QUALIFICATION SPECIFICATION							SECTION A
QUALIFICATION DEVELOPER	Botswana University of Agriculture and Natural Resources (BUAN)						
TITLE	Bachelor of Science in Biodiversity and Ecology			**NCQF LEVEL**	7		
FIELD	Agriculture and Nature Conservation		**SUB-FIELD**	Biodiversity			
New qualification	✓	Review of existing qualification					
SUB-FRAMEWORK	General Education		TVET		Higher Education	✓	
QUALIFICATION TYPE	Certificate		Diploma		Bachelor	✓	
	Bachelor Honours		Master		Doctor		
CREDIT VALUE					528		

RATIONALE AND PURPOSE OF THE QUALIFICATION

Rationale for the qualification

A need assessment survey conducted highlighted the dire need to introduce an undergraduate degree in Biodiversity and Ecology. The need was rated 4.2 out of 5 by the appropriate stakeholders from professional, industrial and academic bodies. One of the most highly sought-after areas of specialisation was identified as Ecology, by 69% of survey respondents. Withal, the Human Resource Development Council Top Occupations in High Demand listing pinpointed the necessity for range ecologists, entomologists, agriculture climatologists, research technicians, science and technology researchers and environmental officers at national level. These occupations are either currently experiencing short term supply in the labour market or prospected to show relatively strong employment growth in the long term (Human Resource Development Council, 2016). The proposed BSc Biodiversity and Ecology qualification addresses the need to produce such professionals. Human capital development in the qualification is important to the attainment of sustainable economic development and sustainable environment (Botswana National Vision 2036). The qualification seeks to contribute to the robust drives from a resource to a knowledge-based economy; aligning training with industry needs as stipulated in Botswana Education & Training Sector Strategic Plan (ETSSP) 2015-2020, thus adding to the reduction value for an ultimate decline in the importation of bio ecological expertise. The learners of this qualification will be highly inclined to understanding the dynamic nature of the sector or enterprise for which it is developed and will be equipped in response to innovation and technological advancements.

Besides, The National Development Plan 11 prioritizes sustainable use of natural resources reflected in Millennium Development Goal 7: to ensure environmental sustainability (BOTSWANA: Millennium Development Goals Status Report 2015). This qualification will produce specific economic sectoral workforce to address some of Botswana's biodiversity societal areas of concern ranging from ecotoxicology, human-wildlife conflict, wildlife poaching, widespread wildfires to changes in land use. This degree will capacitate the learner with 'competencies' such as critical thinking skills, and techniques to solve biodiversity loss. Since the degree is not currently available in any of the local institutions, it is prospected to attract learners both locally and across the SADC region in a way minimizing the cost government incurs training learners abroad.

Purpose of the Qualification

The purpose of this qualification is to:

- train graduates in the application of technical processes and practices for Biodiversity management and/or restoration (maintenance of ecological balance, utilise natural resources in a sustainable manner, protect natural habitats).
- develop graduates with experiential learning skills for identification of threats to biological diversity.
- equip graduates with skills to plan and execute research on biodiversity and critically evaluate the results and formulate relevant evidence-based biodiversity management principles.
- impart analytical skills needed for the solution of problems relating to the coexistence of humans and wild animals at fine spatial scales and justify the need to embrace such through making inferences to the behaviour and activity patterns of the animals.
- develop graduates with critical skills for evaluation of current and future developments relevant to the conservation of biological diversity.
- impart the knowledge, skills and attributes needed by graduates for communication of evolutionary and ecological concepts, data, and interpretation using multiple formats appropriate for target audiences, including non-scientists.
- equip graduates to operate at a substantial level of responsibility and accountability in directing environmental conservation and ecological research teams/surveys and their outcomes.

ENTRY REQUIREMENTS (including access and inclusion)

- Certificate IV (NCQF level 4) with a pass in Biology, Chemistry, Physics, Mathematics and English Language.
- RPL shall apply where candidates do not meet the minimum entry qualifications prescribed. RPL and CAT will be assessed in accordance with institutional and national policies.

QUALIFICATION SPECIFICATION SECTION B	
GRADUATE PROFILE (LEARNING OUTCOMES)	**ASSESSMENT CRITERIA**
Graduates of this qualification should be able to: 1. Demonstrate proficiency in scientific methodologies such as experimental design, and the critical analysis of ecological data in the field.	1.1 Design experimental ecology research projects. 1.2 Collect ecological data. 1.3 Analyze ecological data.

2. Present and communicate ideas effectively to people at different levels of life to offer professional insight into ecological principles for the solution of societal environmental problems.	2.1 Identify ecological issues and concerns. 2.2 Develop ecologically based solutions 2.3 Apply ecological principles to address problems identified. 2.4 Provide oral and written reports.
3. Interact effectively as part of a team to ensure a healthy working ecosystem.	3.1 Identify the causes of ecological imbalances. 3.2 Develop ecological processes to counteract the variances. 3.3 Apply the developed processes. 3.4 Monitor and evaluate the processes. 3.5 Communicate the results.
4. Demonstrate scientific ecological knowledge of how climate change issues impact Biodiversity	4.1 Establish long term trends of climate change. 4.2 Measure the responses of ecological processes to climate change. 4.3 Develop mitigation measures to climate change. 4.4 Apply alleviation measures.
5. Explain ecological processes, patterns, and interaction of living species in the ecosystem and how these impact on biodiversity.	5.1 Identify anthropological and environmental activities detrimental to endangered and threatened species in the ecosystem. 5.2 Measure the extent of the impact on the species. 5.3 Develop processes to counteract the impacts.
6. Demonstrate wide range of knowledge on the fundamentals of organism physiology, behavior, evolution, ecological niche and how these disciplines interrelate.	6.1 Identify effects on biodiversity caused by the interaction of organisms in terms of their physiology, behavior and ecological niche. 6.2 Craft solutions based on simulations on identified effects. 6.3 Communicate the solutions to the public.
7. Demonstrate skills and knowledge essential to the formation and operation of a small business that addresses adverse effects of anthropogenic activities to the global environment.	7.1 Develop proposals for eco-friendly biodiversity businesses. 7.2 Implement strategies of conducting the business. 7.3 Monitor ecological businesses.
8. Apply advanced research skills appropriate for further study and employment.	8.1 Develop research proposal. 8.2 Design and execute research project. 8.3 Analyze data and report findings.

QUALIFICATION STRUCTURE SECTION C			
FUNDAMENTAL COMPONENT Subjects / Units / Modules /Courses	**Title**	**Level**	**Credits**
	Mathematics I	5	12
	General and Inorganic Chemistry	5	12
	Physics I	5	12
	Biology of Cells	5	12
	Computer Skills Fundamentals I	6	8
	Introduction to Communication and Academic Literacy Skills	6	12
	Mathematics II	5	12
	Physical and Organic Chemistry	5	12
	Physics II	5	12
	Biodiversity	5	12
	Computer Skills Fundamentals II	6	8
	Advanced and Professional Communication	6	12
CORE COMPONENT Subjects / Units / Modules /Courses	Calculus and Analytic Geometry	6	12
	Population and Community Ecology	6	12
	Biosystematics	6	12
	Introduction to Genetics	6	8
	Biometry I	6	8
	Introduction to Ecology and Conservation	6	12
	Plant and Animal Diversity	6	12
	Introduction to Zoology	7	12
	Financial Management in Agriculture	6	12
	Development of Entrepreneurial Skills in Agribusiness	6	12
	Field Practical Training I	7	12
	Introduction to Plant Biology	7	12
	Biometry II	7	8
	Ichthyology	7	12
	Scientific writing and Presentation	7	12
	Landscape Ecology	7	12
	General Microbiology	7	8
	Introduction to Mathematical Biology	7	12
	Plant Ecology	7	12

	Field Practical Training II	8	12
	Climate Change and Natural Resources Management	8	12
	Restoration Ecology	7	12
	Policies in Wildlife Management	8	12
	Bioethics	7	12
	Project I	7	8
	Human- Wildlife Conflict	7	12
	Environmental Management	8	12
	Project II	8	8
	Endangered Species	7	12
	Applied Techniques in Wildlife Management	7	12
OPTIONAL COMPONENT	**Set 1** **(Select 1)** Forest and Range Entomology Wildlife Ecology Industrial ecology Quantitative Ecology Ecology and Evolution Environmental Economics Resource Economics Measurements Techniques in Agro-Biological Sciences Introduction to Remote Sensing	6	12
	Set 2 **(Select 1)** Marine Ecology Fresh Water Ecology Marine Planktology Molecular ecology Coral Reef Ecology Soil Ecology Human Resource Management	7	12

	Labour Economics Rural Sociology		
ELECTIVE COMPONENT Subjects / Units / Modules /Courses	**Set 3** **(Select 1)** Introduction to Range Management Food Hygiene & Safety Economic Botany Basic Concepts in Marketing Ostrich Production	6	8
	Set 4 **(Select 3)** Game farming and Ranching Pet Management Animal Welfare and You Crops and Humankind Wind Erosion Range Analysis Ecotourism	7	8

Rules of combinations, Credit distribution (where applicable):

This qualification has 528 credits
Core courses carry 328 credits.
Elective courses carry 32 credits.
Optional courses carry 24 credits.

Level	**Credit Value**			
	Compulsory	**Elective**	**Optional**	**Total**
5	**96**	**0**		**96**
6	**140**	**8**	**12**	**160**
7	**180**	**24**	**12**	**216**
8	**56**	**0**		**56**
Total	**472**	**32**	**24**	**528**

ASSESSMENT AND MODERATION ARRANGEMENTS

ASSESSMENT ARRANGEMENTS

Assessment will include both formative and summative modes.

FORMATIVE ASSESSMENT

Formative assessment will contribute 50% to the overall course grade.

SUMMATIVE ASSESSMENT

Summative assessment will constitute the other 50% of the overall course grade.

Assessment shall be carried out by BQA accredited Assessors.

MODERATION ARRANGEMENTS

Internal and external moderators to be engaged will be BQA accredited subject specialists in relevant fields with relevant industry experience and academic qualifications.

Both internal and external moderation shall be done in accordance with applicable policies and regulations.

RECOGNITION OF PRIOR LEARNING (if applicable)

RPL and CAT will be applicable for award of credits to contribute to the award of the qualification in accordance with institutional Policies in line with the National RPL Policy.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning progression Pathways

Horizontal: (NCQF level 7)

i. Bachelor of Science in Biodiversity and Conservation
ii. Bachelor of Science in Biosystematics and Taxonomy
iii. Bachelor of Science in Wildlife Management
iv. Bachelor of Science in Range Sciences
v. Bachelor of Science in Biological Sciences

Holders of this qualification can progress as follows:
Vertical: (NCQF Levels 8 and 9)

i. Bachelor of Science Honours in Biodiversity
ii. Post Graduate Diploma in Biodiversity
iii. Master of Science in Biodiversity

Employment Pathways

i. Ecology consultant
ii. Ecologist
iii. Research scientist
iv. Biodiversity manager
v. Biodiversity Surveyor
vi. Biosecurity and custom officer
vii. Lecturer in tertiary institutions
viii. Charity administrators (e.g. in National Trusts)
ix. Biology field technician
x. Wildlife biologist
xi. Police analyst
xii. Weed management advisor
xiii. Pest Management advisor

QUALIFICATION AWARD AND CERTIFICATION

- Graduates shall be awarded a **Bachelor of Science in Biodiversity and Ecology** upon obtaining a minimum of **528** credits and satisfying all rules of combination as stated above.
- There will be issuance of certificate and transcript at award.

REGIONAL AND INTERNATIONAL COMPARABILITY

SUMMARY OF THE COMPARISONS

The proposed qualification was compared with similar or equivalent qualifications from several institutions both regionally and internationally. Their qualifications have been registered according to their respective framework.

Summary:
Information gathered shows that there is no university locally which offers an undergraduate qualification in Biodiversity and Ecology. Regionally, University of Western Cape, South Africa offers an undergraduate qualification in Biodiversity and Conservation Biology. At international level, there is a good number of universities offering undergraduate qualifications in Biodiversity and Ecology or BSc Ecology and Conservation, for example, University of Southampton, Rice University, Imperial College London, University of California, Santa Cruz and University of Arizona.

Similarities:
This qualification has many common courses/modules e.g., Cell Biology, Introductory Biology, Genetics, Ecology, Evolutionary Ecology, Molecular Biology, Insect Biology, Evolution of genes and genomes, Plant and Animal Diversity, Biochemistry, Biodiversity and Conservation Biology.

Differences:

This qualification differs with other qualifications in: Evolutionary Bioinformatics, Applied Phycology, Coral reef ecosystem, Physical chemistry for the Biosciences, Immunology, Fundamental Neuroscience Systems, Cancer Biology, Molecular Biophysics and Biotechnology. The credit value of this qualification structurally varies from institution to institution.
REVIEW PERIOD
The qualification will be reviewed every five **(5) years**.