OPERATION WALLACEA

South Africa School's Booklet 2026

Contents

1. Study Area & Overall Research Aims

South Africa is the best place in the world if you want to learn about how to make wildlife conservation work financially. Income from game management and ecotourism revenue has meant that there is an ever- expanding network of game reserves that also benefit much other wildlife besides the game species. This booklet will focus on the terrestrial only expedition based in the fynbos reserve at Gondwana, in the Western Cape.

Figure 1. Location of the terrestrial site – Gondwana Game Reserve and the relevant airport.

Gondwana Game Reserve is unique among our South African research sites as it is in the Western Cape on the south coast of the country. The habitat and climate here are very different to our other research sites as the reserve falls within the Cape Floristic Region. This is a highly diverse area of South Africa, with over 9000 plant species many of which are endemic. However, the grazing value of these species for large mammals is largely unknown and so Opwall teams are working to understand the usage of these habitats by species such as elephant, rhino and zebra.

Given all this investment in wildlife management in enclosed reserves in South Africa, a whole series of management practices have grown up on which decisions are made. Some of these approaches seem to be making assumptions that are not borne out in practice. Examples include:

Fynbos vegetation has zero carrying capacity for herbivores.
Setting stocking rates for herbivores based on look-up tables linked to rainfall levels or using a computer programme to calculate amount of foliage based on standard tree shapes, gives accurate stocking levels. In practice developing techniques to measure the amount of foliage available for browsers for individual reserves may give more accurate data.

Elephants damage vegetation and massively reduce the availability of forage for other species so should be stocked at no more than 0.35 animals per km². In practice, they may keep the savannah from converting to woodland where most of the forage is then out of reach of the other herbivores and by knocking over trees make additional forage available to those species only feeding below 2m height.

Direct counts by helicopter are necessary to get accurate counts of game numbers, whereas DISTANCE based transect surveys provide a much more cost-effective method and allow species that cannot be counted from the air, such as Nyala, to also be estimated.

The overall objective of the Opwall surveys in South Africa, which are run in conjunction with WEI, is to develop a manual of best practices for wildlife conservation reserve managers based on the latest scientific data and the results of some of these research projects across the high veld, low veld and fynbos vegetation communities.

2. Itinerary

The full expedition is spent in Gondwana Game Reserve (see section 4 for details). International flights will need to be arranged into George airport by 1400hrs on Monday and out of George airport after 1600hrs on Monday. Internal travel will be costed by the Opwall travel section once the flights have been arranged to ensure transfers to and from Gondwana from the airport at the start and end of the expedition.

On this option the students will begin by complete an African Wildlife Management course which includes lectures, and a series of in camp workshops and practicals. They will also take part in a range of biodiversity surveys (see section 4).

3. Research Objectives, Activities & Schedule at Gondwana Game Reserve

The Gondwana Game Reserve in the Western Cape province was created in 2010 by combining cattle and game ranches into a single fenced reserve of 11500ha. This reserve has a very different vegetation to that of the normal game reserves in high or low veld areas, and lies within the Cape Floral Kingdom which has the most diverse flora of any region in the world. Before the area was settled by man this vegetation community supported Elephant, Rhinos, Lions and Antelope species such as Eland, Blessebok, Bontebok and Springbok. The main natural vegetation communities in this region are Fynbos and Renosterveld. Fynbos grows on acid nutrient-poor soils and is characterised by Proteas (the South African national flower), Ericas, Pincushions, Cape Reeds, Pelargoniums and geophytes and is the most species diverse floral community in the world. However, this important vegetation community is under threat from introduced species and human development, with some flower species already having become extinct. Renosterveld grows on deeper more alkaline soils and is characterised by low growing Renosterbos bushes. Renosterveld vegetation has mainly be ploughed up and only around 3% still remains.

The creation of the Gondwana Reserve on modified areas of former Renosterveld and Fynbos vegetation provides an opportunity to protect some additional protected areas of these communities. However, the browsing and grazing value of both Fynbos and Renosterveld is low and management of the vegetation on the former cattle and game farms by frequent burning had created some areas of grassland within the reserve which provide much of the food for the grazers and foraging species introduced. It is the presence of the Big 5 in the Reserve which is the main attraction for visitors and investors, and the carrying capacity of the reserve for these game species is primarily influenced by the amount of non-Fynbos and Renosterveld vegetation available. On the other hand, the reserve management want to maintain as much of the floristic and faunal diversity of the Fynbos and Renosterveld areas as possible and this also provides an attraction for visitors to the reserve.

Burning is how Fynbos vegetation is renewed naturally, although the natural fire frequency is at fairly long intervals. After a fire the vegetation begins to re-establish but how long does it take for the climax Protea

communities to become established? Immediately after a fire, grasses and edible herbs grow within the burned sections and these provide valuable grazing for the large mammals on which the reserve relies for its income. As the Fynbos recovers the percentage of edible grasses and herbs declines to be replaced with non-palatable woody species. So, from a conservation viewpoint the argument has always been to maintain long burning cycles whilst from a grazing viewpoint the shorter the burning cycle the better.

The management of the reserve is currently using a compromise position of burning on a 10-year rotation. The purpose of the Opwall/WEI research programme is to determine how this burning rotation affects the floristic and faunal diversity of the Fynbos communities and the carrying capacity for the large game species to determine if the 10-year cycle is the best compromise position or whether modifications to the strategy are required. To complicate the argument further, the assertion that Fynbos has zero forage and grazing value for game species is incorrect. Elephants and other species such as Eland within the reserve are feeding on the Fynbos areas. Observational data are needed to determine what plant species are being consumed and what percentage of the diet this comprises. Note if Fynbos provides a significant contribution to grazing and browsing resources available then this could increase the carrying capacity of the reserve.

So in summary the following questions are being addressed by the Opwall/WEI research programme:

1) What is the optimum fire regime for allowing herbivore grazing but also maintaining floristic diversity of the Fynbos?
2) How does fire management affect bird diversity in a Fynbos habitat?
3) Which mammal species feed on Fynbos?
4) How do elephants utilise Fynbos for foraging?

Over the course of the week expedition, the students will complete bush skills training alongside helping with the biodiversity research surveys needed to answer these research questions.
Questions 1-4 are all related to looking at the effects of fire on Fynbos habitat. Currently, burning occurs at two times of year (April and September), and each section of the reserve is burned approximately once every ten years. Since we have access to different habitat types (Fynbos, grassland etc) that contain within them areas burned at various times in the past, the rate of biodiversity regeneration following fire for a number of different indicator taxa can be assessed.

Two aspects of biodiversity will be studied: floral and avifaunal. The study sites for each of these will be the same, the exact number and locations of which will be determined based upon the vegetation map provided by reserve management. The study plots will be located using GPS and several pieces of data collection performed in a single visit. Firstly, a bird point count will be performed at the centre of the study plot (question 2). Then a detailed vegetation survey will be carried out. This will include using quadrats to estimate the percentage cover of each floral family and identification of grass species present at specific points along a transect moving outwards from the central point (question 1).

It is very important for management of Fynbos game reserves to understand which game animals utilise Fynbos for grazing (question 5). Currently, when carrying capacities are calculated, Fynbos is not included as having any grazing capacity. However, local guides have observed several game species feeding on Fynbos suggesting it can help support the game populations in Gondwana reserve. By understanding these feeding patterns better, a more appropriate carrying capacity and thus management plan can be developed. The first step towards this is calculating the relative proportion of time that game is spending in Fynbos compared to other habitats. This can be done using game transects and DISTANCE sampling. Multiple 10km transects will be established throughout the reserve. During transect

surveys, any mammals that are sighted are recorded along with their numbers, GPS location of the vehicle, distance from vehicle to animal and compass bearing from vehicle to animal. Combining this data with the vegetation map, the density of each mammal species present in each habitat type can be calculated.

The large mammal transect data can then be combined with more detailed data collected on the feeding habits of each species found in Fynbos. When game animals are observed grazing in Fynbos, specific individuals of interest will be selected, and their feeding behaviour recorded. The type of vegetation being eaten (Fynbos, grasses etc) will be recorded continuously for up to an hour per individual, or until the individual goes out of sight. Every time the activity of the animal changes, the time will be recorded so that a proportion of time spent grazing on each vegetation type can be calculated. When the animal is in sight but not actively eating, the time will be recorded as "not foraging". The collection of this data should be spread over all species that utilise the Fynbos.

The game transect data will give information on how much time game species spend in Fynbos, while the foraging data will show what proportion of this time is actually spent feeding on Fynbos species. By combining these two, the relative contribution of Fynbos species to diets of game species can be estimated. This information can then feed into future carrying capacity calculations for the reserve to greater assist reserve management planning.

Table 2. Indicative one week timetable at Gondwana Reserve. Note there may be changes depending on fitness of students, group sizes and numbers, weather conditions or operational problems.

Day	Group 1	Group 2
Mon PM	Introduction to camp and safety rules	Introduction to camp and safety rules
Tues AM	Lecture 1 – An introduction to Africa's Biodiversity Workshop 1 – Effects of fire on biodiversity	Vehicle based field visit with briefings about species encountered and safety when encountering these animals
Tues PM	Vehicle based field visit with briefings about species encountered and safety when encountering these animals	Lecture 1 – An introduction to Africa's Biodiversity Workshop 1 – Effects of fire on biodiversity
Tues evening	Lecture on small and potentially dangerous species – spiders, snakes and scorpions	Lecture on small and potentially dangerous species – spiders, snakes and scorpions
Wed AM	First field trek with armed guard to learn about safety issues and approaching game species	Lecture 2 – South African Birds Workshop 2 – Bird identification and practical survey skills
Wed PM	Lecture 2 – South African Birds Workshop 2 – Bird identification and practical survey skills	First field trek with armed guard to learn about safety issues and approaching game species.
Wed evening	Debate on local conservation issues	Debate on local conservation issues
Thurs AM	Bird point counts	Lecture 3 – The herbivores of South Africa Workshop 3 – Calculating density estimates and carrying capacities
Thurs PM	Lecture 3 – The herbivores of South Africa Workshop 3 – Calculating density estimates and carrying capacities	Herbivore damage survey (habitat assessment)

Thurs evening	Create elephant ID kits	Create elephant ID kits
Fri AM	Lecture 4 – The predators of South Africa Workshop 4 – Problems with managing closed populations	Bird point counts
Fri PM	Herbivore damage survey (habitat assessment)	Lecture 4 – The predators of South Africa Workshop 4 – Problems with managing closed populations
Fri evening	Documentary & discussion	Documentary & discussion
Sat AM	Large mammal transect surveys	Lecture 5 – The elephant Workshop 5 – Reducing human-animal conflict
Sat PM	Lecture 5 – The elephant Workshop 5 – Reducing human-animal conflict	Large mammals transect surveys
Sun PM	Lecture 6 – African conservation and wildlife management Workshop 6 – Consumptive vs non-consumptive reserve management	Lecture 6 – African conservation and wildlife management Workshop 6 – Consumptive vs non-consumptive reserve management
Sun evening	Social evening	Social evening
Mon AM	Depart from Camp	Depart from Camp

Accommodation will be in large, shared tents in a fenced compound. There will be hot showers and toilets on site and electrical power each evening.

4. African Wildlife Management Course

During the time in camp during the first week, the students will be completing an African Wildlife Management Course that will have direct relevance to the research they are helping with in the field. Each session starts with a 40 – 45-minute lecture and the rest of the time is then spent on a workshop aimed at reinforcing elements of the lectures and applying the knowledge to practical South African examples.

Lecture 1 – An introduction to Africa's biodiversity
This lecture will outline the term 'biodiversity' and what this can mean in different situations to different groups of people. Students will also learn about the biodiversity of Africa and how humans, latitude and other gradients affect biodiversity.

Workshop 1 – Effects of fire on biodiversity
Different fire regime case studies will be presented to the students which they will discuss and compare best method. The practical activity will be an exercise where students are given example vegetation data from savannah plots and asked to determine for each data set, which herbivores would be utilising the grazing/browsing, the fire loads and whether burning would be beneficial.

Keywords
- Biodiversity
- Biogeography
- Fire

- Succession

Lecture 2 – South African birds: how we name, identify and survey their numbers and distribution
This lecture briefly looks at the importance of taxonomy and its role in conservation. It then looks in more detail at the identification of local birds and how survey work is carried out.

Workshop 2 - Students will learn 10 of the commonest bird calls likely to be encountered on the surveys. In addition, they will be taught how to use a GPS to plot routes and range finders to estimate distances will be demonstrated and the students will have to complete a test course using only GPS and estimating distances of target objects.

Keywords
- Classification; Taxonomy; Binomial system; Dichotomous Keys
- Identification

Lecture 3 – Adaptation: the herbivores of South Africa
This lecture will give an overview of Africa's main ecosystems and how herbivores are adapted for survival. There will also be a brief description of Kruger National Park and its importance in conservation. The lecture will concentrate on the mammalian herbivores and their ecology, behaviour and identification.

Workshop 3 - The requirements in terms of browse or grazing amounts, minimum herd sizes and distance from water that each of the species routinely feeds will be discussed for each of the main ruminant (buffalo, impala, kudu, wildebeest, nyala, giraffe and other antelope species) and non-ruminant (zebra, elephant, rhino, hippo, bush pig, warthog) herbivore species. Students will be given stock density data and asked to estimate what percentage of the browse and grazing capacity was being utilised and what mix of additional browsers and grazers could be added to the reserve.

Keywords
- Ecology; Habitat; Niche; Abiotic; Biotic
- Biome; Ecosystems;
- Adaptation
- Populations; Competition; Interspecific; Intraspecific; Predator Prey; density dependent; independent.
- Behaviour / nutrition

Lecture 4 – Adaption: the predators of South Africa.
This lecture will look at the role of the main predators and how they are adapted for survival. In particular it will focus on the ecology of lions, cheetah and leopards will be looked at in detail.

Workshop 4 – A film on hunting techniques in a savannah environment will be shown. Why reserves are fenced in South Africa and the problems associated with managing closed populations. Determining how many and what types of predators (lion, cheetah, hyena, leopard etc) should be introduced to control the growth of populations.

Keywords
- Ecology; Habitat; Niche; Abiotic; Biotic
- Biome; Ecosystems;
- Adaptation
- Populations; Competition; Interspecific; Intraspecific; Predator Prey; density dependent; independent.

- Behaviour

Lecture 5 – Africa's iconic animal: The Elephant
This lecture looks at the ecology and behaviour of the world's largest land mammal. It also considers the role of this iconic animal in tourism and other problems such as the ivory trade and control of elephant populations.

Workshop 5 - How do we define a damage causing animal and who should take responsibility? A hypothetical example will be given of a human wildlife conflict situation and the students will be asked how to best reduce the impacts.

Keywords
- Conservation, Sustainability
- Tourism, trophy hunting, population control, poaching, CITES
- Damage-causing; compensation
- Behaviour

Lecture 6 - African conservation and wildlife management
This lecture compares the consumptive use of game and non-consumptive use of game on game reserves through ecotourism. This lecture will include case studies on the sustainability of hunting and intensive breeding industries.

Workshop 6 – A film discussing intensive breeding and hunting (legal) in conservation will be shown. Students will be asked to justify the role of private land owners in the conservation of rare (sable and roan) and endangered (lion, cheetah, wild dog and rhino) large mammals in South Africa in the context of consumptive and non-consumptive ecotourism.

Keywords
- Ecotourism
- Hunting
- Game breeding
- Conservation

5. Academic Benefits

Apart from the most obvious values of going on an expedition such as contributing towards conservation, the physical challenge and adventurous travel, the experience can also benefit a student by increasing their chances of gaining entry to university or being successful in a job application and impressing at interview. This can be achieved in many ways, but it will often depend upon which country and educational system a learner is from. Common to most countries the experience will:

Enhance their understanding of course syllabuses Allow learners to gain specific qualifications such as: Research Qualifications e.g. Extended Essays for IB and UK EPQs University Course Credits in US Creativity, Action and Service (CAS) for IB Universities Award from ASDAN

IRPs or Individual Research Projects
In the last few years an increasing number of students joining our research programmes take this opportunity to undertake IRPs. These research projects take many different forms, but what they all have in common is the need to pose and answer a research question. Examples of these include Extended Project

Qualification (EPQ), Extended Essay (EE) for IB, as well as many different projects specific to many education systems worldwide.
We can support the dissertation essay style research question; however individual scientific investigations (in which students design and collect their own data) are more difficult to facilitate given the short amount of time students are present on-site.

It is a fantastic opportunity for a student to witness first-hand many of the aspects of their research question and, in many cases, they will have access to samples of past datasets for their project. Students may also have the opportunity to talk with the actual scientists involved which will give them a convincing 'slant' to the way in which they answer their research question.

Much of the research they will be able to get involved with is specific to their expedition location. The projects that students will encounter range from students helping to collect data through to working and learning alongside the scientists where primary data collection by school students is less practical or more difficult.

For success with IRPs, careful planning is needed by the student and a lot of the work will be done prior to their expedition. They will need close guidance from their school supervisor and the scientists in the field need to be briefed so that support can be provided where they can. We have now developed an application system to ensure that the student will be able to realistically undertake such a project, that their choice of topic is appropriate to their expedition site, the science staff 'on-site' are aware of the project and where practical can assist in a constructive way before, during and after their expedition.

For more information visit the Opwall website:
www.opwall.com/schools/educational- benefits/independent-research-project/

Relevance of their expedition to the syllabus

Specific specifications for Biology, Geography and Environmental Studies have been reviewed for over 10 examination boards from around the world to see how relevant a student's expedition experiences will be when related to what they learn in their classroom. The tables in the appendix section show how this matching works although not all topics are relevant to all sites so have been grey-out.

6. Additional Reading

Allsopp N , Jonathan F Colville , G Anthony Verboom , Fynbos (2016): Ecology, Evolution, and Conservation of a Megadiverse Region, Oxford University Press ISBN-13: 9780198777762

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Whyte, I. & Chittenden, H. (2008) Roberts Bird Guide: Kruger National Park and Adjacent Lowveld: A Guide to More than 420 Birds in the Region. Jacana Media. SBN-13: 9781770096387

Electronic media

BBC Last Chance to See, Episode 3: Northern White Rhino. Available online at http://www.bbc.co.uk/programmes/b00mvbbx

BBC Life of Mammals, Episode 4: Plant Eaters BBC Life of Mammals, Episode 5: Meat Eaters BBC Planet Earth, Episode 7: Great Plains

The Secret Life of Elephants. BBC Video. Available from NHBS - www.nhbs.com/

BBC's Africa Documentary