

Wetland Ecosystem



Praveen Kumar Singh
M. Sc. Environmental Science
Central University of Rajasthan

Wetlands are...

Areas where a water table is at, near, or just above the surface and where soils are water-saturated for a sufficient length of time such that excess water and resulting low soil oxygen levels are principal determinants of vegetation and soil development. Wetlands will have a relative abundance of obligate hydrophytes in the vegetation community and soils featuring “hydric” characteristics.



Ramsar Convention definition

Under the Ramsar international wetland conservation treaty, wetlands are defined as follows:

Article 1.1: "...wetlands are areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters."

Article 2.1: "[Wetlands] may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands."

Wetland Classification Chart

<i>Major Categories</i>	<i>General Location</i>	<i>Wetland types</i>
<i>Coastal Wetlands:</i>		
<i>Marine (undiluted salt water)</i>	<i>Open coast</i>	<i>Shrub wetland, salt marsh, mangrove swamp</i>
<i>Estuarine (salt/freshwater mix)</i>	<i>Estuaries (deltas, lagoons)</i>	<i>Brackish marsh, shrub wetland, salt marsh, mangrove swamp</i>
<i>Inland Wetlands:</i>		
<i>Riverine (associated w/ rivers and streams)</i>	<i>River channels and floodplains</i>	<i>Bottomlands, freshwater marsh, delta marsh</i>
<i>Lacustrine (associated w/ lakes)</i>	<i>Lakes and deltas</i>	<i>Freshwater marsh, shrub and forest wetlands</i>
<i>Palustrine (shallow ponds, misc. freshwater wetlands)</i>	<i>Ponds, peatlands, uplands, ground water seeps</i>	<i>Ephemeral ponds, tundra peatland, ground water spring oasis, bogs</i>

Wetlands – lands covered with water all or part of a year

Hydric (saturated) soils – saturated long enough to create an anaerobic state in the soil horizon

Hydrophytic plants – adapted to thrive in wetlands despite the stresses of an anaerobic and flooded environment

Hydrologic regime – dynamic or dominant presence of water

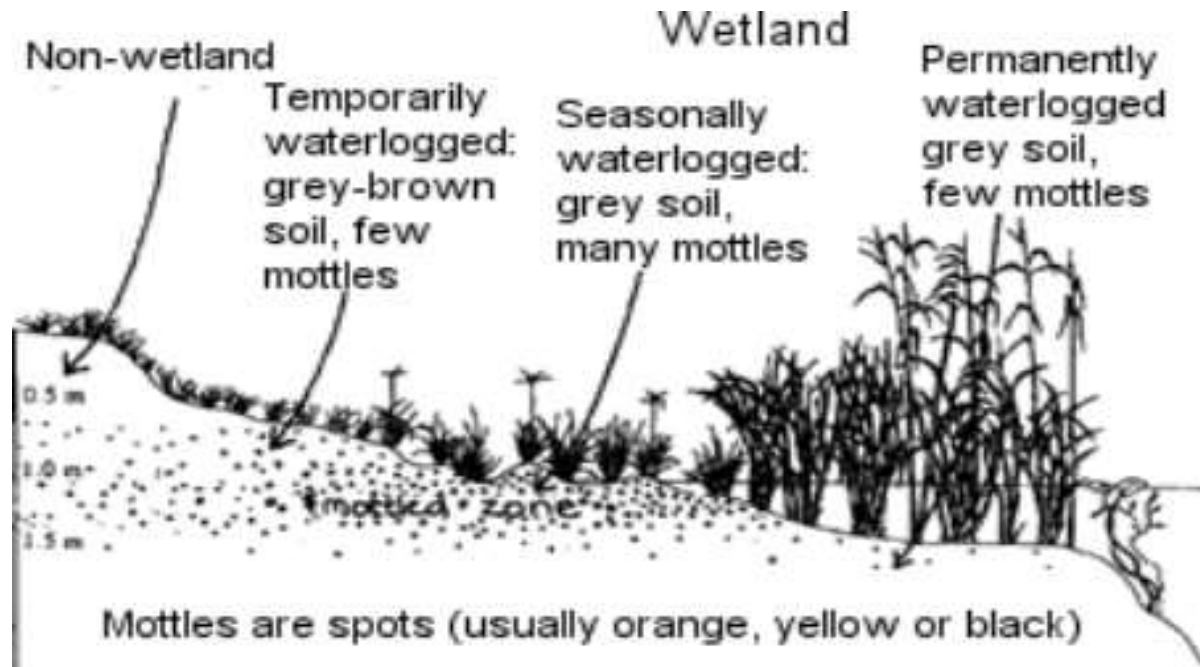


Table 1. ECOSYSTEM SERVICES PROVIDED BY OR DERIVED FROM WETLANDS

Services	Comments and Examples
Provisioning	
Food	production of fish, wild game, fruits, and grains
Fresh water ^a	storage and retention of water for domestic, industrial, and agricultural use
Fiber and fuel	production of logs, fuelwood, peat, fodder
Biochemical	extraction of medicines and other materials from biota
Genetic materials	genes for resistance to plant pathogens, ornamental species, and so on
Regulating	
Climate regulation	source of and sink for greenhouse gases; influence local and regional temperature, precipitation, and other climatic processes
Water regulation (hydrological flows)	groundwater recharge/discharge
Water purification and waste treatment	retention, recovery, and removal of excess nutrients and other pollutants
Erosion regulation	retention of soils and sediments
Natural hazard regulation	flood control, storm protection
Pollination	habitat for pollinators
Cultural	
Spiritual and inspirational	source of inspiration; many religions attach spiritual and religious values to aspects of wetland ecosystems
Recreational	opportunities for recreational activities
Aesthetic	many people find beauty or aesthetic value in aspects of wetland ecosystems
Educational	opportunities for formal and informal education and training
Supporting	
Soil formation	sediment retention and accumulation of organic matter
Nutrient cycling	storage, recycling, processing, and acquisition of nutrients

General Types of Aquatic Macrophytes

Submergent – Plants that grow entirely under water. Most are rooted at the bottom and some may have flowers that extend above the water surface.

Floating-leaved – Plants rooted to the bottom with leaves that float on the water surface. Flowers are normally above water.

Free Floating – Plants not rooted to the bottom and float on the surface.

Emergent – herbaceous or woody plants that have the majority of their vegetative parts above the surface of the water.

Plant zone according to water depth in a freshwater marsh



Zone	Periodically Flooded	Waterlogged or Shallow Water	Emergent Macrophytes	Floating-Leaved and Submersed Aquatics
Plants	lowland grasses	sedges (<i>Carex</i>) arrowhead (<i>Sagittaria</i> spp.)	cattails (<i>Typha</i>) bulrush (<i>Scirpus</i>)	water lilies (<i>Nymphaea</i> spp.) pond weeds (<i>Potamogeton</i> spp.) bladderwort (<i>Utricularia</i> spp.)



Hydrilla



Coontail



Parrotfeather



Floating-Leaved Plants





Free Floating Plants



Emergent Plants



Wide at the base
Called a buttress



Cypress

Tupelo



Previous Student



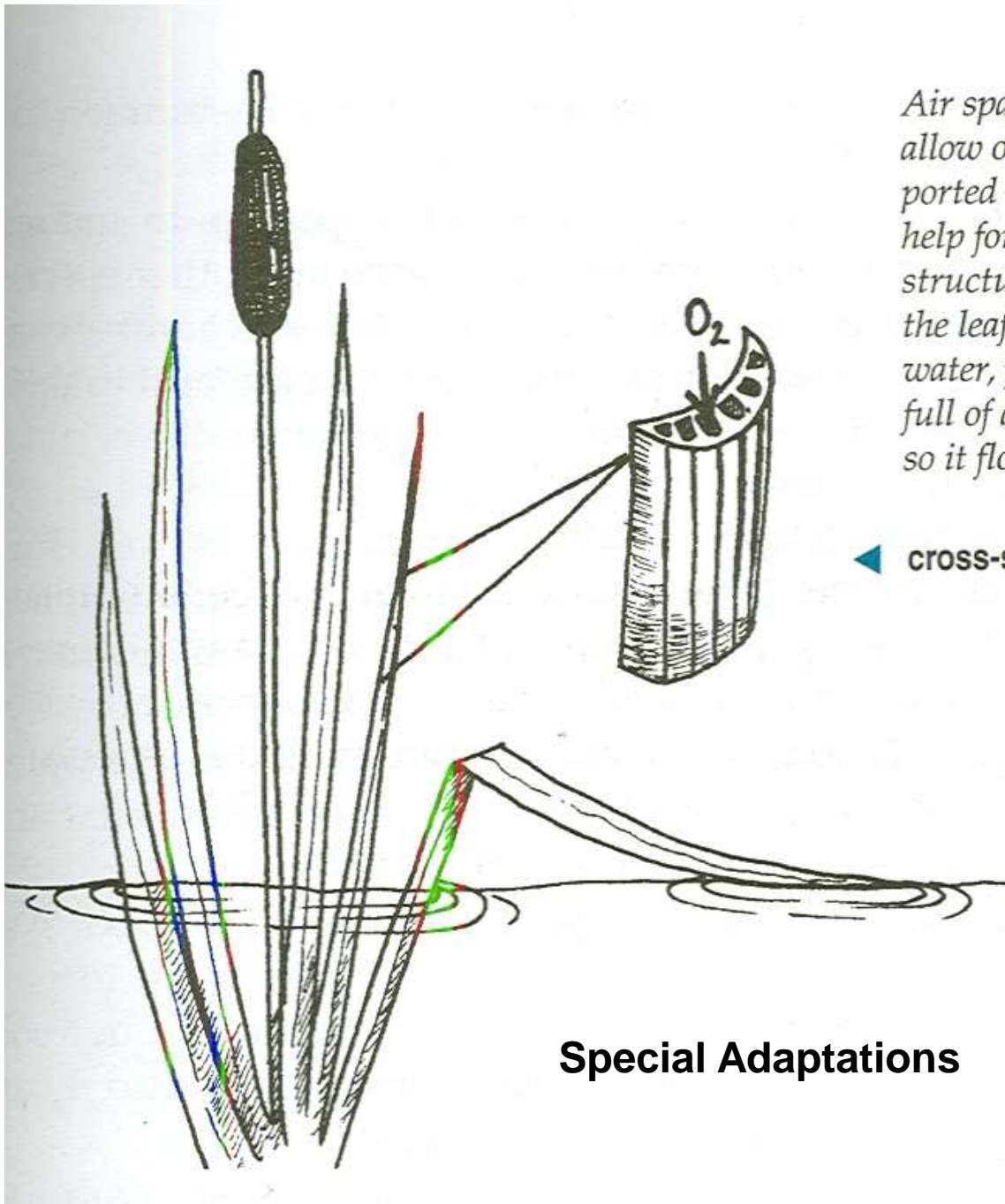
CREEK BOATS

I won this boat



Wetland Trees

NOV 8 2003



Air spaces in the cattail leaf allow oxygen to be transported to the roots. They also help form the leaf's support structure—rigid enough so the leaf stands upright in the water, yet lightweight and full of air (like Styrofoam) so it floats.

◀ cross-section of leaf

Special Adaptations

Benefits of Aquatic Plants

A photograph of a wetland landscape. In the foreground, there are green plants with purple flowers. A small pond or stream flows through the middle ground, surrounded by lush green vegetation. In the background, a dense forest of tall evergreen trees stretches across the horizon under a cloudy sky.

Primary Production

- *Wildlife Food*
- *Oxygen Production*

Shelter

- *Protection from predation for small fish*

Fish Spawning

- *Several fish attach eggs to aquatic macrophytes*
- *Some fish build nests in plant beds*

Water Treatment

- *Wetland plants are very effective at removing nitrogen and phosphorous from polluted waters*

Submerged macrophytes can provide shelter for young fish as well as house an abundant food supply.





Some fish will attach their eggs to aquatic vegetation.



Alligators also build nests from vegetation.

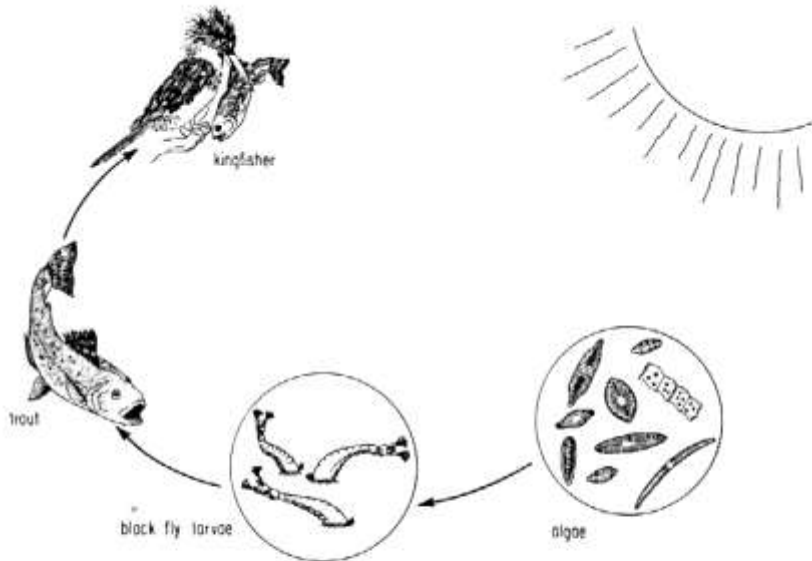
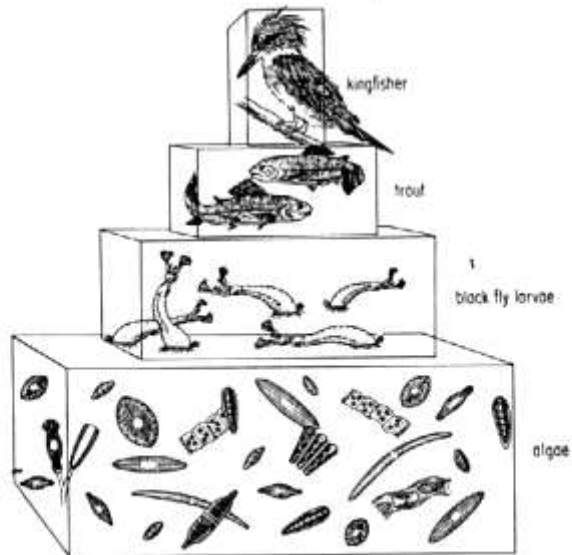
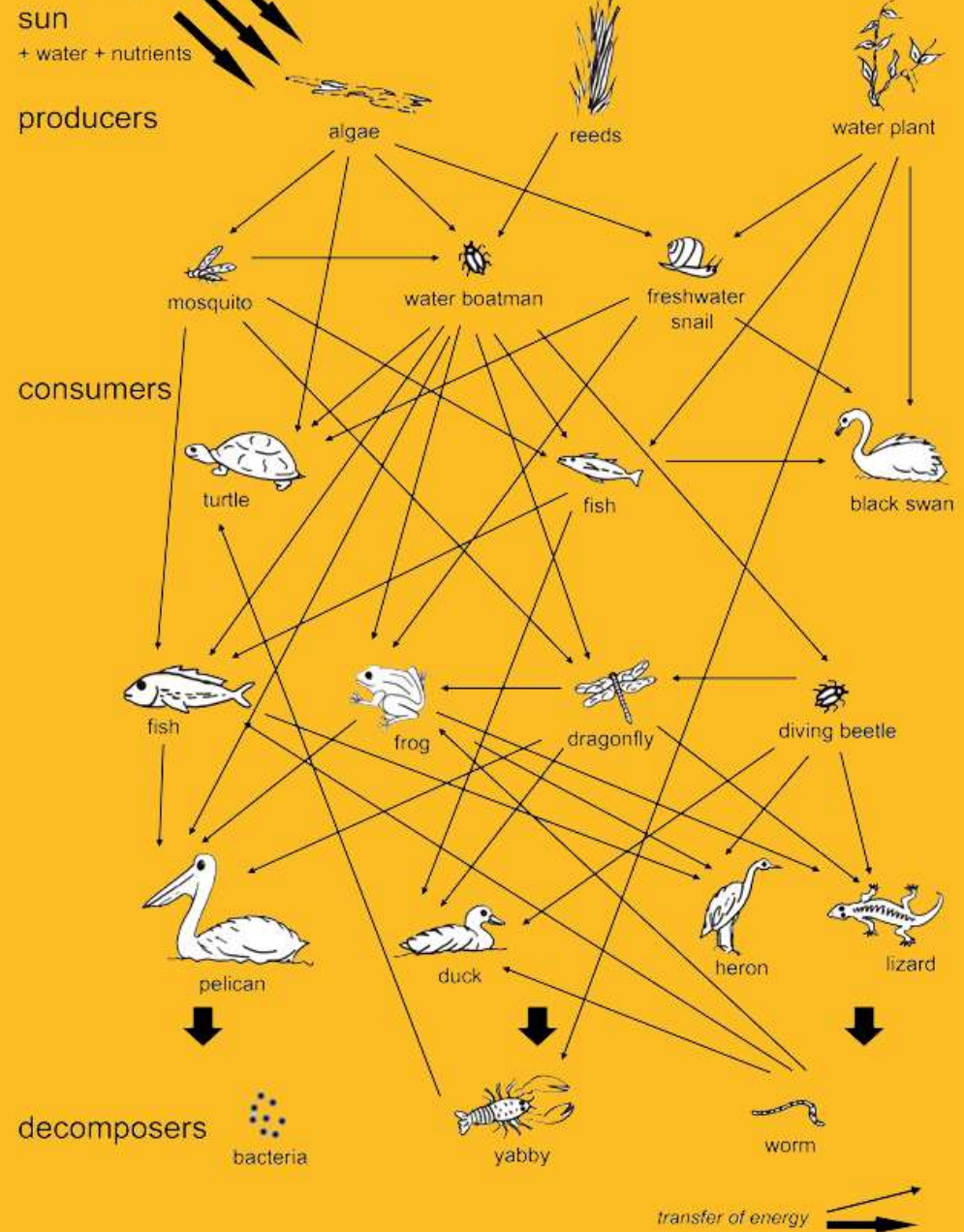


FIGURE 2-3: Stream food chain.

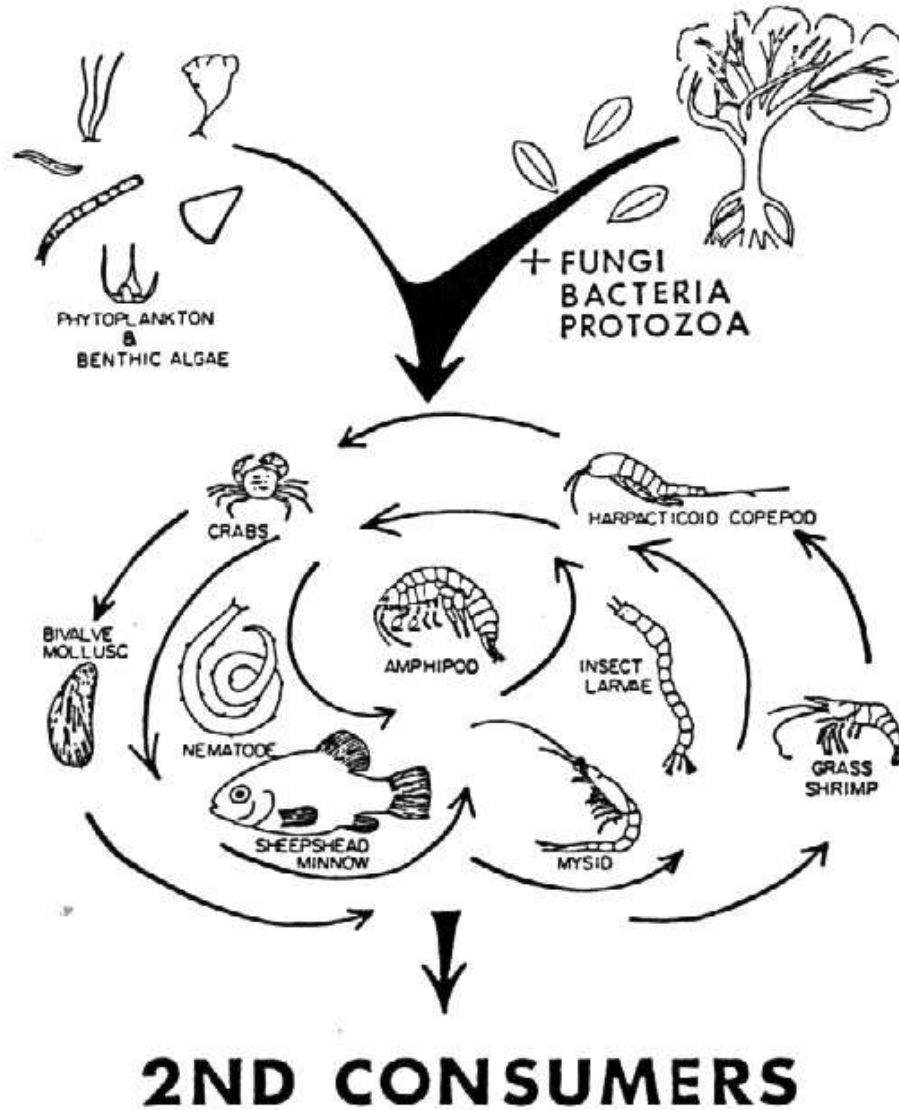
FIGURE 2-4: Stream food pyramid.



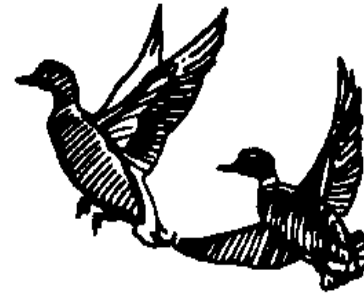
Wetland Food Web



Detritus – based food web in Estuary



Wetlands of Rajasthan



Name

Designated

Area(km²)

Keoladeo National Park

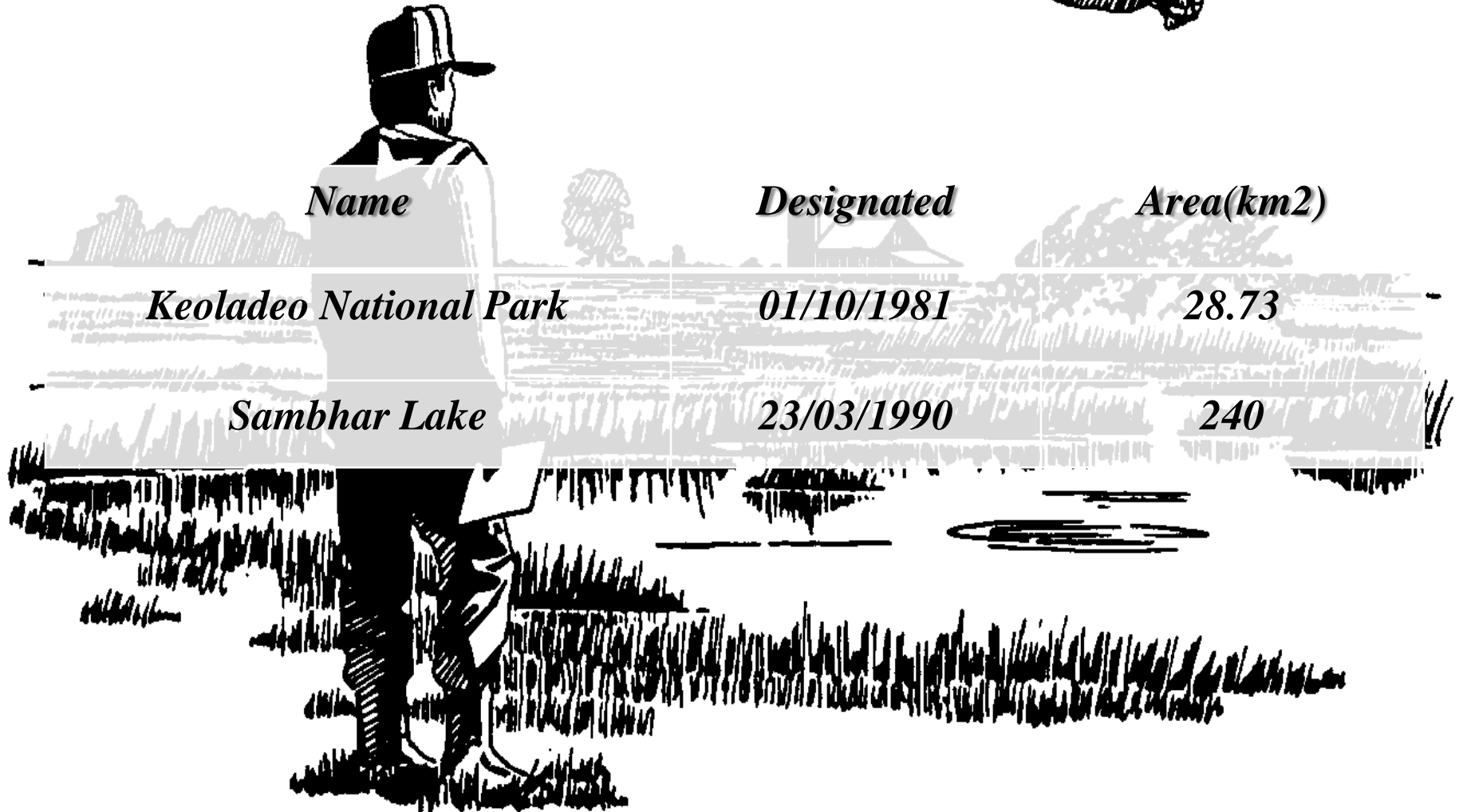
01/10/1981

28.73

Sambhar Lake

23/03/1990

240



The Keoladeo National Park

or Keoladeo Ghana National Park formerly known as the Bharatpur Bird Sanctuary in Bharatpur, Rajasthan, India is a famous avifauna sanctuary that plays host to thousands of birds especially during the summer season.

Over 230 species of birds are known to have made the National Park their home. It is also a major tourist centre with scores of ornithologists arriving here in the hibernal season.

Keoladeo Ghana National Park is a man-made and man-managed wetland and one of the national parks of India.



Geography

- *(27°10'N, 77°31'E) is a World Heritage Site situated in eastern Rajasthan.*
- *One third of the Keoladeo National Park habitat is wetland systems with varying types of microhabitats having trees, mounds, dykes and open water with or without submerged or emergent plants.*
- *The uplands have grasslands (savannas) of tall species of grass together with scattered trees and shrubs present in varying density.*
- *A similar habitat with short grasses, such as *Cynodon dactylon* and *Dicanthium annulatum* also exists. Woodlands with thickets of huge Kadam trees (*Neolamarckia cadamba*) are distributed in scattered pockets.*
- *Richness and diversity of plant life inside the Park is remarkable. The Park's flora consists of 379 species of flowering plants of which 96 are wetland species. The Wetland is a part of the Indo-Gangetic Great Plains.*

Climate

- *Mean maximum temperature ranged from 20.9° Celsius (C) in January to 47.8°C in May, while the mean temperature varied from 6.8°C in December to 26.5°C in June.*
- *The diurnal temperature variation ranged from 5°C in January to 50°C in May. Mean relative humidity varied from 62% in March to 83.3% in December.*
- *The mean annual precipitation is 662 millimeters (mm), with rain falling on an average of 36 days per year.*

Flora

- *A semi-arid biotype, The principal vegetation types are tropical dry deciduous forest, intermixed with dry grassland in areas where forest has been degraded. Apart from the artificially managed marshes; much of the area is covered by medium-sized trees and shrubs.*
- *The north-east of the park are dominated by kalam or kadam (*Mitragyna parvifolia*), jamun (*Syzygium cumini*) and babul (*Acacia nilotica*).*
- *The open woodland is mostly babul with a small amount of kandi (*Prosopis cineraria*) and ber (*Zizyphus*).*

- *The open woodland is mostly babul with a small amount of kandi and ber. Scrublands are dominated by ber and kair (Capparis decidua).*
- *Piloo (Salvadora oleoides and Salvadora persica) also present in the park and happens to be virtually the only woody plants found in areas of saline soil.*

Fauna

- *Macro invertebrates such as worms, insects and mollusks, though more abundant in variety and numbers than any other group of organisms, are present mostly in aquatic habitats.*
- *Keoladeo National Park is popularly known as “bird paradise”. Over 370 bird species have been recorded in the park.*

Waterfowls

- *The park's location in the Gangetic Plain makes it an unrivalled breeding site for herons, storks and cormorants, and an important wintering ground for large numbers of migrant ducks. The most common waterfowl are gadwall, shoveler, common teal, cotton teal, tufted duck, comb duck, little cormorant, great cormorant, Indian shag, ruff, painted stork, white spoonbill, Asian open-billed stork, oriental ibis, darter, common sandpiper, wood sandpiper and green sandpiper. Sarus crane, with its spectacular courtship dance, is also found here.*

Land birds

- *Among land birds are a rich assortment consisting of warblers, babblers, bee-eaters, bulbuls, buntings, chats, partridges and quails. Grey hornbill and Marshall's iora are also present.*
- *There are many birds of prey including the osprey, peregrine, Pallas' sea eagle, short-toed eagle, tawny eagle, imperial eagle, spotted eagle and crested serpent eagle.*
- *Greater spotted eagle has recently been recorded breeding here, a new breeding record for the species in India.*



Mammals

- *Mammalian fauna of Keoladeo National Park is equally rich with 27 identified species. Blue bull, feral cattle, and spotted deer are common while sambar are few.*
- *Wild boar and porcupine are often spotted sneaking out of the Park to raid crop fields.*
- *Two mongoose species, the small Indian mongoose and the common Indian gray mongoose, are occasionally found.*
- *Cat species present include the jungle cat and the fishing cat.*
- *The Asian palm civet and the small Indian civet are also present, but rarely sighted.*
- *The smooth-coated otter can be seen attacking birds such as coots and at times crossing the woodlands.*
- *Jackals and hyenas are also sighted and have taken up the role of predators and feed on birds and rodents.*
- *Many species of rats, mice, gerbils and bats are also found in the park.*

The Sambhar Lake,

India's largest inland salt lake, a bowl shape lake encircles historical Sambhar Lake Town located 96 km south west of the city of Jaipur (Northwest India) and 64 km north east of Ajmer.

Geography

The lakes receives water from an endorheic basin with 5700 square km catchment area. The water is fed to the lake from streams from the rivers Mendha, Runpangarh, Khandel and Karian. The Mendha and Rupangarh are main streams. Temperatures reach 40° Celsius in summer and stay at around 11° Celsius in winter.



Economic importance

It is India's largest saline lake and is the source of most of Rajasthan's salt production. It produces 196,000 tones of clean salt every year, which equates to around 9% of India's salt production. Salt is produced by evaporation process of brine and is mostly managed by Sambhar Salts Ltd.(SSL), a joint venture of the Hindustan Salts Ltd. and the state government.

Ecological importance

Sambhar has been designated as a Ramsar site (recognized wetland of international importance) because the wetland is a key wintering area for tens of thousands of flamingos and other birds that migrate from northern Asia.

The specialized algae and bacteria growing in the lake provide striking water colors and support the lake ecology that, in turn, sustains the migrating waterfowl. There is other wildlife in the nearby forests, where Nilgai move freely along with deer and foxes.



Thank You...