

WWF Conservation Champion Biodiversity Management Guidelines

These more detailed, technical guidelines were produced in 2016 and updated in 2022 by WWF's Conservation Champion programme as an extension of the abbreviated biodiversity guidelines that are part of the Integrated Production of Wine (IPW) Guidelines for Farms in Chapter 2.

The WWF Conservation Champion extension team focuses on expanding relationships with the industry environmental leaders – known as WWF Conservation Champions – to support their long-term conservation commitments as well as their innovations in water and energy efficiency, and climate change adaptation.



Based on meeting rigorous environmental criteria and a commitment to protecting the Cape's unique vegetation, WWF welcomes new Conservation Champion applications.

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More information on the WWF Conservation Champions:

W: http://www.wwf.org.za/what_we_do/sustainable_agriculture_/conservation_and_wine/

New Conservation Champion applications:

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1. Threatened ecosystems

1.1 Threatened vegetation types

- New vineyards should ideally be developed on old agricultural land and not on virgin soil with pristine natural vegetation. **A ploughing permit must first be obtained from the National Department of Agriculture in order to develop virgin soil as stipulated in the Conservation of Agricultural Resources Act 43 of 1983, regardless of who owns the land. Any land that has not been worked for more than 10 years is regarded as virgin land.**
- Not all natural areas have the same **conservation value**. While large areas of mountain habitats still remain in marginal farming areas, the majority of lowland ecosystems have been transformed. Developing or cultivating priority habitats such as renosterveld, lowland fynbos, wetlands and succulent karoo on alluvial soils should be avoided at all costs.
- A national assessment of every vegetation type in South Africa was updated in 2018, classifying vegetation types as critically endangered (CR), endangered (EN), vulnerable (VU) or least threatened (LT), according to how much remains compared to their original extent and/or how many Red Listed threatened plant species are present. In the Western Cape alone, **20 vegetation types are critically endangered** (e.g. Swartland Shale Renosterveld). It is therefore strongly recommended that, before any development is contemplated, you contact the CapeNature representative in your area or WWF Extension Officer to determine the conservation value of any virgin land and consider alternatives. CapeNature's formal comment is likely to be required by the permitting authorities.
- **Critical Biodiversity Areas (CBAs) and Biodiversity Sector Plans** are CapeNature products that should be used with any land-use planning and decision making. CBAs should guide the landowner where cultivation can take place and where alien clearing and fire management should be prioritised.
- **Before you undertake to cultivate a new area, check with the Department of Environmental Affairs if an Environmental Impact Assessment (EIA) or Basic Assessment Report (BAR) needs to be done. When considering any new development on virgin land consult with a suitable qualified Environmental Assessment Practitioner or the WWF Extension Officers to assess the applicability of the National Environmental Management Act 107 of 1998.**
- Familiarise yourself with the legislative requirements in the **National Environmental Management Act 107 of 1998 (NEMA), Listing Notice 1, 2 and 3**. Listing Notice 1 and 3 **Activities Requiring a Basic Assessment**, whereas Listing Notice 2 Activities require full scoping report and EIA.

More information on general environmental questions:

W: <https://initiatives.greenagri.org.za/>

1.2 Aquatic ecosystems (wetlands and rivers)

All developments in water resources are likely to require an authorisation from the Department of Water and Sanitation (DWS) in terms of sections 21 and 22 of the National Water Act 36 of 1998. The Conservation of Agricultural Resources Act 43 of 1983 (CARA) also restricts activities in wetlands. In addition, certain listed activities for rivers and wetlands require environmental authorisation in terms of NEMA. In the Western Cape this is managed by the Department of Environmental Affairs and Development Planning (DEA&DP).

Farmers should contact these departments for advice prior to undertaking any development.

Advice if you want to work in water resources:

Department of Environmental Affairs and Development Planning

W: https://www.environment.gov.za/documents/forms#legal_authorisations

1.2.1 Wetlands

Wetlands act like giant sponges by holding back water during floods, releasing water during dry periods and recharging the water table. They therefore play an important role in minimising soil erosion and regulating floods. Functioning like natural filters, wetlands help to purify water by trapping many pollutants, including sediment, heavy metals and disease-carrying organisms. Wetlands also provide a special habitat for many plant and animal species who depend on them for part of or their entire lifecycle (such as important pollinators), and can form a natural firebreak.

Management guidelines for wetlands

- Wetlands must first be identified and delineated in order to be conserved. It is best to identify wetlands in the winter months, as some seasonal wetland areas may not be easily recognised in the dry summer months.
- Keep buffer areas of undeveloped land that are free of alien plants around wetlands. Where there is no buffer at all between the vineyard and the wetland, or where part of the vineyard impinges on the wetland, it is advisable to withdraw the vineyards from the wetland when replanting takes place and to include an adequate buffer area, where possible. The buffer width will be determined by the size, type of wetland, functionality of wetland and the impacts of adjacent land use.
- The source and downstream portions of the wetland should not be separated. The source is the water flowing into the wetland. Most of the water in a wetland comes from the catchment surrounding the wetland. Therefore wetlands are strongly influenced by activities in the surrounding catchment even when these areas are distant from the wetland. When assessing the impacts of off-site land uses on wetlands, one needs to look at how the land uses change the quality and quantity of water entering the wetland and how this, in turn, affects the functioning and benefits of the wetland. Digging a drainage channel above the wetland or building a road through the wetland are examples of separating the source from the downstream portions of the wetland.
- All activities in the catchment have an effect on wetlands (e.g. hardening in the catchments by roads or paved areas will lead to higher run-off and the possible erosion of wetlands).
- Make sure that there is no over-abstraction of surface or ground water feeding into a wetland as this can cause the wetland to dry up. No high-yield boreholes should be sunk near natural wetlands.
- The 'damming' of wetlands will change seasonal wetlands into permanent water bodies and the special habitat formed by the wetland will be lost. The building of dams requires authorization from the Department of Water and Sanitation (DWS).
- Check for any pollution sources that could have an impact on water quality such as seepage from manure and compost heaps, domestic waste sites or areas where wine skins are stored. Consider adding water-effluent quality checks to your annual drinking and irrigation water-quality sampling procedure. Sample at a spot close to where your farm effluent joins another water source (e.g. drainage canal). Knowing the state of your water quality allows for informed adjustment of practices and it can be used as proof to safeguard you against any water pollution accusations.
- Wetlands often suffer from high levels of alien invasive plants. Alien plants use large quantities of water and can cause wetlands to dry out. Note: Always use 'manual' methods, such as machetes or chainsaws (i.e., no heavy machinery like digger loaders and bull dozers) to clear alien plants in wetlands because wetlands are very sensitive to soil disturbance. Chemical treatment should be scheduled for the drier summer months. You will save money and time if you get advice from an invasive species specialist (see Section 2 for more detail)
- It is illegal to interfere with the flow regime of water through a wetland by canalising water flow, digging drainage ditches or infilling by dumping soil and rubble, except where the

necessary authorisation has been obtained (e.g. to build a dam in a wetland). Wetland functioning can sometimes be successfully restored when the flow regime is reverted to its original state and ditches or canals are closed.

- Wetlands can be utilised for grazing, provided the grazing pressure is not too high, takes place in the correct season (usually summer) and livestock are kept away from the deeper, wetter areas, with unstable soil. Monitoring wetlands for signs of degradation and erosion by overgrazing is important.
- Familiarise yourself with the legislative requirements in the National Environmental Management Act 107 of 1998 (NEMA), Listing Notice 1: Activities Requiring a Basic Assessment:
 - **Activity 11:** Construction of canals, dams, bridges; weirs.
 - **Activity 18:** Infilling, depositing or moving of >5 m³ of any material from a watercourse/wetland.

More information on wetland management and rehabilitation:

Contact the Western Cape Wetlands Forum: wcwetlandsforuminfo@gmail.com

Information on wetland management

W: <https://learnwithicleiafrica.org/resource/wetland-management-guidelines/>

Information on wetland delineation

‘A practical field procedure for identification and delineation of wetlands and riparian areas’

W: http://www.dwa.gov.za/Documents/Other/EnvironRecreation/wetlands/DRAFT_3_Wetland%20and%20Riparian%20Delineation%20Guidelines%202008.pdf

1.2.2 Rivers

Rivers and their associated riparian habitats perform many ecosystem services and are central to human welfare and economic development. Ecologically healthy rivers also have a ‘self-cleansing’ property (i.e. living organisms break down organic waste and concentrate nutrients). To function properly and provide a suitable habitat for fish and other aquatic life, rivers must have adequate flow at all times of the year, good habitat diversity and quality, and an undisturbed riparian zone.

Management guidelines for rivers

- Abide by the **National Water Act 36 of 1998**. According to this Act all water-use activities from a river or watercourse have to be registered or authorised by the Department of Water and Sanitation (DWS). These includes:
 - abstraction from a river
 - building of farm dams
 - discharging of effluent or any other form of pollution into a river or watercourse
 - altering (e.g. ‘bulldozing’) the beds, banks and course or characteristics of a watercourse, even if the flow is erratic or seasonal
 - planning any changes to the allocated amount of water (e.g. after a dam enlargement).
 -

For registration or licensing forms:

W: <http://breedegouritzcma.co.za/index.php/governance/forms/licensing>

or

Melissa Lintnaar-Strauss at the Department of Water and Sanitation

E: Lintnaar-StraussM@dws.gov.za

- Control alien invasive plants, such as wattle, gum, pine, poplar, kikuyu and aquatic weeds (e.g. Parrots Feather, Water Hyacinth) according to best-practice methods. Alien invasive plants reduce river flow and destabilise river banks.
- Keep riparian zones intact; where transformed by past farming practices, rehabilitation is advised. The **well-being of river ecosystems is heavily dependent on the health of the adjacent natural vegetation, or 'riparian habitat'**. This vegetation stabilises the river bank, filters pollutants, helps maintain a natural water temperature, contribute organic matter in support of aquatic life and acts as a buffer to adjacent land uses. Riparian zones must be kept free of alien plants and **bulldozing of river banks and beds should be avoided at all cost**, unless this has been authorised by the regulatory authority (e.g. after a flood event, close to bridges).
- River banks should be gently sloped (only where already transformed and not where the river bank is naturally steeply sloped) and planted with local indigenous riparian vegetation to prevent erosion and improve water quality.
- Allow adequate strips or buffer zones of indigenous vegetation next to the riparian zone to minimise the effect of fertiliser and pesticide run-off from cultivated land. The width of the buffer zones will depend on the size and characteristics of the river. As an absolute minimum, a width of 10 meter each side of the riverbank should be left undisturbed.
- Ensure that an 'ecological reserve' (i.e. enough water for river ecosystem to function adequately) remains in the river throughout the year. High levels of water abstraction, especially during summer, drastically decrease flow, concentrate pollutants, increase water temperature and impact on river health. Minimise water use by implementing 'best practice' such as drip irrigation. If possible, abstraction from rivers (in the winter-rainfall areas) should take place in winter and the water should be stored in a dam for use in summer.
- Consider how farming practices in catchment areas may be improved to reduce sedimentation and water-quality problems. Using 'biological farming' methods will minimise the negative impacts on water quality (see Section 8 for more information on biological farming practices).
- The damming of rivers and building of weirs are not permitted by DWS (except where the necessary authorisation has been obtained) as dams reduce flow, cause sediment build-up in the dam basin and prevent species migration.
- The use of appropriate river and wetland management and rehabilitation methods is a complex science and freshwater experts should be consulted when required. Depending on the level of assistance required, advice may be at no cost (generally from government agencies) or if private, will be charged for.
- Become an active member of your area's Water User Association (WUA).

Information on joining a Water User Association:

W: https://www.dws.gov.za/iwqs/nwa/tmp_Chapter_8.html

- River maintenance plans (RMPs), which were approved under the 2010 NEMA Environmental Impact Assessment regulations, make it possible to introduce the principles and practices of ecosystem-based planning into the management and rehabilitation of rivers in agricultural settings. These plans would be drafted in terms of Activity 18 of Listing Notice 1, which exempts holders of an approved RMP from having to obtain environmental authorisation to excavate, move or deposit more than 5 m³ of material in a watercourse. You can find out from your Water User Association if there is a river maintenance plan for your specific river.

More information on river maintenance plans:

W: http://pmg-assets.s3-website-eu-west-1.amazonaws.com/130731appendix_3.pdf

A comprehensive manual for River Rehabilitation in SA is available at:

W: https://wrc.org.za/wp-content/uploads/mdocs/TT%20646%20consolidated%20FINAL_web.pdf

1.2.3 Farm dams

Farm dams are critically important in wine-growing areas to ensure a supply of water for irrigation in summer. Properly designed and managed farm dams can also enhance the aesthetic beauty of the farm and attract a variety of birds, insects and other animals to the area. Farm dams that are in conservancies or stewardship sites and stocked with local threatened fish species can make a significant contribution to conservation. Farm dams are popular for angling purposes and require permits to stock fish.

Management guidelines for farm dams

- The shores of dams should be clear of alien invasive vegetation and should be planted with local indigenous wetland plants, shrubs and trees. Seek advice from an indigenous landscaper or ecologist about the choice of these species.
- Dams should contain underwater structures (e.g. rocks, logs) as well as indigenous water lilies and weed beds to provide fish with cover from birds and to improve the productivity of the dam. If these dams are stocked with indigenous fish species which are threatened, a reserve level should be determined so that the dams are not totally emptied during the irrigation season.
- Water quality in dams can be enhanced by having adequate buffer areas of indigenous vegetation between the dam and the vineyards. Water entering the dam as a river or watercourse should ideally flow through a wetland just before entering the dam. The wetland will perform a water-purification function.
- The use of 'floating islands' can also contribute to the improvement of water quality and can create a habitat for water birds.

More information on creating floating islands in farm dams:

W: <https://www.birdlife.org.za/images/IBA/Floating%20Wetland%20Guideline%20Final.pdf>

- Farm dams overflow in the rainy season, allowing fish to escape into nearby rivers where they can cause ecological problems. That is why the stocking of farm dams needs to be authorised by a regulatory agency.
- Dams identified for indigenous fish stocking must be free of alien fish and the farm should be part of a conservancy or be a stewardship site.
- Dams can also be stocked with alien fish species such as largemouth black bass, Mozambique tilapia, grass carp and rainbow trout, depending on where the dam is located.

Information on which fish species to stock:

Dean Impson at CapeNature

T: 021 866 8000 C: 082 414 0020

E-mail: dimpson@capenature.co.za

- Carp and sharp-tooth catfish are often a major problem in farm dams, causing them to become muddy. When dams are shallow at the end of summer, these fish species can be netted out to reduce their numbers.

Assistance with reducing the numbers of alien fish species in farm dams:

Willem Jordaan at FFM Services

E: fischerheven@webmail.co.za

T: 081 322 8324

- The movement and stocking of any fish species between dams is not permitted without a relevant permit from Cape Nature. The stocking of alien fish species (such as bass, trout, sterile grass carp) may require a permit from the Department of Environmental Affairs.

Permits to move fish species between dams:

Dean Impson at CapeNature

E: dimpson@capenature.co.za

T: 021 866 8000; 082 414 0020

Permits to stock alien fish species:

Department of Environmental Affairs: Biosecurity Section

W: <http://www.invasives.org.za/animals/invasive-fish>

2. Alien invasive species

Alien invasive species have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and subsurface water. Landowners are under legal obligation to control alien plants occurring on their properties.

Information on or help with identification of invasive species and the NEMBA Alien and Invasive Species Lists, 2016:

W: www.invasives.org.za

Early detection and rapid response on alien invasive species:

Contact SANBI

E: invasivespecies@sanbi.org.za

T: 021 799 8837

2.1 The Alien and Invasive Species Regulations, 2014

The 2014 Alien and Invasive Species (AIS) Regulations of the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) specifies the legal obligations of landowners in respect of invasive plant and animal species that occur on their properties.

2.1.1 Categories

The AIS Regulations list four different categories of invasive species that must be managed, controlled or eradicated from areas where they may cause harm to the environment, or that are prohibited to be brought into South Africa.

The alien and invasive species that must be controlled inside South Africa are listed in the NEMBA Alien and Invasive Species Lists, 2016. These lists include plants (383), mammals (41), birds (24), reptiles (35), amphibians (7), fresh-water fish (15), terrestrial invertebrates (23), fresh-water invertebrates (8), marine invertebrates (16) and microbial species (7).

These invasive species are divided into four categories:

- **Category 1a:** Invasive species that must be combatted and eradicated. Any form of trade or planting is strictly prohibited.

- **Category 1b:** Invasive species that must be controlled and, wherever possible, removed and destroyed. Any form or trade or planting is strictly prohibited.
- **Category 2:** Invasive species or species deemed to be potentially invasive, for which a permit is required to carry out a restricted activity. Category 2 species include commercially important species such as pine, wattle and gum trees.
- **Category 3:** Invasive species that may remain in prescribed areas or provinces. Further planting, propagation or trade is however prohibited.

Permits are required to carry out certain restricted activities with Category 2 listed plants and animals.

Download permits to carry out certain restricted activities with Category 2 listed plants and animals:

W: www.invasives.org.za

2.1.2 Declaration of invasive species

A property that contains invasive species is a liability to the buyer. The AIS Regulations state that the seller of a piece of land must notify the purchaser of the property in writing of the presence of listed invasive species on that property before the sale agreement is signed.

A copy of the Declaration of Invasive Species form needs to be lodged with The Compliancy Officer, Biosecurity Services, and the Department of Environmental Affairs.

Consult accredited invasive species practitioners, landscapers and garden centres for assistance.

Declaration of Invasive Species form and consultant contact lists:

W: www.invasives.org.za

2.2 General clearing principles

- Alien control programmes are long-term management projects and a clearing plan, which includes follow-up actions for rehabilitation of the cleared area, is essential. This will save time, money and significant effort. Especially for larger alien clearing project, it is advised to make use of an alien clearing specialist (see 2.4)
- Alien clearance is integral to restoration and must be done in a way that optimises the restoration potential of an area (e.g. minimising herbicide use, removal of heavy wood before an ecological burn). Where restoration of the natural veld is the goal, this approach will save costs in the long run.
- At a minimum, the plan should include a map showing the location of each management unit, as well as a spreadsheet with the following information: dominant alien species present, density, maturity, target date of initial and follow up clearing, method of clearing.
- Start clearing the lighter infested area first (with young/immature, less dense trees) to prevent the build-up of seed banks. Starting with less dense areas will also require fewer resources and have a greater impact in the long term. In the case of alien species confined to rivers, it is ideal to start in the headwaters and then move downstream, thereby removing the source of re-infestation.
- Ideally dense, mature stands should be left for last, as they probably will not increase in density or pose a greater threat than they are at the moment.
- Collective management and planning with neighbours allows for more cost-effective clearing and maintenance considering that alien plant seeds are easily dispersed across farm boundaries by wind or watercourses.

- Biological control is cost effective and very safe compared with the expense and risks associated with herbicide use, and can be successfully integrated with other management practises (see Section 8 for more information on biological control).
- Consider the role of fire in alien-clearing operations. Appropriately managed fires are a cost-effective clearing method, but untimely and uncontrolled fires easily and often defeat the purpose of mechanical and bio-control clearing. Follow-up after a fire with manual seedling removal is essential or, in extreme cases where there is little other vegetation, herbicide spraying could be considered.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing. It is also important to keep record of the use of herbicide (e.g. product name, method, concentration and time of application)

2.3 Clearing methods

- Different species require different clearing methods such as manual, chemical or biological methods, or a combination of more than one method.
- Fire is **essential** as a tool in restoring fynbos ecosystems after alien clearance. It can be used for control of standing pines when they are still young and have very few cones (veld age 6–7 years) but is not advisable for any resprouter such as *Acacia saligna* (Port Jackson willow). However, after initial clearance of *Acacia saligna*, fire is an essential tool to remove slash and stimulate fynbos germination. There will be lots of *Acacia* germination, but the seeds live very long and it may be strategic to remove the bulk of the seed bank in this way.

More information on the recommended clearing methods for each common alien species and other alien clearing advice:

CapeNature

W: <http://www.capenature.co.za/care-for-nature/conservation-in-action/integrated-catchment-management/alien-vegetation-management/>

More information on biological control:

Plant Protection Research Institute in Stellenbosch

T: 021 887 4691

Fiona Impson

E: impsonf@arc.agric.za

T: 082 622 0691

Information on bio-control agents for alien plant species:

W: <https://www.dwa.gov.za/wfw/Control/>

2.4 Identification of alien invasive species

Invasive Species South Africa has a useful website to help farmers identify and clear alien invasive species listed in the Alien and Invasive Species List, 2016.

Information on alien species and people offering services to identify listed alien invasive species:

W: www.invasives.org.za

Invader Plant Specialist:

Dr Graham Harding

T: 021 976 6127; **C:** 082 412 7411

W: invaderplantspecialists.co.za

2.5 Use of herbicides for alien control

Environmental safety should be the priority when using herbicides for alien control. Most alien vegetation control operations are carried out in riparian areas that are regarded as environmentally sensitive. In order to minimise the impact of the operation on the natural environment the following must be observed:

- Area contamination must be minimised by careful, accurate application of the minimum amount of herbicide to achieve good control. Make sure you are advised by a registered PCO (Pest Control Operator, in terms of section 10 of Act 36 of 1947)
- All care must be taken to prevent contamination of any water bodies. This includes due care in the storage, application, cleaning of equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings should be carefully disposed of at a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation. Also make sure that spray nozzles are calibrated correctly and that you use a trained operator.
- Coarse-droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- You are also referred to Section 14 of the IPW Guidelines for Farms: Handling of Chemicals.

Advice on products that will limit the effect on non-target vegetation:

ConChem Saligna:

T: 021 981 4570

E-mail: info@conchemsaligna.co.za

DOW AgroSciences

T: 021 872 6291

Ecoguard:

Contact person: J.C. Schmidt

T: 021 871 1921

E-mail: paarl.sales@ecoguard.co.za

The safe handling of chemicals:

Integrated Production of Wine (IPW): Guidelines for Farms

Section 14: Handling of Chemicals

W: <http://www.ipw.co.za/content/guidelines/IPW%20Guidelines%20for%20the%20Farm%20Aug%202014.pdf>

2.6 Alien grasses

Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms, but are often the most difficult to detect and control. Alien grasses out-compete indigenous annuals and bulb species that make up an important part of the species diversity in renosterveld and fynbos. Alien grasses also change the fuel load of the veld, causing more frequent and hotter fires, which can be detrimental to biodiversity.

Common alien grass species include wild oats, Italian ryegrass, Quaking grass, kikuyu, ripgut brome and rat's tail fescue.

Alien grass invasion can be avoided by the following measures:

- An adequate buffer should be left along the edges between pristine natural areas and vineyards, other agricultural lands and manure piles to prevent disturbance, edge effects and nutrient run-off into the veld, which promotes alien grass invasion. Where the buffer forms part of the natural area

it should be monitored closely to remove invasive annual grasses regularly to prevent them from moving further into the natural veld.

- Prevent livestock that have grazed in areas infested by alien grasses from moving into areas that have not been invaded to avoid dispersal of seed by animals. These grass species seed between August and November.
- Use fire as a tool to reduce the seed banks of alien annual grasses. Grass seed lies on or close to the surface, is not hard-seeded and gets killed in good fynbos ecological burns (i.e. fires in summer/early autumn). Fire is essential to fynbos and renosterveld restoration.
- Do not use hand clearing as this disturbs the soil, which promotes alien grass growth.
- Apply a pre-emergent, systemic herbicide where there is no indigenous seed bank left – this can be effective.

Information on alien grasses:

CapeNature

W: <http://www.capenature.co.za/wp-content/uploads/2013/09/Landowners-Guide-to-Alien-Grass-English.pdf>

2.7 Alien invasive animals

Alien invasive animal species are animals that are non-native to an ecosystem and that may cause economic or environmental harm or adversely affect human health.

2.7.1 Alien fish

Give careful consideration to which species you stock in farms dams. CapeNature can advise which alien fish species can be stocked without compromising the water quality of your dam and the ecological health of nearby rivers and wetlands. Avoid stocking carp, catfish, smallmouth bass and bluegill as these species negatively affect other aquatic life and water quality.

2.7.2 Mallard ducks

Mallard ducks readily cross-breed with the indigenous yellow-billed duck, red-billed duck and other indigenous duck species. Resulting offspring are not sterile, producing many more hybrid generations that threaten the genetic integrity of the indigenous duck populations. It is recommended that all Mallard ducks are removed from farm dams by hunting or catching them in cages and relocating them to suitable locations.

2.7.3 Feral pigs

Currently occurring in the West Boland areas, these pigs reproduce prolifically and can do much damage to vineyards, orchards, fences and natural areas by trampling, burrowing and digging up and consuming indigenous species of both plants and animals.

2.7.4 Indian house crow (*Corvus splendens*)

This species currently only occurs in the Cape Metropole.

Advice on alien fish:

CapeNature

T: 021 866 8000

Advice on Mallard ducks:

Kevin Shaw at CapeNature

T: 021 866 8000

New alien fauna sightings (e.g. feral pig) that did not previously occur in the area:

Jaco van Deventer at the CapeNature Wildlife Programme

T: 022 931 2900

2.8 Non-local fynbos

The planting of non-local (i.e. not endemic to the specific area) fynbos species can cause enormous damage through hybridisation, and this is not restricted to the *Proteaceae*. Landowners sometimes want to 'beautify' the veld, but should never plant floriferous species that may not belong in that specific area.

More information on botanists who can advise landowners on correct or endemic species for a specific area:

WWF Conservation Champion Programme restoration pamphlet

Jacques van Rensburg

E: jvrensburg@wwf.org.za

T: 021 881 3086

3. Fire management

Fire can be both a friend and a foe with regard to biodiversity management. Although fynbos and renosterveld are fire-adapted systems, just one or two inappropriate fires at the wrong time of year, or no fire at all can cause the local extinction of many species. As a landowner, you are responsible for the prevention and management of all fires that occur on your land, in terms of the National Veld and Forest Act 101 of 1998. If you and your neighbours form a Fire Protection Association (FPA), the FPA will help you to comply with these regulations.

3.1 Fire Protection Associations

Fire Protection Associations (FPAs) are voluntary associations formed by landowners to jointly prevent, predict, manage and extinguish veld fires. The main advantage of an FPA is that no presumption of negligence can be used in civil proceedings due to fire damage if you belong to an FPA, even if the fire started on your property. Furthermore, resources can be combined more effectively with other landowners to manage fires more effectively, and firebreaks can be placed where best for the area as a whole, not just one property.

Contact details for FPAs:

Winelands FPA

E: manager@winelandsfpa.co.za

T: 021 888 5821

Cape Peninsula FPA

E: CPFPA.manager@sanparks.org.za

T: 021 689 7438

Greater Cederberg FPA

E: charl@cederbergfpa.co.za

T: 079 172 4340

Greater Overberg FPA

E: info@overbergfpa.co.za

T: 028 425 1690

3.2 Firebreaks

- Every property must have a system of firebreaks in place. The breaks must be on the boundary of the property unless there is an exemption granted by the Minister or an agreement with the adjoining landowner that the firebreak can be located somewhere else within an FPA.
- Firebreaks must be located strategically to control the spread of wildfires, but they mainly serve as an access road from which to fight a fire. A sensible firebreak width is no wider than 10m in most fynbos and renosterveld vegetation areas and must not be burnt during times when there is a high fire risk.
- It is often preferable to simply have a 'tracer belt' of 2–3 m to allow quick access and an opportunity to use a 'back burn'.
- Owners should ensure that firebreaks are positioned and prepared in such a way as to cause the least disturbance to soil and biodiversity. Fire belts should not be bulldozed, ploughed or 'skoffled' – this triggers the EIA regulations in all critically endangered and endangered vegetation types. If brush-cut only, many of the indigenous species will survive and the risk of erosion will be decreased.

3.3 General fire management principles

3.3.1 Fire frequency

Fire frequency refers to how regular you should burn the fynbos on your farm. This should be neither too often, nor should the intervals be too long. Keep in mind that all the non-sprouting plants should have had a chance to produce sufficient seed before the burn. Ideally at least 90% of individuals of the slowest maturing non-sprouting species should have flowered before the next fire. If the veld is burnt too often, these slow-maturing species (e.g. many of the *Protea* spp.) could become locally extinct. The sprouting species (such as *Restios*) will take over in abundance, which will have a negative impact on species diversity and on the water yield from the area. For example, looking at the *Protea* spp. on certain slopes of the Swartberg Mountains, it will take more than 18 years for 90 % of all species to flower, so the fire frequency has to be 18 years or more.

3.3.2 Season

Generally, a late summer or early autumn burn is best for fynbos species, but due to the risk of runaway fires at that time, burning is usually only feasible in April or May.

3.3.3 Intensity

Intensity is influenced by the fuel load, fuel moisture, relative humidity, gradient and wind speed. The intensity can be manipulated by selecting conditions, point of ignition relative to slope and wind that will

lead to the desired type of fire, remembering that the more intense the fire generally the better it is for fynbos, provided that the fuel load has not been increased by alien vegetation.

3.3.4 Proportion of area burnt

For large, natural vegetation areas, it is important to maintain areas of different vegetation ages within a property. However, it is equally important to keep the burning blocks as large as possible in order to minimise the impact of seed and seedling predation in newly burnt veld. Burning blocks should not be smaller than 5 ha if at all possible, as young vegetation is targeted by granivores (e.g. gerbils, mice) and grazers, which could easily eliminate all palatable species. Small farms could rather have their 'mosaic' incorporated with neighbouring farms.

3.3.5 General

- Obtain the necessary permits and inform property neighbours, your FPA and local municipality fire officers of your intention to burn at least two weeks prior to the event.
- Ensure that fire-fighting equipment is maintained and in good working order before the start of each fire season.
- Keep accurate records of fires, using a map of veld age as a basis. Note the date and time of ignition, weather conditions, etc.
- Guard an extinguished fire for at least two days after a burn.
- Do **not** allow livestock to graze natural areas in the winter and spring following a fire. Many of the renosterveld bulbs and annuals are vulnerable to grazing pressure by domestic stock in the first two years after a fire.

More information on fires and regulations:

Department of Water and Sanitation

W: <http://www.dws.gov.za>

Department of Agriculture, Forestry and Fisheries

W: <http://www.nda.agric.za>

Working on Fire

W: www.workingonfire.org

Fire Wise

W: www.firewisesa.org.za

Fire Stop

W: www.firestop.co.za

For fire-fighting training and assistance with prescribed burns:

Rob Erasmus

W: www.envirowildfire.co.za

E: info@envirowildfire.co.za

T: 021 862 8457

4. Corridors and habitat fragmentation

When large, continuous areas of habitat are broken up into disconnected fragments, many ecological processes that keep these systems functioning are disrupted and many species disappear. Corridors of natural habitats are needed to link fragments to allow species movement, pollination and nesting to continue. They can also provide additional habitat where animals can breed, feed and shelter.

It is important to locate the fragment, or corridor of natural vegetation on your farm. Once the location of a single patch in the landscape is known, its setting in relation to other natural (semi-natural) vegetation fragments should be determined. Corridors connecting fragments can be created by restoring (e.g. by clearing alien vegetation) the degraded areas. Vegetation along rivers or small streams acts as natural corridors, while road or track verges and power line servitudes provide man-made corridors. In agricultural areas, minor changes to certain farming practices can enhance connectivity. For example, a move away from traditional farming to biological farming (working with nature) can assist the movement of insects and other invertebrates between fragments. In addition, insects inhabiting these natural areas will perform pollination services in, for example, orchards, while natural enemies (e.g. ladybirds) of many insect pests will increase in number.

4.1 Management guidelines for corridors and fragments

- Research in renosterveld habitats has shown that, in order for patches of natural veld to be functionally viable, they should ideally be within 500 m of another patch and connected by pollinator-friendly terrain (old fields and pastures are more pollinator friendly than vineyards and orchards).
- There is no single figure available for suggested corridor widths or lengths, as this depends on the animal, plant or vegetation type in question. However, the wider the better!
- During the design phase of new vineyard block layouts, consider leaving corridors between blocks or establishing new corridors. Consult an indigenous landscaper for advice on species suitable for planting.
- Corridors can also include river and stream bank vegetation and wide road-side verges. Where no natural land remains on a property, portions of old fields that are left to naturally rehabilitate can also act as animal movement corridors and provide shelter.

More information on managing natural vegetation fragments in agricultural and urban environments:

Fynbos Ecology and Management, page 98

(By KJ Esler, SM Pierce & C de Villiers C. 2014. Briza Publications, Pretoria.)

5. Restoration/Rehabilitation

5.1 What is restoration?

Restored areas, where the natural vegetation is replaced, serve as important refuge areas for plant and animal species in transformed landscapes, provide important ecosystem services to the surrounding lands, and act as corridors or 'stepping stones' linking larger vegetation remnants. Restored areas therefore directly contribute to maintaining and increasing biodiversity in transformed landscapes.

5.2 Reasons for restoring/rehabilitating veld

As the human population grew, we have transformed our landscapes by removing natural vegetation to plant crops, dam up rivers, mine mountains, etc. In the process we have degraded the very ecosystems that we need for our survival. But all is not lost; through ecological restoration we can repair these affected systems to bring them back to some level of health, integrity and self-sustainability.

5.3 Five phases of restoration

Restoration can occur in five phases:

1. Establish a realistic restoration goal

2. Compile a practical restoration plan
3. Implement the restoration plan
4. Monitor progress
5. Engage adaptive management.

- **Phase 1: Establish a realistic restoration goal**

Possible goals in this phase could be the rehabilitation of basic ecological functions; restoring the natural vegetation structure, or restoring natural vegetation structure and biodiversity.

- **Phase 2: Compile a practical restoration plan**

This phase could involve passive or active restoration.

Passive restoration

Passive restoration can be done where some indigenous vegetation or at least indigenous seed bank is still present. It is only necessary to remove negative impacts (e.g. alien vegetation) and the natural vegetation will re-establish on its own. Where alien vegetation is present, compile a basic alien clearing plan – refer to the basic principles or the guidelines for alien clearing for the most effective methods for each species.

Active restoration

Active restoration is only done as last resort. It is only necessary in areas where no indigenous seed bank exists, this could be because the area had been cultivated over a long time, too hot fires had damaged the seed bank, or the area being very small and too far from other natural areas).

Basic principles of active restoration

- Only plant or sow species that previously occurred in the area. It is therefore important to know the vegetation type that occurred on the site.
- Non-invasive commercial species should only be used if indigenous species are unavailable and the surrounding land use is used for agricultural.
- The time of seed broadcasting depends on the species selected. Some species germinate after the first winter rains, while others only germinate when the temperature starts rising again at the end of winter. Suitable seeding times in the Western Cape are in autumn (March/April) or early spring (September).
- Seed can also be collected in the wild, but for this you need a permit from CapeNature. **Note:** Many of the renosterveld bulb species are rare and should never be collected in the wild.
- Seeds should be stored under cool, dry and dark conditions to avoid rotting and early germination. Dormancy need to be broken in a few cases – here seeds need to be soaked in warm water for a few hours before sowing.
- Seeds are usually broadcast directly onto the field, covered with a layer of soil and irrigated after sowing. Irrigation is only necessary until winter rains have started.

- **Phase 3: Implement the restoration plan**

Here are some **practical hints** for clearing alien vegetation, revegetation, follow-up control, river restoration (riparian zones) and wetland restoration in fynbos or renosterveld.

Initial clearance of alien vegetation

- For dense to closed woody alien stands it is best to fell and remove large-diameter wood in riparian zones. This wood may be sold to offset some of the clearance costs, or else should be burnt in stacks when the soil is wet to minimise soil and seed-bank damage. Where there is no secondary industry market, large-diameter trees should be killed standing (ring-barked or frilled). For aliens under substantive biological control, consider phased removal.

- For light to medium-density stands, slash may be left to decompose *in situ* or burnt in the next fire without negatively impacting the recovery potential of the site. However, large-diameter trees should be killed standing to keep biomass off the soil surface.

Revegetation

- If some indigenous vegetation is present before alien clearance, soil seed banks supplying indigenous herbaceous and shrub under-storey species are likely to be present. If there was little evidence of indigenous vegetation before clearance, seed banks of indigenous species may still be present provided that there was no other habitat disturbance (such as ploughing) or long-term dense invasion (exceeding 2 fire-cycles).
- However, if a severe fire has gone through the area (with evidence of burnt soil organic matter or subsequent soil erosion) seed banks will have been severely depleted.
- Where indigenous seed banks have been depleted, the site requires active revegetation.
- Sowing should be done directly onto bare ground, with the seed lightly raked into the soil or covered by light woodchip mulch. If done after initial clearance, the establishing vegetation has the potential to partially suppress alien species and reduce follow-up costs.
- Planting is best done under similar conditions to the sowing treatment, although some scrub species may establish better in the presence of other sheltering herbaceous species.
- When indigenous seeds are to be broadcast, herbicide application to control weeds or alien vegetation should be completed at least one month before sowing to allow for the herbicide to decompose.

Follow-up control

- Only methods that do not damage recovering indigenous species should be used, for example hand-pull, cutting and stump treatments.
- If foliar herbicide spraying has to be done, then it must be on a wind-free day with all indigenous species first covered in a protective cone or similar device.

River restoration (riparian zones)

- To restore ecosystem functioning, the minimum requirement is river bank stability and soil surface erosion control. Thus a mix of local pioneer, under-storey (herb and shrub) species should be sown.
- Where seed of local indigenous species is not available or insufficient, commercial non-invasive grasses may be used in an area that is primarily agricultural or disturbed.
- In terms of restoring structure, if pockets of indigenous scrub persist along the river – within 200 m or upstream of the site – then these species will recolonise over time. If there are very few pockets of remaining scrub in the catchment, then active planting of scrub species is recommended, especially if the surrounding terrestrial vegetation is degraded and cannot supply pioneer shrub species.
- Riparian scrub species may be established from rooted cuttings or seedlings transplanted in the field, or for some Western Cape species (e.g. *B. stellatifolium*) directly from fruits placed on site.

Wetland restoration

- Canals desiccate wetlands and result in the encroachment by terrestrial vegetation, including alien vegetation. Plug all canals to avoid erosion and to encourage re-wetting of the area.
- Incorporate buffer strips between agricultural fields and natural wetland system; follow best practices regarding fertilization and use of herbicides to prevent pollution
- Adhere to stocking rates to prevent over grazing and avoid compaction of soil by not allowing grazing during the wetter winter months

● Phase 4: Monitor progress

The work does not stop after planting or sowing. The vegetation needs to be monitored on a regular basis. This can be done by fixed photography or sample plots.

● Phase 5: Engage adaptive management

Assess the monitoring results relative to the ecosystem that were set in Phase 1. Where necessary, revisit methods and adapt management.

5.4 Other important facts to consider

- Rehabilitate by using local or endemic species. Wherever possible, use locally collected seed from species that occur in the area.
- Avoid planting indigenous Protea species that are not endemic (from your area). These may also hybridise with naturally occurring, local species and alter their genetic integrity.
- It may be possible to restore renosterveld that has had a history of incorrect burning or grazing, but complete restoration is not possible for sites where the soil has been disturbed by deep ploughing. Overgrazed renosterveld areas that have lost their bulbs and grasses can be rested to recover the grasses, but bulbs appear to require lengthy periods (>20 years) and active reintroduction to recover.
- No fertilisers should be used in restoration projects.
- Generally, all natural vegetation that has been invaded by alien invasive plants (especially pine trees) will recover well after alien clearing, provided that the correct methods are used. Pine plantations less than 50 years old appear to have little impact on the indigenous seed bank, but areas that have been covered by gum plantations recover less easily due to an alteration of soil properties.
- Fynbos is a fire-dependent system; therefore complete restoration will only occur after the next fire, provided the seed bank and topsoil have remained intact.

Indigenous nurseries & restoration specialists:

Johann and Georgina van Biljon at **IntabaGreen Environmental Services:**

W: www.greenintaba.co.za

E: johann@greenintaba.co.za

T: 087 943 4524; 082 522 6316

Good Hope Nursery (near Scarborough towards Cape Point)

T: 021 780 9299

Caledon Fynbos Nursery (48 Mill Street, Caledon)

T: 028 214 1016

Fiona Powrie at Dragon Plants (Klein Drakenstein near Franschhoek)

T: 021 862 61 56; 082 409 7415

Green Futures (Grootbos, Gansbaai)

T: 028 384 8048

Pat Holmes

E: patricia.holmes@capetown.gov.za

T: 021 514 4185; 082 298 4564

Karen Esler at Stellenbosch University

E: kje@sun.ac.za

T: 021 808 4005; 072 529 3232

6. Game/livestock management in natural areas

Keeping game on private land can only be viewed as a form of conservation if correct game management ensures that there is no detrimental effect on the condition of the natural vegetation. Otherwise, this is simply another form of farming.

6.1 Management guidelines for game/livestock

- Manage the introduction of game, ensuring that non-indigenous species and population density do not damage the remaining natural vegetation. To be able to do this, a landowner needs to know:
 - the veld and soil types of the property, as well as where these are located
 - what the feeding habits of game species are (e.g. browsers or grass grazers)
 - the carrying capacity of the various veld types at specific times of the year, in order to calculate the numbers of a species that can be safely kept on a specific area (e.g. in the succulent karoo around Ladismith and Calitzdorp, about 3,5 kudu can be kept per 100 ha).
- Watering points and animal licks must be placed so as not to cause trampling of sensitive veld (e.g. veld just recovering from a fire; seasonal wetlands)
- It is strongly recommended that only game species that historically occurred in the area are kept and not 'extra-limital' species. Species that occurred historically in the area are best adapted to local conditions and will have the least impact on the natural veld. Always consult CapeNature for advice when contemplating which species to introduce.
- Regularly monitor the composition of plant communities, to be aware of the veld condition.
- Where the veld condition shows signs of deterioration, it is advisable to withdraw animals from that area and leave the veld to rest.

Advice on the carrying capacity for game species, which game species to introduce and game-related issues:

CapeNature

T: 021 866 8000

6.2 The impact of livestock on natural areas

- Renosterveld can be lightly grazed in late summer to autumn (January to early March). Grazing by livestock should not be allowed in the winter and spring flowering and growing seasons. Many of the renosterveld bulbs and annuals are vulnerable to grazing pressure by domestic stock in the first two years after a fire.
- All special habitats like silcrete, ferricrete and quartz patches should be fenced off from livestock. Fencing should however allow the movement of tortoises and small antelope species.

6.3 Control of ‘problem animals’

Wild animals have become a problem in many farming regions because humans have made them a problem by introducing cultivated habitats and readily available food into their natural environment. For example, in the wild, baboons would have died back naturally in summer due to a shortage of food. Now, because peak cultivated fruit production creates an abundance of food in summer, their reproductive cycles have changed and their numbers have increased.

Important tip

It is always advised to contact CapeNature regarding the most environmentally friendly and effective method of dealing with ‘damage-causing’ animals. **Extermination by poisoning is a prohibited hunting method and should never be used!**

There are a variety of animals in the Western Cape with which humans could experience conflict. **CapeNature’s Guide: Human Wildlife Conflict**, can advise you on environmentally friendly control methods.

Below are recommended control methods for animals that are often problematic on wine farms.

6.3.1 Baboons

- An effective method used is to employ a full-time baboon monitor during harvest time. This method has proven to be very successful, especially when combined with an electric fence. It is very important that the monitors are already in the vineyard at first light and only leave at dusk. Monitors should wear brightly coloured clothing and move around regularly, while making a loud noise using vuvuzelas, drums, bear bangers, gas cannons, crackers, etc.
- If the baboon monitor can be accompanied by a large dog (on a leash) that can bark at baboons, this method is even more effective.

Human Wildlife Solutions

This organization, preserve biodiversity by providing innovative, non-invasive and sustainable solutions to resolve conflict situations between humans and wildlife.

Contact details:

T: 021 712 9544

info@hwsolutions.co.za

Baboon Hotline: 071 588 6540

- Through learnt behaviour baboons can get used to a certain methods or sounds. It is therefore advisable to change you method of control. Control methods should always have an element of surprise to be most effective.
- In the Citrusdal area, where damage to orange orchards occur, ‘restaurants’ are used. Undersized or damaged fruit are placed away from the orchards. Baboons prefer to eat from this area rather than moving into the orchards.
- It is also important to remember that there is legislation in place for the hunting of baboons. Shooting of the ‘wrong’ baboons (e.g. the alpha male) can cause the troop to split up into more than one troop. This causes the females to go into oestrus, with many more baboons being born!

Hunting notice and hunting permits:

CapeNature

W: www.capenature.co.za

<https://www.capenature.co.za/permits/hunting-permits>

6.3.2 Birds

- To prevent the plundering of grapes by birds, bird-friendly, clip-on nets can be fitted to vine rows.

VINNET bird protection nets:

De Wet Human at Overberg Agri

E: deweth@overbergagri.co.za

T: 083 305 4437

- Alternatively, encourage birds of prey to nest on the farm by providing tall roosting perches so that they can naturally discourage the smaller birds.
- The Eagle Eye optical bird-scarer is a method of relocating problem birds without harming the animals.
- "Reflective Bird Tape", is a highly reflective tape used in agriculture to deter bird (the flashes, as well as the sound scares birds away)

Eagle Eye Bird Control

T: 087 237 9600

E-mail: info@eagleeye.co.za

6.3.3 Buck

Recommended control methods provided by CapeNature include:

- Using spray-on repellents, but these unfortunately do not last long as they are washed off with the rain. 'Hot Sauce' is one of the repellents that is available at most Agrimark shops.
- Fencing off vineyard blocks with electric fencing, or jackal-proof fencing, has proven to be the most effective preventative measure.
- Use smell aversion (e.g. pieces of cloth dipped in Jeyes Fluid can be hung on a fence)..
- Loosening the soil in sandy areas in a strip right around a vineyard block that is targeted by buck. Buck do not like walking on loose, unstable ground and so will not pass over the strip to get to the vineyard. However, this will not work so well in clay-rich soils.
- Hanging a number of cheap radios in trees near the area frequented by buck to play through the night is another option. Combining the radios with a few indicator lights on fences is even more effective.

6.3.4 Porcupine

Placing an electric wire, 25–30 cm above the ground is effective in keeping porcupine away from fields and irrigation piping.

Advice on problem animal control:

Jaco van Deventer at the CapeNature Wildlife Programme

T: 022 931 2900

7. Waste management

'In nature, life operates in a circular system, and waste generated by one organism becomes food for another. Fallen leaves decay, and the nutrients are returned to the earth, where they become food for the tree again.'

7.1 The importance of waste management

Waste-related problems like the following makes it important to manage waste:

- Resources are valuable and should not just be thrown away.
- Reusing and recycling items save space on landfill sites and delay the building of new ones.
- Recycling reduces the need for the constant extraction or mining of resources.
- The recycling industry is a rapidly growing employer.
- Large quantities of recyclables need to be collected to make recycling financially viable.
- Waste recycling and waste reduction reduce pollution and litter, which are very costly to manage.
- Incineration (i.e. the burning of waste) is expensive and releases dangerous toxins into the atmosphere.

7.2 What can we do?

Integrated waste management is a way of actively reducing or minimising the amount of waste created. The actions prioritised below are called waste minimisation:

- Wherever possible, **avoid** or **eliminate** waste production altogether, or **reduce** the amount of waste that cannot be avoided, for example by avoiding over-packaging.
- **Reuse** items in their current form if avoidance and reduction are not possible, such as returning a glass bottle to the manufacturer to be refilled.
- Items can also be **recycled** into new useful items, such as recycling a polyethylene terephthalate, or PET, bottle, which will be broken down into small pieces and used to manufacture new products.
- **Treating** and safely **disposing** of waste should be the last resort. Waste should never be dumped in streets, fields, rivers and oceans, as this causes pollution. Hazardous waste in particular requires special treatment.

Handling of empty pesticide containers:

W: <https://croplife.co.za/the-correct-procedure-for-the-disposal-of-empty-pesticide-containers/>

7.3 Reasons for not burning waste

Incineration (the burning of waste) is not a preferred method of waste disposal for the following reasons:

- The burning of waste is a listed activity under the National Environmental Management: Air Quality Act 39 of 2004 and needs to be authorised.

National Environmental Management: Air Quality Act 39 of 2004: List of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage:

W: <http://faolex.fao.org/docs/pdf/saf128820.pdf>

Waste Act Made Easy:

A user-friendly guide to the National Environmental Management: Waste Act 59 of 2008

W: <http://sawic.environment.gov.za/documents/944.pdf>

- Incineration is very costly when compared to landfill because waste is burnt at very high temperatures (900 °C) to ensure more efficient burning and less pollution.
- Proper waste avoidance, minimisation, recycling and composting could prevent the need for incineration.
- Burning waste turns ground pollution into air pollution, which creates other health and environmental problems.
- Incineration produces some of the most toxic emissions known, including dioxins, furans and very hazardous airborne ash. In some instances 'ash cakes' are recovered, which need to be buried in concrete because they are so toxic.

Dangerous dioxins

Dioxins are a group of persistent, very toxic chemicals formed as by-products of industrial processes involving chlorine, or when chlorine and organic matter are burnt together. Exposure to dioxins damages the immune system, which may increase the risk of contracting infectious diseases and disrupt proper hormonal functions. Dioxins are known to cause cancer in humans, and affect reproduction and development in animals, even at very low doses.

- Burning waste can discourage waste prevention efforts. Incinerators need constant waste volumes to operate economically, and a waste mix that will burn at high enough temperatures to reduce the emission of toxic fumes, which can never be completely avoided. Packaging such as paper and plastic, which are easy to recycle, would therefore need to be retained in the waste mix to be incinerated.

7.4 The relationship between waste and your carbon footprint

Your carbon footprint is a measure of how much carbon dioxide, methane and other greenhouse gases you create through your actions. Our carbon footprint is directly linked to our lifestyles, specifically what we possess, how much we travel and the amount of waste we generate.

Waste has an impact on your carbon footprint, because the manufacturing, packaging and transport of the completed product all generate greenhouse gases. When you buy a product, all greenhouse gases related to that product are added to your carbon footprint, including the methane produced by that product's waste after you have disposed of it. Avoiding the generation of waste is a key method to reduce our carbon footprint, and the first step in minimising waste.

Information on reducing your carbon footprint:

SmartLiving Handbook

W: <https://www.capetown.gov.za/Media-and-news/City's%20Smart%20Living%20Handbook%20-%20a%20guide%20to%20sustainable%20living%20at%20home>

Waste management guidelines:

Integrated Production of Wine (IPW): Guidelines for Farms

- Section 14: Handling of Chemicals

W:

<http://www.ipw.co.za/content/guidelines/IPW%20Guidelines%20for%20the%20Farm%20Aug%202014.pdf>

Integrated Production of Wine: Guidelines for Wineries and Bottling Facilities

- Sections 9.1–9.4: Wastewater management (including monitoring, the amount and quality of cellar waste water; storing and disposal of wastewater)
- Section 11.1: Disposal of solid waste
- Section 11.2: Cleaning of water dams, pipes and other equipment

7.5 General waste management guidelines

Refuse management must comply with legal prescriptions and may not pollute the environment (particularly wetlands and water sources) or create a health hazard.

- Compile a waste management plan, where waste is seen as a resource and recycled where possible.
- Educate farm workers and their families on waste management and recycling.
- Minimise pesticide drift from vineyards onto natural areas. Avoid aerial spraying and, where possible, use Integrated Pest Management (IPM) methods to avoid drift altogether.
- Minimise fertiliser run-off adjacent to natural areas, especially wetlands and rivers. This run-off is literally 'throwing money away'. It also stimulates the spread of alien aquatic plants and actively poisons many indigenous plant species and aquatic animals. The Department of Water and Sanitation has issued target water quality guidelines, which address impacts on water quality and measure pollutants in the final water body and not only in the effluent from the cellar.
- Cellar waste will include cellar effluent as well as solid waste such as grape waste, lees and filter rests.

Water quality guidelines:

W: https://www.dwa.gov.za/IWQS/wq_guide/index.asp

Guidelines on managing cellar waste:

Integrated Production of Wine (IPW): Guidelines for the management of wastewater and solid waste at existing wineries

W: <http://www.ipw.co.za/content/guidelines/WastewaterApril05English.pdf>

8. General

8.1 Use of existing formal conservation structures

Landowners can play an important role in the conservation of South Africa's natural heritage. In the Western Cape, most of the land that hosts important biodiversity does not lie within formally protected areas, but is privately owned land. There are various ways in which you as a landowner can get involved in conservation.

8.1.1 CapeNature's Stewardship Programme

Consider formally setting aside threatened natural areas for conservation under CapeNature's Stewardship Programme to give these areas secure conservation status, and truly ensure that these areas remain conserved for future generations.

8.1.2 WWF's Water Stewardship Programme

Water scarcity is a global challenge, with southern Africa being the hardest hit. South Africa is especially water-stressed – it is ranked the 30th driest country in the world. With annual rainfall levels about half the world average, South Africa also experiences unevenly distributed rainfall in its landscapes and has a highly variable climate where droughts and floods are common.

Water availability is one of the most decisive factors that will affect the economic, social and environmental well-being of South Africa over the next decade, with huge economic development pressures and social upliftment challenges. Half of the country's river flow is supplied by a mere 10% of its land area, and yet only 16% of this land is formally protected! South Africa's current growth and development require a new way of planning to protect these precious natural assets to ensure that future generations inherit healthy landscapes and a water-secure future.

WWF is involved in driving water stewardship initiatives with communities and corporations; identifying water risks; ensuring healthy water-supplying landscapes such as wetlands; and enabling water balance through the clearing of water-thirsty alien vegetation and restoring river systems.

WWF Water Stewardship Programme:

W: http://www.wwf.org.za/what_we_do/freshwater/

8.1.3 Collective action hubs in your area

Many conservation initiatives start at farm level. Quite a few of them, like alien clearing, river and wetland rehabilitation and water-related initiatives (e.g. river health management) are issues that go beyond the farm fence. Joining existing or forming new collective action hubs around issues in your area will lend you greater impetus, improve the chances to access group funding and address conservation and landscape resilience issues at an appropriate scale.

8.1.4 New and existing conservancies

Conservancies are formalised agreements between landowners who share interconnected natural remnants and a conservation agency such as CapeNature. The landowners are empowered to act as curators of natural vegetation and receive support to conserve and manage the remnant network, such as clearing of alien invasive species.

Information on forming or joining a conservancy:

CapeNature

W: www.capenature.co.za

T: 021 866 8000

8.2 Agroecological Farming Practices

The focus of Agroecology lies in reducing or eliminating agrochemical inputs. This can be done by managing and ensuring adequate plant nutrition and protection through organic nutrient sources and integrated pest management.

The design of such systems is based on the application of the following ecological principles:

1. Enhance recycling of biomass and optimise nutrient availability, and balance nutrient flow.
2. Securing favourable soil conditions for plant growth, particularly by managing organic matter and enhancing soil biotic activity.
3. Soil microclimate management, through increased soil cover. Maintain vegetative cover as an effective soil and water conserving measure, met through the use of no-till practices, mulch farming, and use of cover crops and other appropriate methods.
4. Species and genetic diversification of the agroecosystem in time and space.

Various strategies to restore agricultural diversity in time and space include cover crops, introducing livestock, and creating natural corridors, which exhibit the following ecological features:

- *Cover Crops*. The use of pure or mixed stands of legumes or other annual plant species to improve soil fertility, enhance biological control of pests, and modify the vineyard microclimate
 - Animal integration in agroecosystems aids in achieving high biomass output and optimal recycling.
 - *Natural corridors*. Biological corridors are a sustainable option for pest management. By cultivating beneficial plants such as lavender, mint, native trees etc., on or near a vineyard, they act as a valuable trap crop for insects, drawing insects away from the vineyard. Biological corridors can exist on a small scale, i.e. between rows of grapes, or on a large scale, i.e. between vineyards.
5. Enhance beneficial biological interactions and synergisms among agrobiodiversity components, thus promoting critical ecological processes and services.
 6. Promote pest regulation through enhanced activity of biological control agents achieved by introducing and/or conserving natural enemies and antagonists.

These principles can be applied by way of various techniques and strategies. Each of these will have different effects on productivity, stability, and resiliency within the farm system, depending on the local opportunities, resource constraints and, in most cases, on the market. The goal of agroecological design is to integrate components so that overall biological efficiency is improved, biodiversity is preserved, and the agroecosystem productivity and self-sustaining capacity are maintained. The goal is to design a quilt of agroecosystems within a landscape unit, each mimicking the structure and function of natural ecosystems.

8.2.1 Basic guidelines for compost making

The following is a summary of an article, 'Guidelines for making compost on a wine grape enterprise', by Pieter Raath and Johan Fourie. The article was published in *Wynboer* (a technical Guide for Wine Producers).

Guidelines for making compost on a wine farm:

W: <http://www.wineland.co.za/guidelines-for-making-compost-on-a-wine-grape-enterprise/>

What is compost?

All materials of animal and plant waste rot and return to the soil with the help of micro-organisms. The resulting material is rich in nutrients and 'humus' (decayed organic matter). A compost heap is simply an environment in which this natural process can be speeded up.

It helps to think of a compost pile as a living entity which is made up of millions of microbes. The microbes produce compost more quickly when there is a mixture of carbon-rich and nitrogen-rich materials in the pile. As the microbes become active, they create heat. The heat kills diseases and insects pests in the pile. To encourage strong populations of micro-organisms favourable conditions are required, for example food, warmth, moisture and air.

Ten reasons to use good compost

1. Restores soil fertility, soil life to unfertile, dead soils.
2. Adds organic matter to the soil.
3. Is a great way to increase potassium and phosphate levels.
4. Restores micro-nutrients in the soil.

5. Creates heat that destroys weed seeds in organic matter.
6. Improves the soil's water-holding capacity.
7. Increases soil life, which will help to break down minerals in the soil.
8. Gets rid of unwanted pathogenic micro-organisms and toxic compounds.
9. Has ten times the value of manure.
10. Improves the physical condition of the soil by reducing surface crusting, adding water infiltration and plant root penetration and improving soil aeration.

8.2.2 Indigenous windbreaks

Currently most windbreaks on farms consist of fast-growing, hardy, alien trees – which makes them all efficient invaders of our natural veld. The eco-friendly solution is to use the alternatives that grow naturally around us.

Benefits of indigenous windbreaks

- The species are indigenous to the area.
- Planting local species is environmentally sound practice.
- The plants are adapted to the soils and climate.
- These species act as host plants for many of the pest-control predators.
- Although a windbreak is too narrow to be an eco-corridor, they will provide eco-links in the landscape for insects, birds, reptiles and mammals.
- The windbreaks on the borders of the agricultural blocks will provide buffer zones between the vineyards and the veld.
- The species are adapted to fire. Most of the slower-growing trees are resprouters after fire and will quickly regain their height if burnt.

Species to use as windbreaks

- *Olea europea subsp africana* – Wild Olive
- *Kiggelaria africana* – Wild Peach
- *Canthium inerme* – Turkey Berry; Cape Date
- *Apodytes dimiata* – White Pear (requires a bit more water)
- *Dodonea angustifolia* – Sand Olive (fast-growing filler)
- *Maytenus acuminata* – Silky Bark (not readily available)
- *Metrosideros angustifolia* – Cape-gum; Lance-leaved Ironheart (requires a bit more water)
- *Searsia lucida* (previously known as *Rhus lucida* – Varnished Kuni-rhus (shrubby habit so needs more space)
- *Protea laurifolia* – Laurel Protea; Grey-leaf Sugarbush (fast growing filler)
- *Virgilia oroboides* – Blossom Tree (fast growing nurse plant)
- *Portulacaria afra* – Elephant's Food (good firebreak)

More information on indigenous windbreaks:

Fiona Powrie at Dragon Plants

E: dragonplants@yebo.co.za

T: 021 862 6156; 082 409 7415

8.3 Documentation of biodiversity

8.3.1 Bird conservation

The conservation of fynbos vegetation and its rehabilitation wherever possible are crucial to maintaining our fynbos endemic bird species and farmers, in particular, should be aware of these species.

Fynbos endemic bird species include the Cape sugarbird, which relies on Protea stands; the orange-breasted sunbird, which relies on Erica stands; Victorin's warbler; the Cape siskin; Protea seedeater;

Cape bulbul, Cape spurfowl and the Cape rockjumper. These species require healthy fynbos vegetation, maintained by natural fire regimes and with minimal alien vegetation species present.

Maintaining the correct fire regimes to maintain the natural fynbos vegetation cycles is critical to the long-term survival of these bird species.

Additionally, maintaining and rehabilitating wetlands wherever possible is highly beneficial to a number of bird species, both endemic and wider ranging waterbirds.

Providing roosting posts for raptors in vineyards assists with pest control while also providing foraging and roosting habitat in a transformed landscape. Providing nesting boxes for owls and other raptors is also essential, especially in areas where the larger alien trees they have been nesting in, are being removed. This again helps to provide artificial habitat, which is becoming increasingly important in human-altered landscapes.

Information and advice on nesting boxes for owls and raptors:

Hank or Tracy Chalmers of Eagle Encounters

W: www.eagle-encounters.co.za

E: eagles@telkomsa.net

T: 021 870 3207

Fynbos endemic bird species in turn provide an essential pollination and seed-dispersal ecosystem service required for maintaining the Fynbos vegetation.

More information on bird conservation:

W: www.birdlife.org.za

8.3.2 Mammal conservation and camera traps

Protected Areas alone are not adequate for biodiversity conservation, considering that a significant proportion of the province's biodiversity lies within private land. The monitoring of species presence and distribution on private property should therefore be pursued more systematically. The use of camera traps is an ideal tool for a species survey of a property.

Camera traps are robust field camera units that can be left out for extended periods of time. The camera is triggered by motion and heat, and stores the images taken on an external memory card. Camera traps are much like permanent fieldworkers, working day and night, in rain or sunshine. They are non-selective, capturing everything that moves, thus providing the ideal opportunity to gather data on all mammals on a property.

Vineyards and orchards have become integrated into the natural landscape of the Cape Winelands. As such, top blocks of agricultural land that borders onto the lower slopes of mountains are often patrolled by the apex predator in the Western Cape, the leopard. These leopards are notoriously shy and elusive, and very hard to study using conventional methods, but this task is now made much more possible using camera traps. Photographs of leopards are an exceptionally useful tool, since each leopard has a distinctive spot pattern by which it can be identified, like our fingerprints.

Please submit all leopard photos directly to **The Cape Leopard Trust** (boland@capeleopard.org.za)

Information on camera traps:

Contact **The Cape Leopard Trust** Boland Project directly for pointers on which cameras work best and how to best set them up

boland@capeleopard.org.za

Visit the CLT webpage to find out more about leopard research as well as camera trapping:

W: <https://capeleopard.org.za/research/current>

W: <https://capeleopard.org.za/research/techniques/camera-trapping>

8.3.3 Conflict with leopards

In rare instances, a landowner may run into conflict with a leopard on the property. In such cases, early reporting of any losses or damage is key. Report cases to the Cape Leopard Trust, who will then refer you to the relevant CapeNature Conservation Services officer for your property.

Predation management manual:

Download the Predation Management Forum manual – a one-stop guide to help producers identify the problem of predators on their farms, as well as the best method to manage human-wildlife conflict, within the framework of provincial and national legislation.

W: <https://www.pmfsa.co.za/home/ask-our-expert/item/253-predation-management-manual>

8.3.4 Threats to mammals with particular reference to snares and feral dogs:

Illegal wire snares:

There is a worryingly high incidence of illegal wire snares around the mountainous regions of the Western Cape. Snares are very simple to make, incredibly cheap to produce, easy to set in large numbers, and very effective. Discarded wire fencing, old telephone wire, even baling wire or strong string can be used to fashion a noose that will catch an animal by the leg or around the neck or body. These snares are then anchored to a tree, branch or stem, and laid down or suspended on an animal trail. Any animal stepping into or walking through the snare can then get caught, the noose pulls tight around the neck, body or leg, and the more the animal struggles, the tighter it becomes. The cruel and negative aspects of this method are obvious. It is highly unselective, and non-target species are regularly caught. Snares are not necessarily checked very often, and ensnared animals can die a slow and painful death. Some animals will bite and claw at leg or paw snares, causing massive bleeding and broken teeth. Body and neck snares cut deeper and deeper into the flesh until internal haemorrhaging, septicaemia and dehydration takes its toll.

Wire snares are specified as a prohibited hunting method (Nature Conservation Ordinance No. 19 of 1974, specifically article 29 (d)), and setting such snares constitutes a criminal offence. However, due to snaring materials being readily available and the ease of setting the snares, this practice is incredibly difficult to police. By all accounts, many wildlife species are threatened by these low-profile regular bushmeat poachers.

Research by the Cape Leopard Trust and Stellenbosch University (Nieman *et al.* 2019) conducted on several private properties in the greater Cape Winelands region has shown that on properties where there were no anti-snaring regulations, no enforcement of regulations and lack of punitive measures, snaring was significantly more common. Properties with a zero-tolerance policy on snaring had significantly fewer snare problems. More recent patrols in the region revealed that the vast majority of snares are made from wire, with discarded cable and nylon also featuring as snare materials. Most snares in the region are anchored to trees and fence posts, primarily along game trails and fence lines, in stands of alien and disturbed natural vegetation near agricultural activity.

What can you do?

- Establish anti-snaring regulations and punitive measures to be implemented by the property
- Clearly communicate regulations and forewarn all permanent and seasonal workers that snaring is illegal and will not be tolerated (include a clause in contracts)
- All other contractors entering the property (i.e. woodcutters, trail builders, alien clearing teams etc.) should be made aware of zero tolerance towards snaring
- Educate the workforce about the negative aspects and impacts of snaring
- Conduct regular, visible patrols (at least once quarterly) to find and remove snares – especially along corridors and fence lines
- Limit/restrict access to materials that can be used to make snares (i.e. discarded vineyard wire and pieces of cable)
- Clear stands of alien vegetation (often used as anchor points) and restore natural vegetation
- Share knowledge and create awareness about snaring activity among neighbours
- Report illegal snares (or other traps) to the CLT

Report illegal wire snares:

Report illegal wire snares directly to the Cape Leopard Trust via e-mail (conservation.boland@capeleopard.org.za) or submit the info via their online tool. Simply register once and then you are ready to submit your sighting with a GPS location using your smartphone or computer.

W: <https://app.capeleopard.org.za/>

Feral dogs:

Another threat to our native wildlife is that of domestic dogs that have gone feral. The potential role of feral dogs in natural prey depletion, spread of disease, and danger to people is an important consideration. The CLT Boland team has had many anecdotal reports of packs of feral dogs living wild and hunting in the mountains, as well as trained packs of dogs used by humans to hunt wildlife on private land. A dog, being a domestic species, does not fall within the management jurisdiction of CapeNature, and thus the SPCA and Animal Welfare Societies should be contacted.

Contact the CLT Boland Project and your local SPCA if you become aware of such activities on your farm.

8.3.5 Citizen Science projects

It would be interesting for farmers to note where they have substantial populations of any endemic bird species, and to contribute to monitoring these populations over time in order to inform Birdlife SA's conservation planning. In this regard, farmers who have an interest in birds and bird-watching could be encouraged to join the Animal Demography Unit's Citizen Science projects, such as the Second South African Bird Atlas Project and My Bird Patch. In doing so, they can provide critical data needed for the conservation of birds.

Furthermore, there is also an atlas project for mammals, called MammalMAP, also run by the ADU. Anyone, anywhere can contribute to MammalMAP. All you need is a photograph of a mammal along with the date it was taken and where it was taken. This is then uploaded to the online portal, with the aim of creating modern distribution maps for all mammals in Africa. Camera trap photos are particularly useful for this purpose.

Information on Citizen Science projects:

Animal Demography Unit at the University of Cape Town

W: <http://www.adu.uct.ac.za/adu/projects>

ADU's MammalMAP database

W: <http://mammalmap.adu.org.za/>

Contribute to Science

Every observation can contribute to biodiversity science, from the rarest butterfly to the most common backyard weed. We share your findings with scientific data repositories like the Global Biodiversity Information Facility to help scientists find and use your data. All you have to do is observe.

W <https://www.inaturalist.org/>

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