

# South Africa's Working for Water Programme



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Namibian Invasive Alien Species Working Group

29<sup>th</sup> May 2023





# The “Four Ts” of Invasive Species

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## Trade, Travel, Transport and Tourism



### These invasive species may be:

- **Plants** – such as these black wattles (*Acacia mearnsii*) from Australia, coming up like hairs on a dog's back, after a fire which killed the parent plant (the burnt tree in the foreground).
- **Animals** – like these common starlings in the USA. Someone wanted all the birds mentioned in Shakespeare to be introduced into America – with catastrophic impacts, in terms of the starling.
- **Microbes** – like this *Phytophthora*, a fungus-like species whose invasions have been responsible for problems such as potato blight, the rotting of soya beans, sudden oak death, and many others, including needle disease (above) in Chilean plantation of the Monterey pine (*Pinus radiata* – ironically itself an invasive tree in South Africa).

# **Microbial Invasions**





SARS

# Human Health and Invasions

Bio-security alignment with efforts to combat human health invasions is essential – microbial invasions are among the most threatening of all invasive alien species.



Small pox



Ebola Virus



HIV/AIDS



Zoonotic risks



Bird 'flu

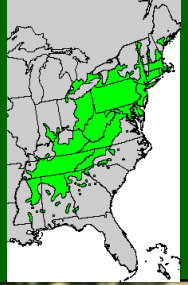




**COVID-19 is also, of course, an invasive organism**

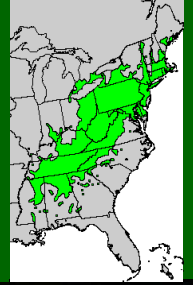


**Chestnut trees once formed almost a canopy along eastern USA,  
running for thousands of kilometres from south to north.**





**Chestnut blight is just one microbial invasion (e.g. Dutch elm disease, sudden oak death – plus Asian long-horned beetle, etc).**







**Bovine tuberculosis is a major zoonotic bacterial disease.**





The polyphagous shot-hole borer is an invasive beetle which, with its symbiont fungus, is killing a wide variety of plants, roughly half of which are indigenous, and a quarter of which are invasives.

In South Africa, there are 81 (known) breeding host species, and 78 non-breeding host species.

There is no chemical control for the PSHB. Bio-control is being researched.





Oak trees are “amplifier” hosts.  
Cut them down pre-emptively?  
Namibia to ban import of  
(untreated?!!) wood or wooden  
products from South Africa?

Estimate is that the PSHB will cause  
damage of R275 billion in next decade.

# **Animal Invasions**





- House crows, from India, kill the young of other birds, spread disease and harass people.
- Zanzibar has over 2 million house crows. The hotel pamphlets list species that are now very hard to find.
- South Africa had invasions in three port cities – Cape Town, Richards Bay and Durban.
- There were 500 birds in Durban in 2005. Left to invade, there would have been more than 250,000 birds in Durban by now. They appear to have been eradicated in Durban and Richards Bay.
- If South Africa fails to eradicate the house crow, we will be a pathway for an invasion up the west coast of Africa, with devastating impacts. We will eradicate them in Cape Town.





# Lionfish



First noticed in  
Florida in 1992.



One lionfish can  
reduce the  
number of  
juvenile fish on a  
patch of reef  
by 79% in just five  
weeks.





MILLE ET UNE PRODUCTIONS PRESENTS  
European Film Awards Best European Documentary 2004  
Europa Cinemas Label Jury Award - Venice Film Festival 2004  
Prix Arte - Best European Documentary

# DARWIN'S NIGHTMARE



A FILM BY HUBERT SAUPER

PRODUCED by Mille et une productions, Paris / Cinepays Film Productions, Vienna / Sogo Film, Bruxelles in collaboration with ARTE and WDR with the support of Centre National de la Cinématographie (CNC) /  
Venice Film Fund (VFF) Austria / Fonds Belge de l'Audiovisuel, Belgique PRODUCTIONS Edward Morisset / Barbara Schindler / Barbara Schindler / Hubert Sauper ARTISTIC COLLABORATION: Sander Fender, Nick Flynn  
EDITOR: Sander Fender / SOUND: INGRIDER / COMPOSER: SEBASTIAN / MUSIC: DEBORA / WRITTEN, FILMED and DIRECTED by Hubert Sauper  
International Sales by Cathexis Europa / Paris / Dina Budnik by Ludo Hout



Nile perch was introduced into Lake Victoria. Together with water hyacinth, it has had a devastating impact.



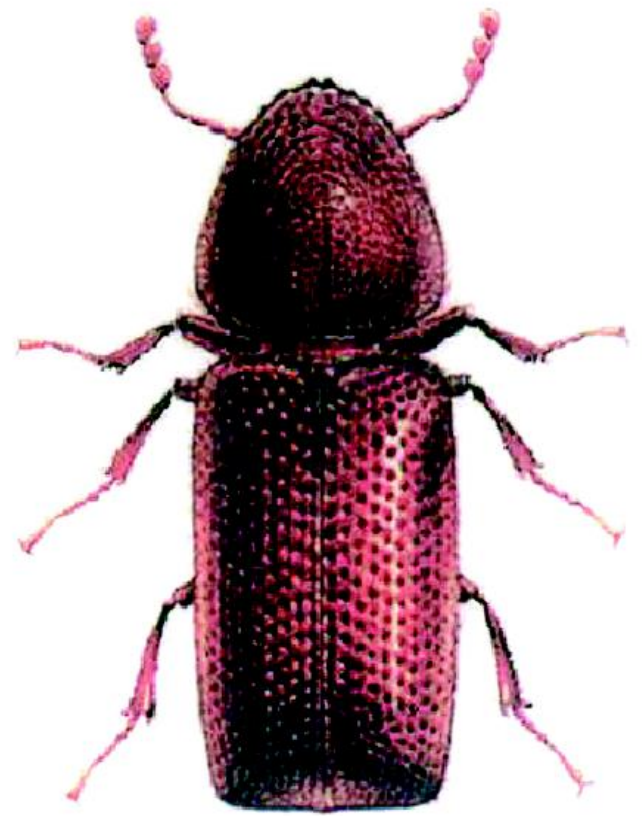


Research at the University of Stellenbosch has shown that over 50% of the endemic species of dragon flies and damselflies are threatened with extinction, owing to invasions by the black wattle (*Acacia mearnsii*).

We had not anticipated such an impact, and doubtless there are others.

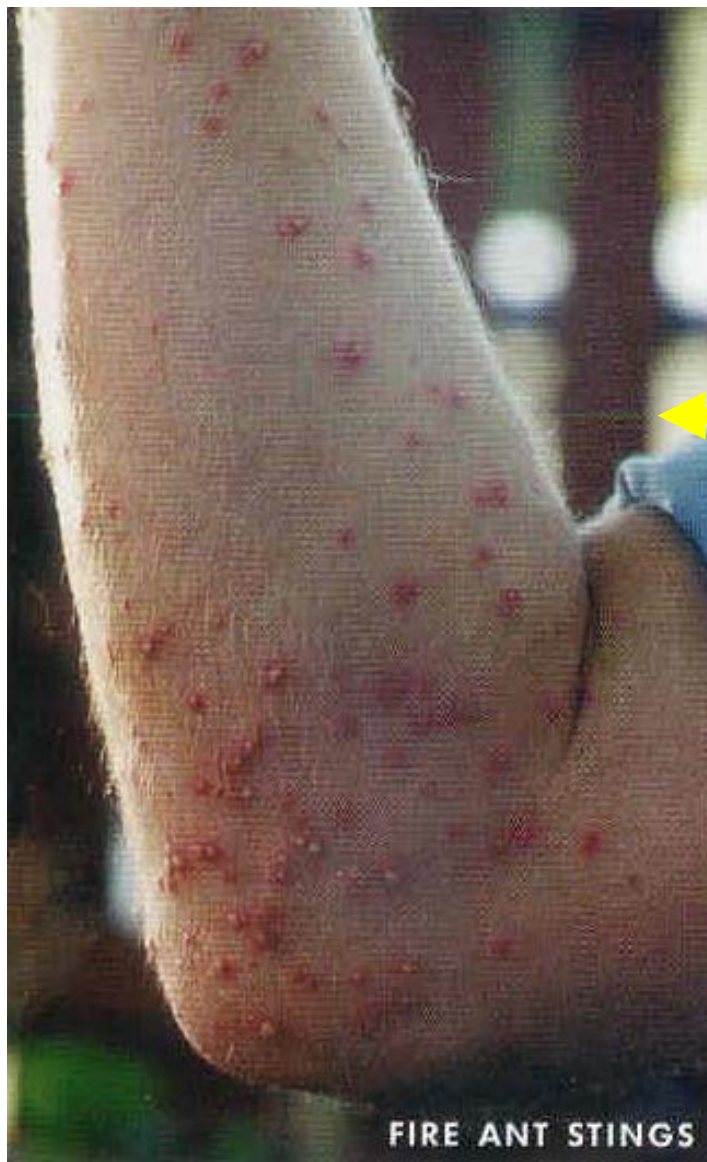






Various pest species are impacting on food security. Of particular concern are our pollinators, such as by verroa mites on honey bees





The introduction into South Africa of invasive animals that threaten human life, amongst other impacts – such as the fire ant and various button spiders – appears almost inevitable, given the levels of trade, travel, transport & tourism.



# SOUTH AFRICA'S PRINCE EDWARD ISLANDS

Home to 28 species of seabirds, including

- 44% of all Wandering Albatrosses;
- 25% of Sooty Albatrosses;
- 10% of Grey-headed Albatrosses.

Mice threaten 19 species with extirpation.





# Mice “Scalping” a Wandering Albatross Chick



Video: Stefan Schoombie



# Plant Invasions



*Prior to human arrival, a new species  
successfully colonized Hawaii once  
every 25,000 to 50,000 years.*



*Nowadays a foreign species  
becomes established in Hawaii  
about once every 18 days.*



***Chromolaena odorata* (triffid weed), from Central and South America, is invading the Hluhluwe-Imfolozi Park. Our wild (and domestic) animals do not eat *Chromolaena*.**



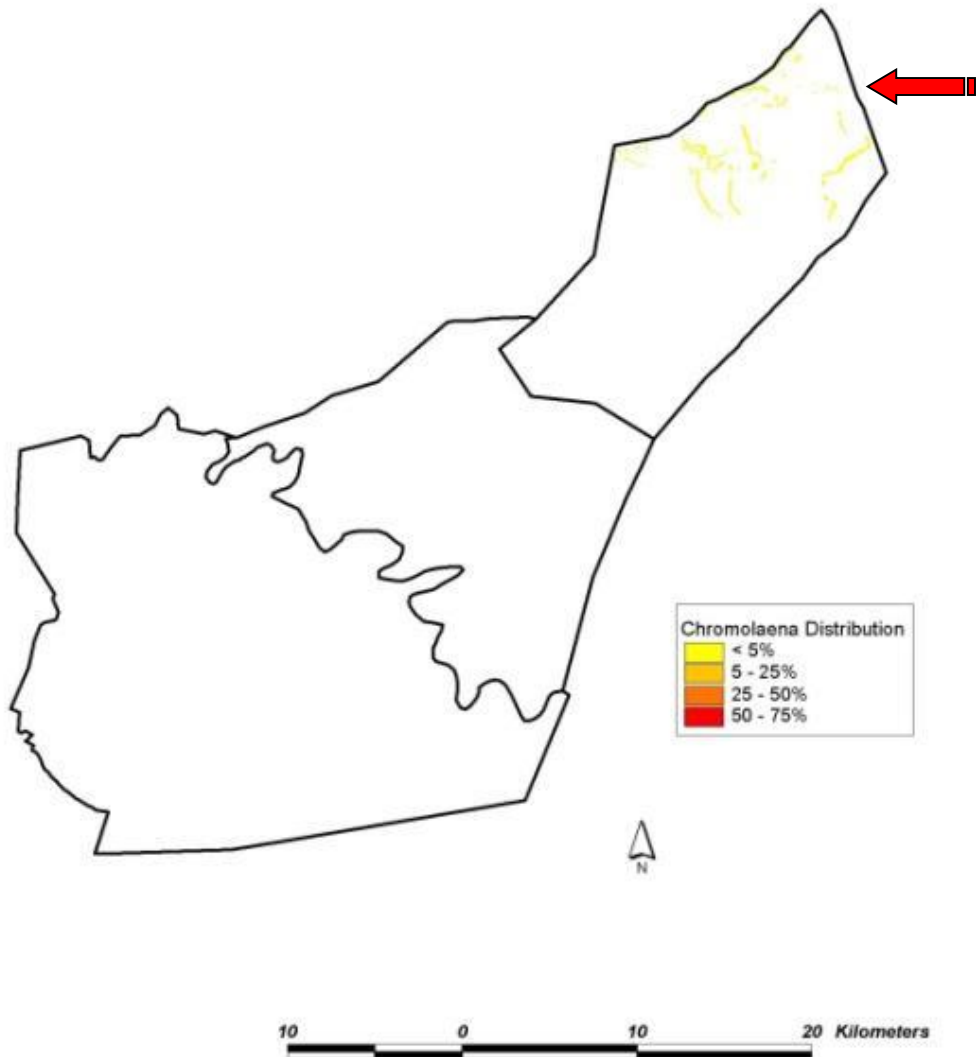




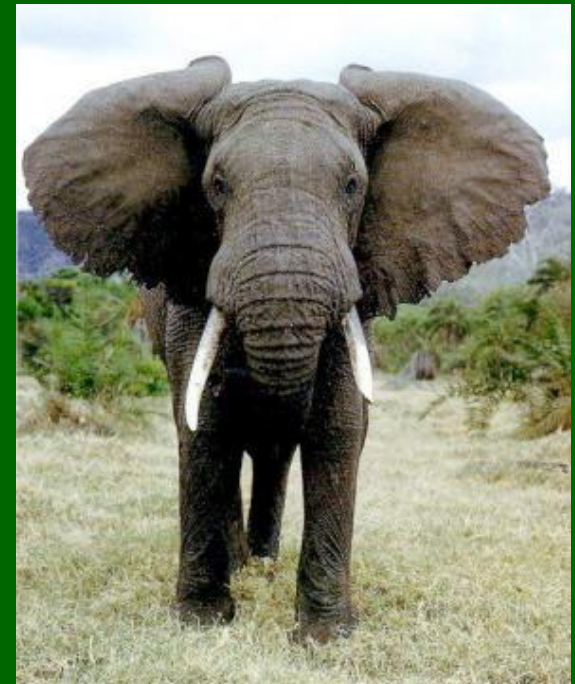
Chromolaena

In South Africa's Hluhluwe-Imfolozi Park, what looks like land with a high carrying capacity for game, is being invaded by *Chromolaena*.

Distribution of *Chromolaena odorata*  
in HIP in 1985

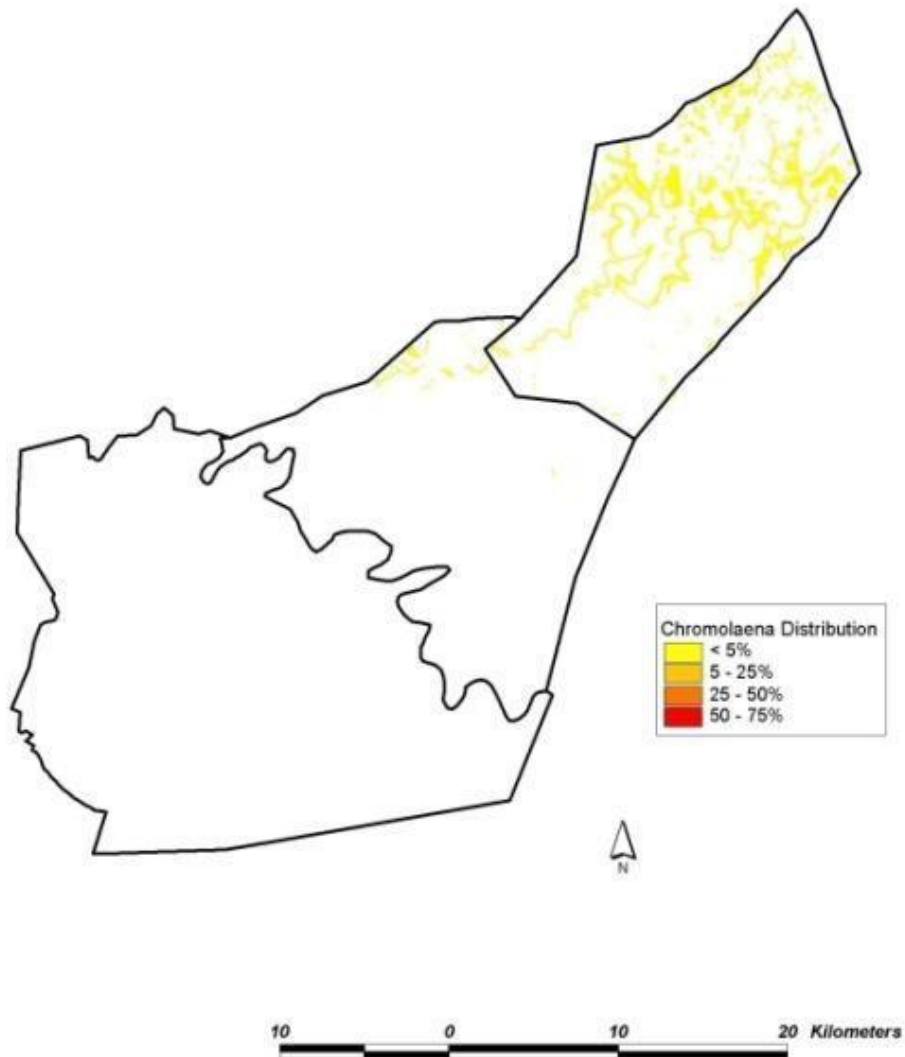


***Chromolaena* was mapped when invading the north-east section of the Hluhluwe-Imfolozi Park in 1985.**





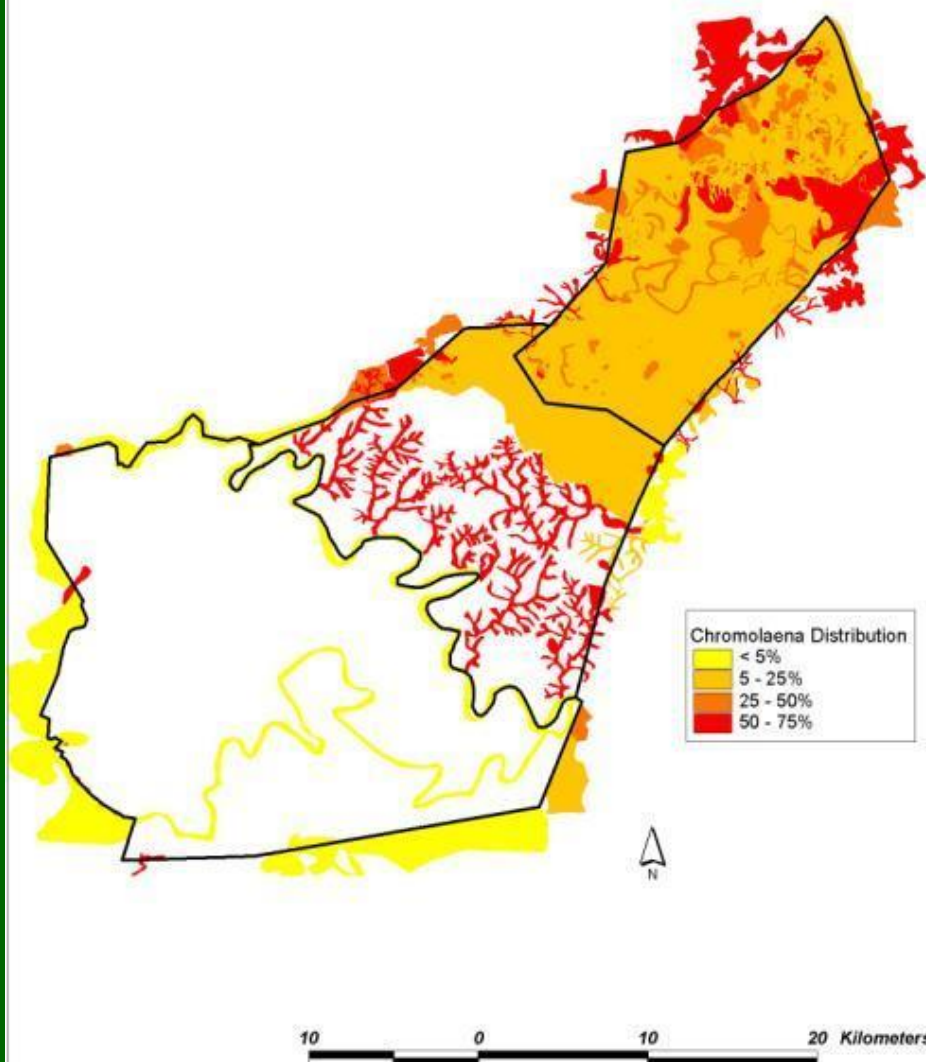
Distribution of *Chromolaena odorata*  
in HIP in 1998



By 1998, the *Chromolaena* was far more widespread in the Park, although still at low densities.



Distribution of *Chromolaena odorata*  
in HIP in 2002

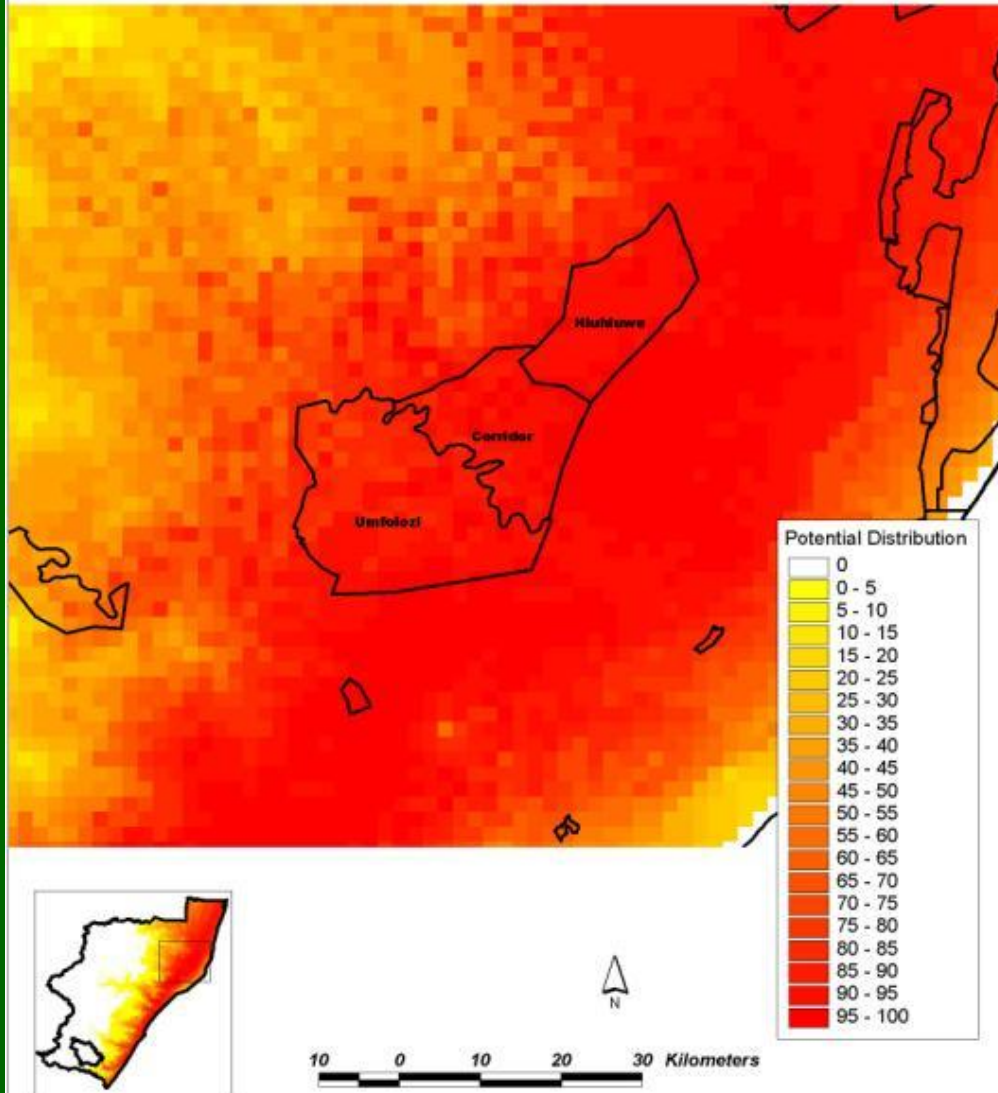


However, by 2002 (just four years' later) the level of invasion had changed dramatically. The *Chromolaena* had spread and grown across much of the Park, and the densities had become far greater as well.





Potential Distribution of *Chromolaena odorata* in HIP

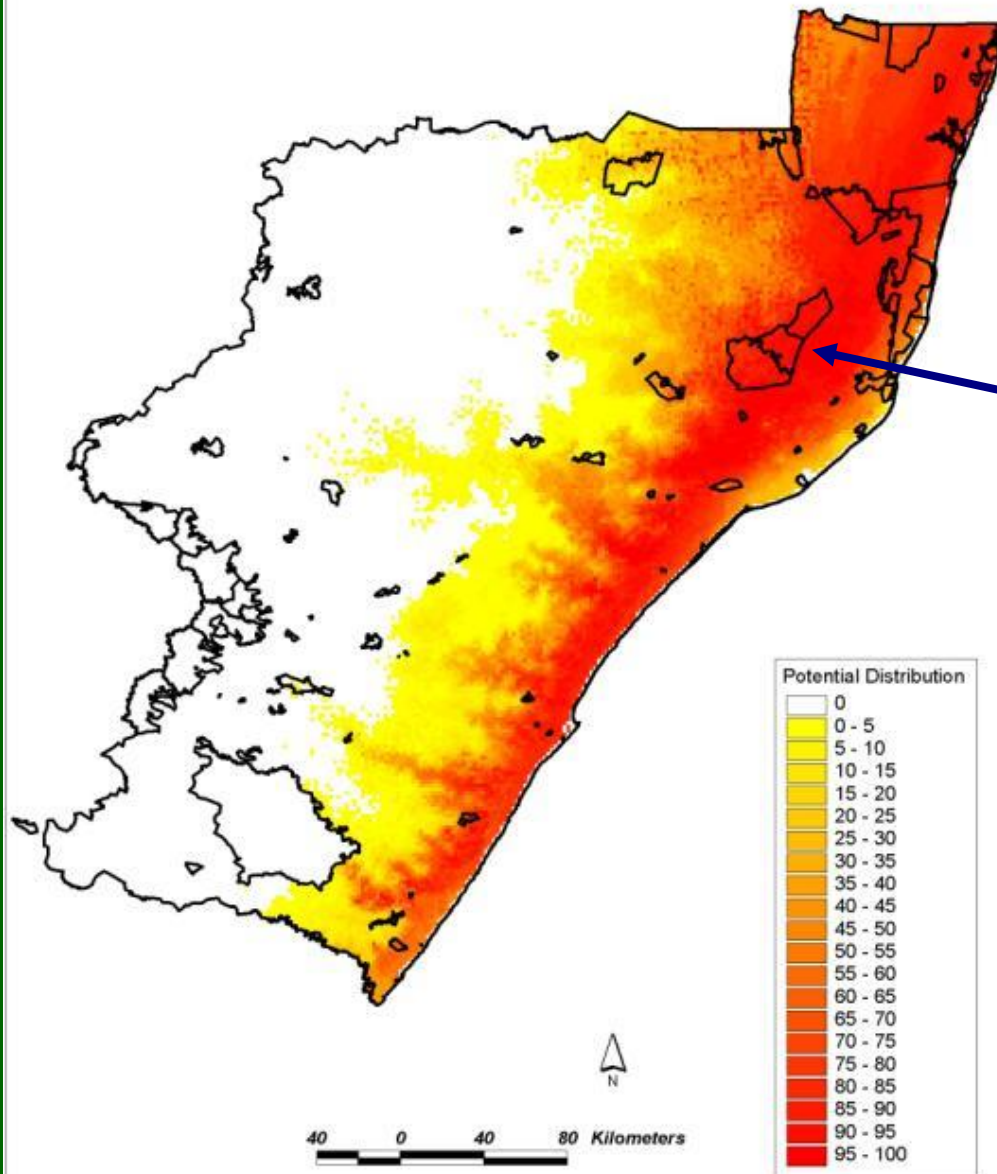


## Projected Impacts in 2005

Our 2005 assessment of the invasion by *Chromolaena* was that it could engulf Hluhluwe-Imfolozi Park within ten years. If that was allowed to happen, then the impacts would be predictable:

- ▶ Little for animals to eat.
- ▶ No animals, no tourists.
- ▶ No tourists, no jobs. (Loss of 3,000 jobs.)
- ▶ Loss of R100 million p.a. revenue.
- ▶ Devastating impact on local economy, in an impoverished part of country.
- ▶ The biggest financial impacts would, however, be felt by the broad support industries that benefit from the tourism in the Hluhluwe-Imfolozi Park – and all of the other Parks that would inevitably face the same fate.

Potential Distribution of *Chromolaena odorata* in KZN  
and Protected Areas



It's not just the Hluhluwe-Imfolozi Park that is being threatened by *Chromolaena*, but all lower-lying areas of KwaZulu-Natal and adjacent provinces in South Africa, as well as Swaziland and Mozambique. This shows the potential spread of the invasive alien plant in KZN.







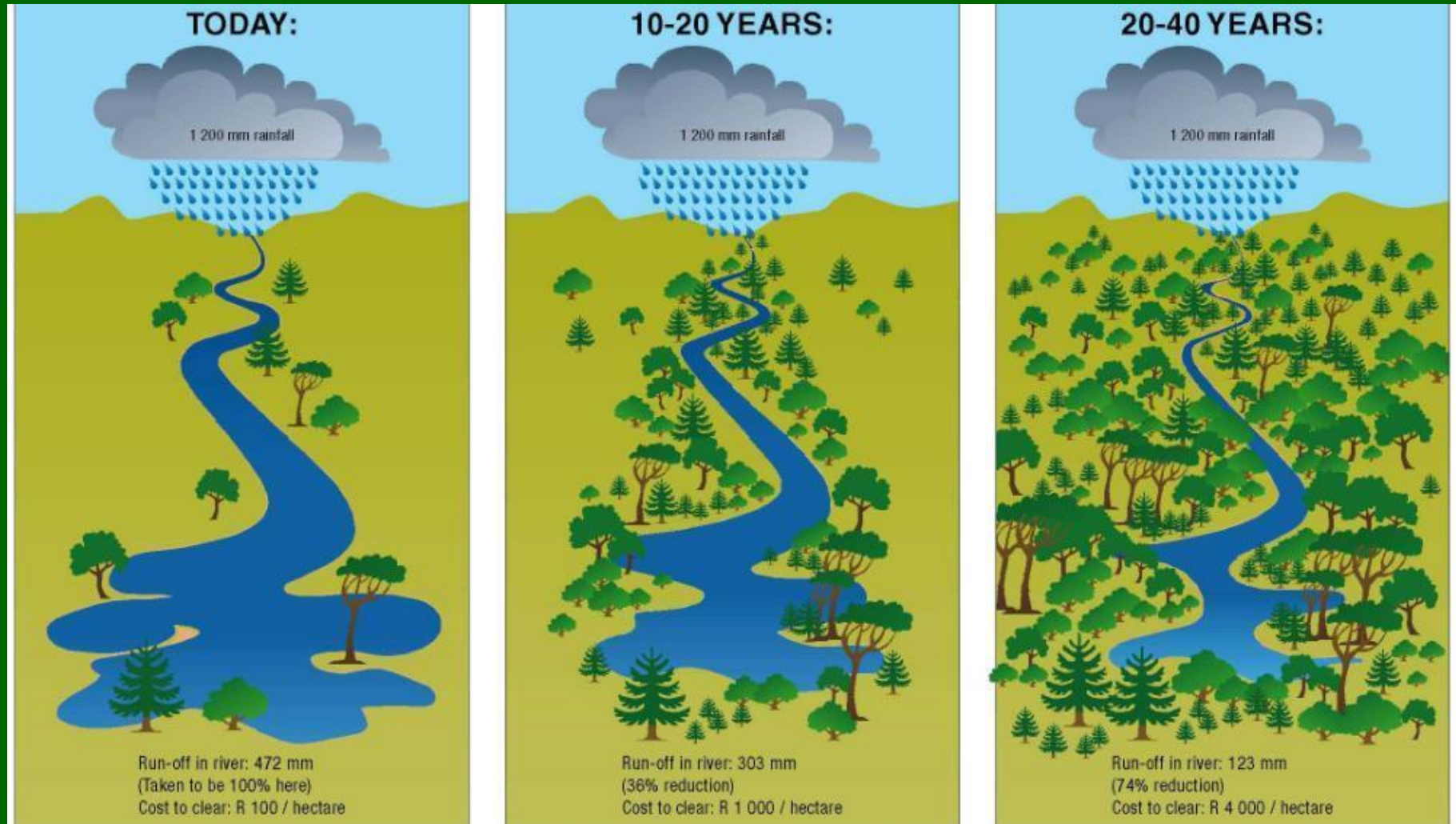
***Chromolaena*'s socio-economic impacts are particularly devastating for resource-poor farmers.**

**It is reported that resource-poor farmers in Swaziland have been forced to abandon their land, as they cannot cope with the speed with which *Chromolaena* is able to invade. The plant may need to be cleared seven or more times in wet years.**





Recent research has indicated that *Chromolaena odorata* may have impacts on water similar to those of large invasive trees like gums, pines and wattles. It is also known as the “paraffin bush”, for the intensity with which it burns.





1. Hluhluwe-Imfolozi Park has the largest population of white rhinos (1,600) in the world.
2. *Operation Rhino* saw the rhino population go from 20 in the 1950s to 10,000+ today.
3. Trade in rhino horn is banned. Cites regulates the movement of live specimens.
4. The plight of the white (below) and black rhinos is front-page news.
5. Opposition to the poaching of rhino is - rightfully - widespread and heart-felt.

YET

6. Rhinos do not eat *Chromolaena*. If the Park is invaded, they will have nothing to eat.
7. Unless *Chromolaena* is contained, there will be no rhinos in the Park.
8. Without effective bio-control (natural enemies), it will need control for centuries.

AND

9. This is but one example of what invasive plants, animals and microbes can do.
10. It's also only one aspect – there are impacts on water, fires, erosion, other species, ...



## Chromolaena and Crocodiles – Unfortunate Bedfellows

Research by A.J. Leslie and J.P. Spotila, published in *Biological Conservation* 98 (2001) revealed that the shading and root mats of *Chromolaena odorata* was causing a shortage of suitable nesting sites for the Nile crocodile. Moreover, it was also found to alter the sex ratio of males to females. They concluded, “This alien plant is posing a very serious threat to the survival of the Nile crocodile in Greater St. Lucia Wetland Park, and unless immediate action is taken, a female-biased sex ratio will result in eventual extirpation of the species from this recently established World Heritage Site.”

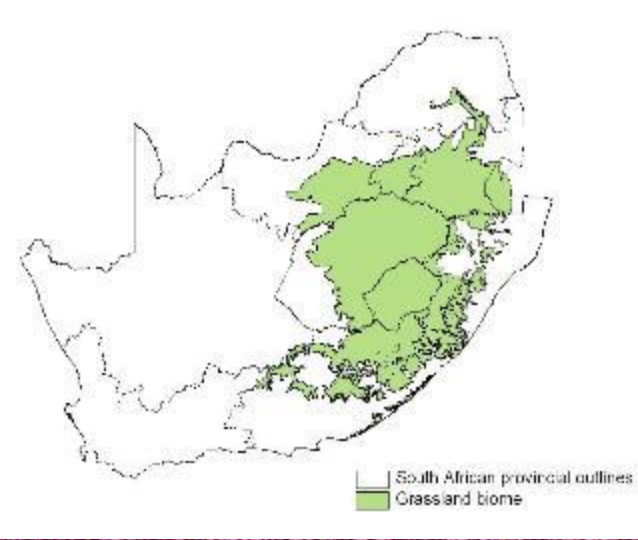




**Famine weed (*Parthenium hysterophorus*) is one of the worst invasive plants in South Africa. It is spreading into the Hluhluwe-Imfolozi Park by tourist and other vehicles. Here it is being sprayed inside the park, with a wall of famine weed outside the fence.**







*Pom-pom weed (Campuloclinium macrocephalum) is unpalatable for both stock and game. It can invade Southern Africa's grassland biome.*



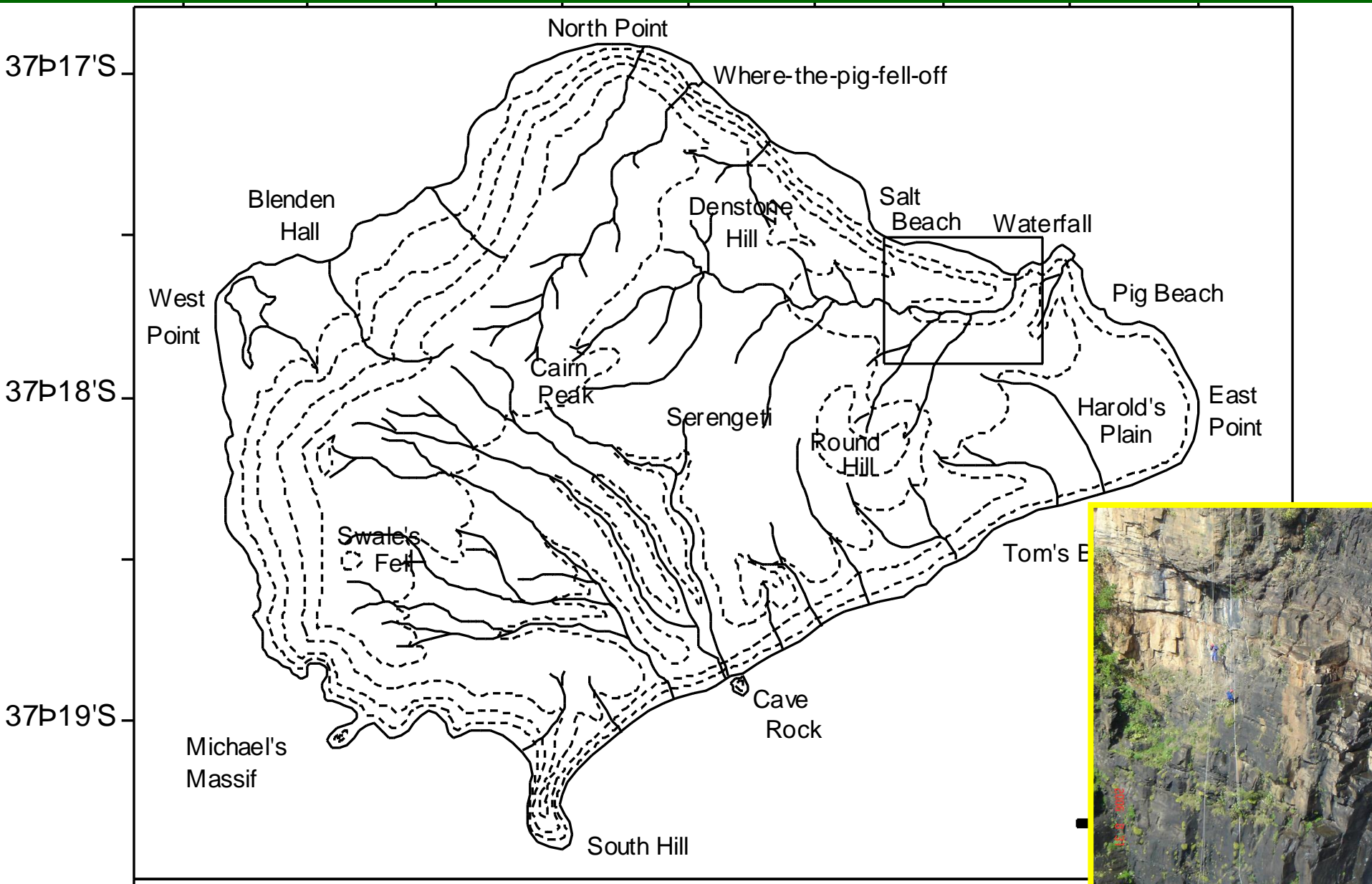


Invasive plants have devastating impacts on water supply, on the productive use of land, on the intensity of wild fires, on soil erosion, on flooding, on disease and many other negative impacts. Their impacts are measured in hundreds of billions of Rands.

Photo: Dr Brian van Wilgen.



High-altitude invasives are a priority. Left alone, they will reach thresholds where it is not possible to control them. It took two workers 12 hours to kill eight invasive New Zealand flax plants on Inaccessible Island, as they had to abseil down 1,000 foot cliffs.





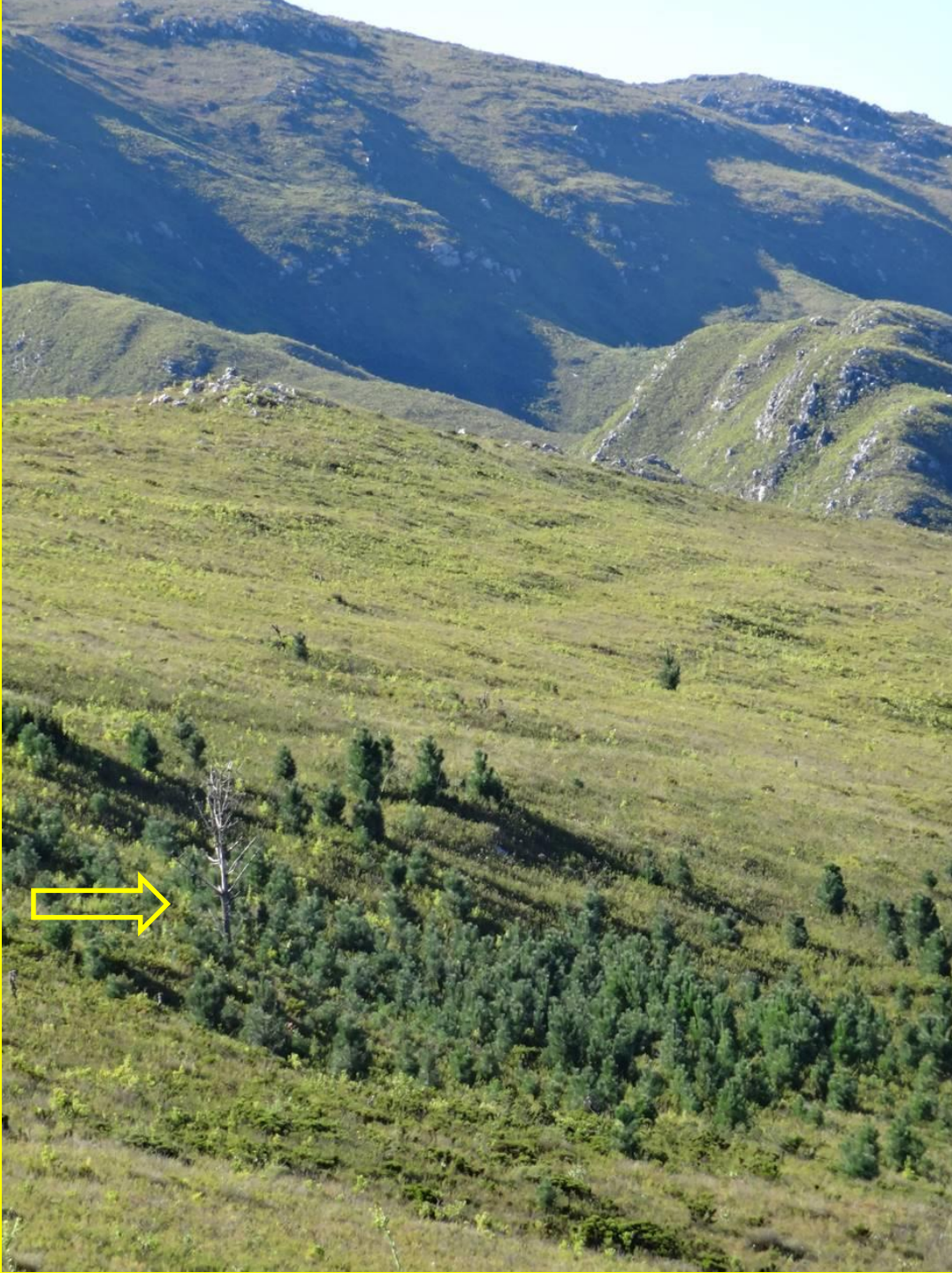


20/02/2012 10:03



## Pines invading at 900 metres altitude in the Langeberg, Western Cape

On the left, the ring-barking of a lone pine (arrowed) in 2007 led to a shedding of cones, and the plume of new seedlings.



## Chemicals versus Suppression

Wattle invasion post a fire. On the right, suppression by grass species had been used, and on the left, spraying with herbicide was used!



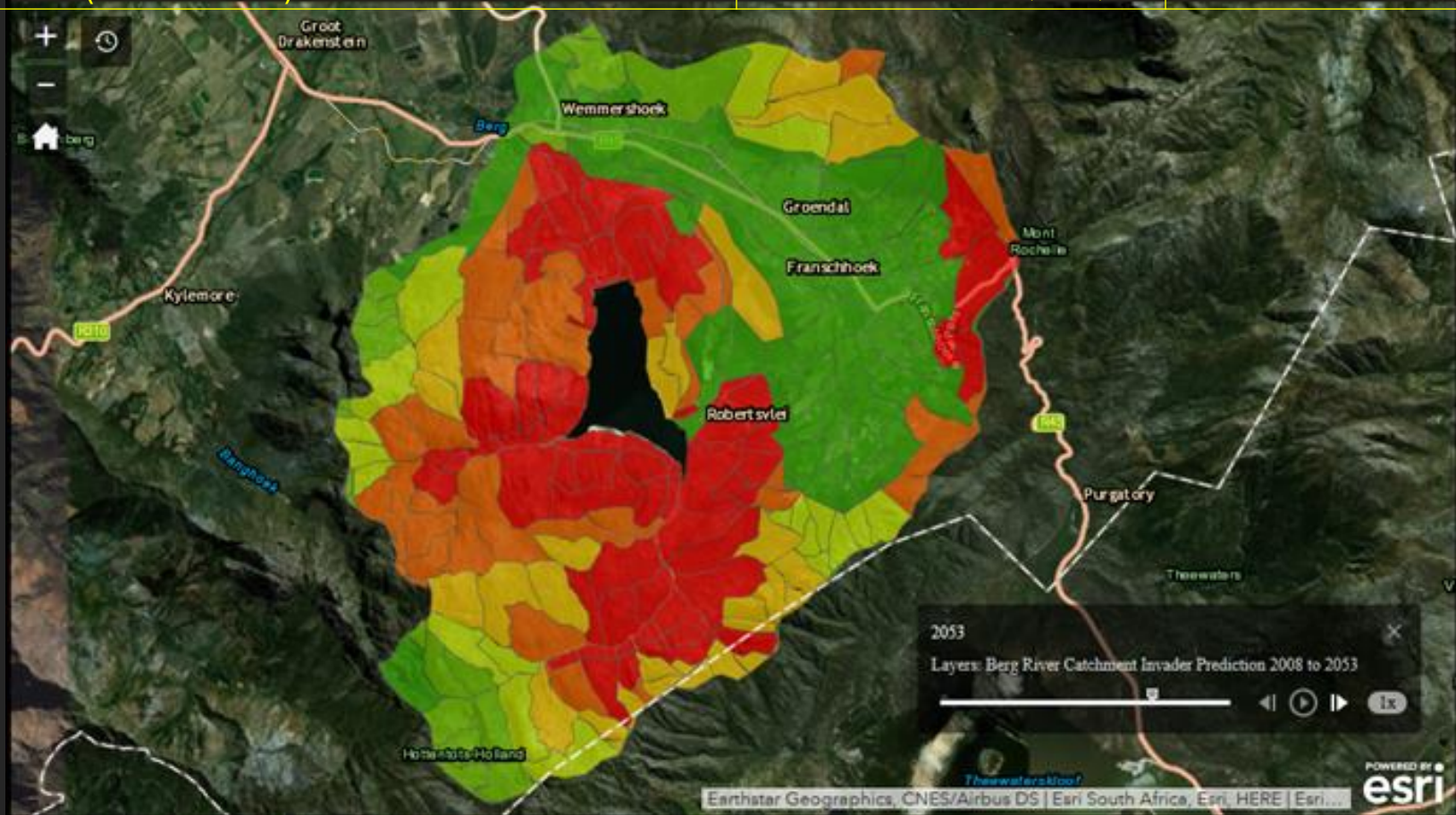


Catchment management – and particularly of invasive plants – is the critical intervention to mitigate a “Day Zero” scenario in a changing climate.



# Comparison of the Spread and Growth – 2008 vs 2053 (45 years)

Impact	2008	2053
Condensed hectares invaded	390 ha <sup>-1</sup>	12,279 ha <sup>-1</sup>
Percentage catchment (non-transformed) invaded	2.73%	90.49%
Cubic meters loss in Mean Annual Runoff	1,899,427 m <sup>3</sup>	63,013,989 m <sup>3</sup>
Percentage loss of MAR	1.39%	46.16%
Cost to clear (2008 Rands)	R4,129,207	R136,987,546





**Table Mountain fire  
in January 2000.**

**80 structures were  
destroyed. Every  
burned house was  
surrounded by  
invasive plants.**







Four WfW workers died in this vehicle when trying to outrun a wild fire in the Craggs area, in 1999. Nine workers jumped out of the vehicle, and lay in a stream. However, because of the invasions there was little water in the stream, and all suffered major injuries (particularly respiratory problem/singeing of lungs).





## **In South Africa, invasive species are:**

- The single biggest risk to our long-term water security.
- The single biggest risk in terms of catastrophic wild fires.
- The single biggest risk to our biological diversity (the third highest in the world).
- Plus many other impacts: erosion, siltation, sedimentation, disease, water quality, flooding, eutrophication, destruction of wetlands, the ecological functioning of natural systems, productive use of land and water, jobs, and the economy.



# THE *WORKING FOR WATER* PROGRAMME



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**EXPANDED PUBLIC WORKS PROGRAMME**  
CONTRIBUTING TO A NATION AT WORK

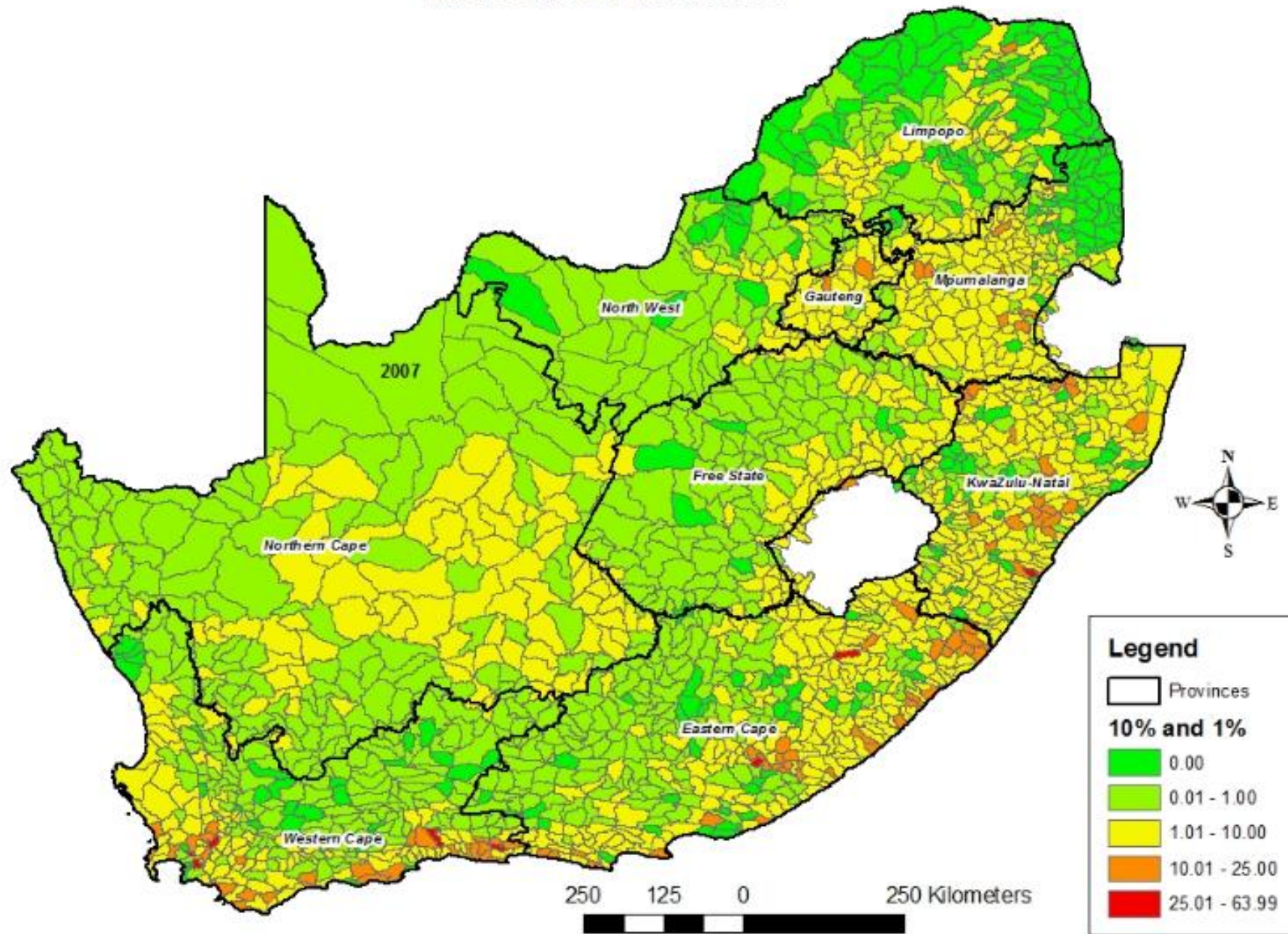
Notwithstanding the compelling reasons to control invasives, the genesis of the Working for Water programme was the employment opportunities that it offered, directly after democracy in 1995, when the new Government was struggling to come up with initiatives that would provide opportunities for those living in poverty; those who had never had employment; the marginalised.

- “Working for Water” – so named to convey the dual focus of addressing invasives (with their impact on water) and employment – was the first really successful initiative of the Reconstruction and Development Programme, which gave us a grant of R25 million in 1995.
- The focus was to provide opportunities for the most marginalised (e.g. 65% youth, 60% women, 2% people with disabilities).
- The WfW model was used as the framework for 14 programmes in my Branch (e.g. Working on Fire, Working for Wetlands), and indeed the entire Expanded Public Works Programme.
- The programmes grew to an annual budget of almost R4 billion by the time I retired in June 2020, and were providing work for ~75,000 people.
- There have been arguments that this labour-intensive focus has detracted from the efficacy of the work. It has, to a degree. But it is also still what cements the funding. Where is the funding for climate change, or soil erosion, or habitat destruction, or ...



# The estimated extent of woody invasives in South Africa in 2007.

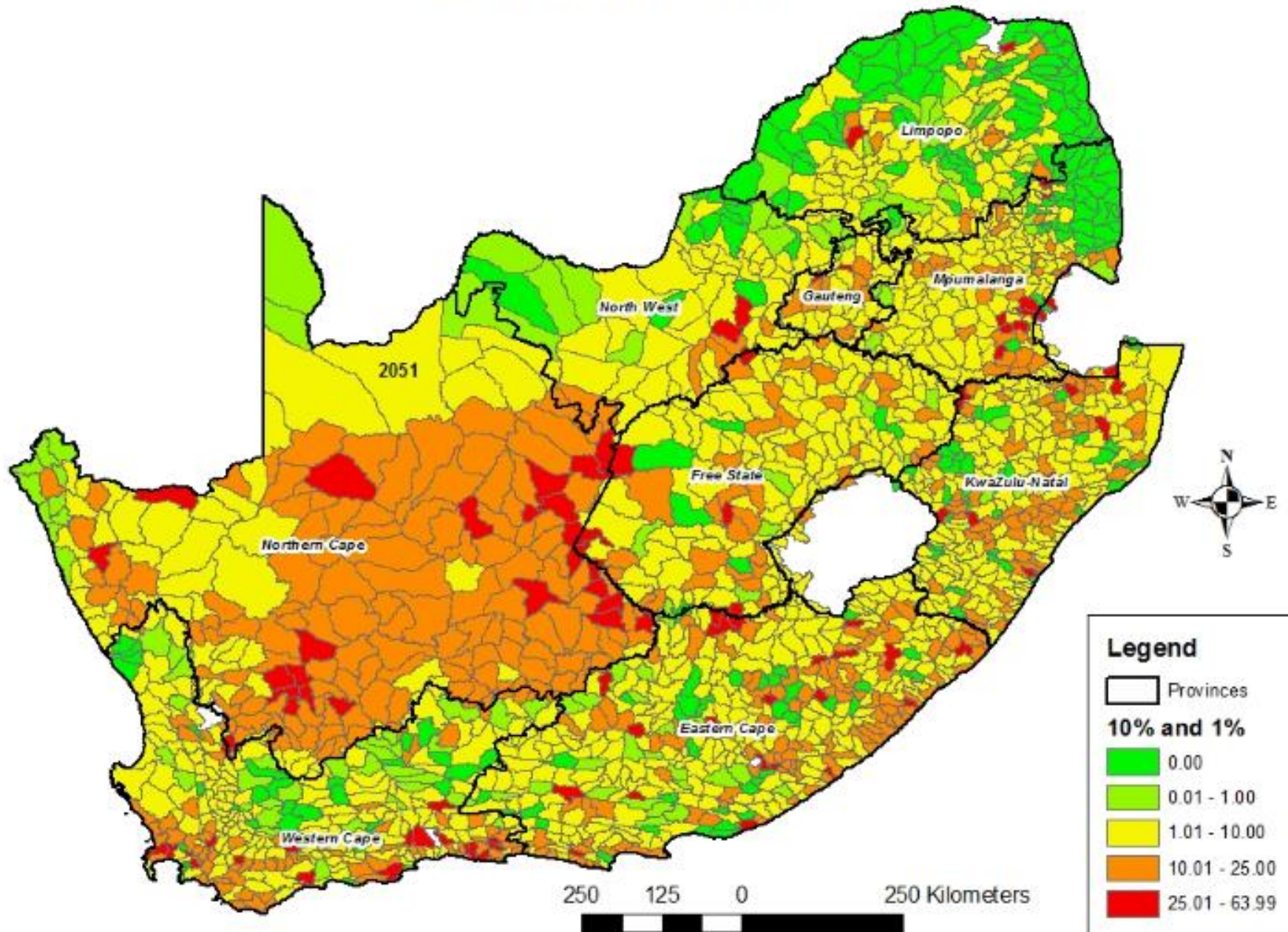
Time: 2007/01/01 12:00:00 AM





# The estimated expansion of invasives in South Africa in 2051, over 44 years.

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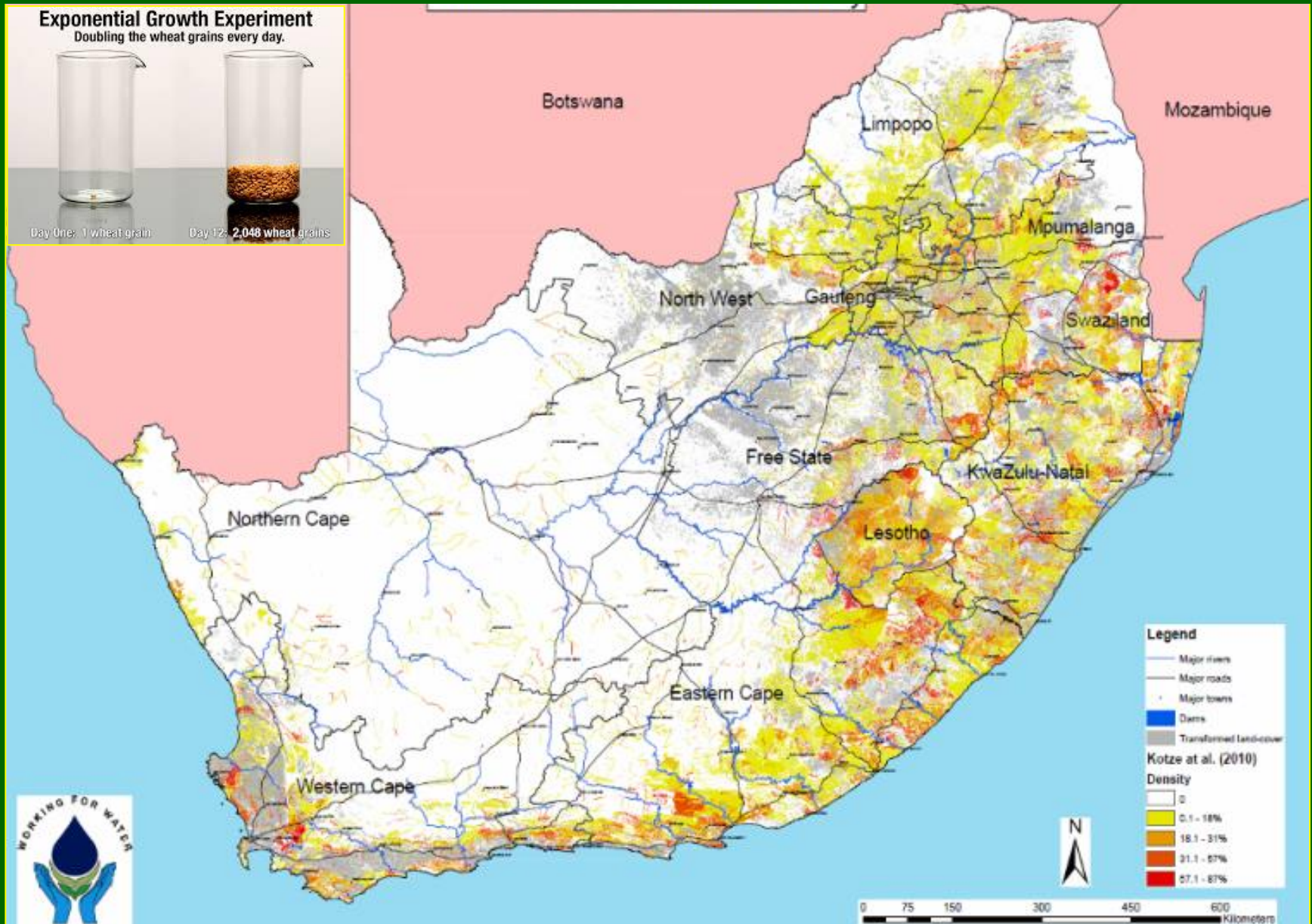








Invasives were estimated to have covered over 20 million hectares of land in 2008 (Kotzé, *et al*, 2008). It is estimated that, on average, they spread and grow at 10% per annum (i.e. doubling in just 7 years). We are thus still in an early phase of the invasion of our land and water – plus facing all the new invasives.





# The Impact of the Clearing of Invasive Alien Plants on the Value of Water, Grazing and Biodiversity

- “Our study showed that reductions in surface water runoff due to current invasions exceeded 3,000 million m<sup>3</sup> (about 7% of the national total).”
- “[T]he potential reductions would be more than eight times greater if invasive alien plants are allowed to spread and occupy the full extent of their potential range.”
- “Although an estimated R6.5 billion was lost every year due to invading alien plants, this would have been an estimated additional R41.7 billion had no control been carried out. This indicates a saving of R35.2 billion every year.”
- “The net present value of all control operations up to the end of 2011 would be in the order of R453 billion.” [“About R400 billion of that relates to water quantity.”]

Dr Brian van Wilgen and Dr Willem de Lange (CSIR) <sup>1, 2</sup>

1. *The costs and benefits of biological control of invasive alien plants in South Africa* (B.W. van Wilgen & W.J. De Lange). African Entomology (2010).
2. *An economic assessment of the contribution of biological control to the management of invasive alien plants and to the protection of ecosystem services in South Africa* (Willem J. de Lange & Brian W. van Wilgen). Biological Invasions (2010).

In the early years, we were  
sometimes wittily referred to as  
*the Walking on Water Programme*,  
such was our perceived success.

But behind every  
successful programme

...







... is a champion



# Professor Kader Asmal

Minister of Water Affairs & Forestry

- No gloves;
  - no goggles;
  - no helmet;
  - no boots;
  - fancy pants;
  - great t-shirt;
  - bad stance;
  - cutting too high;
  - & he took eight swipes to fell the black wattle, but ...
- what a Champion!





# So What Can Be Done



# Key Interventions in an Integrated Programme

*Integration of Advocacy, Incentives, Disincentives and Research*

*Driven by integrity, honesty, courage, curiosity and pragmatism*

- a. Research.
- b. Planning and prioritisation.
- c. Advocacy.
- d. Legislation (and then enforcement critical).
- e. Prevention.
- f. Partnerships. (Inter-Agency, NGOs, Private Sector, Public, Traditional Leaders, Animal Rights, ...)  
(Land-user incentives, and contracts. Policy of work on private land. Tendering and measurement.)
- g. Early detection and rapid response of emerging species.
- h. Biological control.
- i. Use of fire.
- j. Mechanical control.
- k. Physical control.  
(Contracting, task-based, light infestations, source of invasions, training, branding, health & safety.)
- l. High-altitude clearing.
- m. Follow-up.
- n. Monitoring and evaluation.
- o. Value-added industries (coffins, desks, furniture, pads, wood-plastic, Biomass Insulated Concrete).



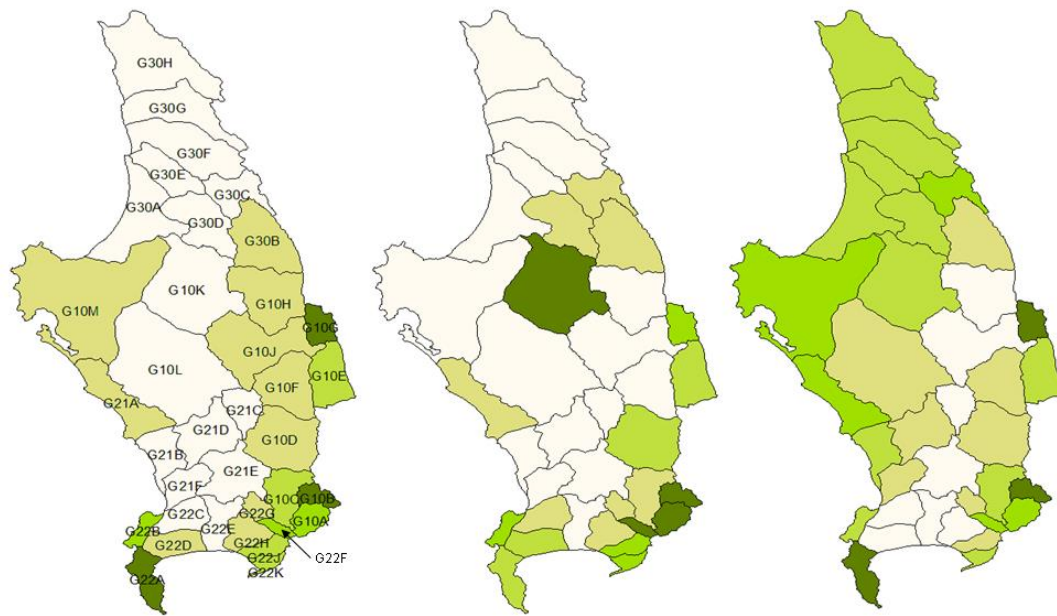
# 1. Planning and Prioritization

Planning and prioritization are key to a successful strategy for the control of invasive alien species.

It is expensive, and can quickly date as invasives spread and grow. Drones are offering scope for enhanced and cost-effective planning information (as well as for monitoring and evaluation).

Consider what is driving the invasion (e.g. wind, water) in planning. Start with light infestations, to reduce seed load.

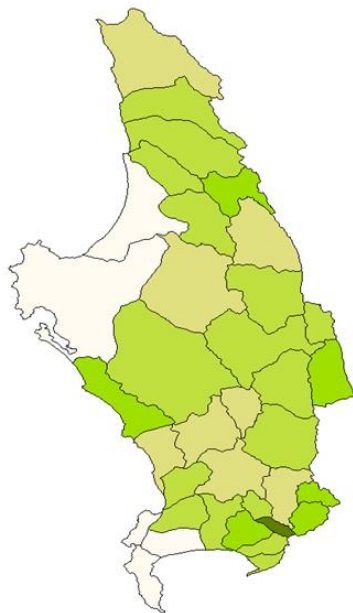
Ensure that there are not pockets of land that are excluded (e.g. when working across private land).



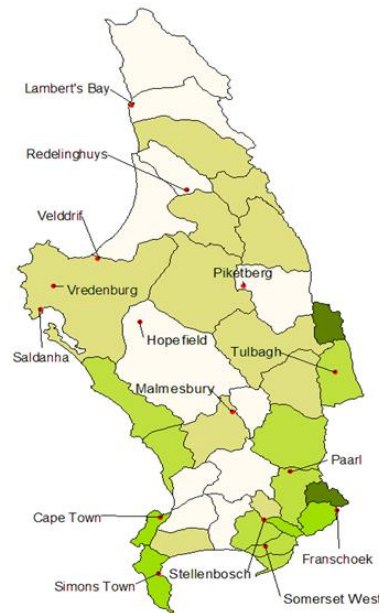
Maintain the gains

Protect water resources

Potential for spread



Protect biodiversity



Combined

## 2. Research

Key to any successful programme is research. Much of it needs to be applied, and there has to be alignment between research and management, so that options are pragmatic, and that they are then implemented.

The scope for research is wide, including for biological control options, and the WfW programme had the second-highest budget for environmental research in the country.

A particular concern is the appropriateness of herbicide and pesticide options, as well as the alternatives to herbicides. There is often scope for non-toxic options – e.g. suppression of seedlings; cutting Port Jackson willows below the first nodule; brashing coppice of gums, and of course biological control.





### 3. Bio-security

Bio-security – the prevention of the introduction of invasive alien species – has not been given the absolute priority it demands.

It makes little sense to spend billions of Rands on trying to control invasive alien species already in the country, and then to not to invest appropriately in preventing new invasives from entering into the country.

A close working relationship with the different agencies is essential if this is to be effective. So, too, is a strong advocacy programme.



## 4. Biological Control

Biological Control has been a very successful component of the integrated control of invasive alien plants.

It is, however, under-funded, under-utilized and under-capacitated.

We need to grow the funding and the capacity for biological control.

This is also essential to combat threats of invasive alien plants in neighbouring countries.

Mass-rearing of agents (including through schools and NGOs) and their distribution will enhance the work, as will regular monitoring.





## 5. Early Detection and Rapid Response

Investment in the early detection of and rapid response to emerging invasive alien species is a pivotal consideration.

Norms and standards can be a challenge, as can be registration of appropriate herbicides or pesticides.



# USA: FY06 General Category Results

## Funding by General Category for all agencies (\$ in thousands)

General Category	FY 2002 Actual	FY 2003 Actual	FY 2004 Actual	FY 2005 Enacted	FY 2006 President's Request	Change from FY05 to FY06
<b>Prevention</b>	<b>79,766</b>	107,747	122,930	128,237	<b>137,148</b>	<b>8,911</b>
<b>ED&amp;RR</b>	<b>98,083</b>	150,956	157,366	214,801	<b>257,024</b>	<b>42,223</b>
<b>Control</b>	<b>357,944</b>	439,450	456,436	491,381	<b>465,906</b>	<b>(25,475)</b>
Research	152,498	169,268	191,604	201,014	227,233	<b>26,219</b>
Restoration	14,258	21,615	23,405	31,501	42,235	<b>10,734</b>
Ed & Public Awareness	39,548	51,598	59,434	60,280	60,239	<b>(41)</b>
Leadership/Int. Cooperation	34,735	60,709	78,204	57,992	65,019	<b>7,027</b>
<b>TOTAL, all categories</b>	<b>776,832</b>	<b>1,001,343</b>	<b>1,089,379</b>	<b>1,185,206</b>	<b>1,254,804</b>	<b>69,598</b>



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## 6. High-altitude Clearing

High-altitude clearing, and other difficult-to-access areas, must be a targeted focus.

The costs to clear in these areas are disproportionately high, but the costs of not doing the work are disproportionately higher!

It is one of the highest returns on investment, and a specialist and nation-wide unit makes sense.

It is expensive, as specialised training and high-quality equipment are essential.

Daily wage, with supervision, rather than task-based work.



## 7. Fire and Invasives

Fire is a management tool that should be optimized in the control of invasive plants. Fire can be a primary control option for many species, as part of integrated control.

Fire-prone systems need to burn, and controlled burns in these areas are essential.

Soil types and slopes are important considerations, as is access for follow-up work.

The burning of felled biomass that is inaccessible and will not be used for soil stabilization is a further important consideration.



## 8. Species versus Areas

An aspect of the planning and prioritization that is difficult is balancing the focus on areas and a focus on individual species.

Part of this difficulty is the need to take land-owners with you, and their own priorities for land-use practices.

Major transformer species should be prioritised, even when established.

Understanding and planning for secondary invasions is important.



Charles T. Bryson, USDA Agricultural Research Service







## 9. Rehabilitation

One of the criticisms of the WfW programme is a perceived lack of focus on the rehabilitation of cleared land.

There are obvious areas where this may have to be done (e.g. river banks, steep slopes). Sometimes there is pressure to do cosmetic rehabilitation.

It may be that the benefits of spending scarce budget on preventing further invasions are greater than general rehabilitation work, and that intact seed banks and land-owner responsibilities can suffice in many areas, but this needs to be assessed on a case-by-case basis.





## 10. Compliance and Enforcement

A successful programme needs a strong focus on enforcement. Otherwise you will be fighting with your hands behind your backs.

Ensure that you get the laws that are needed, and the capacity and will to enforce the legislation.

Land-owners and others (e.g. nursery owners, the pet-trade) must be accountable; follow-up work must be enforced; those bringing species into the country must be held accountable.





## 11. Fundamentalism

This can be a problem. Almost all invasive alien species in the country are here to stay. It is about their long-term control (i.e. over centuries). You have to take people with you, with advocacy and communication.

An example in South Africa was the listing of jacaranda as invasive species. They line many streets in Tshwane (Pretoria) and other urban areas, and are popular garden trees.

A compromise was to treat these urban areas as plantations, and allow the species to be grown (but not in riparian areas), whilst controlling it outside of the areas.



## 12. Follow-up control – and Monitoring & Evaluation

Invasives invade. Follow-up control is essential, or efforts can result in fruitless and wasteful expenditure – as well as antagonizing those whose long-term partnership is essential.

The mechanisms must be put in place to ensure the capacity and commitment to follow up. What constitutes adequate follow-up is difficult. The seed banks will always be a long-term factor.

Investment in monitoring and evaluation is essential, of course. Recently drones have helped greatly in the case of plants.





### 13. Ecosystem Services

There is significant capacity to get payments for ecosystem services. An example in South Africa is the Berg River dam. The returns on investment from keeping the catchments clear are higher than the augmentation of new dams.

Linked to this must be the enforcement of responsibilities of land-owners, to avoid this sort of irresponsible land-use practices.

[The Catskill watershed that supplies clean water to New York is an international example of successful employment of ecosystem services. See <https://cwconline.org/>.]





## 14. Biomass to Energy

A somewhat controversial aspect is the utilization of invasive alien plant (an bush-encroachment) biomass for value-added industries. There are those who feel that this adds value to the invasives, and then perpetuates their invasiveness.

The costs are not competitive against wind and solar, however, even for offsetting up to 10% of coal as feedstock in coal-fired power stations.





## 15. Employment Opportunities

Selection: Opportunities for the marginalized (gender, people with disabilities, age, etc). One per household. Representation. Take care if bringing people into an area (ok for EDRR, but not general clearing).

Task-based work. Paid for what is done. Measurement must be in terms of outcome. Capacitating contractors to buy vehicles and equipment (better looked after). Provide advances, with controls.

Training essential, and should be ongoing, including broader life training (e.g. substance abuse, sexual and reproductive health, gender violence, financial management).







(For all the training,  
mistakes will happen.  
Be pragmatic, but not  
too often!)

## 16. Staff Selection

When selecting staff, as in life, finding the right match is not always easy ...

One of the most important factors is to find those who are passionate, curious, with integrity and a high emotional intelligence, especially when they must deal with stakeholders. Technical skills are also important, of course, but those can sometimes be developed timeously.

There are usually “horses for courses”. Try to let the mules run with the other mules.

Some bad choices are inevitable, and drain leaderships' focus.







## 17. Choose your partners

Due-diligence on your partners is always important. Sometimes it is better to reject offers of assistance, if the association is likely to be negative.

## 18. Pragmatism

Sometimes the impossible is possible.

Sometimes the workload is simply too high.

Many an individual project fails, or is sub-optimal, as a result of trying to do more than is possible with the resources at your disposal.







## 19. Propaganda War

Don't lose the propaganda war!

Being labelled as “Tree Taliban” – or worse – comes with the territory.

We are conservationists, and as much “tree huggers” as those who may criticize us. Just the right trees in the right places.



The spectre of corruption – and of mindless bureaucracy.  
(In rugby, the referee would have had the discretion to award Ghana a goal.)

“The Hand of Satan”



“The Hand of God”



“The Hand of Lucifer”



“The Mind of Bozo”



# THE ALIEN AND INVASIVE SPECIES REGULATIONS, 2014

in terms of the

**NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004  
(ACT NO. 10 OF 2004)**



	<b>Taxa</b>	<b>Listed Invasive Species [s.70(1)]</b>	<b>Prohibited Alien Species [s.67(1)]</b>
List 1:	Terrestrial and Fresh-water Plants	379	238
List 2:	Marine Plants	4	2
List 3:	Mammals	41	18
List 4:	Birds	24	20
List 5:	Reptiles	35	10
List 6:	Amphibians	7	9
List 7:	Fresh-water Fishes	15	110
List 8:	Marine Fishes	0	1
List 9:	Terrestrial Invertebrates	23	131
List 10:	Fresh-water Invertebrates	8	8
List 11:	Marine Invertebrates	16	7
List 12:	Microbial Species	7	7
<b>Total:</b>	<b>Species/Groups of species</b>	<b>559</b>	<b>561</b>



# Categories of Listed Invasive Species

## **Category 1a Listed Invasive Species**

- Take immediate steps to combat or eradicate listed invasive species.

## **Category 1b Listed Invasive Species**

- Control the listed invasive species.
- Comply with any Invasive Species Management Programme.

## **Category 2 Listed Invasive Species**

- Require a Permit to carry out a restricted activity within specified area.
- Must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or Permit.
- Specimens that occur outside the Permitted area or conditions are then Category 1b species.

## **Category 3 Listed Invasive Species**

- Subject to exemptions and prohibitions, as specified in the Notice.
- Any Category 3 plant specimen in riparian areas is to be a Category 1b species.
- Comply with any Invasive Species Management Programme.

## **Some of the laws that we proposed, but are yet to be enforced.**

1. Land-users are responsible for the control of invasive plants on their land, and non-compliance can lead to (a) a fine; (b) the state doing the work at the land-owners' costs and risks, or (c) expropriating the land.
2. Those with invasions on land greater than 10 hectares can get support to clear the land, but must sign land-owner contracts to keep it clear (and failure will lead to the state clearing the land at the land-owners' expense).
3. Those utilizing invasive species require a permit, and are accountable for propagule pollution; further, the onus of proof for the origin of species that are invading lies with them.
4. Associations (e.g. game, forestry, nursery, fisheries) may have self-administration rights for the transfer & transport of Category 2 invasive species, but will be held accountable.
5. Those wishing to transfer land may have to have an invasive certificate, similar to a beetle certificate or an electricity certificate, before being allowed to transfer.
6. Those wishing to export live specimens must have a permit from the receiving country, accepting the import into their country.
7. Those wanting to import alien species into the country must take out insurance to cover their control, should they become invasive.



Conflict species like the mallard duck, the Himalayan tahr and the rose-ringed parakeet, although beautiful, do need to be controlled.









# Fight to save trout industry

## Groups oppose fish extermination

STEPHEN COAN

THE trout industry is fighting back against a state move to exterminate the fresh water fish, which they say will destroy a R1,4 billion industry.

"The Department of Environment and Agriculture is trying to destroy the trout industry by making trout an invasive species," charged Gerrie van der Merwe, acting chairperson of TroutSA, speaking in Nottingham Road yesterday.

In February the DEA, using the Na-

tional Environmental Management: Biodiversity Act, named 532 species they propose listing as invasive aliens. One of them was trout.

The intention is to declare trout as invasive in all nature reserves, all mountain catchment reserves and all so-called fish sanctuary areas. This means they have to be eradicated.

Maps of affected areas recently released by the department include most of the trout fishing locations in KwaZulu-Natal, from the northern to the southern Drakensberg, thus impacting on trout fishing operations based around Not-

tingham Road and Underberg.

TroutSA was formed in December to respond to this threat and has combined with the Federation of South African Fly Fishers (Rosaal) to present a number of "road shows" highlighting the issue in trout fishing areas around South Africa and to garner support for the legal battles that might lie ahead.

Yesterday they made a presentation at the Nottingham Road Hotel. Those attending included hatchery owners, tackle dealers, farmers and fisher folk.

Pietermaritzburg lawyer Ian Lax, Rosaal's national chairperson, together with Durban-based lawyer Ian Cox, a member of the governing committee of TroutSA, have submitted a 68-page document to DEA commenting on the proposed Alien and Invasive Species List and Regulations on behalf of TroutSA and Rosaal.

The heart of their submission tackles the department on the legality of the laws they intend promulgating, while also taking issue as to whether trout are invasive or not.

Van der Merwe said trout have been in South Africa for 125 years and in the past the DEA and conservation bodies such as Esensvelo KZN Wildlife were active in the intro-

duction, breeding and conservation of the species.

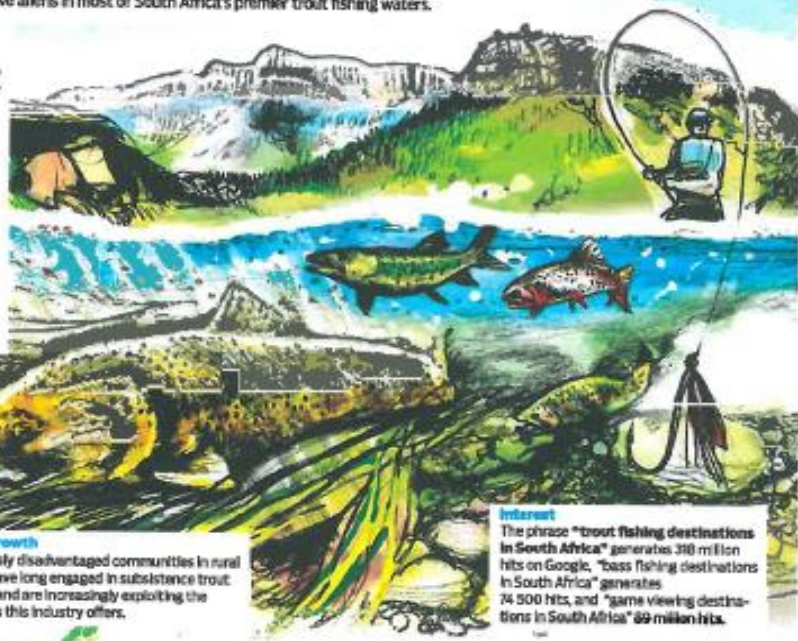
"Now the department plans to eradicate trout," said Van der Merwe. "This hinges on whether trout are considered invasive or not."

Van der Merwe said there are around 40 trout hatcheries in South Africa and

# How trout add value to South Africa

The Department of Environment and Agriculture via the National Environmental Management: Biodiversity Act intends to declare trout invasive aliens in most of South Africa's premier trout fishing waters.

**More than fishing**  
The trout fishing industry is estimated to be worth over R1,4 billion. Trout is much more than just recreational fishing. There are two principal drivers to this industry: the trout farming and trout processing industries, including the research and development components at Rhodes University and the University of Stellenbosch. Add to this tackle manufacturers, dealers and shops; trout fishing destinations and developments that exist either in whole or in part because many South Africans and foreign trout tourists fish here.



**Rural growth**  
Previously disadvantaged communities in rural areas have long engaged in subsistence trout fishing and are increasingly exploiting the benefits this industry offers.

**Fishing getaways**

The trout fishing industry in South Africa covers everything from day ticket fishing on public, communal and private waters, offering a massive variety of trout fishing getaways, ranging from camping and farm stayaways to luxury lodges that cost tens of thousands of rand a night. Tackle dealers estimate that approximately 100 000 fly rods are sold a year in South Africa.

**Interest**

The phrase "trout fishing destinations in South Africa" generates 310 million hits on Google. "bass fishing destinations in South Africa" generates 74 500 hits, and "game viewing destinations in South Africa" 89 million hits.

**Preferred choice**

There are 1,2 million fly anglers in South Africa who fly fish at least once a year, mostly for trout.



HARJEEMALAN, STEPHEN COAN AND ANDRÉ GOUWS, Graphics24



Ian Cox, a member of the governing committee of TroutSA (left), Ian Lax, Federation of South African Fly Fishers' national chairperson, and Gerrie van der Merwe, acting chairperson of TroutSA, gave a presentation on the threat posed to trout by the proposed legislation on alien and invasive species tabled by the Department of Environment and Agriculture at the Nottingham Road Hotel yesterday.

PHOTO: STEPHEN COAN

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Vested-interest groups, lobbying for fly-fishing and aquaculture using brown and rainbow trout, arguing disengeniously that it is our intention to eradicate trout and destroy aquaculture.

tional Environment Management Act (Nema), the umbrella legislation for the Biodiversity Act. He said there was a failure to appreciate that South African environmental law is anthropocentric in its orientation and implementation. He said Nema took a human rights approach to the environment.

"For a species to be defined invasive, it must be a threat to humans. If you can't show a species is harmful to humans, it is not invasive."

• StephenCoan@witsness.co.za



# Invasive Alien Plants and Run-of-River Abstraction, Low-Flows and the Water Reserve



- The pictures to the right show the Jan Dissels River in Clanwilliam in the year 2000 (top) and 2013 (bottom), after clearing of the black wattles by the Working for Water programme..
- Yield from run-of-river abstraction remains central to water security in South Africa, and clearing invasives is essential.
- Without this clearing, releases from dams to meet the environmental water reserve will be considerably higher.



# Seventy Species Under Biological Control

Water lettuce	Creeping prickly pear	Leucaena
Crofton weed	Small round-leaved prickly pear	Stink bean
Mistflower	Sweet prickly pear	Mesquite (Prosopis)
Pompom weed	Round-leaved tuna	Red sesbania
Triffid weed	Drooping prickly pear	Parrot's feather
Spear thistle	Bur cactus	Brazilian waterweed
Parthenium	Large round-leaved prickly pear	Hydrilla
Mexican sunflower	Australian pest pear	St John's wort
Red sunflower	Velvet opuntia	Australian myrtle
Madeira vine	Serpent cactus	Giant reed
Cat's claw creeper	Barbados gooseberry (Pereskia)	Water hyacinth
Yellow bells	Small-leaf spiderwort	Rock hakea
Long-spine cactus	Bailey's wattle	Silky hakea
Queen of the night	Rooikrans	Carolina water fern
Chain-fruit cholla	Silver wattle	Red water fern
Boxing-glove cactus	Green wattle	Giant salvinia
Imbricate prickly pear	Long-leaved wattle	Balloon vine
Pencil cactus	Black wattle	Satansbos
Strangler cactus	Australian blackwood	Bugweed
Moon cactus	Pearl acacia	Dense-thorned bitter apple
Devil's rope cactus	Golden wattle	Chinese tamarisk
Spiny snake cactus	Port Jackson willow	Lantana
Dragon fruit	Mauritius thorn	
Jointed cactus	Honey locust	

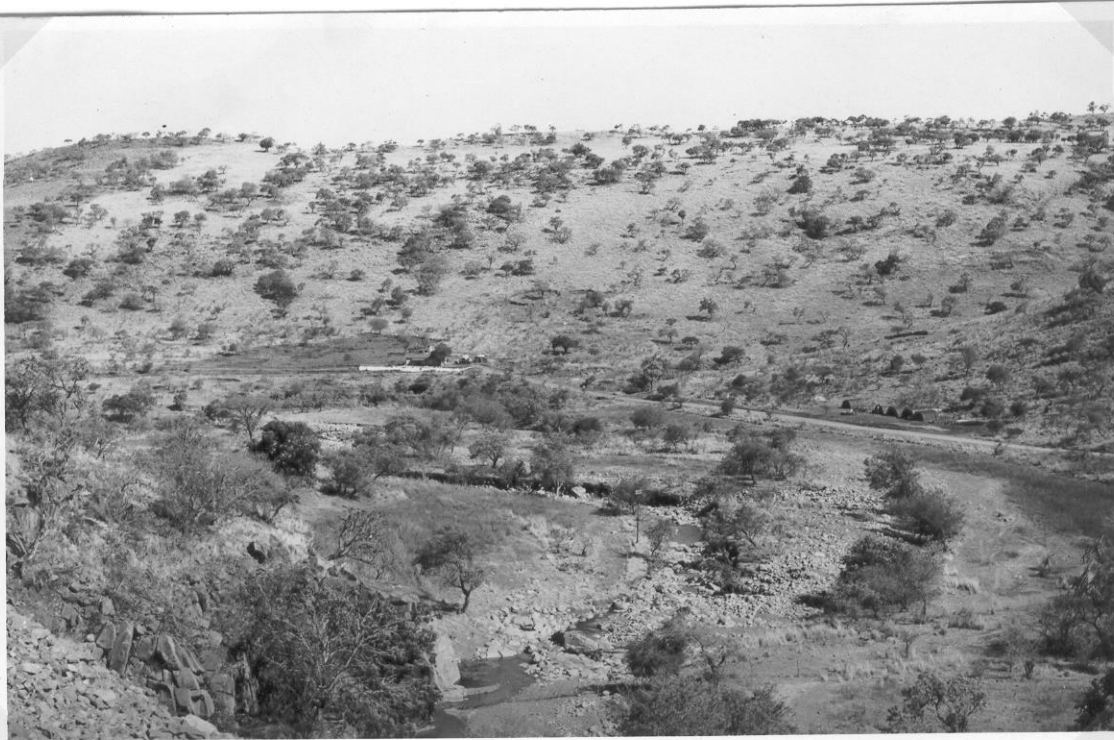
Research by Dr Barney Kgope, Professor Guy Midgley and a visibly concerned Professor William Bond (below) confirmed a potentially catastrophic link between climate change and habitat modification – and one that will be exacerbated by woody invasive alien plants.



Root and shoot growth of sweet thorn (*Acacia Karroo*) at different parts-per-million of atmospheric carbon dioxide (CO<sub>2</sub>).

This will lead to massive impacts on a productive use of land, water security, wild fires, biological diversity, and more.





From pre-industrial  
to current CO<sub>2</sub> levels?  
Trees have increased  
world-wide in savannas

Open savanna, South Africa  
1955



Same place, 1998

(from T. Hoffmann, IPC)





Encroachment by sicklebush (*Dichrostachys cinerea*)





Bush encroachment by mopane  
(*Colophospermum mopane*)







Bush encroachment by sweet thorn  
(*Acacia karroo*)





# *Value-Added Industries*



**Making useful products from invasive species  
(and ensuring that cherry-picking does not thwart efforts to control invasives)**



# Through our Eco-Furniture Programme, we have been using invasive biomass for:



Eco-coffins



High-quality furniture (desks, chairs, etc)



Eco-benches



Eco-desks



Toys & games, and crafts



Multi-purpose chess tables

Over 800,000 Learners now have quality school desks through our Eco-Furniture Programme, and many other products are being developed, to take full advantage of the potential utilization of invasive biomass.



Wood-wool erosion blankets & bio-char



A variety of options are still being looked at, such as biodegradable sanitary pads & nappies, and wood-plastic composite products.





An Emergency Hut was built on Gough Island (which can sleep ten people), with wood-plastic composite cladding, and furniture and fittings from invasive poplars.









Approximately 4,000 people lost everything in a fire that swept through Masiphumelele in Cape Town in 2015 (right).

Its happens time and again.



Rather than fighting fires (here through our Working on Fire planes and helicopters), we wanted to prevent them.



We wanted to use invasive biomass (which is a major factor in wild fires) to build fire-proof structures – and to design houses and communities that were safe, dignified and green.







The successful fire-test in Mamelodi, testing woodwool-cement board. A Light House was surrounded by 8 shacks that were then incinerated. One of the shacks was lined with our material, and fire-shutters. Both the treated shack and the Light House were unscathed. The others were burned to the ground. Temperatures reached 1,500°C. We were so confident that we had people in the house during the fire.





Invading alien plants are cleared, chipped and used to replace sand and stone in a strong, **low-cement, bio-based wood-chip cement concrete**. A patented binding agent is mixed with the woodchips (75%) and additives (including just 15% cement), to make a material stronger than conventional options.







The Agrément certification has been achieved with flying colours – a three-hour fire-rating; three-story load-bearing, and superior properties shown overleaf. It was tested over 3 years to be termite-proof (left).



BIC fares very well in comparison to clay brick, hollow concrete and poured concrete structures:

- It has superior acoustic properties.
- It has excellent thermal properties.
- It has a three-hour fire rating in the Agrément test – the best yet tested.



## Ranked comparison between Biomass Insulated Concrete Wall (130 mm panels and 200 mm in-situ walls) with other wall options, and comparisons of foundation options



The ranking of the different products was done with the best performer receiving first position and the worst performer receives maximum points.  
The product with the lowest amount of ranking points is the recommended number #1 choice.

Parameters	ROK 225mm thick with Plaster	R1	Hollow Concrete MA Block with Plaster	R2	Traditional Concrete Pour	R3	BIC Panel 130mm thick	R4	BIC In-situ 200mm thick	R5	Recycled Plastic & Fly-ash Blocks (90 mm)	R6
Basic Raw material	Clay, Aggregate, Sand, Charcoal	4	Stone Aggregate, Sand, Cement	5	Stone Aggregate, Sand, Cement	5	Biomass Chips, Cement, Fly ash, Water.	1	Biomass Chips, Cement, Fly ash, Water.	1	Waste polystyrene, Cement, Fly ash, Water.	1
Product Agrément history	tbd	1	2000	2	2011/403	3	2018/578	5	2018/578	5	2015/477	4
Production Process & setup	Clay mixer & kniers.	1	Mobile or stationary block plants	4	Stationary plant with mobile 12-ton delivery	6	Using ribbon mixer.	1	Using ribbon mixer.	1	Using traditional mixer.	4
Lead time (days)	14	6	7	3	1	1	7	3	1	1	7	3
Requiring Plaster or Paint	Plaster & Paint	4	Plaster & Paint	4	No Plaster, No Paint	1	Skim Plaster & Paint	3	No Plaster with Paint	2	Plaster & Paint	4
Dry Density (kg/m3)	1840-2400	5	1700	4	2240-2400	6	600-1400	3	500-1400	2	375-550	1
Compression Kg/cm2 (Mpa)	51-90 ( 5.1- 9.0Mpa)	3	30-70 (3.0-7.6Mpa)	5	120-140 (12-14Mpa)	1	( 5.1- 14.0MPa)3111 mix	1	58-90 (5-9.0Mpa)	3	27-58 (2.9-4.2Mpa)	5
Tensile strength kg/m2	22,5	1	21,42	6	20,91	5	22,95	1	22,95	1	tbd	4
Aging	Lose strength with age	5	Yes	5	Yes	1	Gains strength with age (Like conv concrete)	2	Lose strength with age	2	Lose strength with age	2
Usage	Heavy weight structural and non-structural applications	5	Light weight structural and non-structural applications	1	Structural applications only	6	Light weight structural and non-structural applications	1	Light weight structural and non-structural applications	1	Light weight structural and non-structural applications	1
Sound insulation	Excellent 59 STc	2	Good 38 STc	5	Good 36 STc	6	Excellent 66 STc	1	Excellent 49 STc	3	Excellent 40 STc	4
Eco-friendliness	Consumes clay material. Based on sustainable green building. Not pollution-free due to brick firing, Scope 1 emission, consumes fly-ash (and hazardous industrial material)	6	Low energy, no smoke, use stone aggregates, soil erosion, sand rehabilitation, heavy on roads and high transport costs.	4	Low energy, no smoke, use stone aggregates, soil erosion, sand rehabilitation, heavy on roads and high transport costs.	4	Invasive plants biomass (with water, fire, biodiversity & erosion benefits). Based on sustainable green building. Pollution free. No primary energy consumption. Consumes fly-ash (and hazardous industrial material).	1	Invasive plants biomass (with water, fire, biodiversity & erosion benefits). Based on sustainable green building. Pollution free. No primary energy consumption. Consumes fly-ash (and hazardous industrial material).	1	Consumes waste styrene material, as recycled material. Based on sustainable green building. Pollution in carbon footprint (EDR not available). No primary energy consumption. Consumes fly-ash (and hazardous industrial material).	3

- It is a largely straight-forward building option, requiring limited equipment.
- It is more labour-intensive than other options.
- There is virtually no waste on a building site.
- It is the “greenest” building option, including with a negative carbon footprint.
- Instead of mining for aggregate, it turns harmful biomass into a superior aggregate.

Parameters	ROK 225mm thick with Plaster	R1	Hollow Concrete MA Block with Plaster	R2	Traditional Concrete Pour	R3	BIC Panel 130mm thick	R4	BIC In-situ 200mm thick	R5	Recycled Plastic & Fly-ash Blocks (90 mm)	R6
Water saving -(m3/m2.a)	0,028	3	0,034	5	0,032	4	-5,825	2	-5,8	1	0,034	5
Thermal conductivity W.mK	0.6-1.1 (density depending)	4	1.8-2.1 (equivalent thickness and density depending)	6	1.1-1.8 (equivalent thickness and density depending)	5	0.11-0.15 (density depending)	3	0.11-0.18 (density depending)	2	tbd	1
R-value (m2K/W)	(230mm)	1	(Concrete block 6") 1.25	1	(Concrete block 6") 1.25	1	(ABC block 6.5")	1	(ABC block 6.5")	1	(1.109 @ 4")	1
R-value equivalent thickness (m2K/W)	0,30	5	0,104	2	0.8-1.1	2	1,18	2	3,55	1	1,11	2
Fire rating (min)	30-240min (Cracked after 30min)	2	60 (cracked after 20min)	6	78	5	94	2	180 (no crack after 3h)	1	60-120	2
Block size and shape	Any size, shape given by mould 2200x105x73	1	Typical size mould 140x190x390	6	Any size, shape given by mould 100mm	1	Any size, shape given by mould 140x190x390	1	Any size, shape given by mould	1	Size 1200x900x90mm, shape given by mould	5
Water absorption capacity	ROK Brick (without plaster or waterproof rendering) absorbs water at approximately 12-20%.	6	Concrete Block absorb more water than CLC brick	2	Cured Concrete Pour absorb water 2.5%	1	ABC Block (without plaster or waterproof rendering) absorbs water at approximately 0-15%.	3	ABC Block (without plaster or waterproof rendering) absorbs water at approximately 0-15%.	3	Block (without plaster or waterproof rendering) absorbs water at approximately 0-15%.	3
Labour intensity	Good	4	Fair	5	Fair	6	Excellent	1	Excellent	1	Good	3
Cost / m2 wall	R841,59	6	R464,87	2	R613,92	5	R470,00	3	R430,84	1	486.86**	4
Cost / m2 Foundation / Slab	R850,00	3	R850,00	3	R850,00	3	R665,00	1	R665,00	1	R850,00	3
<b>Total Comparison Ranking</b>	<b>86</b>	<b>4th</b>	<b>96</b>	<b>6th</b>	<b>87</b>	<b>5th</b>	<b>45</b>	<b>2nd</b>	<b>38</b>	<b>1st</b>	<b>71</b>	<b>3rd</b>

The comparison is compiled and based on test and data available from reliable sources & work studies during the R&D process.

The Engineering calculations and comparison is independently compiled for WOF by NESconsult and Associates.



# The BIC Material is also more cost-competitive and labour-intensive

1. A comparison of the costs of a BIC in-situ house and a masonry house is shown below.
2. These are the financial costs. The economic costs are orders of magnitude better. And they matter.
3. The numbers of jobs are also impressively better using the BIC material.

Numbers of person days required for the construction of a Masonry House compared to a BIC In-situ Light House								
Floor Area (m <sup>2</sup> )	STRUCTURE AND FINISHES			NUMBER OF PERSON HOURS (hours)		Person days / house		
				Materials	Site Labour		Total	Person hours Total/m <sup>2</sup>
51 m <sup>2</sup>	MASONRY HOUSE (Reference 1)			160	1400	1560	30.59	195
	Internal water and sanitary fittings							
	Internal electrical reticulation							
	Double-pitched sheeted roof							
	Ceilings							
	Plastered and painted internal & external.							
43 m <sup>2</sup>	BIOMASS INSULATED CONCRETE IN-SITU LIGHT HOUSE (Reference 2)			529	1530	2059	47.89	257
	Internal water and sanitary fittings							
	Internal electrical reticulation							
	Flat roof slab with vertical extension option							
	Down lighters and skimmed ceilings							
	Painted internal & external							
	Note that this is 84% of the size of the Masonry House. If projected to the same size, the BIC may have 42% more person days (not 32%).							
Average Cost per square metre of wall and floors for various materials								
Material	ROK 225mm thick with plaster	Hollow concrete block with plaster	Traditional concrete	BIC Panel 130mm thick	BIC In-situ 200mm thick	Recycled plastic & fly-ash blocks		
Walls (Cost per m <sup>2</sup> )	R841.59	R464.87	R613.92	R470.00	R430.84	R486.86		
Floors (Cost per m <sup>2</sup> )	R850.00	R850.00	R850.00	R665.00	R665.00	R850.00		



Agrément  
certification

Carbon-  
negative

Three-hour  
fire-rating

Three-story  
load-bearing

Termite  
-proof

Bullet-  
proof

Lower  
cost

Superior  
thermal  
properties

Superior  
acoustic  
properties

Exceptional  
longevity

Labour-intensive

Faster,  
easier  
construction

And the benefits of using invasives for:  
Water ... Fire ... Biodiversity ... Erosion  
... Recreation ... Productive use of Land







The death toll has risen to 35, making it the deadliest week of wildfires in California's history



George Rose | Getty Images

A firestorm that began in Napa Valley's Calistoga destroys more than 1,000 homes and businesses in just the northwestern Coffey Park neighborhood as viewed in this aerial photo taken on October 12, 2017, in Santa Rosa, California. State officials are calling the Tubbs Fire the most destructive wildfire in history.

The number of structures destroyed by the 245,000-acre Northern California wildfires climbed to 8,400 and authorities warned Monday the total could continue to go up as crews assess damage in scorched areas.

The devastating wild fires in California, Portugal, Greece, Australia and elsewhere, have been fuelled by gums, pines and other species that are “born to burn”. We have a solution to their problem – using their fire-prone trees.

## Portugal's alien-fuelled fires of June 2017

News > World

### Portugal Forest fire: Death toll rises to 72



## Reeling from its deadliest forest fire, Portugal finds a villain: eucalyptus trees





## It's not just about *Prosopis* species!

Although (if left to invade) they will become considerably worse than they already are, with unaffordable impacts on groundwater, biodiversity and the productive use of land.

Namibia has been less at risk of invasions, historically, than major hubs of trade, tourism, transport and travel. But that is changing, and the risks of new invasive species must be confronted now. Too often we only react when it is almost too late.

Climate change will exacerbate the problems of invasive species.

Their control offers enormous scope for employment that adds real value.



# THANK YOU

**Leslie Henderson's book on South African invasives:**

[https://wwfafrica.awsassets.panda.org/downloads/invasive\\_alien\\_plants\\_in\\_south\\_africa.pdf](https://wwfafrica.awsassets.panda.org/downloads/invasive_alien_plants_in_south_africa.pdf)

**List of species being attacked by the Polyphagous shot-hole borer:**

[https://www.fabinet.up.ac.za/images/PSHB/PSHB\\_host\\_list\\_v6\\_20230417.pdf](https://www.fabinet.up.ac.za/images/PSHB/PSHB_host_list_v6_20230417.pdf)

**Alan Woods' book on biological control of hakea species:**

<https://www.arc.agric.za/arc-ppri/weeds/Pages/Silky-hakea.aspx>

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**GPreston@mweb.co.za**



# A Strategy Against Invasive Alien Species

1. **Research.** (IAS & Environment, Agriculture, Human Health ... Tourism, Transport, ...)
2. **Planning and Prioritization.** (Plants, Animals, Microbes.)
3. **Advocacy, Education and Communication.**
4. **Regulation** (Progressive, Fair and Balanced Laws, Compliance and Enforcement).
5. **Incentives and Disincentives.**
6. **Co-operative Governance and a Public-Private-Community Partnership.**
7. **Prevention** (Bio-security, including Risk Assessment and Management).
8. **Early Detection of and Rapid Response** against Emerging Invasive Alien Species.
9. **Control** (Labour, Chemical, Fire, Mechanical, Bio-Control, Suppression) **& Restoration.**
10. **Monitoring and Evaluation**, for systematic interventions to secure outcomes.



**environmental affairs**

Department:  
Environmental Affairs  
REPUBLIC OF SOUTH AFRICA



**EXPANDED PUBLIC WORKS PROGRAMME**