Quadrant II – Transcript and Related Materials

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TERRESTRIAL BIOME – TEMPERATE

Temperate biomes are between the tropics and the polar regions. The changes in these regions between summer and winter are generally moderate, rather than having extreme differences. This allows for numerous types of habitats, including forests and grasslands.

Temperate biomes cover most of the continental United States and Europe. They also cover large parts of Asia.

There are 3 major types of temperate biomes:

1. Temperate Forests
2. Temperate Grasslands
3. Cold Desert

1. Temperate Forests
    i. Temperate deciduous forest
    ii. Temperate evergreen woodland (Chaparral)
    iii. Temperate rainforests.

(i) Temperate deciduous forest: The temperate forest biomes are characterized by a moderate climate and broad-leaved deciduous trees, which shed their

leaves in fall, are bare over winter and grow new foliage in the spring. These forests are the characteristics of North America, Europe, Eastern Asia, Chile, part of Australia and Japan, with a cold winter and an annual rainfall of 75—150 cm and a temperature of 10—20°C. In these biomes the precipitation may be fairly uniform throughout the year. In India, at elevations of 9000' (=2743.2m)—12,000' (=3655.6m) in Himalayas occur temperate vegetation including pines, fir, yew and juniper trees with an undergrowth of scrubby rhododendrons. Soils of temperate forests are podozolic and fairly deep.

Trees are quite tall—about 40—50m in height and their leaves are thin and broad. The predominant genera of this biome are maple (*Acer*), beech (*Fagus*), oak (*Quercus*), hickory (*Carya*), basswood (*Tilia*), chestnut (*Castnea*), cottonwood (*Populas*), sycamore (*Platanus*), elm (*Ulmus*) and willow (*Salix*). In some locations, coniferous vegetation may be quite predominant and that incudes white pine (*Pinus strubos*), hemlock (*Tsuga canadensis*) and red cedar (*Juniperus virginianus*). There are not many epiphytes or lianas save for some species of mosses, algae and lichens growing on tree trunks, and a few vines, notably Vitis, the grape.

The understory of shrubs and herbs in the deciduous forest is typically well-developed and richly diversified, with a considerable portion of the photosynthesis and flowering attuned to the short day of the spring season, prior to the leafing out of and consequent shading by the tree canopy. Accordingly, there are often two separate herb assemblages. One consists of spring flowers, which bloom before the trees have expanded their leaves and are gone by summer, and the other is adapted to the low light levels of the forest floor and lasts into the fall.

The animals originally present in temperate forests are deer, bears, squirrels, gray foxes, bobcats, wild turkey and wood peckers. Other common animals of this region are invertebrates such as earthworms, snails, millipedes, Coleoptera and Orthoptera and vertebrates like amphibians such as newts, salamanders, toads, and cricket frogs; reptiles such as turtles, lizards and snakes; mammals such as racoon opossum, pigs, mountain lion, etc., and birds like horned owl, hawks, etc. All these animals and plants show a profound seasonality; some may even hibernate throughout the winter. The range of animal size and adaptations is wide; the largest animals include such forms as the deer and black bear. The dominant carnivores are large, including the wolf and mountain lion, although smaller carnivores such as fox and skunk are also common. Diversity of fauna is

lower than in any of the rain forests and a few species seems clearly to be dominant.

(iii) Temperate evergreen woodland (Chaparral): Many parts of the world have a Mediterranean-type climate with warm, dry summers and cool, moist winters. These are commonly inhabited by low evergreen trees with small hard needles or slightly broader leaves. The most important area of tropical evergreen woodland in North America is the 'chaparral' of the Pacific coast, the Mediterranean 'maquis', Spanish 'encinar' and 'melle scrab' on Australia's South coast are the same type of community. In such a woodland, trees are essentially lacking, although shrubs may range upto 3—4 m in height. Species diversity is roughly intermediate between that of a temperate deciduous forest and a drier grassland. Fire is an important factor in this ecosystem, and the adaptations of the plants enable them to regenerate quickly after being burned. The characteristic animals of temperate evergreen woodland or chaparral are mule deer, brush rabbits, wood rats, chipmunks, lizards and brown towhees. Small-hooved cursorial ungulates are the dominant herbivores. Saltatorial (jumping) animals and many fast-moving ungulates are also common in this fauna.

(iv) Temperate rainforests: The temperate rainforest is a colder ecosystem than any other rainforest. Such a forest has a definite seasonality, with both temperatures and rainfall varying throughout the year. Rainfall is high, but fog maybe very heavy and actually more important as a source of water than rainfall. The diversity is much lower, both in plants and animals, in comparison to warmer rainforests, yet it remains still higher than other temperate forest types. The diversity is much lower, both in plants and animals, in comparison to warmer rainforests, yet it remains still higher than other temperate forest type. The dominant trees (canopies) are coast redwood (*Sequoia sempervirens*) of the Pacific coast of North America and the alpine ash (*Eucalyptus regnans*) of Australia and Tasmania, both of which reach more than 100m in height. Epiphytes and lianas are common but are not abundant like those of another rainforest. The animals of temperate rainforests are similar to those of deciduous forests, but show a somewhat higher diversity.

2. Temperate Grasslands

The grassland biome is found where rainfall is about 25 to 75 cm per year, not enough to support a forest, yet more than of a true desert. The seasonality of grasslands is pronounced, both with respect to rainfall, which is concentrated in the summer and to temperature. Grasslands typically occur in the interiors of continents and include the tall grass prairies, short grass prairie or great plains and arid grassland of North America as well as the steppes of Eurasia (Southern Russia, Siberia and Asia). The grassland communities are open land communities with limited moisture conditions, irregular rainfall, sharp seasonal and diurnal variations and very high radiation. Vegetation of grassland is dominated by grasses, legumes and composites. Since tall trees or other thick vegetations are excluded from these communities there is a free movement of air. These winds carry the particles of sand or dust. These open habitats provide natural pasture for grazing animals (herbivore) which are excluded from predation by predators which hide in thick vegetation and prey upon them.

In grasslands, the stratification is reduced essentially to a single story, but within that level, species diversity may be as high as in a deciduous forest-especially for the tall grass prairies. Only along the streams are trees to be found, but the "gallery forests" within a few meters of stream bank are characteristics of grasslands. The grasses comprising of the grassland can be divided into two basic groups, the tall grasses more than 1m high, which are found in moist portions of the grassland, and the short grasses less than 1 m high which are found in the drier regions. For example, prior to its conversion to agriculture and urban development, the tall grass prairie toward east of North America was dominated by species of bluestern (*Andropogon*) forming dense covers 122 cm to 183 cm tall. Westward, Buffalo grass (*Buchloe dactyloides*) and other grasses but a few centimeters high dominated the landscape. Flowering herbs including many kinds of composites are common, but much less important than grasses.

Since the precipitation—evaporation ratio is below one in the grassland, leaching is considerably less. The soils of the grasslands are rich, fertile prairie soils (black-earths) and chernozems. Organic matter (humus) accumulates in the upper portion of the soil, rendering it dark; this upper portion remains neutral to slightly alkaline because of the continued replenishment of cations like calcium and potassium through the upward movement associated with evaporation.

Typical animals of grasslands tend to be quite small, with the exception of a few very large cursorial herbivore mammals such as the bison and pronghorn in

North America, the wild horse, ass, and saiga antelope of Eurasia. The large herbivores are nowhere near as diverse as they are in savanna areas. Likewise, carnivores are relatively small such as are coyotes, weasels, badgers, foxes, ferrets, owls and rattle snakes. Rodents such as prairie dogs, rabbits, and ground squirrels are common

3. Cold Deserts

The cold deserts occur at high elevations where the temperatures are low and rainfall scanty as the air losses all its moisture content as it ascends higher and higher. Cold deserts occur in Ladakh regions of Himalayas, Tibet, and Bolivia Arctic. Most cold deserts have sage brush.

TERRESTRIAL BIOME – TUNDRA

Tundra presents the most common example of “fragile ecosystem” (Clapham, Jr., 1973). Tundra which means “marshy plain”, lies largely north of latitude 600 N (i.e., between the Arctic Ocean and polar ice-caps and the forests to the south) and is characterized by the absence of trees, the presence of dwarfed plants, and an upper ground surface that is wet, spongy and uneven, or hummocky, as a result of freezing and thawing of this poorly drained land (Kormondy, 1976). Some five million kilometers areas of Tundra stretch across Northern America, Northern Europe and Siberia. Although there is variation from place to place within the biome, temperature, precipitation, and evaporation are characteristically low, the warmest months averaging below 10°C and the wettest with about 25 mm of precipitation. Despite the small amount of precipitation, water is usually not a limiting factor because the rate of evaporation is also very low.

The ground usually remains frozen except for the uppermost 10 to 20 cm, which thaw during the brief summer seasons. The permanently frozen deeper soil layer is called permafrost. The permafrost line which may exist at a depth of a few centimeters to several meters, is the ultimate limit of plant root growth, but the immediate control is the depth to which soil is thawed in summer. The rather thin carpet of vegetation of tundra biome includes few species: grasses and

sedges are characteristic of numerous marshes and poorly drained areas, but large areas consist of grasses, sedges, mosses and lichens, with occasional occurrence of dwarf birches (*Betula*) and willows (*Salix*). Perhaps the most characteristic arctic tundra plant is the lichen known as “reindeer moss” (*Cladonia*). Tundra is also characterized by heath-plants such as Erica and other members of Ericaceae family. The net primary productivity is extremely low.

The animals that have adapted to survive in the tundra are caribou or reindeer, musk ox, the arctic hare, arctic fox, polar bear, wolves, lemmings, snowy owls, ptarmigans and during the summer, swarms of flies (Dipteran black flies), mosquitoes and a host of migratory birds.

Tundra biomes cover large areas of the arctic zone. There are two tundra biomes one in the palaearctic, and another in the nearctic region. Tundra-like areas, called the alpine tundra are also quite similar to some of Arctic tundra, but in the absence of permafrost and in the growing season, mosses and lichens are less prominent, flowering plants more so.