Unit 1 General Geography G1 GEO 2020
Geography of Environments at Risk
Assessment 3 Geographical Inquiry

Assessment Type: Geographical Fieldwork

Task Weighting: 15% of the school mark for this of unit
(Part A 10%  Part B 5%)

Conditions:
Part A: To be completed at home
Due Date: Fieldwork booklet 4/5/20

Part B: Validation: 7/5/20 (this will be a short comprehension exercise that takes place in class or will be loaded on Connect – TBA)

Students investigate an environment at risk: Jarrah (sclerophyllous) forest of WA

Complete the fieldwork booklet attached using the information provided and further research on the internet. You can either print this document, or write your answers on file paper.
Jarrah forest biome

Introduction:
The Jarrah forest biome is a unique local ecosystem in the south west of Western Australia. It has developed over a long period of time in isolation from other forests.

The jarrah forest sits on the western edge of the Darling Plateau. The Plateau is approximately four hundred meters high with shallow rolling valleys and gentle rises. The western edge of the plateau has a north-south escarpment, the Darling Scarp. This steep slope separates the plateau from the coastal plain.

The area experiences a relatively low annual rainfall of 1,300 millimetres on the scarp and 700 millimetres in the inland and north-east areas of the ecosystem. There are many unique plants and animals in the area that able to cope with the relatively dry Mediterranean climate. In particular there are many sclerophyllous plants in the area. These plants have hard leathery leaves with little moisture in them. These leaves reduce transpiration and help them resist dry summer conditions. The Jarrah forest ecosystem is often called a sclerophyllous forest.

Location:
This unique local ecological area is located in the south west of Western Australia extending from just north of Perth south to Manjimup and east towards Albany on the Darling Plateau.

Key words and notes:
Activity 1: (17 marks)

Using an atlas/Google maps and the attached blank map:

- Identify the location and distribution of the Jarrah forest.
- Label the 5 major towns in the Jarrah forest. Bridgetown, Manjimup, Collie, Nannup, Dwellingup.
- Label the major rivers shown on the map.
- Use BOLTS to complete the map.
Activity 2: Biodiversity

What is biodiversity? Read the text below and provide a definition in your own words. (4 marks)

Biodiversity, also known as biological diversity, is the variety of life across all of the different levels of biological organization. On a large scale this can be across the whole earth. On a smaller scale, biodiversity can be used to describe the variety of a species in an area such as an ecosystem.

The biodiversity of the Jarrah forest is a complex ecosystem with many food webs and biotic interactions. There are disturbances and imbalances that need to be addressed which does affect the Jarrah forest ecosystem that will be discussed further.

The biodiversity of an area has a large impact on the ecosystem stability of that area. A well-functioning ecosystem with high levels of species and genetic diversity has a more complex ecosystem, with a variety of food webs and biotic interactions. This complexity helps an ecosystem return to a stable state after disturbance because the ecosystem has more ways to respond to the disturbance to fix any imbalances or problems.

Components of the Jarrah forest

The Jarrah forest ecosystem has biotic (living) and abiotic (non-living) components such as flora (vegetation), fauna (animals), climate, topography, drainage and soil which have relationships which enable the ecosystem to function as a large living unit of nature.

Examples of biotic (living) and abiotic (non-living) components of the Jarrah forest ecosystem

<table>
<thead>
<tr>
<th>Biotic</th>
<th>Abiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants</td>
<td>Water</td>
</tr>
<tr>
<td>Animals</td>
<td>Sunlight</td>
</tr>
<tr>
<td>Insects</td>
<td>Soil</td>
</tr>
<tr>
<td>Fungi</td>
<td>Air</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Temperature</td>
</tr>
</tbody>
</table>

4
**Flora (vegetation)**

The Jarrah forest vegetation is dominated by the Jarrah tree. The Jarrah tree is a slow growing evergreen hardwood with a long straight trunk and grey stringy bark. They are unusually tall for a Mediterranean climate and grow to over 50 meters in height. They grow widely spaced which creates an open canopy. Other trees include the marri tree, blackbutt and sheoak.

There are three distinct layers of vegetation. The open canopy allows sunlight to filter through the Jarrah canopy which results in three distinct “storeys”.

**Vegetation of the Jarrah forest**

<table>
<thead>
<tr>
<th><strong>Upper story</strong> (Canopy) 50m</th>
<th><strong>Middle story</strong></th>
<th><strong>Lower story</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jarrah</td>
<td>Marri - Red gum</td>
<td>Wattle</td>
</tr>
<tr>
<td>Blackbutt</td>
<td>Banksia</td>
<td>Grass trees</td>
</tr>
<tr>
<td></td>
<td>Sheoaks</td>
<td>Hakeas</td>
</tr>
<tr>
<td></td>
<td>Saplings</td>
<td></td>
</tr>
</tbody>
</table>

**Key words and notes:**

Activity 3: Construct a well labelled cross section of the flora species for your geographical inquiry. Represent each species and label its height.

Include Jarrah, Marri, Wandoo, tuart, karri, tingle, blackbutt, banksia, sheoak, Cape Leeuwin (crested) wattle, grass trees, kangaroo paws and hakeas
**Fauna (animals)**
The Jarrah forest is inhabited by many animals, including mammals, birds, reptiles and insects.
Mammals: echidna, brush wallaby, grey kangaroo, possum, quokka, bandicoot, numbat, chuditch (native cat), dunnart, mardo, woylie, tammar wallaby, pigmy possum, bush rat and mouse. Rabbits, foxes and feral cats are all introduced species.
Birds: Parrots, honeyeaters, wattle birds, magpies, cockatoos, butcher birds, doves, emus, kookaburras (introduced) and robins.
Reptiles: dugite snake, tiger snake, carpet snake, geckos, goannas, lizards and skinks.
Insects: ants, mites, beetles, millipedes, centipedes and termites.

Dunnart               Mardo              Chuditch

**Key words and notes:**
Relationships: Food chains

All biotic elements are part of a food chain. Ecosystems have different energy levels called trophic levels, which are basically where different organisms exist in the food chain. Trophic levels are determined by the elements role in the food chain. Primary consumers (herbivores) eat plants. Secondary consumers (carnivores or omnivores) eat either plants and animals or just animals. Tertiary consumers at the top of the food chain eat other secondary consumer animals. Decomposers break down dead cells of all levels.

<table>
<thead>
<tr>
<th>Primary producers</th>
<th>Primary consumers (herbivores)</th>
<th>Secondary consumers (carnivore or omnivore)</th>
<th>Tertiary Consumers (eats secondary consumers)</th>
<th>Decomposers/Recyclers (breaks down dead cells)</th>
</tr>
</thead>
<tbody>
<tr>
<td>jarrah</td>
<td>possum</td>
<td>dugite snake</td>
<td>eagle</td>
<td>fungus</td>
</tr>
<tr>
<td>marri</td>
<td>wallaby</td>
<td>frog</td>
<td>fox (introduced)</td>
<td>bacteria</td>
</tr>
<tr>
<td>banksia</td>
<td>grey kangaroo</td>
<td>lizard</td>
<td></td>
<td>earthworm</td>
</tr>
<tr>
<td>wattle</td>
<td>caterpillar</td>
<td>goanna</td>
<td></td>
<td>ant</td>
</tr>
<tr>
<td>grass trees</td>
<td>woylie</td>
<td>tiger snake</td>
<td></td>
<td>termite</td>
</tr>
</tbody>
</table>

Relationships: Flow of energy along the different trophic levels of the food chain

Energy from the sun is converted through photosynthesis by primary producers into heat which is used by each level of the food chain. At each stage some energy is lost until the decomposers cycle exhausts the energy supply and new energy from the sun is needed to support the food chain. This is a continuous cycle without which the food cycle would collapse.

Key words and notes:
Activity 4: Using the information below, place all of the animals into the appropriate category in the table below (21 marks)

<table>
<thead>
<tr>
<th>Primary producers</th>
<th>Primary consumers (herbivores)</th>
<th>Secondary consumers (carnivore or omnivore)</th>
<th>Tertiary Consumers (eats secondary consumers)</th>
<th>Decomposers/Recyclers (breaks down dead cells)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Jarrah</td>
<td>6 Marri</td>
<td>9 Wattle</td>
<td>4 Possum</td>
<td>8 Wallaby</td>
</tr>
<tr>
<td>5 Snake</td>
<td>10 Lizard</td>
<td>15 Goanna</td>
<td></td>
<td>12 mardo</td>
</tr>
<tr>
<td>1 Eagle</td>
<td>1 Fox (introduced)</td>
<td>7 Ant</td>
<td>14 Termite</td>
<td>21 Earthworm</td>
</tr>
</tbody>
</table>
Activity 5: Using the information above, create a food energy chain from the jarrah forest ecosystem. (8 marks)
Label what level of consumer each animal is in the food chain and show how energy is lost along the food chain as it travels through the trophic levels of the Jarrah forest food chain.

Example:

Solar energy

Banksia Primary producer → caterpillar Primary consumer → tiger snake Secondary consumer → eagle Tertiary consumer → bacteria Decomposer / recycler

Energy losses
**Relationships: food webs**
Food webs are an expanded network of multiple food chains in an ecosystem. They incorporate numerous life forms and their interactions/relationships.

Example:

![Food Web Diagram](image)

**Activity 6: Create food web for the Jarrah forest ecosystem.**

**Food Web – Jarrah forest**
Abiotic (non-living)

Climate
The jarrah forest climate is typically a Mediterranean climate with hot dry summers and mild cool moist winters. The annual rainfall is between 700 and 1000 millimetres. About eighty percent of rain falls between May and December.

The forest is prone to frequent fires particularly in summer. Natural fires are often started by lightning igniting the forest floor.

Activity 7: Use the climate data below to create a climate graph for the town of Collie (copy the information in to an Excel page and then follow the instructions on “How to create a climate graph” located in Connect/Content/Information to complete fieldwork booklet

Town of Collie Climate Data

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean maximum temperature (°C)</td>
<td>30.5</td>
<td>30.1</td>
<td>27.3</td>
<td>23.1</td>
<td>18.9</td>
<td>16.3</td>
<td>15.5</td>
<td>16.3</td>
<td>18.1</td>
<td>20.7</td>
<td>24.8</td>
<td>28.3</td>
</tr>
<tr>
<td>Mean minimum temperature (°C)</td>
<td>13.2</td>
<td>13.1</td>
<td>11.5</td>
<td>8.7</td>
<td>6.3</td>
<td>5</td>
<td>4.2</td>
<td>4.5</td>
<td>5.8</td>
<td>7.4</td>
<td>9.7</td>
<td>11.7</td>
</tr>
<tr>
<td>Mean rainfall (mm)</td>
<td>15.7</td>
<td>14.3</td>
<td>23.5</td>
<td>47</td>
<td>123.5</td>
<td>173.5</td>
<td>175.9</td>
<td>140.5</td>
<td>99.7</td>
<td>62.4</td>
<td>31.7</td>
<td>17.2</td>
</tr>
</tbody>
</table>
Topography and drainage
The jarrah forest sits on the western edge of the Darling Plateau. The Plateau is approximately four hundred meters high with shallow rolling valleys and gentle rises. The western edge of the plateau has a north-south escarpment, the Darling Scarp. This steep slope separates the plateau from the coastal plain. Westward flowing streams flow from the plateau to the sea. They include the tributaries of the Helena, Canning, Serpentine, Murray and Blackwood rivers.

Key words and notes:

Soils
Jarrah can grow on coastal sand, but they prefer the deep, relatively infertile, reddish –coloured laterites of the Darling Scarp and Plateau.
A two to five centimetre top layer of slowly decomposing litter and top soil covers a lateritic soil.
The laterite soil, (rich in iron and aluminium), of the Jarrah forest consists of an approximately fifty centimetre layer of ironstone gravel mixed with sand.
The laterite soil lies over a fifty centimetre layer of laterite caprock layer (rich in bauxite).
Below this layer is a level of bauxite and a layer of whitish clay kaolin which together range from five to ten meters in depth.

Beneath these there is a deeply weathered granite parent rock.

Activity 8: Label the diagram below using the information above.
Biotic and abiotic component relationships

The relationships/interrelationships between these living and non-living components allow the ecosystem to function as a large living unit of nature.

Climate – Vegetation – Animal relationships

Climate factors such as rainfall can determine the broad boundaries of the Jarrah forest. The forest boundary is limited on the north and east by lower rainfall. More rainfall results in more tree density. Cooler wetter conditions produce taller trees with more foliage. The ability of sunlight to infiltrate the canopy then effects the lower layers of the forest such as the which understory plants grow and the density of the layers below.

Xerophytic plants are those that need little water to survive. Adaptions such as the sclerophyllous features of plants such as the jarrah are considered to be a result of climate. In addition the jarrah has a strong “sinker” root system to locate water deep in the soil to allow them to continue to grow through the dry summers and droughts.

The jarrah forest vegetation has adapted to survive fires. The Jarrah has very thick bark to protect it from fire. The marri and sheoak regenerate from buds that grow from beneath their burnt bark. Fire is essential for some species to regenerate. The hakea need fire to split their seed pods to germinate.

Animals have also adapted to the climate particularly to summer and drought. Wallabies can survive on little water; frogs bury themselves to stay cool. Other animals are nocturnal and only come out when it’s cool. Fire can provide lush new regrowth grasses for shelter and feed for animals.

Climate – soil – vegetation relationships

The soil of the jarrah forest is the result of the combination of climate and vegetation. Past hotter and wetter tropical climate weathered the granite rock quickly and provided mineral content in the soil and the lateritic caprock, (rich in iron and aluminium). This climate also leached the nutrients out of the soil to leave the high iron and aluminium lateritic caprock layer.

The topsoil layer is shallow because of the lack of organic material. The hard dry leaves decay slowly in the current climate.

Key words and notes:
Soil – vegetation – topography relationships
The jarrah forest soil is a gravelly and infertile. The jarrah has strong roots to penetrate these hard soils to find underground water. Vegetation controls the movement of water in the soil. It absorbs some rainwater and allows the rest to become part of the soils surface water or recharges underground water.

Topography and soil impacts on vegetation distribution. Jarrah grows well on the top of ridges and the slopes of valleys where the thickest laterite occurs. Marri prefers the wetter valley floors Blackbutt trees prefer more fertile soils and sheoak prefer sandy soils.

Climate – landforms – soils
Temperature and rainfall effect landforms through weathering and erosion. The sharp rise of the land from the coastal plain to the plateau causes more rainfall to the east of the scarp. The higher altitude of the scarp results in cooler temperatures then the coastal plain.

Vegetation – animal relationships
The vegetation absorbs solar energy and provides the nutrients and energy for all the food chains that support life in the jarrah forest. Vegetation and animals are linked through food chains. Energy is lost at each stage as the food chain progresses.

Vegetation also provides a habitat for animals for both shelter, vegetation cover for protection and nesting sites. Plants are the primary producers of the ecosystem.

Animals can affect plants by spreading seeds, pollinating plants and controlling pests. Ants can be great pest controllers for trees!

Relationships between animals are not always productive. Introduced animals can negatively affect the ecosystem. Introduced species such as the kookaburra, (from the Eastern states), the fox, feral bee and feral cats which create in imbalance in the ecosystem and native species become threatened.

Key words and notes:
Activity 9: Using the information provided about the biotic and abiotic components of the Jarrah forest ecosystem, fill in the graphic organiser below with a short description in the first column and a picture or diagram in the second column:  

(15 marks)

<table>
<thead>
<tr>
<th>Relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate – vegetation – animal relationships</td>
</tr>
<tr>
<td>Climate – soil – vegetation relationships</td>
</tr>
<tr>
<td>Soil – vegetation – topography relationships</td>
</tr>
<tr>
<td>Climate – landforms – soils</td>
</tr>
<tr>
<td>Vegetation – animal relationships</td>
</tr>
</tbody>
</table>