

## KS3 Russia: Teacher notes lesson two

In this lesson, students will study a **global-scale** map showing large areas of vegetation cover in Eurasia. These are called **biomes**. Their differing locations can be explained by **temperature** and **precipitation** variations across the Earth's surface. This lesson aims to build student geographical capabilities as follows:

- ✓ They will start to consider important **interconnected** ways in which the different vegetation and plants found in different parts of Russia interact with other aspects of geography, such as the climate.
- ✓ In terms of **skills**, they will identify the defining characteristics of different **landscapes** and **places**.
- ✓ They will also make use of a variety of **maps** in order to describe the main features of the **distribution** of major biomes across Russia.
- ✓ They will **think critically** about how a **changing climate** could have systemic effects for the vegetation and landscape in different parts of Russia.

### Explaining biomes

The Earth is home to large plant and animal communities called **biomes**. Students may already be familiar with some of their names, such as tropical rainforest, desert or grassland. Global biome distribution roughly follows lines of **latitude**. Latitude is a very important influence on air temperature, because of the curved surface of the Earth (sunlight arriving at the equator is highly concentrated but at the poles it is spread more thinly). Precipitation is the other significant climatic influence on biome distribution and it tends to be high in coastal regions and along the equator.

The lesson will introduce some important Russian biomes and landscapes for students to identify and perhaps offer some explanation for.

- **Tundra** (or polar desert) is found at the Arctic Circle in Russia. [The sun's rays have little strength and temperatures are below freezing for most of the year. Only tough, short grasses can survive.]
- **Coniferous forest** dominates below the tundra as far south as 50-60°N. [Temperatures are so cold that trees have evolved with needle leaves that reduce moisture and heat loss. Snow slides easily off sloping branches. This biome is known locally as the **taiga**.]
- **Deciduous forest** grows in lower latitudes (around 50°N) in western Russia. [There is even more rain here which allows trees to grow. However, the sun's rays are less strong at this latitude and cooler winter temperatures encourage trees to shed leaves at the end of autumn.]
- **Grassland** is found immediately south of Russia's forests, known locally as the **steppes**. [There is a little more annual rainfall here, which encourages grasses rather than trees to grow.]
- **Deserts** are found globally close to the Tropics of Cancer and Capricorn. Air that is travelling polewards at high altitude sinks downwards at the Tropics (due to complex air patterns caused by the earth's rotation). The sun's rays are still highly concentrated at this latitude and because the air is dry it brings desert conditions. Large parts of central Eurasia experience desert conditions, including a small area of southern Russia close to the Caspian Sea called the Ryn desert.

### Local factors affecting biomes

- Russia's biome map is made more complicated by some factors that operate at a local level. Human factors such as **deforestation** have of course caused change, but important physical factors also operate locally. **Drainage** is especially important, as most trees will not grow in waterlogged or permanently frozen areas. In northern Russia, forests are replaced by marshland where soil conditions are especially wet.
- **Alpine vegetation** can be found at lower latitudes provided altitude is high, for instance in southern parts of the Ural Mountains.

## Cold and hot deserts

Key Stage 3 geography students are expected to know the difference between **hot and polar deserts**, both of which are found in Russia.

POLAR DESERT	<b>Glacial</b> Ice-covered places e.g. Severny Island, N Russia
	<b>Tundra</b> Places with frozen soils e.g. Siberia, NE Russia
HOT DESERT	<b>Deserts</b> Truly arid places with < 250mm rain a year e.g. Ryn Desert, SE Russia
	<b>Drylands</b> Semi-arid places with 250mm - 500mm rain a year e.g. dry steppes north-west of Caspian Sea

- A truly **arid** climate is one that receives less than 250mm rainfall each year. Arid regions are also known as hot deserts. On the borders of deserts are semi-arid areas. Also called **drylands**, annual rainfall ranges from 250mm to 500mm.
- Cold polar climates are found in areas of high latitude, especially inland areas far from the warming influence of the sea. Places where the land is partly or completely covered with ice glaciers are called **glacial** regions. Lying alongside are **tundra** regions that cover around 20 per cent of the Earth's surface. They are not directly beneath ice but do experience very cold weather for most of the year, leaving the ground beneath permanently frozen. This gives them a distinctive appearance and environment, as students will see.

### Landscape features, animals, plants and people in extreme climates

These are all interesting extension topics for students to research as an additional classroom activity, or homework. Each could be augmented with investigative work using Google Earth.

The tundra is a fascinating **landscape** to research further. Important geographical themes include:

- permanently frozen-ground - called **permafrost** - which can melt seasonally, leading to waterlogged and boggy conditions at ground level (see photographs).
- landforms called **frost polygons** or **patterned ground** (see Wikipedia [http://en.wikipedia.org/wiki/Patterned\\_ground](http://en.wikipedia.org/wiki/Patterned_ground))
- the important way in which the frozen permafrost has locked away a store of **methane**, a potent **greenhouse gas**. Scientists fear that global warming could melt the ground and lead to more methane escaping.

Interesting animal **adaptations**: many tundra and glacial animal species have evolved white fur and feathers so that they cannot easily be seen against winter snow. Caribou have two layers of fur.

In the high latitudes of the Ural Mountains, or the very high latitudes of Severny Island, small tough **alpine plants** grow on the exposed rock surfaces that can be found poking through the snow. Along with lichen and moss, they form the basis for simple small food webs. Plants survive strong winds by growing close to the ground in crevices and cracks. Spiders and tiny mice can also scratch out a living on glacial mountain-sides.

Many different **indigenous groups** live in central and northern Russia. They have adapted to life in a range of interesting ways. Many of Earth's coldest regions show evidence of long-term settlement, despite the challenging environmental conditions found there. Today, people can be found living in all the cold regions of the Arctic Circle. In Russia, we find nomadic reindeer herders called the Khanty people. They are part of an even larger ethnic group called the Inuit who are spread throughout the Arctic Circle in Canada, Alaska, Russia and Scandinavia. In all these places, unique cultures have survived into the modern age.

Find out more at the Arctic Council website: <http://www.arctic-council.org/index.php/en/about-us/permanent-participants/russian-association-of-indigenous-peoples-of-the-north-raipon/123-resources/about/permanent-participants> or the Cultural Survival website <https://www.culturalsurvival.org/publications/cultural-survival-quarterly/russia/indigenous-peoples-russian-north>

## The tree line and climate change

The boundary between the **coniferous forest (taiga)** and the **tundra** is called the **tree line**.

Climate change research from the Scott Polar institute tells us that the 'relationship between climate change and tree growth is more complicated than initially thought. To generalize our results, *the tree line is definitely moving north on average* ... our results suggest that a rate of around 100 meters per year is realistic. In some places, the tree line is actually moving south. The predictions of a loss of 40 per cent of the tundra by the end of the century is probably far too alarming. According to the report, Earth's surface temperature has risen, but the average is greater in the far north'. Rees' study coordinated experts from across various Arctic nations, including Russia.

- In addition to temperature, other conditions must be considered -- suitable soil, the absence of animals that destroy saplings, and the ability of trees to produce viable seeds.
- Scientists are paying close attention to the Arctic tree line for several reasons. Trees impact the earth's climate in several ways – they are darker than tundra and therefore absorb sunlight and increase temperature. Trees also transpire more than small plants, having an impact on the hydrological cycle of the earth.

Source: Alaska Dispatch News website: <http://www.adn.com/article/arctic-treeline-advance-not-fast-previously-believed>