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NAAC ACCREDITED “A” GRADE

Topic: Biogeographical Realms and their fauna, endemic, rare, exotic and cosmopolitan species
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Biogeographical Realms

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What is biogeographical realm?

A biogeographic realm or ecozone is the broadest biogeographic division of Earth's land surface, based on distributional patterns of terrestrial organisms.

They are subdivided into ecoregions, which are classified based on their biomes or habitat types.

The realms delineate the large areas of the Earth's surface within which organisms have been evolving in relative isolation over long periods of time, separated from one another by geographic features, such as oceans, broad deserts, or high mountain ranges, that constitute barriers to migration. As such, biogeographic realm designations are used to indicate general groupings of organisms based on their shared biogeography. Biogeographic realms correspond to the floristic kingdoms of botany or zoogeographic regions of zoology.

The seminal work of an English ornithologist, Philip Lutley Sclater, and the eminent English biogeographer and naturalist, Alfred Russel Wallace, eclipsed the ideas of Prichard and Swainson on animal distributions. Using bird distributions, Sclater (1858) recognized two basic divisions (or ‘creations’, as he termed them) – the Old World (Creatio Paleogeana) and the New World (Creatio Neogeana) – and six regions.

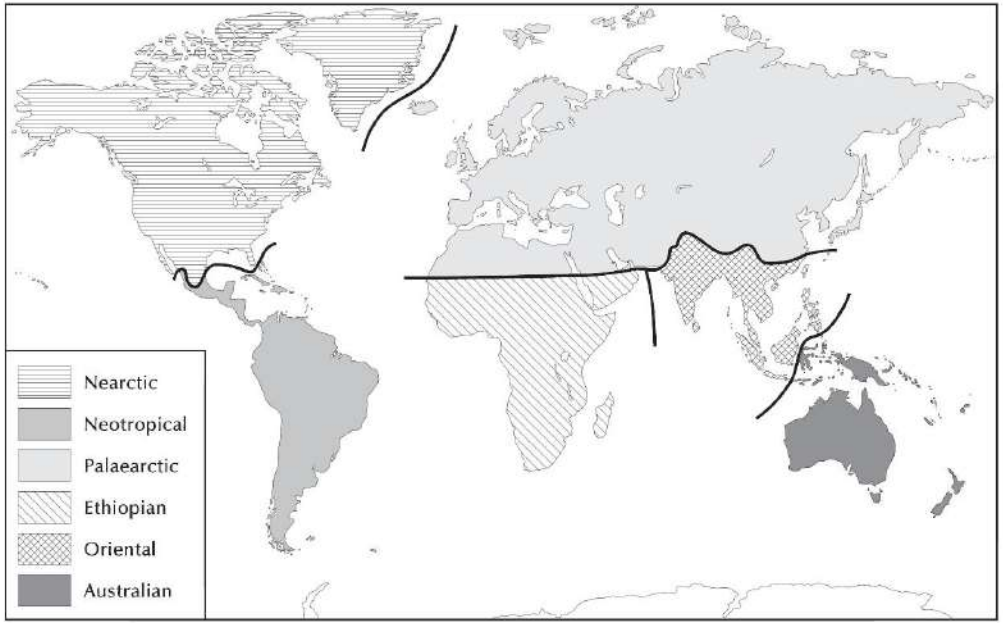


Figure 4.1 The Sclater and Wallace classification of faunal regions.

Biogeographical realms by Wallace

Table 4.1 Biogeographical regions and subregions, as defined by Alfred Russel Wallace

Region	*Subregion*
Palaeogaea (Old World)	
Palaearctic	North Europe
	Mediterranean
	Siberia
	Manchuria (or Japan)
Ethiopian	East Africa
	West Africa
	South Africa
	Madagascar
Oriental	Hindustan (or central India)
	Ceylon (Sri Lanka)
	Indo-China (or Himalayas)
	Indo-Malaya
Australian	Austro-Malaya
	Australia
	Polynesia
	New Zealand
Neogaea (New World)	
Neotropical	Chile
	Brazil
	Mexico
	Antilles
Nearctic	California
	Rocky Mountains
	Alleghenies
	Canada

Source: After Wallace (1876)

Endemic mammalian families found in realms

Table 4.2 Endemic mammal families in the faunal regions

Faunal region	*Number of endemic families*	*Names of endemic families*
Eurasian (Palaearctic)	2	Blind mole rats (Spalacidae); dzhalman (Seleviniidae)
North American (Nearctic)	2	Mountain beaver or sewellel (Aplodontidae); pronghorn antelope (Antilocapridae)
South American (Neotropical)	27	Solenodons (Solenodontidae); West Indian shrews (Nesophontidae); New World monkeys (Cebidae); marmosets (Callithricidae), caenolestids or marsupial mice (Caenolestidae); monito del monte or 'monkey of the mountains' (Microbiotheriidae); anteaters (Myrmecophagidae); sloths (Bradypodidae); degus, coruros, and rock rats (Octodontidae); tuco-tucos (Ctenomyidae); spiny rats (Echimyidae); rat chinchillas (Abrocomidae); hutias and coypus (Capromyidae); chinchillas and viscachas (Chinchillidae); agouties (Dasyproctidae); pacas (Cuniculidae); pacarana (Dinomyidae); guinea-pigs and their relatives (Caviidae); capybaras (Hydrochoeridae); quemi and its allies (Heptaxodontidae)[a]; bulldog bats (Noctilionidae); New World leaf-nosed bats (Phyllostomidae); moustached bats, ghost-faced bats, and naked-backed bats (Mormoopidae); vampire bats (Desmondontidae), funnel-eared bats (Natalidae); smoky or thumbless bats (Furipteridae); disk-winged bats (Thyropteridae)
Ethiopian	15	Giraffes (Giraffidae); hippopotamuses (Hippopotamidae)[b]; aardvark (Orycteropodidae); tenrecs (Tenrecidae); the Old World sucker-footed bats (Myzopodidae); lemurs (Lemuridae); woolly lemurs (Indriidae); aye-ayes (Daubentoniidae); golden moles (Chrysochloridae); otter shrews (Potamogalidae); scaly-tailed squirrels (Anomaluridae); the spring hare or Cape jumping hare (Pedetidae); cane rats (Thryonomydiae); the rock rat or dassie rat (Petromyidae); African mole rats (Bathyergidae)
Oriental	5	Spiny dormice (Platacanthomyidae); tree shrews (Tupaiidae); tarsiers (Tarsiidae); flying lemurs or colugos (Cynocephalidae); Kitti's hog-nosed bat or bumblebee bat (Craseonycteridae)
Australian	19	Echidnas or spiny anteaters (Tachyglossidae); platypus (Ornithorhynchidae); marsupial 'mice' and 'cats' (Dasyuridae); Tasmanian wolf (Thylacinidae); numbat or banded anteater (Myrmecobiidae); marsupial mole (Notoryctidae); bandicoots and bilbies (Peramelidae); burrowing bandicoots (Thylacomyidae); spiny bandicoot and mouse bandicoot (Perorycticidae); striped possum, Leadbeater's possum, and wrist-winged gliders (Petauridae); feathertail gliders (Acrobatidae); pigmy possums (Burramyidae); brush-tailed possums, cuscuses, scaly-tailed possums (Phalangeridae); ringtail possums and great glider (Pseudocheiridae); kangaroos and wallabies (Macropodidae); rat kangaroos, potoroos, and bettongs (Potoroidae); koalas (Phascolarctidae); wombats (Vombatidae); noolbender or honey possum (Tarsipedidae)

Notes: a Recently extinct. b Those living on the Lower Nile are technically in the Eurasian region

H. Smith (1983) delineated similar regions to those in the Sclater–Wallace scheme, but significant differences emerged. In Smith's system, there are four regions – Holarctic, Latin American,Afro-Tethyan, and Island – and ten subregions.

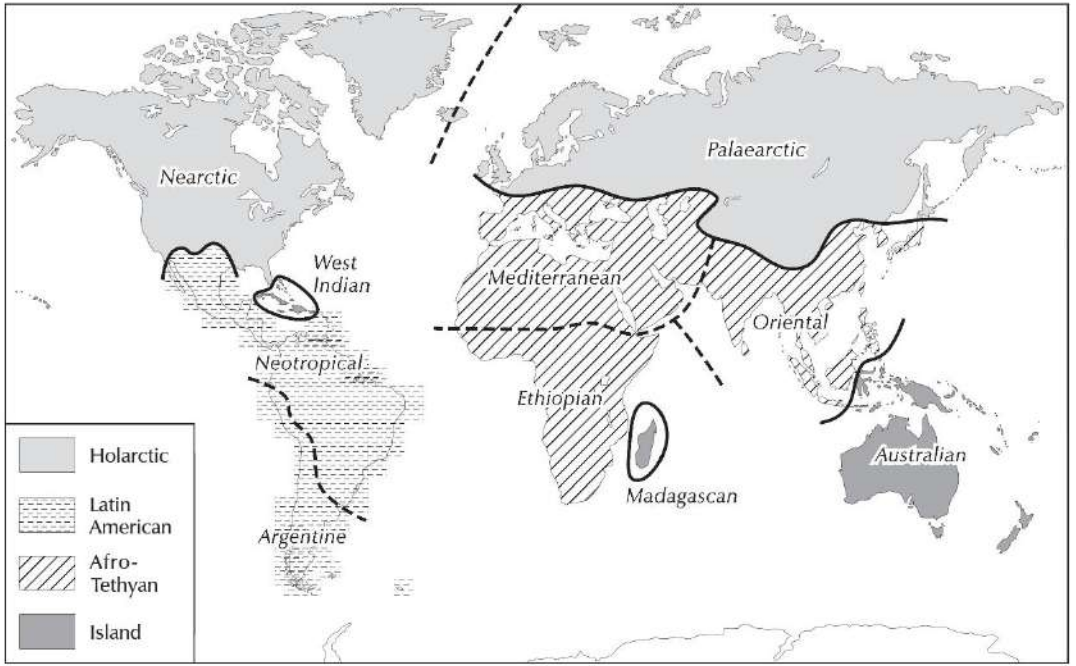
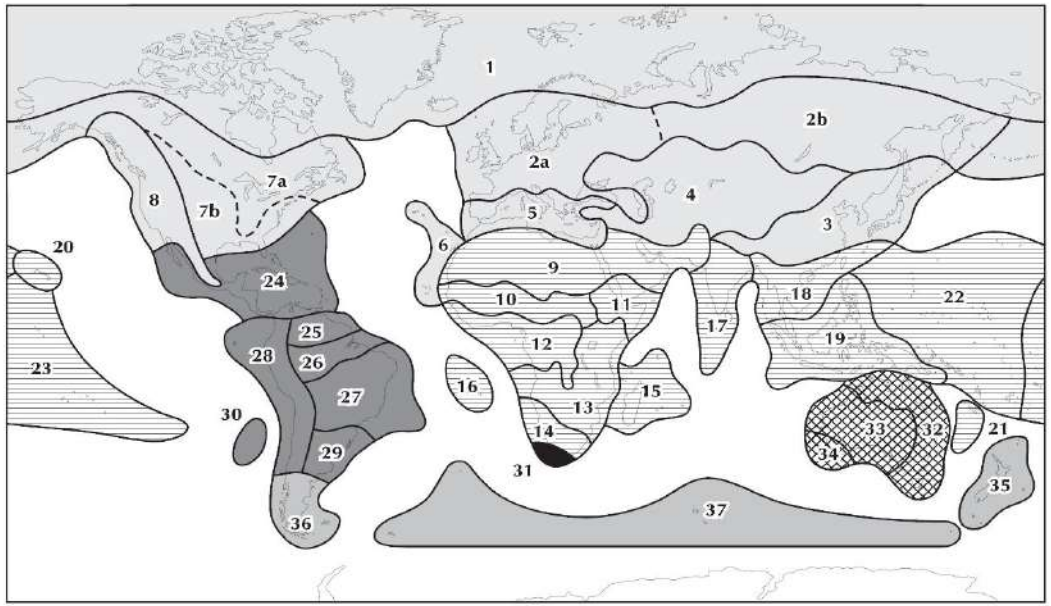


Figure 4.2 A numerical classification of mammal distributions showing four main regions and ten subregions.
Source: Adapted from C. H. Smith (1983)

Floral regions :

In The Geography of the Flowering Plants (1974), British botanist Ronald Good summarized the distribution of living angiosperms by adapting a scheme devised by Adolf Engler during the 1870s. Good delineated six major floral regions, though he styled them ‘kingdoms’: the Boreal region, the Palaeotropical region, the Neotropical region, the Australian region, South African (Cape) region, and the Antarctic floral region. Each of these comprises a number of subregions (Good called them regions), of which there are 37 in total.



Boreal region

1. Arctic and Sub-arctic
2. Euro-Siberian
   a. Europe
   b. Asia
3. Sino-Japanese
4. W. and C. Asiatic
5. Mediterranean
6. Macaronesian
7. Atlantic North American
   a. Northern
   b. Southern
8. Pacific North American

Palaeotropical region

9. African–Indian Desert
10. Sudanese Park Steppe
11. N. E. African Highland
12. W. African Rain-forest
13. E. African Steppe
14. South African
15. Madagascar
16. Ascension and St Helena
17. Indian
18. Continental S. E. Asiatic
19. Malaysian
20. Hawaiian
21. New Caledonia
22. Melanesia and Micronesia
23. Polynesia

Neotropical region

24. Caribbean
25. Venezuela and Guiana
26. Amazon
27. South Brazilian
28. Andean
29. Pampas
30. Juan Fernandez

South African region

31. Cape

Australian region

32. N. and E. Australian
33. S. W. Australian
34. C. Australian

Antarctic region

35. New Zealand
36. Patagonian
37. S. Temperate Oceanic Islands

Figure 4.3 The 6 floral regions and 37 subregions mapped by Good.
Source: Adapted from Good (1974)

Comparisons and contrasts between taxa:

The world's regional mammal faunas interconnect with each other in complex ways, as do the world's regional floras. Connections at the species level are weak, except between the Eurasian and North American regions, but some regions share genera and families.

Each biogeographical region possesses two groups of families: those that are endemic or peculiar to the region, and those that are shared with other regions. Although no agreed system of naming shared taxa (species, genera, families, or whatever) exists, a useful scheme suggests that taxa shared between two biogeographical regions are characteristic, taxa shared between three or four biogeographical regions are semi-cosmopolitan, and taxa shared between five or more biogeographical regions are cosmopolitan.

Transitional zones and filters

Various kinds of barrier, determined mainly by climate, mountains, and water gaps, separate the chief faunal and floral regions.
Two water gaps – the Bering Strait and the Norwegian Sea,both of which experience cold climates – separate the North American region from the Eurasian Region.

A narrow land-link (the Isthmus of Panama), which replaced an earlier water gap, acts as a filter between North America and South America, with arid conditions lying north of Mexico. The Sahara desert divides the Palaearctic region from the Ethiopian region.The Ethiopian region is insulated from the Oriental region by arid lands in southwest Asia And the Arabian peninsula. The Himalayas and their eastward extensions create a formidable barrier between the Oriental region and the Palaearctic region.

Wallacea

The famous zoogeographical transition zone between Lydekker's line and Wallace's line issometimes called Wallacea. Orientaland the Australian faunas grade into one another in a large area of Wallacea. The faunas of both these regions thin out across the transition zone.

Wallace's line, which passes between Bali and Lombok and along the Makassar Strait between Borneo and Sulawesi, marks the easternmost extension of a wholly Oriental fauna. A few Oriental species (shrews, civets, pigs, deer, and monkeys) have colonized Sulawesi and Bali, but they are genetically distinct from their relatives in the Oriental region.

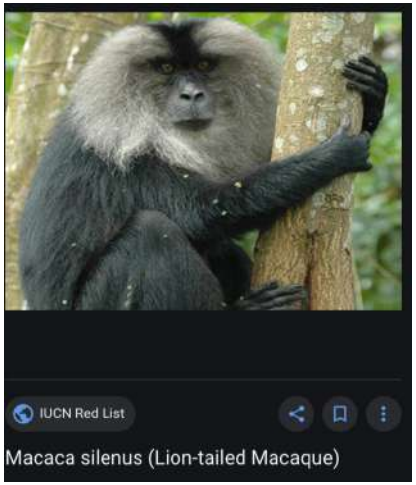
Endemic, Pandemic and Cosmopolitan species

An endemic species lives in only one place, no matter how large or small that place should be. A species can be endemic to Australia or endemic to a few square metres in a Romanian cave.

A pandemic species lives in all places. The puma or cougar (Felis concolor), for example, is a pandemic species because it occupies nearly all the western New World, from Canada to Tierra del Fuego.

Cosmopolitan species inhabit the whole world, though not necessarily in all places. It is possible for a cosmopolitan species to occur in numerous small localities in all continents.

Endemic species



The lion-tailed macaque, or the wanderoo, is an Old World monkey endemic to the Western Ghats of South India.

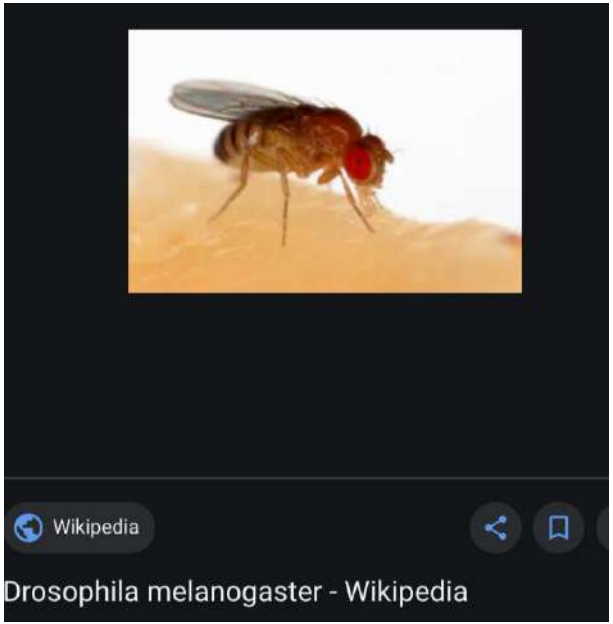
The Malabar grey hornbill (Ocyceros griseus) is a hornbill endemic to the Western Ghats and associated hills of southern India.

Pandemic species :

The black-hooded oriole (Oriolus xanthornus) is a member of the oriole family of passerine birds and is a resident breeder in tropical southern Asia from India.

The Asian elephant (Elephas maximus), also called Asiatic elephant, is the only living species of the genus Elephas and is distributed throughout the Indian subcontinent and Southeast Asia, from India in the west, Nepal in the north, Sumatra in the south, and to Borneo in the east. Three subspecies are recognised—E. m. maximus from Sri Lanka, E. m. indicus from mainland Asia and E. m. sumatranus from the island of Sumatra. and Sri Lanka east to Indonesia.

Cosmopolitan species :



Drosophila (/is a genus of flies, belonging to the family Drosophilidae, whose members are often called "small fruit flies" or (less frequently) pomace flies, vinegar flies, or wine flies, a reference to the characteristic of many species to linger around overripe or rotting fruit. It is found in all continents.
Humans are also cosmopolitan species.

Micro-endemic species

Some species have an extremely restricted or micro-endemic distribution, living as a single population in a small area. The Devil’s Hole pupfish(Cyprinodon diabolis) is restricted to one thermal spring issuing from a mountainside in southwest Nevada, USA (Moyle and Williams 1990).

Endemic plant families

Two restricted and endemic flowering-plant families -lies are the Degeneriaceae and the Leitneriaceae. The Degeneriaceae consists of a single tree species, Degeneria vitiensis, that grows on the island of Fiji. The Leitneriaceae also consists of a single species – the Florida corkwood(Leitneria floridana). This deciduous shrubs native to swampy areas in the southeastern US where it is used as floats for fishing nets.

Exotic species :

- Exotic species, which are also known as alien species, invasive species, non-indigenous species, and bioinvaders, are species of plants or animals that are growing in a nonnative environment. Alien species have been moved by humans to areas outside of their native ranges.
  A species living outside its native distributional range, but which has arrived there by human activity, either deliberate or accidental. Non-native species can have various effects on the local ecosystem. Introduced species that become established and spread beyond the place of introduction are considered "naturalized". The process of human-caused introduction is distinguished from biological colonization, in which species spread to new areas through "natural" (non-human) means such as storms and rafting.

Conflict :

According to a practical definition, an invasive species is one that has been introduced and become a pest in its new location, spreading (invading) by natural means. The term is used to imply both a sense of urgency and actual or potential harm. For example, U.S. Executive Order 13112 (1999) defines "invasive species" as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health".
The biological definition of invasive species, on the other hand, makes no reference to the harm they may cause, only to the fact that they spread beyond the area of original introduction.

Nature of introduction of exotic species:

Intentional anthropogenic introduction :

1. For economic use : Perhaps the most common motivation for introducing a species into a new place is that of economic gain. Non-native species can become such a common part of an environment, culture, and even diet that little thought is given to their geographic origin. For example, soybeans, kiwi fruit, wheat, honey bees, and all livestock except the American bison and the turkey are non-native species to North America. Collectively, non-native crops and livestock account for 98% of US food.
2. Human enjoyment : Introductions have also been important in supporting recreation activities or otherwise increasing human enjoyment. Numerous fish and game animals have been introduced for the purposes of sport fishing and hunting.Pet animals have also been frequently transported into new areas by humans, and their escapes have resulted in several successful introductions, such as those of feral cats and parrots

Unintentional introductions:

Unintentional introductions occur when species are transported by human vectors. Increasing rates of human travel are providing accelerating opportunities for species to be accidentally transported into areas in which they are not considered native.

For example, three species of rat (the black, Norway and Polynesian) have spread to most of the world as hitchhikers on ships, and arachnids such as scorpions and exotic spiders are sometimes transported to areas far beyond their native range by riding in shipments of tropical fruit.

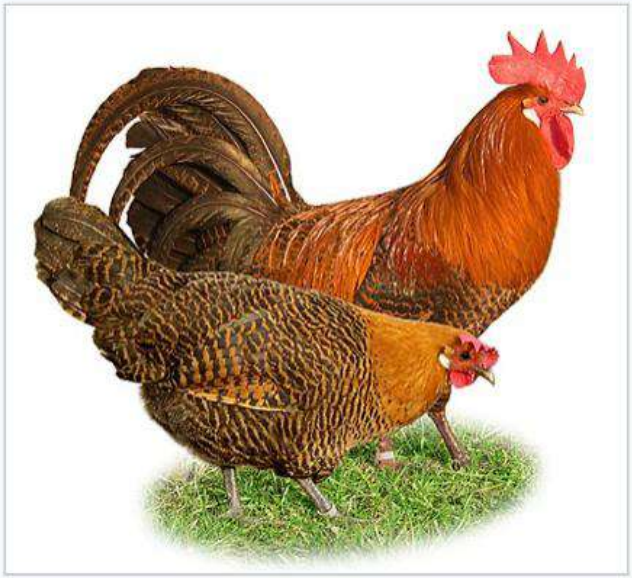
Examples :

Some species, such as the brown rat, house sparrow, ring-necked pheasant, and European starling, have been introduced very widely. In addition there are some agricultural and pet species that frequently become feral; these include rabbits, dogs, ducks, goats, fish, pigs, and cats.

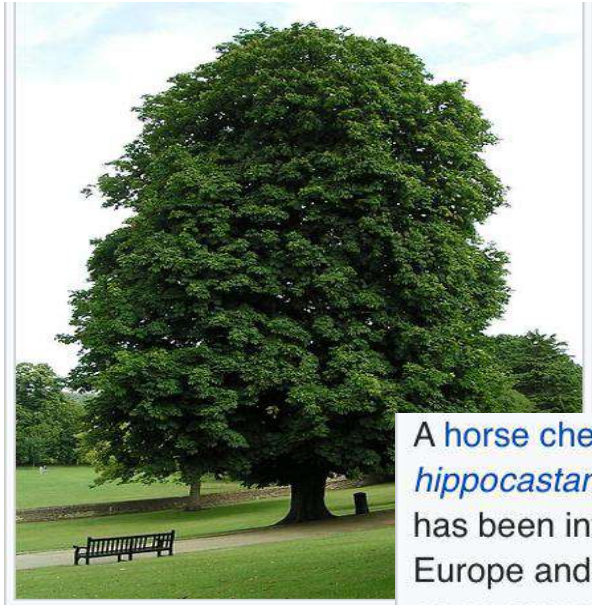
Examples of introduced animals that have become invasive include the gypsy moth in eastern North America, the zebra mussel and alewife in the Great Lakes, the Canada goose and gray squirrel in Europe, the muskrat in Europe and Asia, the cane toad and red fox in Australia, nutria in North America, Eurasia, and Africa, and the common brushtail possum in New Zealand.

Many non-native plants have been introduced into new territories, initially as either ornamental plants or for erosion control, stock feed, or forestry. Whether an exotic will become an invasive species is seldom understood in the beginning, and many non-native ornamentals languish in the trade for years before suddenly naturalizing and becoming invasive.

Peaches, for example, originated in China, and have been carried to much of the populated world. Tomatoes are native to the Andes. Squash (pumpkins), maize (corn), and tobacco are native to the Americas, but were introduced to the Old World. Many introduced species require continued human intervention to survive in the new environment



Chickens *Gallus gallus domesticus*, from Asia, introduced in the rest of the world



A horse chestnut tree, *Aesculus hippocastanum*. Native to Greece, it has been introduced across most of Europe and parts of North America as an ornamental plant. The horse chestnut tree is an example of a non-invasive introduced species, as while it is foreign it has naturalised and integrated into the ecosystems it was introduced to without apparent negative effects on native species there.

Happy reading