

# Restoration Ecology in Tunisia



## PLAN

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- 2/Restoration Ecology Techniques .**
- 3/Restoration ecology in Tunisia .**
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## RESTORATION ECOLOGY

Restoration Ecology is the scientific study of restoring damaged, degraded or destroyed ecosystems to their natural state.

- Focuses on ecosystems affected by :
- deforestation,
- pollution,
- mining,
- agriculture,
- urbanization,
- climate change

**Aims to rebuild biodiversity, ecosystem functions, and resilience**

Ultimately, restoration ecology plays a critical role in conserving biodiversity, rebuilding ecosystem services, and enhancing the resilience of both natural and human communities.

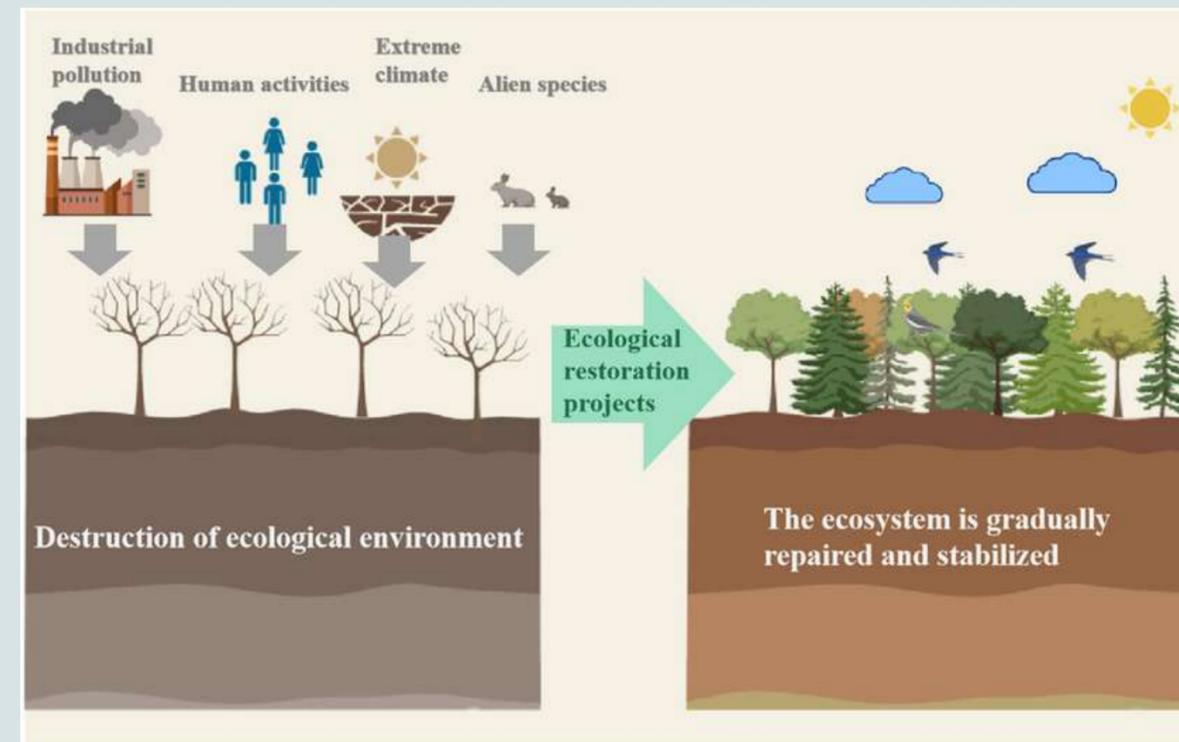




## DAMAGE AND RESTORATION

Many degraded ecosystems cannot recover naturally without human intervention, especially when soils are eroded, polluted, overgrazed, or dominated by invasive species. Recovery is unlikely if the original species have been eliminated or if the physical environment has been permanently altered, such as in mined or heavily contaminated sites.

Effective restoration often requires removing invasive species, improving soil and water conditions, reintroducing native species, and reestablishing natural processes so ecological succession can begin again. Because each site is different, restoration methods are often tested experimentally and monitored over long periods in an approach known as adaptive restoration.



The ultimate goal is to create self-sustaining ecosystems that resemble reference sites in species composition and ecological function, ensuring long-term stability and biodiversity conservation.



## CORE PRINCIPLE OF RESTORATION ECOLOGY

A REFERENCE ECOSYSTEM CAN SERVE AS THE MODEL FOR PLANNING AN ECOLOGICAL RESTORATION PROJECT AND LATER SERVE IN THE EVALUATION OF THAT PROJECT IT REPRESENTS A KEY POINT OF ADVANCED DEVELOPEMENT



Reference sites provide explicit goals for restoration and supply quantitative measures of the success of a project.

The use of reference sites does not mean restoration goals are set in stone: since ecosystems change over time because of changing climate, plant succession, the varying abundance of common species, and other factors, the goals of restoration may have to change over time as well, to remain realistic



## RESTORATION PROJECTS IN THE CHESAPEAKE BAY



The Chesapeake Bay is one of the most important fishing grounds and recreational areas in the United States. Water became unsafe and polluted for swimming due to pollution from residential, agricultural, and industrial lands enclosing the bay affecting all aspects of biodiversity. In 1987 the federal, state, and local government bodies responsible for the bay signed an agreement to reduce nutrient and sediment loads coming into the bay by 40%, to be achieved mainly through improving the health of streams and watersheds feeding water into the bay. over 4700 individual restoration projects have been implemented, at a cost of over \$400 million (Hassett et al. 2005; Craig et al. 2008; Stokstad 2009).





## TECHNIQUES OF RESTORATION ECOLOGY

A key step in creating a shared vision of ecosystem restoration is to adopt principles that underpin the full set of ecosystem restoration activities which they focus on repairing degraded ecosystems by promoting self-sustaining, biodiverse, and resilient natural systems. Restoration ecology provides theories and techniques to restore various types of degraded ecosystems :

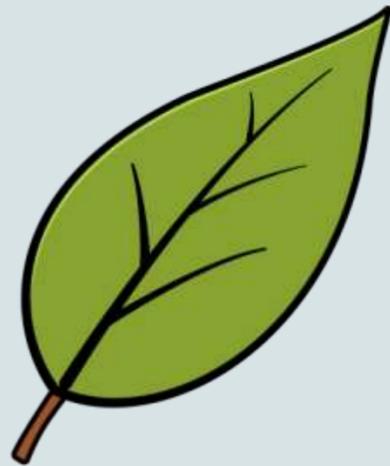
### CORE TECHNIQUES OF RESTORATION ECOLOGY





### 1/ NO ACTION

previous restoration attempts have failed, or experience has shown that the ecosystem will recover on its own which is known as passive restoration and it is typical for old agricultural fields in eastern North America, which return to forest within a few decades after being abandoned.



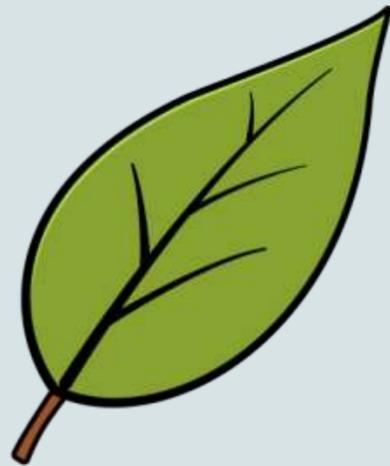
### 2/REHABILITATION

Replacing a degraded ecosystem with another productive type, using just a few or many species this technique establishes a biological community on a site and restores ecological functions such as flood control and soil retention.



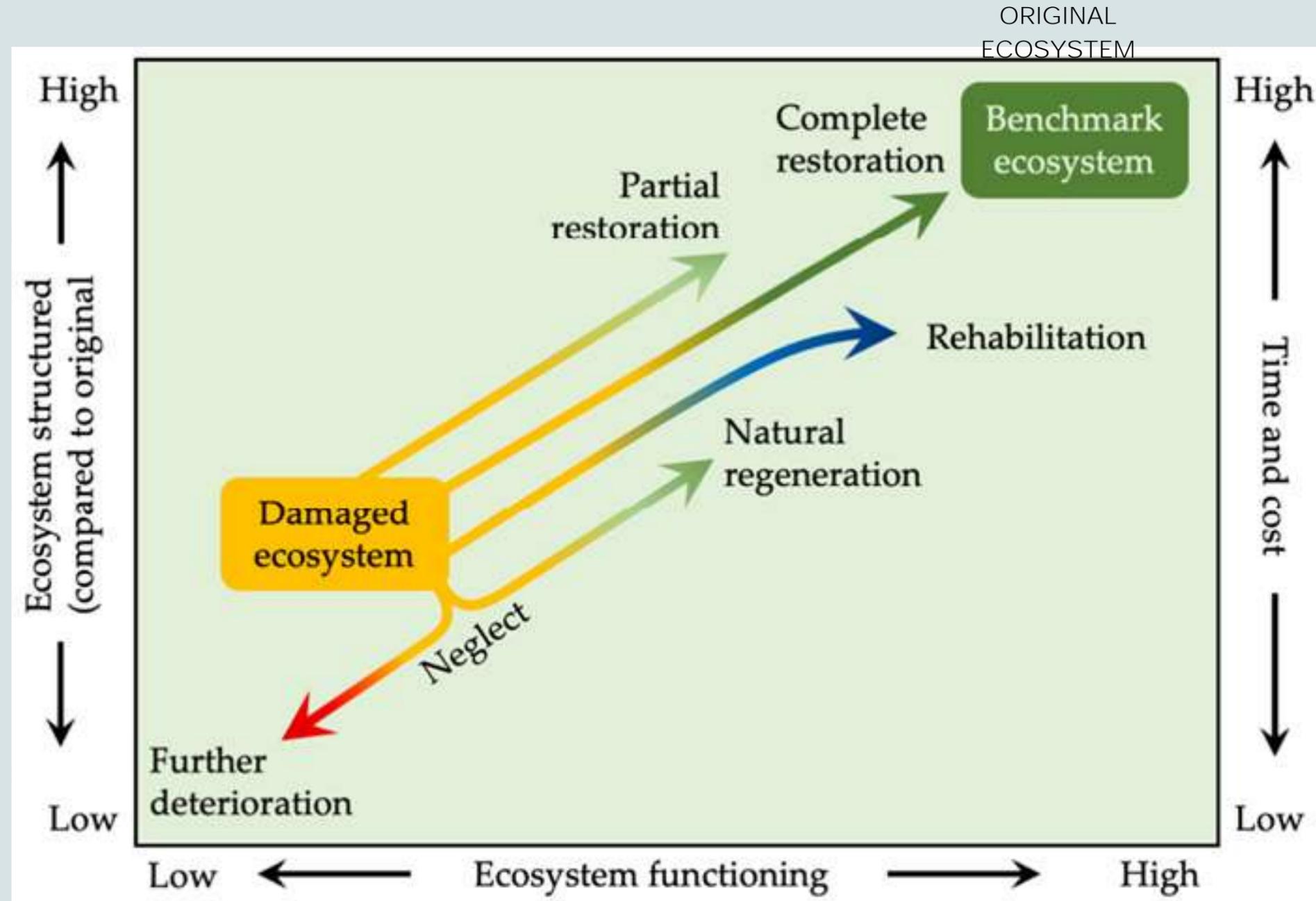
### 3/ PARTIAL RESTORATION

Partial restoration typically focuses on dominant species or particularly resilient species that are critical to ecosystem function, delaying action on the rare and less common species that are part of a complete restoration program.



### 4/ COMPLETE RESTORATION

Restoring the area to its original species composition and structure by an active program of site modification and reintroduction of the original species.





## WETLANDS RESTORATION IN JAPAN

Parents, teachers, and children have built over 500 small ponds next to schools and in public parks to provide habitat for dragonflies and other native aquatic species

The schoolchildren are responsible for the regular weeding and maintenance of these "living laboratories," which helps them to feel an ownership of the project and to develop environmental awareness.



## THE GRAND CANYON-COLORADO RIVER ECOSYSTEM

River damming has severe and extensive impacts on downstream ecosystems, and restoring river flow may allow these ecosystems to recover.

To restore this crucial flooding event, the Bureau of Reclamation began experimenting with varying the rate of water release as a restoration technique, releasing an experimental flood of 900 million m<sup>3</sup> (1350 m<sup>3</sup> / s) from the Glen Canyon Dam over the course of a week in March 1996 (Yanites 2006) .



## RESTORATION IN URBAN AREAS

Restoring native communities on huge urban landfills presents one of the most unusual opportunities. In the United States, 150 million tons of trash are being buried in over 5000 active landfills each year. These eyesores can be the focus of conservation efforts. When they have reached their maximum capacity, these landfills are usually capped by sheets of plastic and layers of clay to prevent toxic chemicals and pollutants from seeping out. If these sites are left alone, they are often colonized by weedy, exotic species .

The eventual goal is to create a large public parkland area (almost three times the size of Central Park) with abundant wildlife and many recreational, cultural, and educational amenities.

# WETLAND RESTORATION

## THE KISSIMMEE RIVER



A RIVER IN SOUTH-CENTRAL FLORIDA

The Kissimmee River was formerly a long, meandering river that flowed from Lake Kissimmee to Lake Okeechobee in central Florida.

The U.S. Army Corps of Engineers dug a 90-km-long drainage canal down the center of the floodplain, built levees and water control structures along the length of the canal, and regulated water flow from the feeder lakes. Two-thirds of the river's floodplain wetlands were drained, water flow was eliminated in the native river channel, and much of the drained land was converted to rangeland for cattle. As water flow was diverted through the canal, dissolved oxygen concentrations in the remaining sections of wetland declined, and an ecosystem that had been characterized by highly variable water levels and patchy, diverse habitats became a stable, homogeneous environment.

 The negative effects on biodiversity were almost immediate: The numbers of overwintering birds declined sharply, habitat for game fish was degraded, and a diverse natural community of wading birds and fish was replaced by a few dominant species such as cattle egrets, gar, and bowfin (Jones et al. 2010). As the impact of the channelization became apparent, pressure mounted from conservation groups to restore the Kissimmee River to its original state. Initial plans focused on restoring certain target species



In 1992, the U.S. Congress authorized the restoration of approximately one-third of the Kissimmee River and floodplain through backfilling 36 km of the flood-control canal, removing two water-control structures, and recarving the old river channel (Jones et al. 2010). To accomplish this, more than 40,000 ha of land are being acquired by the state and federal governments. Important habitat will be provided for over 260 fish and wildlife species, including the threatened bald eagle, the endangered snail kite, and the endangered wood stork

# ECOLOGICAL PROBLEMS IN TUNISIA



# Restoration ecology in Tunisia

TUNISIA LAUNCHES \$24MLN PROJECT TO RESTORE FORESTS, REVITALIZE RURAL ECONOMIES



TUNIS: The Government of Tunisia, in partnership with the African Development Bank Group, has launched a flagship \$24 million initiative to restore degraded forest landscapes and boost climate resilience in rural ecosystems.

The initiative aligns with Tunisia's national development priorities, including the 2030 Sustainable Development Strategy and the country's commitment to reducing carbon intensity by 45% by 2030. It is expected to generate nearly 4,500 green jobs across the governorates of Béja, Siliana, and Bizerte.

This project addresses the urgent need to protect natural resources through an integrated, value chain-based approach. It targets both ecological restoration and the creation of sustainable economic and social opportunities for rural communities.

Key targets of the project include the restoration or stabilization of 33,200 hectares of land, including 2,450 hectares of private land under sub-projects focused on agroforestry, forestry, and the cultivation of aromatic and medicinal plants. Additionally, 42,000 people will receive training in sustainable land management practices. Over a 25-year horizon, the project is expected to enable sequestration of 32 million tonnes of carbon, significantly contributing to Tunisia's climate goals.

# Oasis restoration in Tunisia

The development of community managed agricultural cooperatives and the restoration of vital irrigation infrastructure is renewing the oases of Tunisia and the livelihoods of their communities.

Hundreds of microprojects contribute to an economic boost for Tunisians

Scaling up this work to combat climate change and desertification across North Africa can reduce water scarcity and support stability in the region.



The Oases Ecosystems and Livelihoods Project has brought sustainable land practices to more than 880 hectares of land . These micro-projects resulted in 735 direct jobs and improved income. The micro-projects focused on sustainable land and water management; conservation; artisanship; income-generating oases projects such as date jam and honey; and ecotourism development.





# Challenges in Restoration

## Ecology.

Restoration ecology focuses on repairing damaged ecosystems but in real life it's full of challenges.

### Lack of Funding:

Securing sufficient financial resources for a restoration ecology project can be a major challenge. Restoration efforts often require significant funding for equipment, materials, labour, and ongoing monitoring.

### Degraded Soil & Hydrology:

Rebuilding ecological processes is harder than simply planting trees , Nutrient depletion , Soil compaction ,Altered river flow from dams ,Loss of wetlands

### Site Selection:

Identifying a suitable site for restoration can be difficult. Factors such as soil quality, availability of native species, and the extent of environmental degradation must be considered. Additionally, acquiring or gaining access to the chosen site may face legal or logistical challenges.

### Lack of Knowledge and Expertise:

Insufficient understanding of the ecosystem, the causes of degradation, and effective restoration techniques can impede progress. It is crucial to have experts who can assess the ecological context and implement scientifically sound restoration practices.



# The Future of Restoration

## Ecology

Restoration ecology is a rapidly growing field within conservation biology, supported by its own scientific society, journals, university courses, and expanding research base. It offers valuable tools for repairing damaged ecosystems and can create new opportunities to protect biodiversity.

However, conservation biologists must ensure that restoration projects are genuine and not merely public relations efforts by companies seeking to justify continued environmental damage. Small, highly visible restoration projects cannot compensate for large-scale destruction elsewhere, and recreating ecosystems in new locations rarely replicates the original species composition or ecological functions. Therefore, while restoration is important, the highest priority in conservation should remain the protection and proper management of existing natural biological communities.



THANK YOU FOR YOUR ATTENTION

