



Friends of the Bot River Estuary & Environs

Business Case

Project for Botfriends Alien Clearing Program

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1 Executive Summary

The Bot River Estuary in the South Western Cape is a critical part of the Kogelberg Biosphere. Much of the environs of the Bot River Estuary have become invaded by alien species (introduced species from elsewhere in the world), especially by Port Jackson and by Australian Myrtle in the last decade. This area has high biodiversity and many wetlands, due to very variable geology and by it being an intersection area of broad vegetation types. It has been rated as a low priority area, by government, for reasons other than environmental reasons. The fire risk has increased to such an extent that the risks of using fire as a tool are very high. Many areas have been abandoned, including demarcated green areas. What little money has been spent on controlling invasive species has compounded the problems rather than relieving them, through the incorrect application of management techniques. There is no overall plan for the area to work towards.

The aims of the Bot Alien Clearing Project (BACP) are to

- 1 Clear aliens in the Bot River environs*
- 2 Reestablish wetlands in the Bot River area and demarcate three biodiversity corridors*
- 3 Reduce the fire risks to manageable proportions*
- 4 Develop a detailed management strategy in collaboration with other role players for improving clearing in the greater Hermanus area*

The area can be recovered to be a low fire risk area with a relatively quick return of indigenous vegetation as has been demonstrated by correct clearing and management techniques, implemented on 24 ha by volunteers in the last three years, using their own funds. This project needs to be urgently expanded into the greater area before the costs of rehabilitation spiral out of control.

The wetland areas will be reestablished to both increase the water supply to the estuary and to function as filters to preserve the quality of the water supply to the estuary, a declared RAMSAR site. These wetland areas fall within three biodiversity corridors stretching from the estuary to the mountains, which when established will allow the free movement of both flora and fauna.

The final conclusion of this project is to provide a detailed land use plan, management strategy and data for the environmental assessments which are required for the expansion of Hermanus into this area in the near future in a stable and sustainable manner.

2 About Botfriends

Friends of the Bot River Estuary and Environs (Botfriends) is a volunteer organisation concerned with environmental impacts around the Bot River estuary. Botfriends has a proper constitution linked to the Wildlife and Environmental Society of South Africa (WESSA) with an elected committee, meets monthly and is responsible to the members of Botfriends whose membership is growing rapidly. Botfriends are all volunteers who pay a minimal annual subscription. Members include environmental professionals and other experts. Botfriends has its own Facebook page and a website. In terms of their constitution they have to report to WESSA for any large projects. WESSA plays an oversight and guidance role. The Botfriends committee is elected at an annual general meeting, and the limited membership fees go towards running expenses for the society.

Botfriends has established itself as an organisation which is capable of monitoring and coordinating initiatives for removing alien species in this area. We have successfully cleared 24 ha with proper follow-up clearing of seedlings, to reestablish these areas. Because of a limited budget and private funding this has been done extremely cost effectively.

We have dealt with and commented on many different issues which have an environmental impact in this area and are members of the various groups which deal with environmental issues. The committee has a seat on numerous local organisations such as the Ratepayers association, the local ward committee, BREF (Bot River Estuary Forum), PJAT (Paddavlei Joint Action Team), recently set up by Minister Bredell (Western Cape), at the request of a Botfriends member) and attends local meetings which may have environmental impacts on the area.

Various documents on geology, alien invasions, species lists, environmental assessments, management issues and fire risks have been prepared. They are in the process of assisting the redrafting of local fire regulations and generated much biodiversity and species lists information on the local area. Well established contacts within Cape Nature and provincial government have been established. Reports on fire problems, wild horses and local environmental impact assessments have been made. They have a thorough knowledge of the area.

The Botfriends committee will oversee the whole project and attempt to coordinate all environmental impact initiatives which may affect the estuary, to achieve much needed cost savings and extend expenditure already been made, for the most environmental impact.

3 Business Case

Funding is required to develop and run the Botfriends Alien Clearing Program (BACP) for a three year period, expand a very successful pilot project in Fisherhaven, to the greater Bot River estuary area and generate the data required for a feasible plan for the whole area to provide a stable, sustainable future for the area. The data and knowledge generated by the BACP can benefit the greater Hermanus region.

In the last decade no funding has been made available for alien clearing of public land on the eastern shore of the Bot River estuary. Very little funding has also been available for the western shore of the estuary. There has been almost no commitment to applying the environmental laws to privately-owned land. In theory, commitments are made on paper in various reports but the responsibility for applying the environmental laws has not been designated.

Reports of environmental damage made by private persons have been received. These have sometimes been workshopped and commitments made to solve some of the problems in the future, but no actual work has been done. Apart from a Botfriends pilot project, some small attempts have been made in very limited areas, but have been so badly managed that they have often compounded the problems.

3.1 Business Opportunity

The invasion of alien species has led to a considerable decrease in biodiversity and to extremely high fire risks to infrastructure, both public and private. Wetlands are no longer functioning correctly as wetlands and the ability to deal with vegetation fires (a natural occurrence in the area) has been restricted to such an extent that controlled burns have been abandoned. In 2017, a report was compiled of a section of the east bank, workshopped by the Western Cape, DEA&DP (Department of Environmental Affairs and Development Planning), presented by them and a Joint Action Team established by the local environmental minister at the request of a member of Botfriends. However, this action team, run by local government, is a very slow process and the environmental problem is escalating at a disastrous rate.

Since 2017, the Paddavlei, an open water body and wetland, within the area, has changed to a polluted swamp a quarter of its size. A fire which started last year in a particularly invaded area, adjacent to Fisherhaven, could not be handled even with helicopter support, in gentle wind conditions. Had this been in high wind conditions, we probably would have had a larger disaster than the Betty's Bay fire of 2019, where many houses were destroyed.

The area from Hawston past Meerensee to Fisherhaven still remains as an extreme fire risk area and what little money has been spent on disaster management has usually compounded the problem by incorrect application of techniques such as blanket spraying of weedicide, clearing with no poisoning of stumps, mowing of environmentally sensitive areas or the indiscriminate use of a digger/loader to clear areas.

However, Botfriends and private initiatives and money have successfully cleared and done follow-up clearing on approximately 24 ha. This has been properly costed and the most efficient and quality techniques established. The indigenous vegetation is recovering and most of this area now has well-established indigenous vegetation which is outcompeting the alien seedlings. The fire hazard, in this limited area, has been reduced by a factor of 10-15 times a severely alien-invaded environment.

This properly cleared area needs to be extended considerably and will provide a motivation for private land owners to follow the good example. It will reduce costs to do the clearing correctly and will lead to establishing a reduced cost, stable and sustainable indigenous vegetation. Where we are working with nature, we tip the balance in favor of this sustainable environment and we reestablish the biodiversity and the functioning of the wetlands. We plan to establish biodiversity corridors linking the estuary to the mountains and provide a sound basis for planning and development of this area.

This is the logical next expansion of Hermanus, which is already short of land for expansion and no environmental plan exists for the area. There are some small areas which are already earmarked for housing development within the estuary environs. These will require temporary techniques to control the fire hazard and reduce seeding of the alien species until such time as they are replaced by roads and houses.

Most of the areas still have viable seed banks of indigenous species, but timing has become critical, especially given that many areas have been abandoned for most of the last decade. It is critical to move on many fronts as this is an integrated ecological system and part of the Kogelberg Biosphere. We cannot wait until a crisis develops in the estuary itself, a RAMSAR site within the Kogelberg Biosphere, as has already happened in some of the smaller estuaries nearby.

4 Alternative Solutions

There are three possible solutions to the problem of alien invasions which will be examined below. The normal government channels for protection of the environment, for this area, only take place as emergency disaster management. The disaster management solutions are then inadequate, short term management solutions with no long view to an overall plan. This often compounds the problem rather than solving it.

4.1 Option 1

The first option is to institute the BACP program, already begun on a small scale.

4.1.1 Description

Botfriends has established a clearing program on 24 ha within Fisherhaven with volunteers and very limited funds. They have established techniques and gathered data, including cost data, to establish the basis for an expanded program.

A work team has been trained and can rapidly be expanded. Processes are in place for efficiently removing alien infestations and priority areas for alien vegetation clearing have been established. We have limited equipment available, an established newsletter, Facebook page and website. At the moment Botfriends operates with volunteers, using private space and office equipment.

Relationships have been established with all three levels of government and the various other levels of both government and semi-private organisations. We have also established and maintain contact with private experts and local businesses involved in alien removal. We are in a position to appoint a full time project director/manager and team leaders for the rapid expansion of our program.

Botfriends is in an ideal position to monitor and expand their existing project to the greater Ward 8 area and to coordinate other projects and organisations to get the actual work done.

If there is committed funding available, Botfriends will have the ability to expand funding from other sources for specific projects which will arise from within this specific project such as potential dredging, which may be required to reestablish some of the water bodies such as the Paddavlei and Skilpadsvlei.

4.1.2 Benefits

The benefits of the BACP are described below:

Benefit Category	Benefit Description	Benefit Value
Cost effective clearing	Data gathered from existing operations are less than half the costs of government attempts because they are efficient and correctly done, not leading to making the problem worse.	50% cost of initial clearing, 100% less in initial follow-up clearing and negligible in maintenance thereafter, when done correctly the first time
Fire Hazard	Very reduced risks of infrastructure damage, by removing aliens such as Port Jackson which decreases fire intensity by a factor of 10 and reduced fire load by as much as a factor of 3. The use of controlled burning with reduced risks of fire extending to greater areas	Vastly better control of fires and the ability to use fire as a tool in the management of this fire prone environment.
Biodiversity and water quality	Dramatic increases in biodiversity from existing seedbanks of indigenous vegetation. Allowing indigenous species to grow better and faster and complete their lifecycles, providing additional seed. Increased amounts of water of a better quality	Reestablishment of permanent open water bodies and associated wetlands with a dramatic increase in species variety.
Wetlands and corridors	Reestablishment of wetlands with all the associated benefits in terms of water quality, pollution removal and establishing corridors which function to increase biodiversity of flora and fauna into surrounding areas	Reversal of the present destruction of wetlands. Halting or reversing the spread of pollution down the water courses to the estuary Rapid spread of species into surrounding areas
Increased tourism especially birders	Clean, stable and sustainable environment will lead to increases in the number and species of flora and fauna for the pleasure of local inhabitants and tourists	Increased awareness by the general public which will lead to less dumping and abuse of the environment

4.1.3 Costs

The costs of BACP are described below:

Expense Category	Expense Description	Expense Value	Expense Type
Initial clearing	The removal of all invasive plants with the preservation of the indigenous vegetation, using tried and tested techniques. These areas will be worked into severely invaded	Very variable depending on past management. Averaging about R25/100 metre ²	

	areas which will provide a fire break, such that the 100% invaded areas can use fire as the initial removal tool with reduced risk		
Follow-up clearing	Removal of seedlings and regrowth within 12-18 months of the initial clearing	Less than R10/100 metre ²	
Using fire as a tool	In some areas the alien invasive species have canopied over. The sheer volume of material to be removed makes it very cost-ineffective to remove by hand. These areas will use controlled burns to remove this material. The regrowth of alien species can then be removed by hand, allowing the germination and growth of indigenous species	Outside of the project. To be done by fire protection services.	Minimal management

4.1.4 Feasibility

Feasibility rating is from 1-10

Solution	Feasibility Rating	Assessment Method
Remove established alien vegetation	10	Using tried and tested methods which are very cost-effective as per the areas already done. Extremely badly encroached areas will take more time to recover and for indigenous species to reestablish themselves. Species counts will be done on sample areas before and after clearing
Follow up removal of seedlings	10	This is much cheaper if the timing is correct and is assisted by competition from indigenous species. Species counts will be followed up
Restore wetlands	8	The removal of water expensive alien species immediately increases water available which inhibits the growth of many of the alien species, allowing nature to take its course which further promotes the wetlands water holding capacity. Monitoring of species and water flows will be conducted
Create an overall plan for the area	8	The clearing of alien species provides vastly better access to be able to assess areas correctly for the longer term management and planning. Improved assessments of wetland areas and a rating system for the continued management and land use will be compiled
Protect the area from further alien invasion	6	This will involve enacting existing environmental legislation in most areas. Some areas will have to have their land use changed in order for existing legislation to be enforced. Environmental assessments based on the data gathered can be conducted. With the area cleared, and together with the data gathered existing funding can be extended cost effectively to maintain the area and where necessary to enact the required protection.

4.1.5 Risks to the environment

Risk Description	Risk Likelihood	Risk Impact	Risk Mitigating Actions
Cleared areas not formally recognised as protected green spaces	Low	Possibility of no follow ups, allowing alien species to dominate the environment again	Once properly cleared, the major areas need to have legislative protection, by changing the existing zoning or land use. This will require well documented reports of before and after clearing.
Application of incorrect methods of clearing	Low. Recent past application of incorrect methods on short term disaster management. At present more areas are being abandoned.	Present lack of any clearing is leading to increased fire risks and a greater likelihood of disaster management techniques being applied	Education of local government authorities. This has already started and will be ongoing. The greater the areas cleared the greater the input is. Input into fire regulations and cooperation of local environmental bodies. This is ongoing and reasonable progress has been made.

4.1.6 Issues

Issue Description	Issue Priority	Action Required to Resolve Issue
Registered as an institution capable of doing the job correctly	High	Already established criteria for doing the work. Under the new sponsorship we may have to register as a not-for-profit organisation

4.1.7 Assumptions

- Can BACP be done within the time constraints?
- The alien species invasions have entered a logarithmic phase of growth, therefore there is a severe time constraint on getting the project going.
- The assumption is that there will be adequate funding to correct the mismanagement of the last decade. No government interference, especially with incorrect management techniques

Waiting for government to have funds available and to provide funds for clearing of alien species, is likely to take a few more years through budget procedures, especially as this area is currently rated as a low priority area.

The problem is that it is earmarked as a major development area and the recovery of green spaces within this area in 5-20 years' time will require vast sums of money as the indigenous species seedbank will be destroyed. Parts of the wetlands have already been buried in rubble and drainage ditches have been dug which allow rapid spread of pollution towards the estuary.

An assessment of the area has concluded that a privately-funded project is capable of reestablishing good quality water flow through the system and reversing some of the destruction which has occurred. Many areas will have to be abandoned as being too expensive to salvage by the time funds become available.

4.3 Option 3

The only other option is to limit the areas severely to not much more than has been achieved already, with the very limited budget which is available.

This has achieved very little in reducing the enormous fire risk which is increasing rapidly as the alien infestation is growing so rapidly.

The ongoing and rapidly expanding seedbank of alien seeds from surrounding areas will lead to destroying what work has been done.

The threat of untimely fires from un-cleared areas into cleared areas will result in the destruction of many indigenous species before they complete their lifecycle and produce seed.

Funds from the very few individuals involved will dry up and participation of volunteers will decrease.

5 Recommended Solution

The only viable alternative seems to be to expand the BACP project rapidly in the near future, with external funding as described in option 1.

The invasion of alien species has taken place in the last decade around the environs of the Bot River Estuary.

In many areas, the fire hazard is now so severe that controlled burning has been abandoned because the risks are so high and the risks of severe damage to infrastructure in dry, high wind conditions are, are very likely to become the norm.

Therefore, the only viable alternative is the physical clearing of most of the area, especially on the east bank of the estuary, which includes the settlements of Fisherhaven, Meerensee and Hawston.

Finances have been budgeted since 2017, but have been diverted to other priorities. There are new initiatives, but these will still take years to even begin the work on the ground. Such funds as do become available are being spent on disaster recovery. Techniques employed compound the problem rather than solve the problem. Option 1 is the only viable option for solving the problem.

Option 2 costs are growing at such an enormous rate that in a few years' time it will be unviable. Privately funded clearing can continue immediately, keeping costs reasonable, and reducing the fire risk to manageable proportions.

Option 3 has established costs and techniques, but if confined to only these small areas, these small areas will probably revert to invaded areas again as has happened in the last decade.

6 Defining the Project

6.1 Vision

By the end of the project, the vision is to:

- to clear the alien vegetation within the project area and provide a detailed environmental management plan for the estuary environs.

- define three biodiversity corridors from the Estuary to the mountains, which include the degraded wetlands of the eastern side of the Bot River estuary.
- to remove and control the alien vegetation between these corridors in order to reduce alien seeding and considerably reduce fire risks to infrastructure, and increase the water supply to the wetlands and the estuary.
- to assist with and expand the programs on the western and northern shores of the estuary to re-establish a good fynbos cover.
- to provide an example of properly managed land and re-establish a community involvement in the built-up areas within the area.
- to enact the legislation to protect the green belts and parks within the area for a sustainable, stable indigenous vegetation cover, which will maintain itself for the future.

6.2 Objectives

The objectives of the project are to:

- to clear alien species from the Paddavlei and Afdaks River systems and establish three biodiversity corridors from the estuary to the mountains, by linking up existing environmental plans.
- to re-establish and preserve the wetlands within the greater area, increasing biodiversity.
- to provide a detailed management strategy for the whole area for the forward planning and coordination of existing money been spent on the area.
- to facilitate and join cleared areas on the western and northern areas of the estuary, to provide stable, sustainable vegetation cover.

6.3 Scope

The project area has been determined primarily by ecosystem boundaries of naturally occurring boundaries rather than land ownership boundaries. It is hoped that this area will expand to at least the natural drainage areas surrounding the project (See Figure 1).

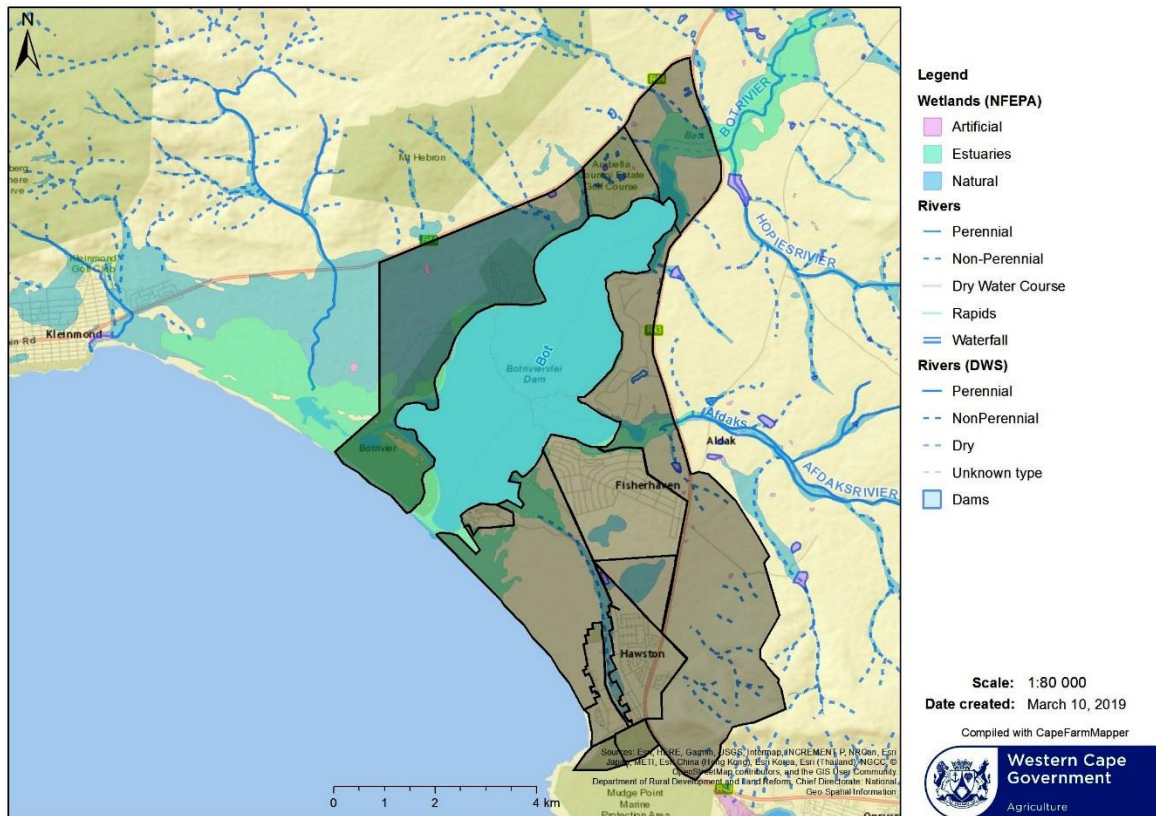


Figure 1. Map of the area of the project

The scope of the project includes the drainage area between the western side of the Bot River Estuary up to the R44, which includes Roosand nature reserve, Public Resort 565 and privately owned land. Part of the Bot River and Hopies River drainage area south of the R43, including Benguela Cove, part of the Afdaks catchment area, Fisherhaven and the Paddavlei catchment area which includes most of Hawston and Meerensee, with particular emphasis on the wetland areas.

Some of these areas have well-established indigenous vegetation, but require maintenance. Some of the areas on the western and northern side of the estuary are severely invaded, adjoining well-maintained areas. On the north east side of the estuary there is a mix of agricultural productive land, some localized invaded areas and some well-maintained areas of indigenous vegetation as far south as Benguela Cove. The Fisherhaven, Meerensee and Hawston areas are a mix of partly-cleared recovering vegetation and severely-invaded areas posing extremely high fire risks areas.

See Appendix 1 for a detailed description of the geology and vegetation status of individual farms and municipal boundaries within this area.

6.4 Deliverables

The following deliverables are planned within the BACP time allocation:

- Alien removal and 2 year follow up removal of alien seedlings, which will give the indigenous vegetation a considerable advantage to outcompete further alien seedling emergence
- Considerable reduction of the fire risk for the whole area, which will reduce the considerable costs of runaway fires and damage to infrastructure
- Fewer fires, which will allow seed production from indigenous vegetation
- Reestablishment of the wetlands which will increase birdlife, water flows, both ground and surface water
- Reduction of pollution especially with regard to improving the water quality of the estuary

- Cleaning the environment and halt further dumping and destruction of this environment with an integrated management plan for the whole area.

7 Project Implementation

If Option 1 is chosen, the extensive work done by members of Botfriends provides a very good basis for prioritising a program for the initial clearing of alien species of the whole area, approximately 3000 ha. Parts of the area have such dense invasion of alien species that access has made it too difficult to map the area adequately. Some environmental impact reports (EIA) have simply referred to this difficulty of access and then ignored such areas. Nevertheless, an extensive gathering of historical information from local inhabitants, studying of all reported information, assessment of aerial photographs and older maps of the area together with walkthroughs (which in places required hacking a pathway) has been done. From this a rough guide can be made of priority areas to start with.

As more areas are cleared of aliens, better assessments can be made and the program of work adjusted accordingly. The normal approach is to start with the high-lying areas, in this area usually less densely invaded. However, it is critical to get the wetland channels done early. A balance will then need to be put in place to prioritise the work.

To begin with, the expansion of the already-cleared areas, mostly so-called green areas, with reasonable amounts of indigenous vegetation, will be made. These are all public spaces. The three main corridors of wetlands will be rated high priority. These are a mixture of public spaces and privately-owned land, mostly public spaces.

Secondly, the expansion of these corridors, with further assessments after proper access will be made. Where these corridors cross privately-owned land, attempts will be made to get the owners more involved, especially in providing funding, as long as the correct techniques are applied. Thirdly, the remaining areas will be cleared or at least managed to prevent seed spread into the priority areas.

Once, the project has made substantial progress, an overall land use plan for the area can be proposed, taking into account the development needs of the area. The initiation of legislation to redefine areas to afford protection as declared green areas, after doing a proper environmental assessment can then be initiated.

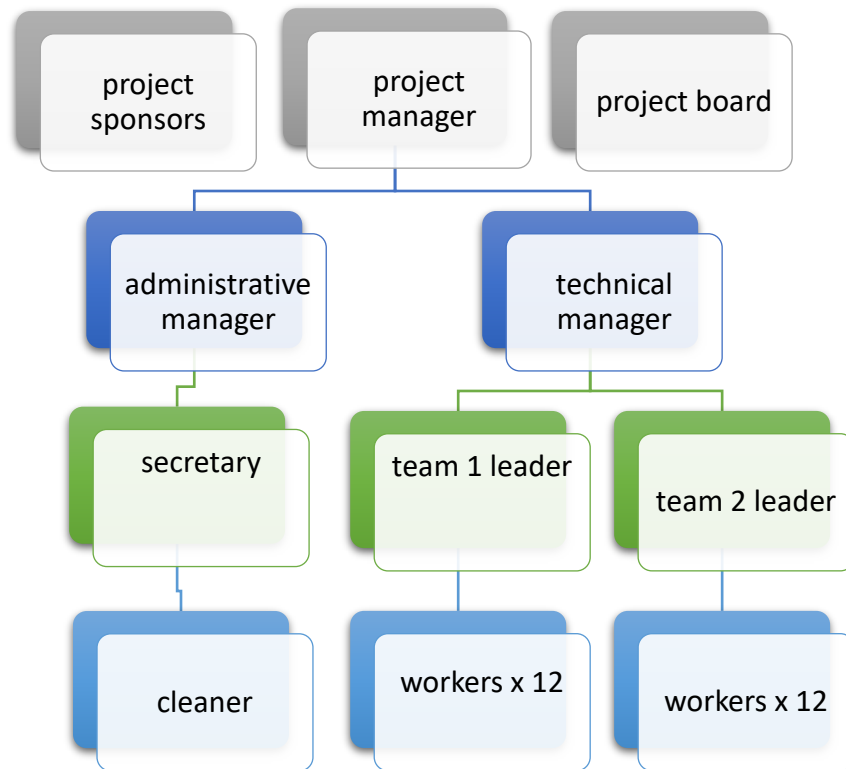
A top priority is to do timeous follow-up clearing on the areas on which work has already been done. The education and greater involvement of the local and wider community will be an ongoing part of the project and is seen as a high priority in maintaining the area beyond the end of this project.

The project consists of the intensification expansion of an existing project. Most of the existing project so far has been done by volunteers with extremely limited private funding. The relevant techniques and methodology have been established, but a major constraint is the lack of funding. It has become critical to establish a stable, sustainable and balanced environment to allow stable development to take place in the near future, both from the point of view of the environment and before the costs spiral.

7.1 Project organisation

The proposal is to have the following project organisation:

Botfriends Alien Clearing Programme Flow Chart



The customers of this project are the general public, bird watchers, tourists, development planners, local government and horse watchers.

The stakeholders will be estuary management committee, Kogelberg Biosphere, Rooisand Nature Reserve, Wild Horses Watch, the local fire department and the local environmental department.

7.2 Project Inception

The project is dependent on urgent funding to appoint an independent and appropriate project director/manager to drive this project forward.

The first task of the director/manager is to review the project paperwork as outlined and the other data on the area already gathered. The budget needs to be reviewed and any necessary amendments made and approved. The initiation phase of the project can then be completed and a more detailed project plan can then be put together to allow the project to proceed in a coordinated fashion. This should only take a week or two.

7.3 Project Execution

The project is fairly straight-forward and will require minimal time to set up an office. Not much equipment is required and the office can be set up in a month. Most of the training is on-the-job training as initial clearing work proceeds. The most important aspects of the physical work are quality control and reporting. As areas are cleared, further surveys can be conducted and will be ongoing. The final reports will come out towards the end of the project, using the data gathered after initial clearing.

The second half of the project will be mostly concerned with follow-up clearing by well-trained workers; management will be involved with data gathering and interpretation.

The establishment of the boundaries of the green corridors will depend on the clearing for access and the data gathered from such cleared areas. An overall land use plan can be established based on sound data, after clearing and legislation enacted to protect the critical areas. This will then provide critical data for development proposals and environmental assessments which are required before developments can proceed.

7.4 Project Closure

Project closure will follow the format of normal project closure procedures. It is envisaged that with a successful project both management and workers will most likely have very little difficulty in getting involved with further clearing projects in surrounding areas.

Most of the expenses of materials and equipment are on consumable items; decisions on the balance of equipment can then be made at the end of the project.

All documentation and reports are to be handed over to Botfriends, together with refined analyses of species lists, costings and management techniques for the correct maintenance in the future.

7.5 Project Management

The project director/project manager has a critical role in performing time, cost, quality, and change management roles. The procurement role will be with the assistance from the administration manager and is mostly at the start of the project.

The admin and technical manager will have well-set out templates for data gathering, produced by the project manager.

The rest are field staff doing relatively simple repetitive tasks and require continuous quality and productivity assessments.

The responsibilities and work required is set out in much more detail in the roles and organisational charts.

7.6 Project Costing

A detailed project costing has been done over three years and is set out in the financial plan attached.

Summary financial plan (10% inflation/year)

Expense type	Year 1	Year 2	Year 3	Total
Labour	2 509 200	2 760 120	3 036 132	8 305 452
Equipment Capex Tools and spares	549 318			549 318
Materials Running costs Protective clothing	955 200 38 100	1 050 720 41 910	1 155 792 46 101	3 161 712 126 111
Suppliers	8 800	9 680		18 480
Administration Office rental Capex Office Running costs	48 000 54 660 89 650	52 800 0 96 965	58 080 0 1 06 662	158 880 54 660 293 277
Other	54 000	59 400	65 340	178 740
Total	4 306 928	4 071 595	4 468 107	12 46 630

8 Appendices

8.1 The status of biological invasions of the Bot River estuary and immediate environs. M N Austin, April 2019. Botfriends, Fisherhaven, South Africa.

Chapter 1 Introduction

A current report on the status of biological invasions of the environs of the Bot River Estuary does not exist. Any project or proposal of trying to deal with invasive species or environmental management needs to have an assessment of the current status of the environment as a yardstick to measure the progression of improvement or deterioration of the environment. This document is a simple start which can be built on in order to assess the current management needs of this area.

The national report on the status of biological invasions and their management has recently been released by Minister Hanekom (Van Wilgen et al 2018). This extensive, extremely well-written report is the first attempt to assess the status of biological invasions at a national level. The major conclusions of the report which are relative to this area are that:

- The Western Cape is the most invaded province
- The Fynbos Biome is particularly at risk
- Of the 13 worst invasive species in the country, Port Jackson, Rooikrans, pine and gum occur as the main invasive species in this area, together with Australian Myrtle
- SA invasive species regulations are substantial and robust
- Large sums of money have been spent on the control of terrestrial and freshwater species, but have been generally ineffective
- It is imperative to improve management efficiency, and lack of adequate planning and monitoring of outcomes is the major weakness in invasive species control operations in South Africa
- Positive returns on investment from spending on invasive species control is possible especially in terms of reduced fire hazard, increased clean water retention and social benefits associated with alien species control programs.

A brief assessment of the current situation of the areas adjacent to the Bot River estuary (Fig. 1) follows with comment on the broad soil types and an assessment of the invasion status of each area.

Chapter 2 Western area of the estuary

Most of this area consists of soils with a diagnostic ferrihumic horizon (Fig. 2). In the southern area they tend to be shallow with colluvial and alluvial sand, capable of growing shortish fynbos, classified as Gb 4 (Appendix 1). Close to the estuary and along the sea are grey regic sands, fairly undifferentiated and more prone to invasive species without careful management, classified as Hb 27. The area around Arabella and stretching north from Arabella are deeper soils with a higher production potential, classified as Ga 14. Generally this area gets significantly more rainfall than the eastern side of the estuary, because of its proximity to the mountains. It has developed deeper soils, with a higher clay content, with better water-holding capacity and better nutrient status and is therefore capable of much better vegetation production of fynbos, with greater species diversity. However, these conditions lead to greater growth production of invasive species.

Rooisand Nature Reserve (217 ha) is generally in good condition, well-covered in fynbos, supplying good competition to invasive species and relatively cheap to maintain, the soils are classified as Gb 4 and Hb 27. A few hectares of the south west are invaded with Rooikrans which can be relatively easily removed. Follow-ups will be required as this area consists of deep, undifferentiated sands and will take time for fynbos to re-establish.

Farm Re 892 (455 ha), has recently been cleared and most of it has reasonable cover of the pioneering fynbos species and a good grass component. This acts as an ideal buffer zone from further invasions from the west. Most of this area is classified as Gb 4 and Hb 27 along the sea coast, sand dunes. A section just inland from the coast is classified as wetland areas, this is the Lamloch swamps and periodically flooded areas.

Farm RE 563 (352 ha) is a mixed bag with rather severe invasion of mostly Port Jackson and Myrtle, especially below the R44 and the southern end. It has a large grassy area in the centre. The northern end with deeper soils, is predominantly invaded by a mix of gum and Port Jackson. However, a significant number of the taller fynbos species persist, including Protease species. This area should be cleared especially to reduce the seed source to Rooisand nature reserve and Farm 565. This all falls within Gb 4 soil classification.

Farm 565 (76 ha) consists of well-cleared, well-established Fynbos, kept clean by Cape Nature. This is a prime example of what the surrounding farms can be, especially all the area below the R44, classified as Gb 4.

Farm 1/542 (314 ha) is a mixed bag with gum and pine species, Port Jackson and Myrtle interspersed with the taller species of Fynbos including Protease species. The southern end is classified as Gb 4 below the R44, slightly deeper soils on the northern end, Ga 14. A section adjacent to Farm 565 is being cleared and parts of it have establishing a good cover similar to the species mix on Farm 565. The remaining area especially below the R44 needs to be cleared soon to allow the rapid reestablishment of fynbos and reduce the very high fire risk to surrounding areas.

Arabella, Farm portion 274/542 (19.3 ha) has been cleared of severe invasive species and they have an environmental plan in place. These are deeper soils classified as Ga 14. Much of this area is established as lawns.

The narrow strip above the R44, before the steep slopes of the mountain, is also a mixed bag. Some parts are reasonably clear and some parts are severely invaded, especially on the deeper soils where extremely good growth of invasive pine and gum species is occurring, (the main invasive species of this area). These are classified as Gb 4 in the south and deeper soils Ga 14 in the north.

Farm 2/542 (273 ha) is a commercial farm with a mix of pastures and planted trees interspersed with invaded gum and pine. This sits at the head of the estuary and the area to the North and West consists mostly of deeper soils put to commercial use, Ga 14. The southern and eastern section needs some further attention and parts are severely invaded with pine, gum and Port Jackson and needs some attention.

Chapter 3 Eastern side of the estuary

The eastern side of the estuary generally consists of shallower soils, less weathered because of the lower rainfall, lower clay content and thus lower water-holding capacity. The north eastern edge of the estuary consists of soils that are prisma-cutanic and/or pedocutanic diagnostic horizons where the B horizon is mainly not red. They are derived from siltstone, mudstone and shale of the Bokkeveld group with alluvial sand in the valleys, classified as Db 223 deeper soils in the north and Db 105 (the shallower version) in the south. These soils become shallower the further south one goes and in Fisherhaven they change to grey regic sands and other soils, classified as Hb 27. These are recent coastal sand and dunes which may be very deep in places, often saline with generally a very low nutrient status. The shale derived soils may have been partly buried in places by regic sands and the species composition can vary considerably over very short distances. Most of Fisherhaven, Meerensee and Hawston consists of regic sands with Meerensee and Hawston west of the Paddavlei River to the sea consisting of sand dunes prone to blowing. Port Jackson and Rooikrans were introduced to this area from Australia, in an attempt to stabilize the dunes. The vegetation consists mostly of Port Jackson and some Rooikrans; there is very little evidence of fynbos species, with scattered patches of open sand.

Farm 2/541 (89 ha) was until recently ploughed and is now mostly grassland for grazing. Some patches are severely invaded, primarily by Port Jackson and Rooikrans along the shore of the estuary. The area is classified as Db 223 soils.

Benguela Cove is mostly vineyards and is well-maintained with a strip along the estuary of well-kept fynbos. The farm is classified as Db 105. Some areas which were cleared of all vegetation and then not used as vineyards are in the process of rehabilitation. These areas have a good cover of indigenous grasses with a smattering of shrub species, spreading into the grassy areas. They have extended clearing into the road verge section. This area is a good example of what can be achieved in a relatively short time and with continuous follow-up treatments. There is now minimal alien seedling germination, mostly confined to the edges of indigenous vegetation blocks where some disturbance is ongoing. The good stand and cover of indigenous vegetation is outcompeting alien seed germination and therefore the cost of ongoing maintenance has been reduced to a minimum. Alien invasive seed source within the estate has been reduced to very little; the only input is from surrounding areas. Natural deterioration of the huge seedbank has proceeded well and even in recently disturbed areas, very few alien seeds grow. The fire hazard has been severely reduced and has been pushed back onto surrounding property areas, some of which are covered in 100% alien species with the attendant very high fire risk.

Farm portion RE 541 (1058 ha) is mostly commercial with wheat fields. The balance of it is used for grazing and appears to have been kept free of invasive species. Most of the wheat fields are classified as Db 223 and the grazing section is classified as Fa 208.

Farm portion 2/575 and 19/575 (411 ha & 52 ha) are mostly commercial wheat fields. The river valleys are moderately invaded and need some attention. Both of these sections are classified as Db 105.

Farm portion 21/575 (717 ha) has some severely invaded areas. Much of this was ploughed before, but has been abandoned. This area is mostly classified as Db 105, but the soils tend to be shallow, with a small section of Hb 27. Much of the farm has a grass cover on the abandoned lands, maintained by a lack of fynbos species seeds from years of cultivation and too frequent fires in the recent past. The river courses and wetland areas are severely invaded and are spreading into the grassland component. The section west of the R43 has mostly Port Jackson which has invaded into the estuary and poses a severe fire risk where it borders Fisherhaven and Benguela Cove. Between Fisherhaven and Hawston, the most severely invaded areas above the R43 are in the process of being declared a township expansion area. Unfortunately, the invasion is spreading to the upper slopes, which the proposed EIA (Environmental Impact Assessment) for the township expansion specifies must be cleared of alien species. These upper slopes are presently abandoned from an agricultural point of view, with frequent fires occurring.

Farm portion 7/575 and 573 (13.85 ha) border on the Afdaks section of the estuary, classified as Db 105. This consists of short fynbos which has had bad management in the past. It has recently been cleared of invasive species, with properly-managed techniques and two follow-ups of seedlings having been done. Unfortunately, there still exists a seedbank of Port Jackson, especially on the eastern end, with seed from the severely invaded, mature Port Jacksons on Farm 21/575. Some planted shrubs which are not indigenous still remain, but at present are not spreading. Some indigenous shrubs, that were no longer present in the area due to previous bad management, have been successfully re-introduced. This area needs legal protection to protect the well-established indigenous vegetation. The clearing work and follow-ups that have been done on these two sections were done by private funding and volunteers. The area is still zoned for agricultural use. Bordering on the estuary, they need to be rezoned as green areas.

Fisherhaven municipal area.

This area has extremely variable soils, ranging from deeper and shallower soils classified as Db 105, to shallow and deep grey regic sands, Hb 27. Many of the shallow soils are periodically flooded, in parts with internal drainage areas exacerbated by road construction and inadequate drainage. The great variety of soils, with large changes over short distances, has led to a great variety in species composition. Extensive species lists have recently been compiled on public spaces and show that the biological diversity is much higher than was previously documented.

The area ranges from extremely invaded areas, especially in the last decade, to less invaded areas. The human interference and the lack of an environmental management plan has led to severe invasions of both alien and indigenous species invasions. The incorrect application of clearing techniques compounds the problems and, in some cases, has led to great social and economic losses. The costs now involved in re-establishing natural vegetation in some areas have become not economically viable.

The fire risks have increased dramatically and illegal techniques are now being proposed for reducing fire risks that ignore environmental legislation.

This area consists of public open space and privately-owned erven. Environmental legislation needs to be applied to privately-owned erven, to halt the spread of alien seed, especially onto green areas. This will also reduce the fire risks which are building to unacceptable levels.

Many of the public open green spaces have recently been cleared of invasive species, with properly managed techniques, with follow-up clearing operations. This is ongoing and done by private funding and volunteers and has been extremely cost-effective. These green spaces constitute 15.27 ha. These areas will require follow-up clearing of alien seedlings and it will take time for the fynbos species to re-establish themselves adequately, and supply strong competition to invasive seedlings growth. These areas need to have proper legal protection to protect them and the work that has been done on them. The fire risks have been considerably reduced.

Unfortunately, 5.9 ha of public open green spaces have been so badly managed in recent years with incorrect management techniques that a decision needs to be made whether they are worth salvaging. These areas have become an ecological desert. These management techniques were applied by the OSM on land which they are legally bound to manage. With no overall plan and no feedback from government, private capital and time cannot be spent on these areas. The amount of public funds already spent on these areas far exceeds the amount spent on the properly-managed 15.27 ha. More funds spent on temporarily reducing the fire risk by applying current poor management techniques will not only enhance the ecological desert, but will necessitate ongoing high yearly expenditure for the foreseeable future, in order to control the severe fire risk build up.

A section of public green space of 115 ha has been not been managed at all. A small piece of it gets mowed as a firebreak, which has destroyed the fynbos species, and consists of grass, Port Jackson and Myrtle, which is forming a carpet under the mowing regime. This coincides almost exactly with the most sensitive biological component of this block.

The rest of the area consists of a mixture of Port Jackson, Myrtle and pine which was standing more than 3 metres high. It also has greater than 30 000 cubic metres of garbage and rubble dumped on it, most of this in the last few years, but some of has been there so long that grass and other weeds have grown over it. This was such a severe fire risk that it was abandoned. Most of it burned out this year with an uncontrollable fire in very gentle conditions. The standing dead tree trunks and the massive germination, especially of Port Jackson (extremely flammable, even as young plants) will pose an even greater fire risk within a year. The area consists of deep regic sands and a series of wetlands. The wetland corridor needs to be rehabilitated and cleared of invasive species, in order to both re-establish the wetland functions, and to provide for a corridor of green area for the free movement of both flora and fauna. No overall environmental plan exists for this area, which has led to no management strategy, or to environmentally destructive emergency management techniques being applied. Other than the corridor joining the wetland areas, the rest of this area is probably not economically viable to rehabilitate and may as well be subdivided for future housing. An interim management plan needs to be put into place to reduce the severe fire risk. Attempts have been made to put together an overall plan for the area but government has done nothing. The costs of future management decisions are increasing at an alarming rate on a logarithmic scale.

Other green spaces within Fisherhaven reserved for other amenities such as schools have great biological value. It is unlikely that these will ever be used for community purposes. The natural vegetation should be preserved on these areas with correct management techniques. In the past, these areas have been mowed, or randomly sprayed with herbicide, which destroys the fynbos. These are worth saving and not turned into ecological deserts, as has happened by applying the same poor techniques on some of the other green open public spaces.

Public Works land adjoining Fisherhaven and surrounding Meerensee

This area which consists of farm portions RE 566 (66 ha) and 2/566 (12.2 ha plus 54 ha) borders on the estuary and is classified as Hb 27, with grey regic sands and other soils. There is a mixture of very shallow soils, sand-buried soils and deep sands or dunes. Some of it bordering the estuary and close to Fisherhaven is moderately invaded, primarily by Port Jackson. Most of it is severely invaded by Port

Jackson and Myrtle, with a closed canopy. There are substantial wetland areas along the Paddavlei River with severe recent reed growth due to pollution moving down through the area. The area constitutes a very severe fire risk to Meerensee and to Fisherhaven. Parts of the section south of Meerensee are blowing dunes and periodically-flooded areas invaded with Port Jackson and Rooikrans. A permit for clearing the area was issued in 2017, but nothing has been done yet. This area provides an obvious extension of the proposed corridors, through Fisherhaven, and up the Paddavlei wetland area, to link to the water's edge of the estuary.

Meerensee estate, bordering on the estuary is all classified as Hb 27. It is fenced off and only gated access is allowed. Most of it has been built up and parts of it are declared green areas which seem to be maintained.

Farm portion 244 (99.7 ha) is all classified as Hb 27 and consists of deep sands. A fire through this area a few years ago caused a partial evacuation of Meerensee. Most of this area is severely invaded by Port Jackson. The fire risk is building up rapidly, but is not severe yet.

Farm portion 3/566 (207 ha) consists of deep sands and blowing dunes. This is an especially difficult area to manage and already constitutes a severe fire risk to parts of Hawston with dense stands of primarily Port Jackson.

Farm portion 6/575 (84.9 ha) northern end is classified as Hb 27 and the southern end is classified as Db 105. It consists of mostly shallow soils with some sections of wetlands. A recent EIA was approved with most of it rated *not for building* except the south east corner. It was cleared poorly a few years ago and substantial regrowth of Port Jackson has occurred throughout the portion, forming a closed canopy over much of the area. The wetland area is an obvious extension of the proposed corridor.

Hawston Built-up area.

This is a mixture of Hb 27 on the western side changing to Db 105 on the eastern side ranging up the mountain with very shallow soils and bare rock. The Paddavlei River flows through the built-up area with two open waterbodies: the Paddavlei and Skilpadsvlei, joined by wetlands. Both water bodies have become reed-infested swamps in the last year with substantial pollution occurring into the Paddavlei from the streets of Hawston. Ten years ago the open water body of the Paddavlei had not varied much from 1938; in the last decade it has now been substantially reduced by approximately 70-80%. A proposed cost effective management scheme has not been implemented. The Skilpadsvlei is severely polluted, primarily from the sewage farm, and has dense reeds growing to 3-4 metres in sections which consisted of open water 2 years ago. Authorities deny the physical evidence of obvious pollution. Extensive invasion of numerous species has occurred alongside, and into, the wetlands. Extensive dumping of rubble and other rubbish is evident throughout the area and particularly into wetland areas, where wetlands have been buried. The whole wetland area and its margins now constitute a severe fire risk. The open water bodies and their associated wetlands are worth saving and would constitute a green corridor through the township area, with much reduced fire risks.

The Hawston area extends right up to the top of the mountain, and provides part of the catchment area of both the Paddavlei and Afdaks Rivers. In the past this area has had frequent fires, which has been very detrimental to the indigenous vegetation, which does not reach maturity so therefore does not generate seed. Many of the long-maturing species have disappeared. Invasive species, particularly Port Jackson have invaded up the slopes. The area is degraded and needs to be rehabilitated. There has been much soil loss and erosion. However, the area can be recovered, water flows restored with a sound environmental management plan. It will probably never reach the status of the Fernkloof Nature Reserve but can certainly provide a stable, sustainable backdrop to Hawston and Fisherhaven and the proposed extensions of these built-up areas. It will contribute to the establishment of three major green corridors linking the mountains to the estuary and the rebirth of the wetland systems through Hawston, between Hawston and Fisherhaven and to the north and east of Fisherhaven.

Farm portion 8/572 (43.13 ha), Department of Transport, 1/572 (13.59 ha) are all classified as Hb 27, consisting of deep, very level sands. This is mostly a sponge area which together with about 50 ha of RE 572 absorbs all the rainfall plus the run off from the mountain area of approximately 60 ha of RE 572 which releases slowly into the Paddavlei and numerous seeps within Hawston. This area is severely invaded with Port Jackson, Myrtle and gum species which use up all the water and has caused the seeps in Hawston to dry up. There is also extensive dumping on sections of 1/572. Sections of these

portions need to be classified as green areas to link the Paddavlei corridor to the approved corridor for Hoek van die Berg, which extends up the mountain, thus providing a link from the estuary to the mountains.

RE 572 (463 ha) and 3/572 (21.6 ha) is mostly Hb 27 with shallow and deep sands and some exposed rocks with very shallow soils or exposed rocks on the mountain section. Much of this is severely invaded with Port Jackson, Myrtle and gum trees. Clearing is progressing below the R43. Above the R43 a recent fire has caused extensive germination of Port Jackson and with no follow up treatment, and is evolving into a closed canopy of invasive species on the lower slopes of the mountain.

The approved development plan for RE 572 provides for two vegetation corridors linking from the mountains to the sea. The deep sands area, which absorbs water and provides water through the dry season into the Paddavlei and seeps within Hawston, is part of one of these corridors. The clearing and maintenance of this corridor linked to the Paddavlei corridor will be invaluable in re-establishing the open water bodies and associated wetlands of the Paddavlei corridor. The underlying geology of this area prevents most of the water going south directly to the sea. This underlying ridge extends across RE 572 and extends along the entire length of the Paddavlei River, between the river and the sea, right to its exit into the Bot River Estuary.

Conclusions

The western side of the estuary consists of a mix of good stands of indigenous species interspersed with moderate to severe, alien-invaded areas. The alien vegetation needs to be cleared to reduce the severe fire risk and reduce the spread of seed into cleared areas. A good seedbank of indigenous species exists which will help with a rapid rehabilitation of the area below the R43. An extension of clearing above the R43 needs to be considered before this extends up the mountain sides.

The northern edge of the estuary consists of moderate to severely invaded strips of land between productive agricultural lands. These are mostly privately owned lands and need to be cleared to reduce erosion and provide water filters for water entering the estuary.

The northern section of the eastern side of the estuary consists of privately owned land, most of which is agriculturally productive. Small areas are moderately invaded and should be cleared to consolidate the indigenous vegetation blocks.

The southern section of the eastern side of the estuary has very poor soils and very little agriculturally productive land. What little agricultural production which occurred in the past has been abandoned. It also has extensive built-up areas which will be expanded in the near future. There is no environmental plan in place for this development and limited *ad hoc* crisis management techniques have been applied in the last decade, usually leading to further destruction to the environment.

Most of the area is severely invaded by alien vegetation especially the numerous wetland areas, interspersed with a few small areas of reasonably managed indigenous vegetation. Much of the area surrounding the built-up areas, is public land.

Hawston Heights is critical to the whole area as a water catchment area, providing water into three of the proposed biodiversity corridors which will link the many wetland areas. These are the priority corridors which need to be cleared of alien vegetation in order to provide biodiversity corridors linking the wetlands, re-establishing the open water bodies and considerably reducing the pollution which is visibly moving down the waterways into the estuary. Additional green spaces within the built-up areas or proposed built-up areas need to be delineated and correctly managed and cleared of alien vegetation. The existing fire risks directly on infrastructure in the area are very high and need urgent attention.

The areas surrounding the proposed corridors need to have a management plan to reduce the severe fire risks and to reduce the potential reinvasion into the corridors and other green areas until such time as they become built-up areas. The mountain areas, including Hawston Heights, which are primarily water catchment areas for the wetlands need to be cleared to reduce the devastating frequent fires, soil erosion and to improve considerably the aesthetics of the environment.

References

Van Wilgen, B.W. & Wilson, J.R. (Eds.) 2018. *The status of biological invasions and their management in South Africa in 2017*. South African National Biodiversity Institute, Kirstenbosch and DST-NRF Centre of Excellence for Invasion Biology, Stellenbosch.

Appendices

Figure 1 Location of the area surrounding the Bot River Estuary

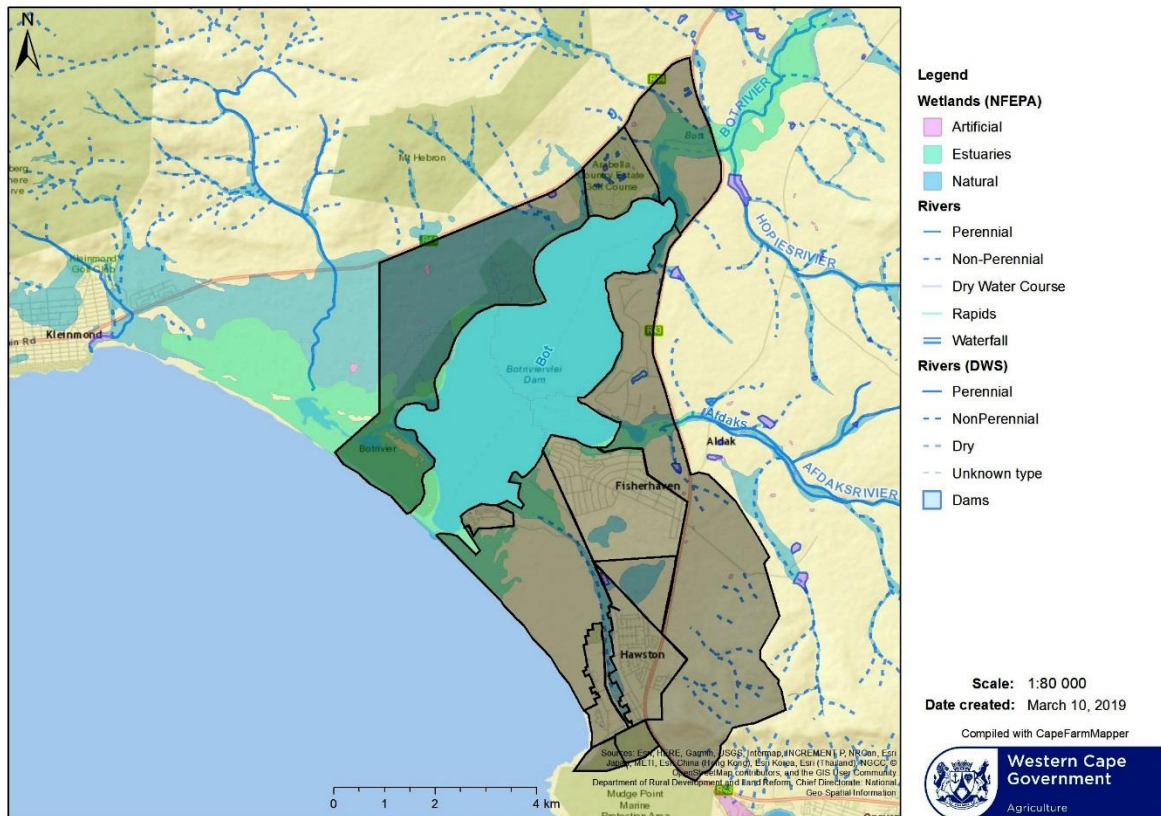
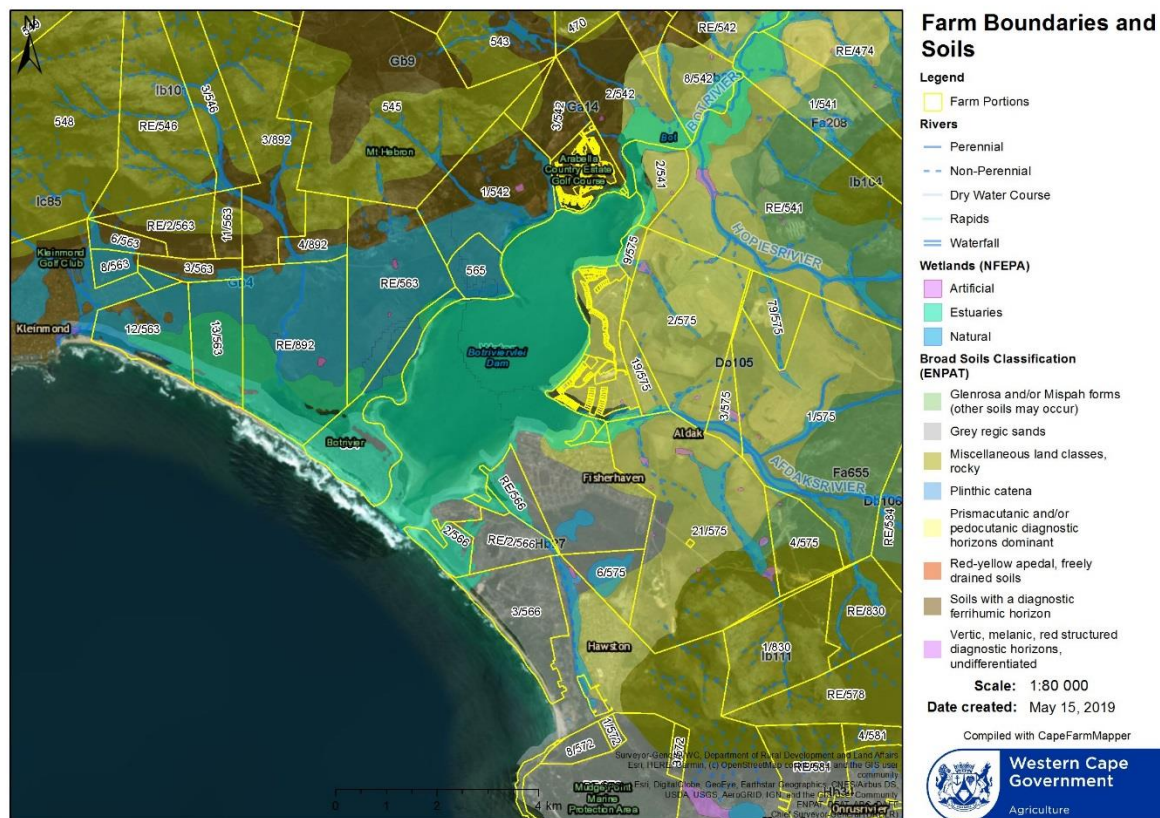


Figure 2 Soil types and existing farm boundaries surrounding the Bot River Estuary



Appendix A

Brief description of the major soil groups within the area of study

Soil type and Geology of the estuary environs

Land Type Hb 27

These are predominantly grey regic sands with other soils scattered through the landscape.

Soils have limited pedological development, sandy, excessively drained soils. Usually greater than 750mm deep with very little clay, less than 15% with high erodability (0.64) and subject to wind erosion.

Geology. Recent coastal sands and dunes with a slight occurrence of shale of the Bokkeveld group and sandstone of the Peninsula Formation, Table Mountain Group.

Land Type Db 105 and Db 223

Soils are Prismacutanic and/or Pedocutanic with diagnostic horizons dominant. The B horizons are not red, with strong texture contrast, with a marked clay accumulation, strongly structured. The soils are generally shallow, less than 450mm, and usually less than 15% clay with high erodability (0.66). The Db 223 soils tend to be less shallow.

Geology. Siltstone, mudstone and shale of the Bokkeveld group with alluvial sand in the valleys.

Land Type Gb4

Soils with diagnostic ferrihumic horizon predominantly shallow (Houwhoek Form). There are scattered rocky areas with limited soils. The soils are shallow, less than 450mm, with low clay content, usually less than 15%.

Geology. Colluvial and alluvial sand with rocky areas with limited soils.

Land Type Ga14

Soils with diagnostic ferrihumic horizon predominantly deep (Lamote Form). The soils are deep, more than 450mm, with low clay content, usually less than 15%.

Geology Quartzitic sandstone of the Peninsula Formation, Table Mountain Group. Lower areas consist of shale of the Bokkeveld Group partly covered by alluvial sand.

Land Type Fa 208

Lime is rare or absent in the entire landscape. Mostly Glenrosa and/or Mispah Forms (other soils may occur). Soils with limited pedological development, usually shallow on hard or weathered rock, with or without intermitant diverse soils, with lime in parts of the landscape. Soils are less than 450mm and less than 15% clay. Classified as high erodability (0.59).

Geology. Quartzitic sandstone of the Table Mountain Group occurs on the higher midslope. Shale, mudstone and siltstone of the Gydo Formation, Bokkeveld Group on the lower midslope and footslopes.

End...

8.2 Separate Financial plan: BACP. Botfriends, Fisherhaven.

(See separate attachment)

8.3 Detailed financial schedule: BACP. Botfriends, Fisherhaven.

(See separate attachment, excel sheet)

8.4 Project Roles and Job descriptions: BACP. Botfriends, Fisherhaven.

(See separate attachment)

End...