha**



The background of the slide is a photograph of a dense, lush green thicket. The foliage is thick, with many small, bright green leaves. Interspersed among the leaves are numerous small, light pink flowers, some in full bloom and others as buds. In the lower portion of the image, there are clusters of small, round, orange-colored berries or fruits hanging from the branches. The overall scene suggests a healthy, growing natural environment.

SIGNIFICANT INCREASE IN :

- WEATHERED MINE SPOILS**
- TOTAL N**
- AVAILABLE P**
- AVAILABLE K**

SOCIO-ECONOMIC RETURNS

- fuel wood -1.2 t/ha
 - fodder -2.2 t/ha
 - timber -4.4 t/ha
 - fiber & other -as per requirement
- NWFP's requirements**



Dense and Diverse Rock Phosphate Mine Doon Valley



Ecological Gains

Timber **Rs. 1.47 Lakhs**

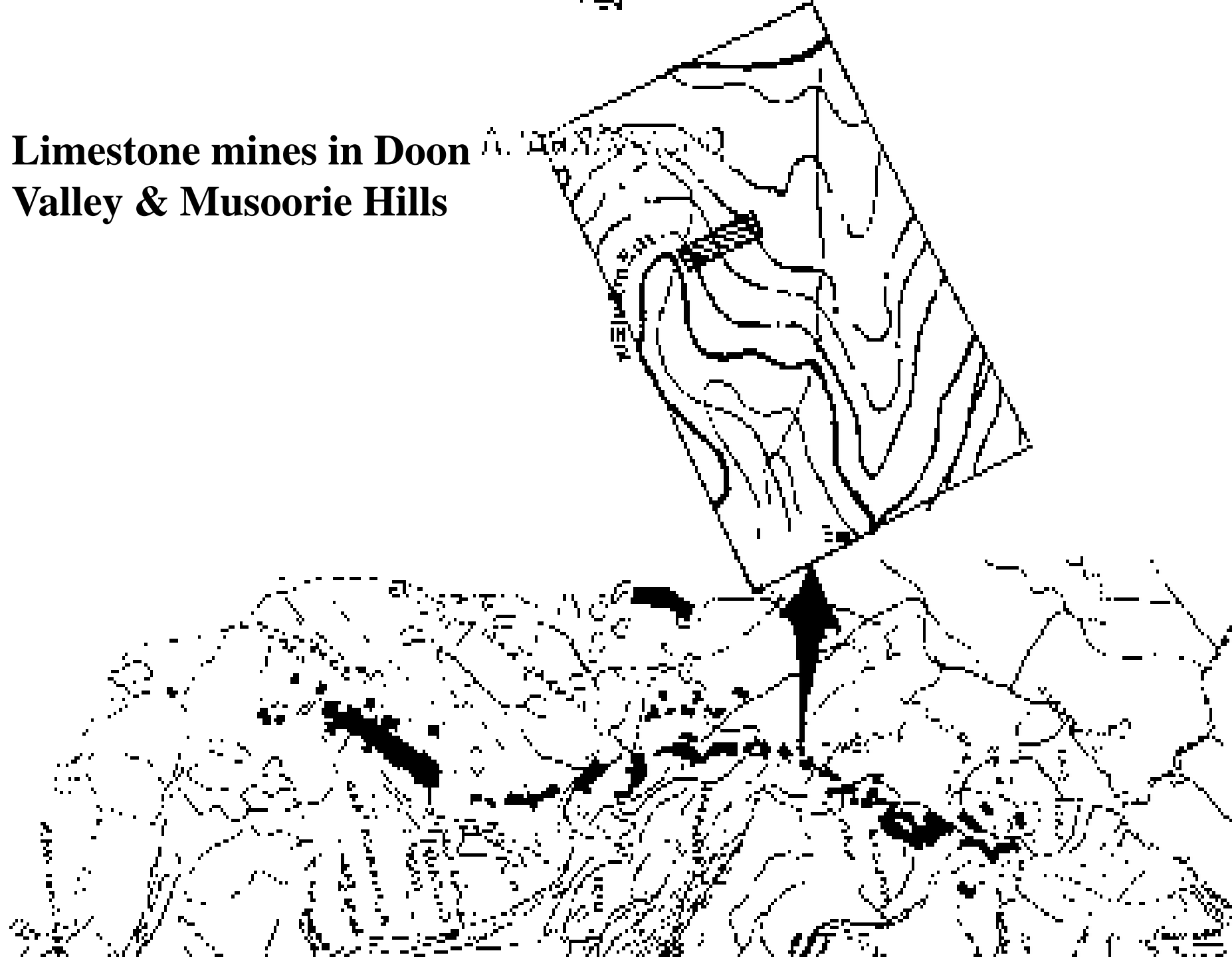
Fertilizers **Rs. 3000/ha**

**Organic
Matter** **Rs. 4000/ha**

Water Quality
(Sediment load from 360
to 60-70 mg/litre)



Limestone mines in Doon Valley & Musoorie Hills



Abandoned Limestone Mine



Grasses And Shrubs After One Season



GRASSES AND SHRUB COVER AFTER TWO YEARS





2 YEAR LATER

5 YEARS LATER



Stabilization of degraded watercourse

Water flow
improved
significantly



Restored Limestone mine Mussoorie hills



Iron Ore Mines

Jharkhand & Orissa



MINE SPOILS

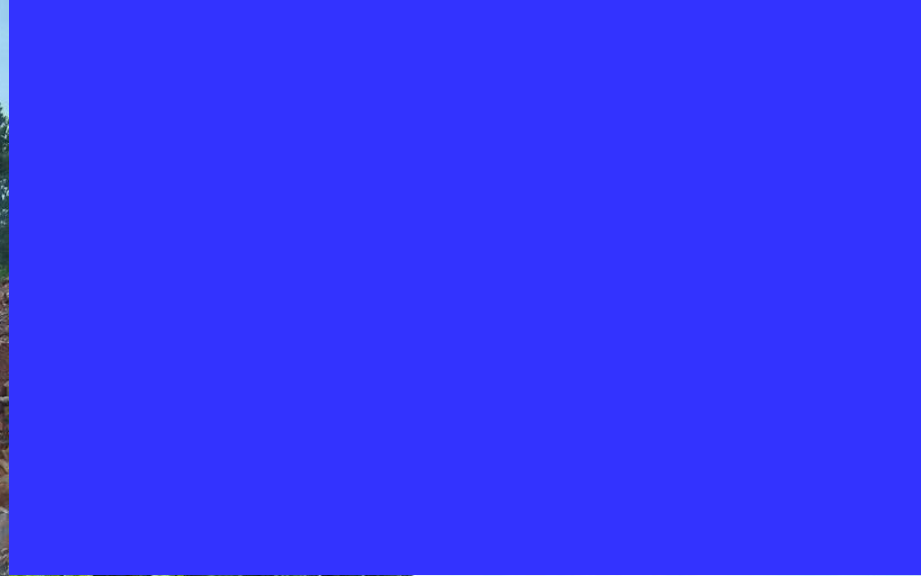


NATURAL FORESTS

O.B.dumps







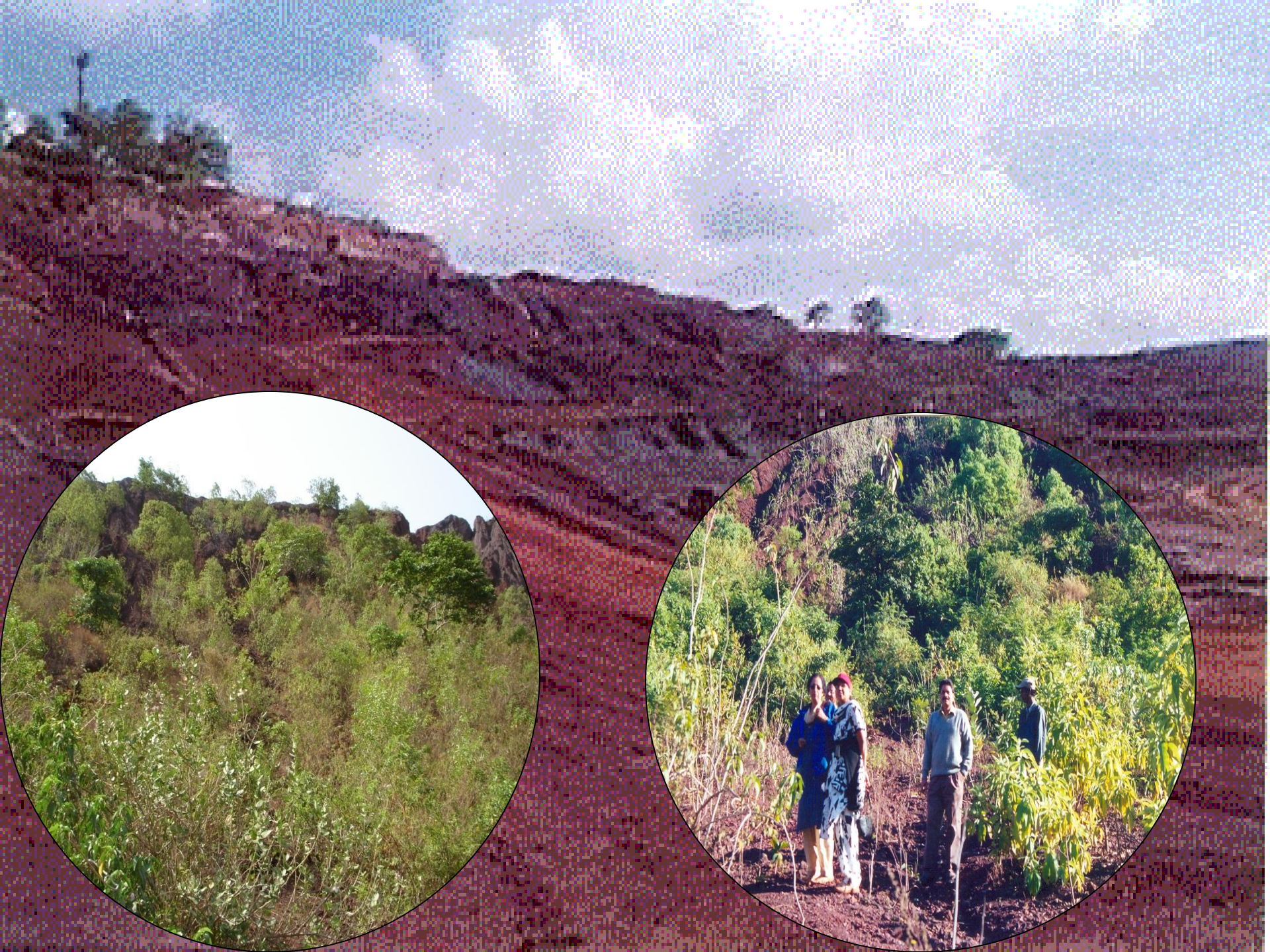


Restoration of Benches





8 5 2007



Stone Mines in Haryana





Large chunk of land is degraded due to Mining

**Can sequester ~12
tons Carbon Dioxide**

**Can Release 35% more
Oxygen**



Uranium Tailing Ponds, Jaduguda



Plantation – July 2007



11 9 2007



Colebrookea oppositifolia



Jatropha gossypifolia



Furcaria foetida



Dodonaea viscosa



Saccharum spontaneum



Pogostemon benghalense

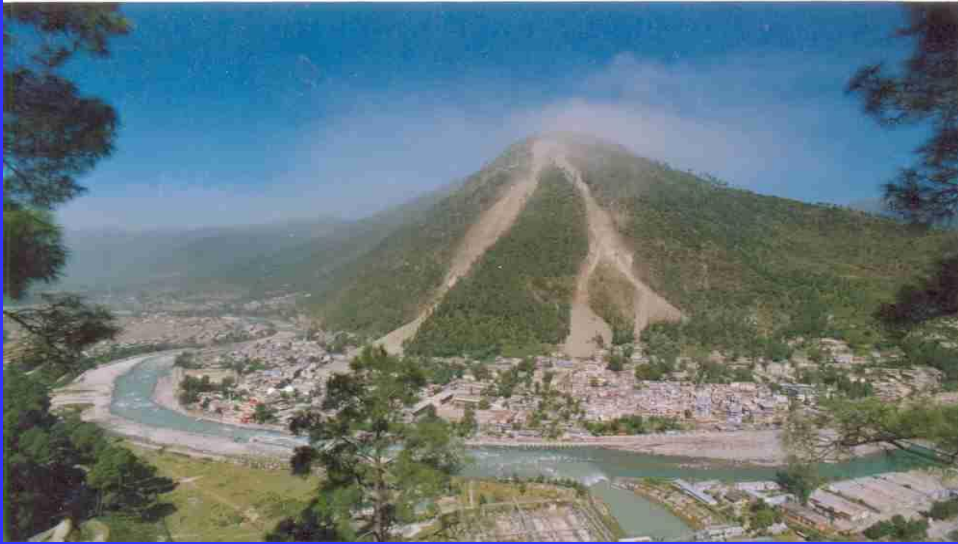


Imperata cylindrica

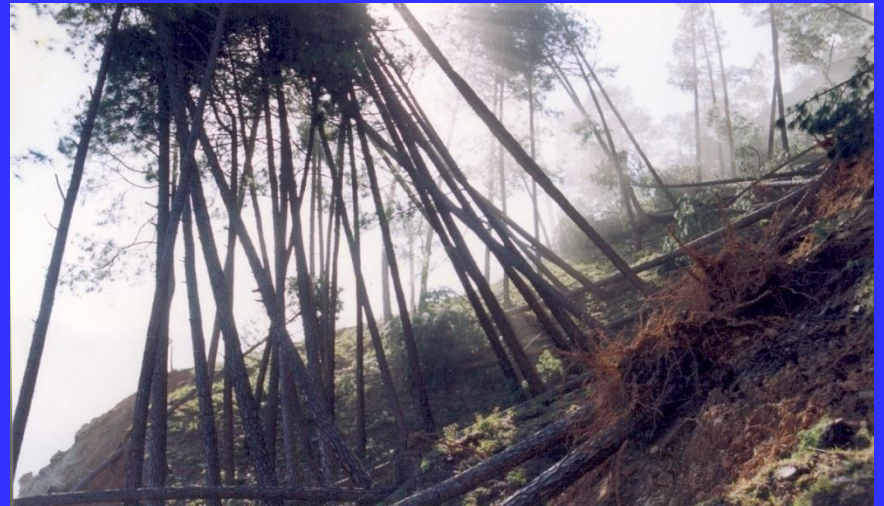




Varunavat Landslide and its Consequences



**A General View of
Varunavat Landslide**



Uprooting of Trees



Deforestation

Damage to Property



Management of Landslide using bioengineering measures in Crown Portion



Crown area before
treatment

Spreading of Geo-Jute



Combination of Grasses and Shrubs



Management of Middle Portion (Terraces)



Establishment of Grasses, Shrubs & other Native Species



Management of Dumping Sites



Spreading of Geo-Grid

Spreading of Geo-Jute



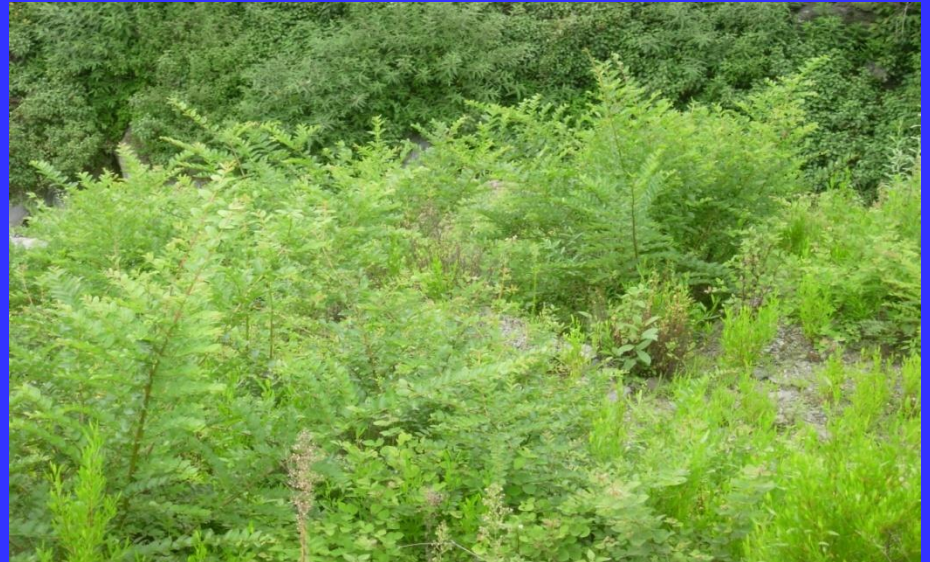
Colonization and Establishment of Species



Establishment of Soil Binding Species

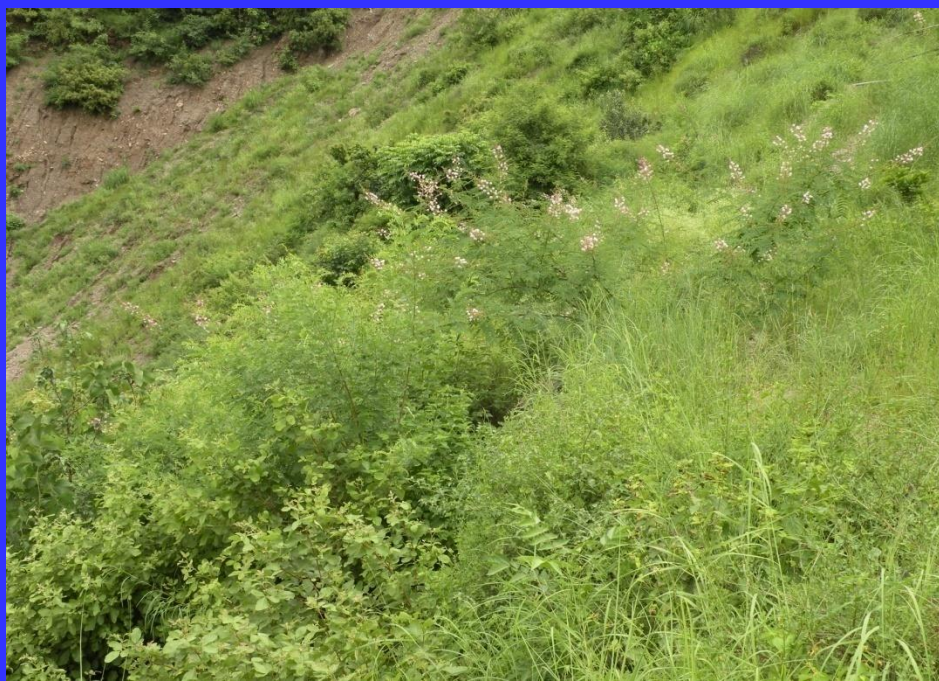


Colonization of Native Trees and Shrubs



Fodder Resource Generation





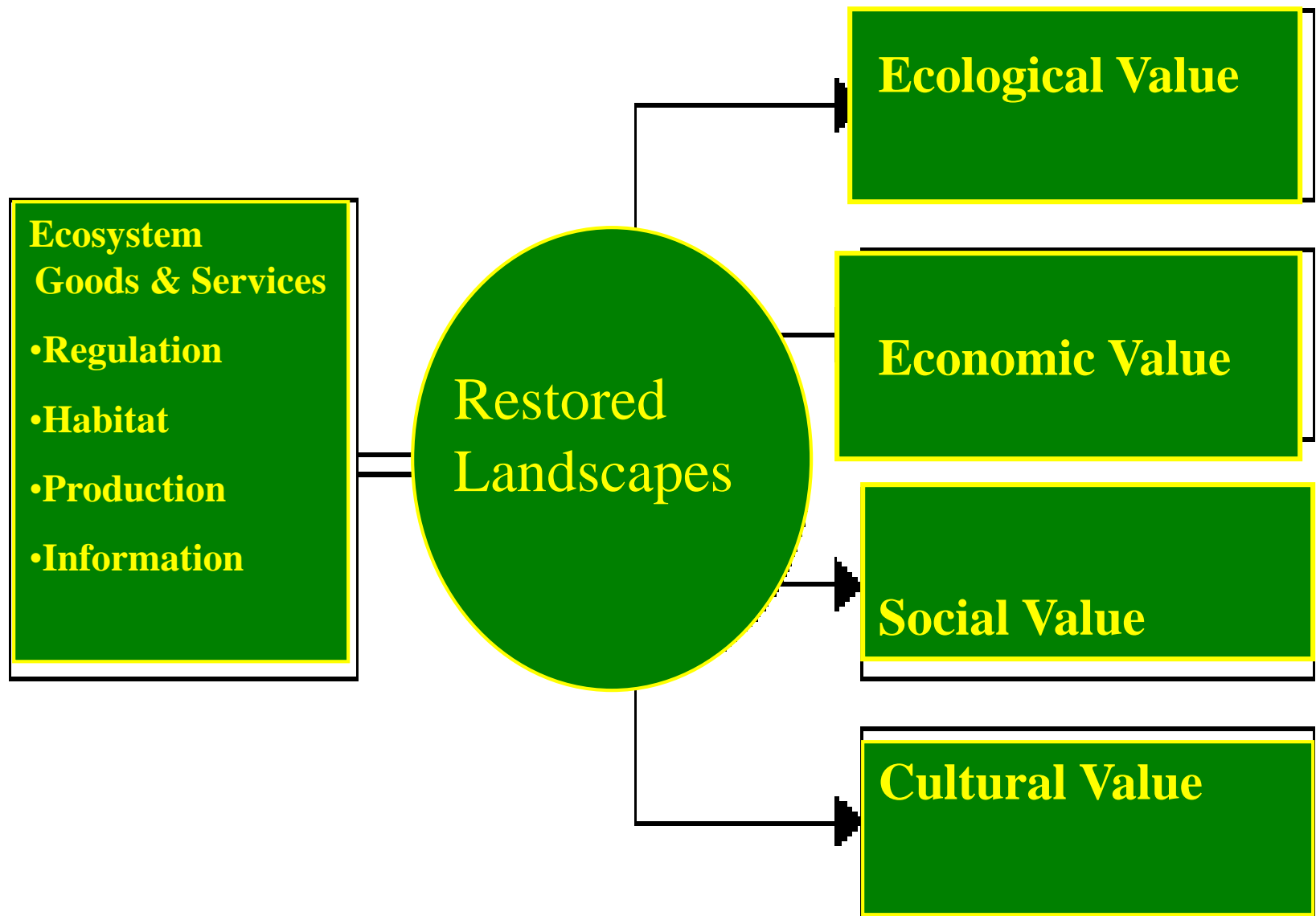
Plantation and Fodder Resource Generation in Adjoining Natural Forest





Slope stabilization at Hydropower Project Site





Functions and Values of a Restores Landscape

A photograph of a vast, dense forest covering a mountain slope. The trees are a deep green color, and the forest extends to the horizon under a clear blue sky. The text is overlaid on the upper left portion of the image.

Ecorestoration aims at a self sustainable
ecosystem with all ecological ,economic
and social services

We are fortunate to
have this environment !

Let's enjoy &
Conserve



A young boy with dark hair, wearing a dark brown sweater, is in the foreground, holding binoculars to his eyes. He is looking out over a vast mountain valley. The valley features a river with white rapids, rocky banks, and lush green vegetation. In the background, there are steep, forested mountains under a clear blue sky. A small town is visible on a hillside in the distance. The text "Protect the diversity of life" is overlaid in white serif font on the left side of the image.

Protect the diversity of life

Thanks

2010/05/21