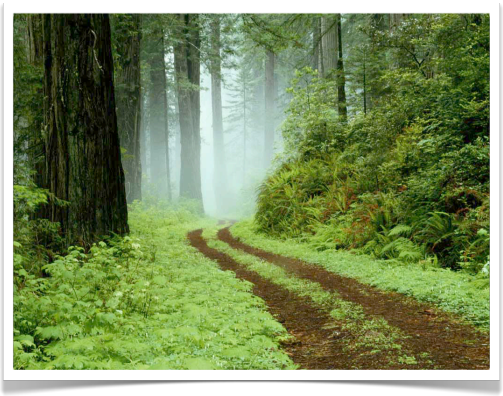


SUSTAINING BIODIVERSITY: THE ECOSYSTEM APPROACH

APES 2013

1

FOREST ECOSYSTEMS

- OCCUPY 30% OF LAND SURFACE (EXCLUDING ANTARCTICA AND GREENLAND)
- OLD-GROWTH FOREST - AN UNCUT OR REGENERATED PRIMARY FOREST THAT HAS NOT BEEN SERIOUSLY DISTURBED BY HUMAN ACTIVITIES OR NATURAL DISASTERS FOR 200 YEARS OR MORE
  - THESE PROVIDE ECOLOGICAL NICHES FOR MANY ORGANISMS
- SECOND-GROWTH FOREST - STAND OF TREES RESULTING FROM A SECONDARY ECOLOGICAL SUCCESSION. DEVELOP AFTER TREES HAVE BEEN REMOVED BY HUMAN ACTIVITIES OR BY NATURAL PROCESSES SUCH AS FIRE, HURRICANES, OR VOLCANIC ERUPTION

2

TREE PLANTATIONS

- ALSO CALLED TREE FARMS OR COMMERCIAL FORESTS
- MANAGED TRACT OF UNIFORMLY AGED TREES OF ONE OR TWO GENETICALLY UNIFORM SPECIES THAT USUALLY ARE HARVESTED BY CLEAR-CUTTING AS SOON AS THEY BECOME COMMERCIALLY VALUABLE
- THE LAND IS THEN REPLANTED AND CLEAR-CUT IN A REGULAR CYCLE
- THIS CAN DEPLETE THE SOIL OF NUTRIENTS

3

FOREST ECONOMIC AND ECOLOGICAL SERVICES

- REMOVE CO_2 FROM THE ATMOSPHERE AND STORE IT IN ORGANIC COMPOUNDS
  - HELPS TO STABILIZE THE EARTH'S TEMPERATURE
- TRADITIONAL MEDICINES ARE DERIVED MOSTLY FROM PLANTS
- HOME TO TWO-THIRDS OF TERRESTRIAL SPECIES
- ONE-FOURTH OF ALL PEOPLE DEPEND ON FORESTS FOR THEIR LIVELIHOODS

4

LOGGING

- 1ST STEP: BUILD ROADS (INCREASES EROSION AND SEDIMENT RUNOFF, CAUSES HABITAT FRAGMENTATION)
  - EXPOSE FORESTS TO INVASION BY NON-NATIVE SPECIES
- 2ND STEP: CUTTING TREES
  - SELECTIVE CUTTING - INTERMEDIATE AND MATURE TREES ARE CUT SINGLY OR IN A SMALL GROUP
  - CLEAR CUTTING - REMOVE ALL THE TREES IN AN AREA
    - INCREASES RUNOFF AND LOSS OF SOIL NUTRIENTS (HARMFUL POSITIVE FEEDBACK LOOP)
  - STRIP CUTTING - CUTTING STRIPS OF TREES ALONG LAND CONTOURS (MORE SUSTAINABLE THAN CLEAR CUTTING) REGROWTH IN FEWER YEARS

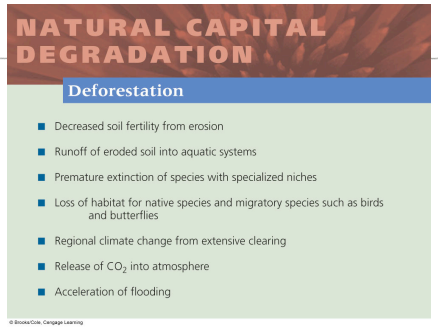
5

OTHER IMPACTS ON FORESTS

- FIRE
  - SURFACE FIRE - ONLY BURNS UNDERGROWTH AND LEAF LITTER, KILLS SEEDLINGS AND SMALL TREES
    - BENEFITS - BURN AWAY FLAMMABLE GROUND MATERIAL THAT COULD CAUSE A MORE DAMAGING FIRE IF LEFT, FREES UP NUTRIENTS, STIMULATE GERMINATION OF SEEDS, CONTROL DISEASE AND INSECTS
  - CROWN FIRE - HOT FIRE THAT LEAPS FROM TREETOP TO TREETOP AND BURNS THE WHOLE TREES
    - PROBLEMS - DESTROY MOST VEGETATION, KILL WILDLIFE, INCREASE SOIL EROSION, DESTROY HUMAN STRUCTURES

6

DEFORESTATION



- TEMPORARY OF PERMANENT REMOVAL OF LARGE EXPANSES OF FOREST FOR AGRICULTURE
- OVER THE PAST 8,000 YEARS HUMAN ACTIVITIES HAVE REDUCED THE EARTH'S ORIGINAL FOREST COVER BY ABOUT 46% MOST OF IT OCCURRING OF THE LAST 60 YEARS

7

U.S. FOREST RECOVERY

- FORESTS WERE SEVERELY DEPLETED BY THE 1920S
- MANY HAVE NOW NATURALLY GROWN BACK
- MANY ARE PROTECTED AS "NATIONAL FORESTS" (40% OF THE TOTAL FOREST AREA)

8

TROPICAL FORESTS

- COVER 6% OF THE WORLD'S SURFACE AREA
- STATE OF FORESTS IS MONITORED BY SATELLITE IMAGERY
- INDONESIA - ILLEGAL TREE CUTTING IN NATIONAL PARKS ACCOUNTS FOR 75% OF THE COUNTRIES LOGGING
- HALF OF ALL TERRESTRIAL PLANTS AND ANIMALS LIVE HERE. BECAUSE OF THEIR SPECIALIZED NICHES, THEY ARE VERY VULNERABLE TO EXTINCTION.

9

SUSTAINABLE FORESTS

- FOREST FIRES (PRESCRIBED BURNING)
- IMPROVE EFFICIENCY IN WOOD USE (60% WASTE)
- NEW SOURCES FOR PAPER

10

SUSTAINABLE GRASSLANDS

- GRASSLAND ECOLOGICAL SERVICES
  - SOIL FORMATION, EROSION CONTROL, NUTRIENT CYCLING, STORAGE OF ATMOSPHERIC CARBON DIOXIDE, MAINTENANCE OF BIODIVERSITY
- RANGELANDS - UNFENCED GRASSLANDS THAT SUPPLY VEGETATION FOR GRAZING ANIMALS
- PASTURES - MANAGED GRASSLANDS
- OVERGRAZING - TOO MANY ANIMALS GRAZE FOR TOO LONG (EXCEED CARRYING CAPACITY OF RANGELAND)
  - MODERATE GRAZING IS ACTUALLY GOOD (STIMULATES REGROWTH AND ENCOURAGES PLANT DIVERSITY)
  - UNDERGRAZING CAUSES PROBLEMS (LOSS OF NPP)

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SUSTAINABLE RANGELANDS

- ROTATIONAL GRAZING - GRAZING ANIMALS ARE CONTAINED IN ONE AREA FOR A PERIOD OF TIME THEN MOVED TO A NEW LOCATION
- CATTLE TEND TO CONGREGATE AROUND RIPARIAN ZONES (AREAS AROUND PONDS AND RIVERS WITH LARGE AMOUNTS OF VEGETATION)
- SUPPRESS GROWTH OF UNWANTED VEGETATION (CONTROLLED BURNING OR HERBICIDES)

12

PARKS AND RESERVES

- STRESSES:
  - POPULARITY (VISITORS MORE THAN TRIPLED BETWEEN 1960 AND 2007)
  - OFF-ROAD VEHICLES
  - NON-NATIVE SPECIES (DELIBERATE INTRODUCTION OR MIGRATION)
  - NEARBY HUMAN ACTIVITIES

FIG. 10-23

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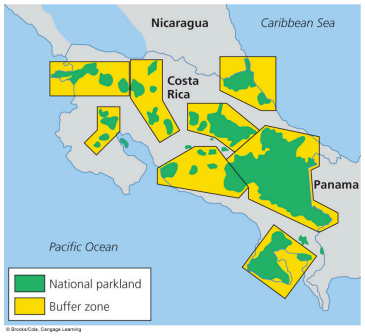
COSTA RICA



- 1963–1983: cleared much of the forest
- 1986–2006: FORESTS GREW FROM 26% TO 51%
  - GOAL: TO REDUCE NET CARBON DIOXIDE EMISSIONS TO ZERO BY 2021
- Eight zoned megareserves
  - DESIGNED TO SUSTAIN AROUND 80% OF COSTA RICA'S BIODIVERSITY

14

WILDERNESS ACT OF 1964

- ALLOWED THE GOVERNMENT TO PROTECT UNDEVELOPED TRACTS OF PUBLIC LAND FROM DEVELOPMENT AS PART OF THE NATIONAL WILDLIFE PRESERVATION SYSTEM
- PROBLEMS:
  - STILL ONLY 1.8% OF LOWER 48 STATES PROTECTED
  - ONLY 4 OF 413 WILDERNESS AREAS ARE LARGE ENOUGH TO SUSTAIN THE SPECIES THEY CONTAIN
  - IN 2005, GOVERNMENT ENDED ROADLESS RULE WITHIN THE NATIONAL FOREST SYSTEM SO OIL GAS AND MINING COULD USE THEM

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FOUR-POINT ECOSYSTEM PROTECTION PLAN

- MAP GLOBAL ECOSYSTEMS AND CREATE AN INVENTORY OF THE SPECIES CONTAINED IN EACH OF THEM AND THE ECOSYSTEM SERVICES THEY PROVIDE
- LOCATE AND PROTECT THE MOST ENDANGERED ECOSYSTEMS AND SPECIES, WITH EMPHASIS ON PROTECTING PLANT BIODIVERSITY AND ECOSYSTEM SERVICES
- SEEK TO RESTORE AS MANY DEGRADED ECOSYSTEMS AS POSSIBLE
- MAKE DEVELOPMENT BIODIVERSITY-FRIENDLY BY PROVIDING SIGNIFICANT FINANCIAL INCENTIVES (SUCH AS TAX BREAKS AND WRITE-OFFS) AND TECHNICAL HELP TO PRIVATE LANDOWNERS WHO AGREE TO HELP PROTECT ENDANGERED ECOSYSTEMS

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BIODIVERSITY HOTSPOTS

- AREAS RICH IN SPECIES THAT ARE FOUND NOWHERE ELSE AND ARE IN DANGER OF EXTINCTION

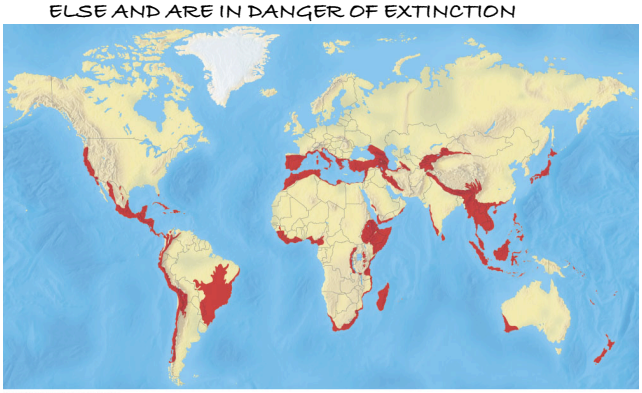

FIG. 10-26

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ECOLOGICAL RESTORATION

- RESTORATION: RETURNING A PARTICULAR DEGRADED HABITAT OR ECOSYSTEM TO A CONDITION AS SIMILAR AS POSSIBLE TO ITS NATURAL STATE
- REHABILITATION: TURNING A DEGRADED ECOSYSTEM INTO A FUNCTIONAL OR USEFUL ECOSYSTEM WITHOUT TRYING TO RESTORE IT TO ITS ORIGINAL CONDITION (REMOVING POLLUTANTS AND REPLANTING TO REDUCE SOIL EROSION IN ABANDONED MINING SITES AND LANDFILLS AND CLEAR-CUT FORESTS)
- REPLACEMENT: REPLACING A DEGRADED ECOSYSTEM WITH ANOTHER TYPE OF ECOSYSTEM (A PASTURE OR TREE PLANTATION MAY REPLACE A FOREST)
- CREATING ARTIFICIAL ECOSYSTEMS: CREATING ARTIFICIAL WETLANDS TO HELP REDUCE FLOODING OR TO TREAT SEWAGE

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