Year 12 Biology 2019/2020
Unit 3, Topic 1 – Describing biodiversity, and Topic 2 – Ecosystem Dynamics

2019 – Term 4

Week	Topic/ Lesson	Unit Goals (Syllabus)	Resources
W5	Biodiversity Intro to Unit 3	**recognise** that biodiversity includes the diversity of species and ecosystems	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**
	Biodiversity Classification	**describe** the classification systems for similarity of physical features (the Linnaean system)	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**
	Species concept	**recognise** the need for multiple definitions of species **explain** the classification of organisms according to the following species interactions: predation, competition, symbiosis and disease	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**
W6	Ecosystems Classification Abiotic and biotic factors	**understand** that ecosystems are composed of varied habitats (microhabitat to ecoregion)	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**
	Classifying Ecosystems	**interpret** data to **classify** and name an ecosystem **explain** how the process of classifying ecosystems is an important step towards effective ecosystem management (consider old-growth forests, productive soils and coral reefs)	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**
	Ecosystem types: aquatic and terrestrial		**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**
W7	Ecosystems Measuring features Species diversity and richness	use species diversity indices, species interactions (predation, competition, symbiosis, disease) and abiotic factors (climate, substrate, size/depth of area) to compare ecosystems across spatial and temporal scales • explain how environmental factors limit the distribution and abundance of species in an ecosystem.	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:** Richness S = s / √N
	Simpson Index	**determine** diversity of species using measures such as species richness, evenness (relative species abundance), percentage cover, percentage	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**

		frequency and Simpson's diversity index	Diversity Index D = Σn(n-1) / N(N-1) Simpson's Diversity Index SDI = 1 – [Σn(n-1) / N(N-1)]
	Stratified sampling	**describe** the process of stratified sampling in terms of - purpose (estimating population, density, distribution, environmental gradients and profiles, zonation, stratification) - site selection - choice of ecological surveying technique (quadrats, transects) - minimising bias (size and number of samples, random-number generators, counting criteria, calibrating equipment and noting associated precision) - methods of data presentation and analysis.	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**
W8	Survey techniques (Transect, Quadrat, Abiotic factors) Ecological Surveying techniques (PPT)	**Lead into Mandatory practical:** Determine species diversity of a group of organisms based on a given index. **Lead into Mandatory practical:** Use the process of stratified sampling to collect and analyse primary biotic and abiotic field data to classify an ecosystem.	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**: **Important formulae:**
	PRAC: Field methods		
	PRAC: Field methods		

2020 – Term 1

Week	Topic/ Lesson	Unit Goals (Syllabus)	Resources
W1	Lesson 1	Australia Day/ alternative program	
	Lesson 2 **Quiz** and Revision: Biodiversity and Biological interactions		**OBI Chapters**: 2 – 3 **Important vocabulary**: Biodiversity Ecosystem Biotic Abiotic Taxonomy Mutation Species Ring Species Ecology Environment Biosphere Habitat Population Community Niche Optimal range Tolerance range Intraspecific Interspecific Preditor/ prey Symbiosis Mutualism Parasitism Abundance Holdridge life zone system Specht Classification Woodland Forest Grassland Plankton Nekton Benthic Littoral Abyssal Neritic Biome Stratification (vertical, horizontal) Canopy Ecozone Ecoregion Richness Abundance Diversity Simpson's Index

			Cooperation Commensalism Amensalism Quadrat/ plot Transect (line, belt, strip)
	Lesson 3 Revision: Biodiversity and Biological interactions		**Important diagrams/tables**: Ringspecies – Fig 3, p. 41 or Fig 5, p. 43 Ecosystem – Fig 1, p. 66 Abiotic Range – Fig 1, p. 68 Interspecific relationships – Tab 1, p. 74 Holdridge Life zones – Fig 1, p. 78 Specht's Australian Vegetation – Tab 1, p. 78 Oceanic zones – Fig 3, p. 82 Freshwater ecosystems – Tab 1 & 2, p. 84/85 Terrestial communities – Tab 1, p. 86 Terrestial biomes – Fig 1, p. 87 Ecozones – Fig 9, p. 89 Australian Ecoregions – Fig. 10, p. 90 Australian Vegetation Zones – Fig 11, Tab 2, p. 90 Simpson's diverstiy Index – Worked Example, p. 96 Abiotic Measurements – Tab 1, p. 99 **Important formulae:** Richness S = s / √N Diversity Index D = Σn(n-1) / N(N-1) Simpson's Diversity Index SDI = 1 – [Σn(n-1) / N(N-1)]
W2	Lesson 1 Energy in ecosystems (Ch 4.1)	**sequence and explain** the transfer and transformation of solar energy into biomass as it flows through biotic components of an ecosystem, including – converting light to chemical energy – producing biomass and interacting with components of the carbon cycle **construct and analyse** simple energy-flow diagrams illustrating the movement of energy through ecosystems, including the productivity (gross and net) of the various trophic levels	**OBI Chapters**: 4.1, 4.3 **Important vocabulary**: Food chain Consumer Productivity Biomass Gross primary production Net primary production Producer Consumer Decomposer/ detrivores Trophic level Energy transfer Food web Biogeochemical cycles Nutrient cycle Reservoir pool Cycling pool Phosphorus cycle Water cycle Oxygen cycle Carbon cycle Nitrogen cycle Nitrogen fixation **Important diagrams/tables**: Food chain – Fig 2, p. 119 Energy transfer chain – Fig 5, p. 122 Food web – Fig 6, p. 123 Nutrient cycling Tab 1, p 126 Phosphorus cycle Fig 2, p. 128 Water cycle Fig 3, p. 129 Oxygen and Carbon cycle Fig 4, . p 130 Nitrogen cycle Fig 5, p. 131
	Lesson 2 Energy in ecosystems (Ch 4.1) Ecological pyramids (Ch		
	Lesson 3 Ecological pyramids (Ch 4.2) Data Analysis and interpretation practice	**analyse and calculate** energy transfer (food chains, webs and pyramids) and transformations within ecosystems, including loss of energy through radiation, reflection and absorption efficiencies of	**OBI Chapters**: 4.2 **Important vocabulary**: Ecological pyramid Pyramid of numbers Pyramid of Biomass Pyramid of Energy Standing crop **Important diagrams/tables**:

		energy transfer from one trophic level to another biomass	NEED TO FIND MORE
W3 **Swimming Carnival Senior Wed all day**	Lesson 1 4.2) Biogeochemical cycles (Ch 4.3)	**describe** the transfer and transformation of matter as it cycles through ecosystems (water, carbon and nitrogen)	**OBI Chapters**: 4.2 **Important vocabulary**: Ecological pyramid Pyramid of numbers Pyramid of Biomass Pyramid of Energy Standing crop **Important diagrams/tables**: Pyramid of numbers – Fig 1 and 2, p. 124 Pyramid of Biomass – Fig 3 and 4, p. 124 Pyramid of Energy NEED TO FIND MORE
	Lesson 2 Keystone species (Ch 4.4)	**define** the term *carrying capacity* **define** *keystone species* and understand the critical role they play in maintaining the structure of a community **analyse** data (from an Australian ecosystem) to identify a keystone species and predict the outcomes of removing the species from an ecosystem.	**OBI Chapters**: 4.4 **Important vocabulary**: Keystone species Umbrella species Flagship species **Important diagrams/tables**: NEED TO FIND MORE
	Lesson 3 Revision Data Analysis and interpretation practice		**OBI Chapters**: 2 – 4 **Important vocabulary**: **Important diagrams/tables**:
W4	Lesson 1 Population: Distribution and abundance (Ch 5.1) Density factors (Ch 5.4)	**define** ***ecological niche*** in terms of habitat, feeding relationships and interactions with other species **understand** the competitive exclusion principle **analyse** **data** to identify species (including microorganisms) or populations occupying an ecological niche	**OBI Chapters**: 5.1 **Important vocabulary**: Population Distribution Abundance Population density Competition Competitive exclusion principal Niche Displacement Predation Random distribution Evenly spaced distribution Clumping Density dependent factors Character displacement Resource partitioning Infection **Important diagrams/tables**: Distribution Pattern – Fig 1, p. 141 Organism distribution – Fig 2, p. 141 Predator-Prey relationship – Fig 3, p. 151 **Important formulae:** Population density : P-density = P-size/area
	Lesson 2 Population growth and strategies (Ch 5.2-5.3) Lincoln index (capture/ recapture) (Ch. 3.8, p. 104)	**calculate** population growth rate and change (using birth, death, immigration and emigration data) **use** the Lincoln Index (capture-recapture) to	**OBI Chapters**: 3.8, 5.2 and 5.3 **Important vocabulary**: Capture –recapture Lincoln index Population growth and growth rate Density independent factors Limiting factor r-strategist

		estimate population size from secondary or primary data	K-strategist Biofilms **Important diagrams/tables**: Growth curve and rate – Fig 1, p. 143 Characteristics of strategist – Tab 1, p. 147 **Important formulae:** Lincoln Index N = M x n / m Population growth r = (b+i)-(d+e)
	Lesson 3 Population growth and strategies (Ch 5.2-5.3)	**analyse** population growth data to determine the mode (exponential growth J-curve, logistic growth S-curve) of population growth	**OBI Chapters**: 3.8, 5.2 and 5.3 **Important vocabulary**: **Important diagrams/tables**: NEED TO FIND MORE **Important formulae:**
W5 **IA1**	Lesson 1 Carrying capacity (Ch 5.5)	**define** the term *carrying capacity* **explain** why the carrying capacity of a population is determined by limiting factors (biotic and abiotic) **discuss** the effect of changes within population-limiting factors on the carrying capacity of the ecosystem.	**OBI Chapters**: 5.5 **Important vocabulary**: Environmental limiting factors Biotic potential Carrying capacity Environmental resistance J-curve S-curve Equilibrium Ecological homeostasis **Important diagrams/tables**: Exponential growth Fig 1, p 152 Population growth curve fig2, 153 S-curve – fig 3, 153 Carying capacity Fig 4, p. 154 Homeostatic control Fig 5, p. 154
	Lesson 2 Data Analysis and interpretation practice Revision for IA1- Data Test		**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
	Lesson 3 **EXAM**		**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
W6	Lesson 1 Interactions btw ecosystems (Ch 6.1) Changes in communities (Ch 6.2)	**explain** the concept of ecological succession (refer to pioneer and climax communities and seres) **differentiate** between the two main modes of succession: primary and secondary	**OBI Chapters**: 6.1, 6.2 **Important vocabulary**: Latitudinal zonation Altitudinal zonation Sere Primary succesion Pioneer species Micro-environments Dominant pspecies Climax community Primary forces Secondary succesion Secondary force Disclimax community Desertification **Important diagrams/tables**: Latitudinal zonation Fig 4, p. 165 Sand dune zonation Fig 5, p. 169 NEED TO FIND MORE
	Lesson 2 Interactions btw ecosystems (Ch 6.1)	**identify** the features of pioneer species (ability to fixate nitrogen, tolerance to extreme conditions, rapid	**OBI Chapters**: 6.1, 6.2 **Important vocabulary**: Latitudinal zonation Altitudinal zonation Sere

	Changes in communities (Ch 6.2)	germination of seeds, ability to photosynthesise) that make them effective colonisers	Primary succession Pioneer species Micro-environments Dominant species Climax community Primary forces Secondary succession Secondary force Dis-climax community Desertification **Important diagrams/tables**: Latitudinal zonation Fig 4, p. 165 Sand dune zonation Fig 5, p. 169 NEED TO FIND MORE
	Lesson 3 Ecosystem changes in past (Ch 6.3)	**analyse** data from the fossil record to observe past ecosystems and changes in biotic and abiotic components	**OBI Chapters**: 6.3 **Important vocabulary**: Fossils **Important diagrams/tables**: NEED TO FIND MORE
W7	Lesson 1 Data Analysis and interpretation practice	**analyse** ecological data to **predict** temporal and spatial successional changes	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
	Lesson 2 Human impact on ecosystems (Ch 6.4)	**predict** the impact of human activity on the reduction of biodiversity and on the magnitude, duration and speed of ecosystem change.	**OBI Chapters**: 6.4 **Important vocabulary**: Habitat fragmentation Eutrophication Biological oxygen demand Exotics Pests Biodegradability Biological magnification Half-life Persistence Primary pollutant Secondary pollutant Photochemical smog Temperature inversions Microclimates **Important diagrams/tables**: Erosion Fig 3, p.176 Water pollution Fig 5, p178 DDT Concentrations Fig 7, p180 Microclimate Changes Fig 9, 182
	Lesson 3 Ecosystem Management Revision/ Catch-up Unit 3	Bringing it all together! Evaluating and elaborating on ideas about ecosystems → management	**OBI Chapters**: 3.9 **Important vocabulary**: **Important diagrams/tables**: Carbon Dioxide and Ocean Acidification Fig. 1, p.107 FuseSchool video; Ecosystems at risk (examples of management)
W8 **IA2: PRAC** **½ day**	Lesson 1 IA 2 (L1) Hand-out/ preparation for initial Fieldtrip		**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
	Lesson 2 **Prac:** **½ day excursion**	**Mandatory Practicals:** 3.8 A – OBI U3&4, p. 416 3.8 B – OBI U3&4, p. 423 6.4 – OBI U3&4, p. 425	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
	Lesson 3 IA2 (L2)		**OBI Chapters**: **Important vocabulary**:

	– Rationale -> RQ – Modifications		**Important diagrams/tables**:
W9 **IA2**	Lesson 1 Revision: Diversity and Linnean system (Ch 2.2-2.4) Features in classification (Ch 2.5) Identification keys (Ch 2.7) Cladistics (Ch 2.6)	**describe** the classification systems for – similarity of physical features (the Linnaean system) – methods of reproduction (asexual, sexual — K and r selection) – molecular sequences (molecular phylogeny — also called cladistics) **define** the term *clade* **recall** that common assumptions of cladistics include a common ancestry, bifurcation and physical change	**OBI Chapters**: 2.2-2.4 **Important vocabulary**: Hierarchical Classification Reproduction Asexual/sexual Taxonomy Taxa Mutations Species Genus Family Classes Phyla Kingdoms Domains Order Division Binomial nomenclature Specific name Reproductive isolation Hybrid Apomixis Parthenogenesis Ring species Varieties Geographical isolation Subspecies Race Phylogeny Cladistics Shared/derived characteristics Cladogram Cladogenesis Plesiomorphic Apomorphic Clades Karyotype Molecular analysis Molecular clock Immunological difference DNA-hybridisation Mitochondrial DNA Dichotomous keys Homologous structure Divergent evolution Convergent evolution Analogous structures Vestigial structures Embryology Geographical distribution **Important diagrams/tables**: Linnaean Taxonomy Fig 1, p. 35 Classification by Domain Tab 1, p. 35 Ring species Fig 3, p 41 and Fig. 5, p. 43 Homologous Structures Fig 1, p. 45 Embryology Fig. 2, p. 46 Geographic Distribution Fig 3, p. 47 Fossil Evidence Fig 4, p. 48 Cladogram Fig 1, p. 50 Molecular Analysis Fig. 2 & 3, p. 51 DNA Hybridisation Fig. 5, p. 53 Dichotomous Keys Fig. 1 p. 56 and Tab 1 p.57
	Cladistics (Ch 2.6) Data Analysis & interpretation	**interpret** cladograms to infer the evolutionary relatedness between groups of organisms **analyse** data from molecular sequences to **infer** species evolutionary relatedness	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
	IA 2 (L3) – Checkpoint RQ and modifications		**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
W10 **IA2: PRAC full-day**	Lesson 1 **Prac:** **1-day excursion**	**Mandatory Practicals:** 3.8 A – OBI U3&4, p. 416 3.8 B – OBI U3&4, p. 423 6.4 – OBI U3&4, p. 425	**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
	Lesson 2 IA 2 (L4) – Checkpoint Rationale		**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
	Lesson 3 Revision/ Catch-up Unit 3		**OBI Chapters**: **Important vocabulary**: **Important diagrams/tables**:
