



Clearing Invasive Weeds



A Share-Net Resource Book

Reading-to-learn curriculum materials to support
Technology, Natural Sciences and Language learning areas



Acknowledgments

The Handprint resource books have been compiled by Rob O'Donoghue and Helen Fox of the Rhodes University Environmental Education and Sustainability Unit. Lawrence Sisitka was responsible for coordination and review, and Kim Ward for editorial review and production for curriculum and Eco-School use. Development funding was provided by CAPE. Cover illustrations are by Tammy Griffin.

Knowledge and activity support materials have been adapted from various sources including the Internet, and web addresses have been provided for readers to access any copyright materials directly.

For this particular resource book, thank you to Clare Peddie, from Share-Net, for always being willing to help and for a useful electronic resource on invasive weeds.



Available from Share-Net
P O Box 394, Howick, 3290, South Africa
Tel (033) 3303931
sharenet@wessa.co.za

January 2009
ISBN 978-1-919991-03-0

Any part of this resource book may be reproduced copyright free, provided that if the materials are produced in booklet or published form, there is acknowledgment of Share-Net.

CEE

Centre for Environment Education



ACKNOWLEDGED BY



UNITED NATIONS
UNIVERSITY





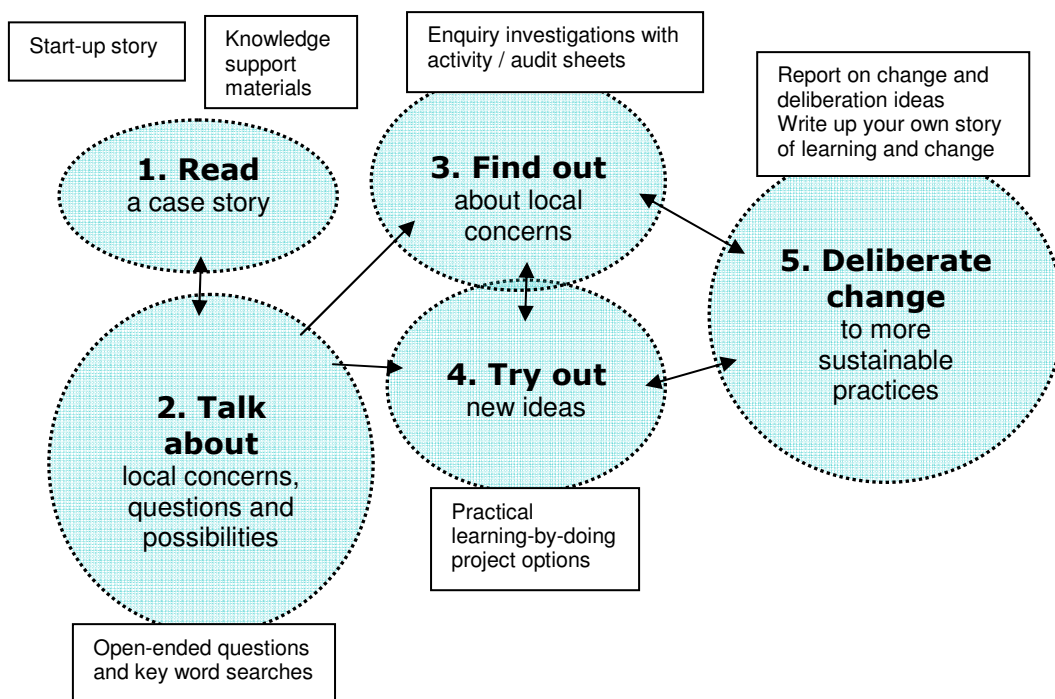
RESOURCE BOOKS

The **Handprint Resource Books** have been designed for creative educators who are looking for practical ideas to work with in the learning areas of the National Curriculum. The focus is on **sustainability practices** that can be taken up **within the perspective that each learning area** brings to environment and sustainability concerns.

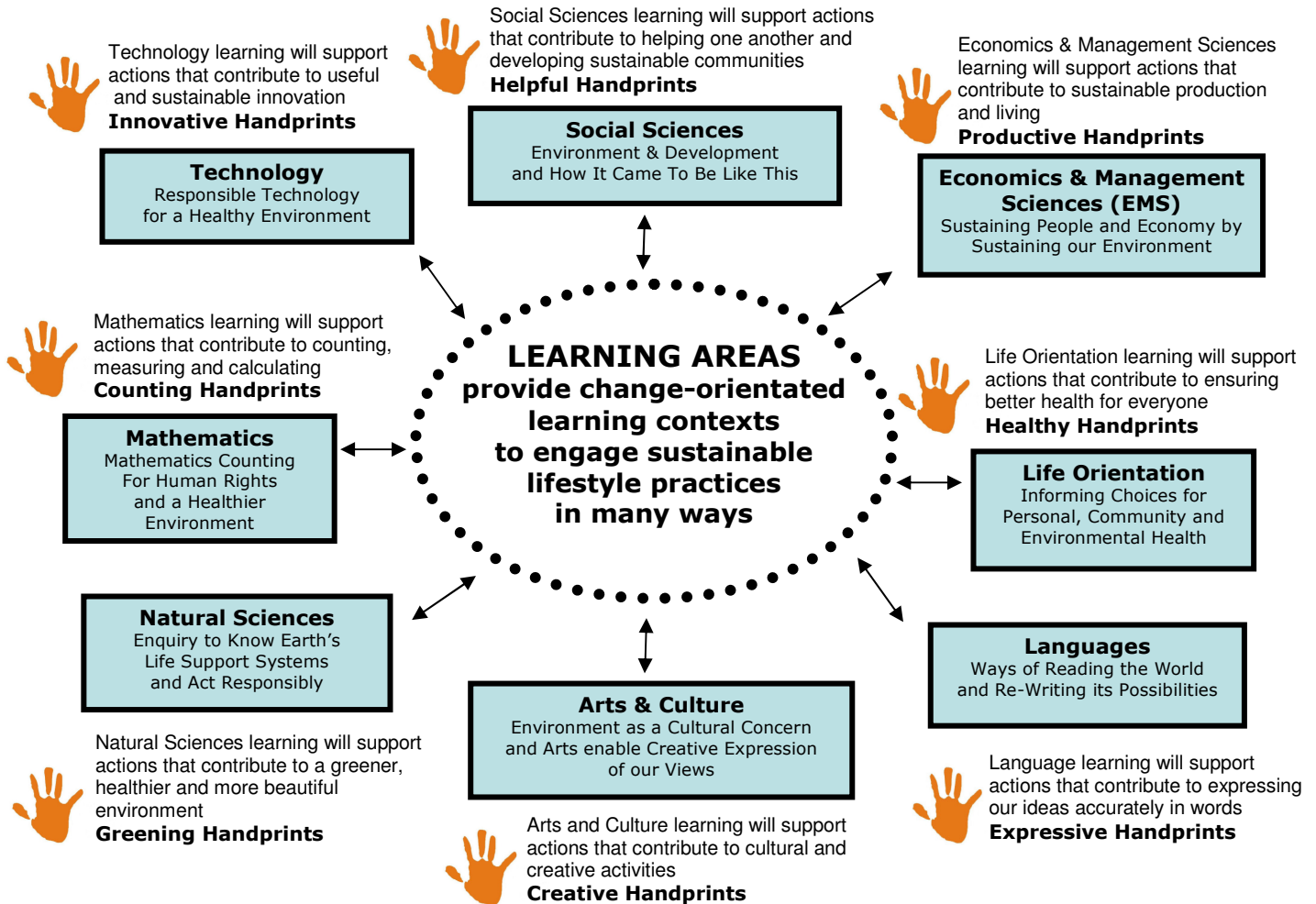
The resource books are intended to provide teachers with authentic start-up materials for change-orientated learning. The aim is to work towards re-imagining more sustainable livelihood practices in a warming world. Each start-up story was developed as a **reading-to-learn** account of environmental learning and change. Included are copies of the knowledge resources that informed those involved in the actual learning experiences described here. Working with local cases of learning and change has allowed us to develop the resource books around **locally relevant knowledge resources** and **practical learning activities** that relate to our African context. We are grateful to teachers and Eco-School support groups who have willingly shared their learning experiences and activities.

The **Handprint Resource Books** are an attempt to work from authentic cases of environmental learning and change. They combine some of the best teaching and learning tools that are being used to support change-orientated learning in the everyday realities of our South African schools. The resource books include:

1. **Start-up stories** with **knowledge support materials** (*Reading for information to build up a picture*)
2. Questions to **talk** about (*Talking to clarify issues and to plan local enquiry*)
3. Tools to **find out** about local concerns (*Writing about and reporting on local issues*)
4. Things to **try out** (*Writing up and reporting on what has been tried out*)
5. Ideas to **deliberate** (*Discussing, weighing up and recording decisions that will allow us to 're-imagine and re-write' our sustainability practices in a warming world*).



Change-orientated learning & the curriculum



The activities in this book can be used to support learning in the **Natural Sciences**, **Technology** and **Language** learning areas, and can contribute to the development of **Greening**, **Innovative** and **Expressive Handprints**.

Teachers should consult the learning outcomes and assessment standards and should adapt the activities to suit their grade requirements.

CONTENTS



Starting points

1. Reading to Learn	1
School story: Clearing Invasive Weeds	
2. Comprehension Questions	3
to guide local learning	
3. Discussion Points.....	3
to start local enquiry and action	
4. Finding Out Activities	4
5. Trying Out Activities	4
6. Deliberation Ideas	4
to think carefully about and debate	



Ideas and Tools for Local Learning

Knowledge & Activity Support Materials (SM)

SM 1. Water Loss! An Economic, Environmental and Social Example of the Consequence of Invasive Alien Plants.....	5
SM 2. Working for Water Campaign	6
SM 3. Challenges of Invasive Alien Plants in SA.....	7
SM 4. Eradication Strategies for Invasive Weeds	8
SM 5. Black Wattle	10
SM 6. Recording Sheet.....	11



Clearing Invasive Weeds

Key words

Diversity

Habitat

Invasive

Reproductive

Research



During this last week we have been learning about water in our natural science class.

The thing that was stressed was how

precious water is. South Africa is a water scarce country so we must look after this resource carefully. Our teacher explained that particular invasive weeds are one of the biggest threats to our water and that we were going to be learning about these for the next couple of days. Our homework was to find out about the impact of invasive weeds on our water supply. I found something on the Internet that gave examples of the increased water use by invasive weeds, particularly in KwaZulu-Natal and the Western Cape (**SM 1**). I was surprised that invasive alien plants use as much as 15%, or 116mm per year, of the Western Cape's water. Also mentioned were the benefits of the Working for Water programme in improving our country's water supply.

I'd heard about Working for Water on the news, but didn't know what it was all about so decided to do a little extra research, which I thought would also impress my teacher. From my research (**SM 2**) I found out that the programme was initiated in 1995. It had two main aims: to remove alien invasive weeds and to create jobs. From what I read it seemed to be a positive initiative, but I'm sure there must be a number of challenges. Removing invasive alien plants from our country is not an easy task.

Our teacher organised for an expert on invasive weeds to visit our class and give us a talk on the effects of these plants on our

country (**SM 3**). This speaker was passionate about the negative effects of invasive alien plants and strongly encouraged us to make a difference by removing any invasive weeds from our local area. We also learned about the four main impacts of alien invasive weeds on our country:

- they decrease our biological diversity;
- they harm ecosystems and transform habitats;
- they increase the intensity of fires; and
- they reduce the amount of water available.

Because this was a natural science class we expected to go on an investigation excursion. This is almost always the most enjoyable way to learn about our subject. This time, our teacher took us on a long hike up a mountain near our school. On the way we learned some of the history of the area. It used to be covered with invasive trees, mostly black wattle and blue gum. Since 1995, through the Working for Water programme, the trees have been removed step by step, starting at the top of the catchment. This is important as the seeds mostly spread by water and therefore move downstream. Since the area has been cleared the previously dry stream has begun to flow again, and people frequently spot eagles and sometimes snakes. Diversity of vegetation is also coming back. It took us about an hour to get to the site where we were going to do a vegetation survey. There was an indigenous forest that had been growing here for years, but right next to it was a small black wattle forest that had not yet been cleared. We did a vegetation

survey to find out roughly how many plants were growing in the indigenous forest compared to the black wattle forest. I was amazed at the difference.

In the black wattle forest, there was only black wattle with a few herb-like plants growing underneath. I also noticed how the soil was grey and compacted. There didn't seem to be much life in this forest either, the bird song was muted and I didn't notice any animal droppings.

In the indigenous forest there were so many different kinds of plants growing, including trees and shrubs and herbs. In one 5m² area I counted as many as 48 different species. The soil was also a rich brown colour and smelled lovely. One of my favourite smells is wet earth. We also heard many bird songs. We actually spent some time being quiet and listening to see how many birds we could hear. I counted up to nine different bird calls. In the black wattle forest I heard two.

We had a discussion about why the two forests were so different. Our teacher explained that the black wattle out-competes the indigenous plants for nutrients and water. This is why it is called an invasive weed because it takes over and pushes out the other plants so they can't share the same space.

After hearing the talk the previous day that encouraged us to make a difference, and seeing first-hand the effects of invasive weeds on our ecosystems, we decided as a class to undertake an action project, removing the small wattle forest that was growing a few hundred metres below our

school. We ordered the 'Hack Attack Pack' from Share-Net (see contact details on inside front cover) that gave advice about how to remove invasive weeds (**SM 4**) and read an information sheet on black wattle (**SM 5**). The most important things I learned about clearing invasive weeds were:

1. It is important to break the reproductive cycle.
2. Follow up on previously cleared areas.
3. Don't clear more than you can handle.

What I also enjoyed about our project was working out useful ways of using the wattle wood we had cut down. It is straight wood and can be used for a variety of things. We decided to use it to make fences around our trees that we'd planted last year at our school, during Arbor Day. We had planted eight trees, but they weren't doing very well because sometimes cows would get into the school grounds, when the gate was left open and eat them. Our trees would now be protected by our wattle fences and we hoped they would be able to become proper trees.



Glossary

Diversity: a range or variety of different plants or animals.

Habitat: natural home of a plant or animal; an area where particular living things live.

Invasive: a plant that takes over an area, pushing out other plants, by using up the nutrients and water that the other plants would normally use.

Reproductive: producing new life or seeds.

Research: using scientific methods to find out information about a particular topic.

Comprehension Questions

1. What is one of the biggest threats to our country's water?
2. How much of the Western Cape's water is used by invasive plants?
3. What are two aims of the Working for Water programme?
4. Can you name three negative impacts that invasive weeds have?
5. Why is it important to start clearing invasive weeds at the top of a catchment?
6. What differences did the learners discover between an indigenous and black wattle forest?
7. What impact do invasive weeds have on our water supply? **(SM 1)**
8. What is the Working for Water programme? **(SM 2)**
9. What do you personally think is the most serious impact invasive weeds have? **(SM 3)**
10. What useful advice did you learn about to remove invasive weeds? **(SM 4)**
11. Name one interesting fact that you learnt about black wattle. **(SM 5)**

Discussion Points



FINDING OUT ACTIVITY

Survey the plant diversity of an indigenous forest or woodland compared to a plantation or a plot of invasive plants.

You will need:

- a. Tape measure
- b. Pegs
- c. String
- d. Recording sheets (**SM 6**)
- e. Pen

Mark out five 5 m² plots in your two sites, using your tape measure, string and/ or pegs if you have them. Count how many different plants occur in the different plots, marking the numbers on a recording sheet (**SM 6**). You could make up a name or take a voucher specimen for identification at a local herbarium. Also record whether the plant is a herb, bush or tree. You could get your learners to produce two graphs comparing the number and variety of plants that occur in the two plots.

TRYING OUT ACTIVITIES

Activity 1: Adopt an area in your neighbourhood that has been infested with invasive weeds. Plan a rehabilitation or restoration project. Use **SM 4** to guide you in this process.

Activity 2: Using the wood from the invasive trees you have removed, make protective fences for your trees or come up with some other use for the wood. You can be creative in making these. You will have to plant four thick upright poles into the ground. Attach thinner lengths of wood to this, either using wire, string or nails. String is the easiest but will need to be maintained. Make sure it is high and wide enough to keep the cows or goats away from the trees.

DELIBERATION IDEAS



To deliberate is to think carefully about, to consider, to discuss in a focused way, to weigh up and debate. Here are some ideas to support this process in your learners.

Hold a discussion with your learners on the best way to manage invasive weeds. You might want to consider what laws should be in place; what uses invasive weeds could be put to; the best way to remove them...



Water Loss! An Economic, Environmental and Social Example of the Consequence of Invasive Alien Plants

A far reaching economic, as well as ecological and social concern is the depletion of South Africa's water resource incurred by alien invader plant species.

In KwaZulu-Natal, alien invader plants use approximately 576 million m³ of water per annum more than the natural vegetation they have invaded or replaced. This figure is so vast it is often difficult to place it in perspective. Consider Midmar Dam, home of the Midmar Mile and a favourite venue for anglers, sailors, campers and nature lovers. Before the recent expansion of the dam wall, the capacity of Midmar Dam was 177 million m³. Therefore this vast hydrological resource can only hold approximately one-third of the water that is devoured by alien weeds and invader plants within the Western Cape – every year!

The mean annual run-off of the primary catchments in the Western Cape is estimated at 6 555 million cubic metres of water, whilst the annual loss of run-off caused by invasive alien plants in the region is 1 036 million cubic metres. This equates to 15.82% of water used by invasive alien plants, or 166 mm of rainfall. Water scarcity is not new to the people of the Western Cape; the Western Cape has suffered from water restrictions and water needs to be brought to the Cape Metropolitan from other areas.

Grasslands invaded with water guzzling alien trees have decreased run-off leaving less water for streams and rivers, and subsequently less for communities. At a constant rainfall over 20-40 years, a water catchment area with unchecked alien plants can be reduced by 74%. After 20 years, it would cost 400% more per hectare to clear.

One estimate of the value of the work done by the Working for Water Programme by 2002 was, that in terms of yield, the water made available was equivalent to the amount of water that would be yielded by the Berg River Dam that is being built. More importantly, if left to invade, the plants would use the equivalent of three to four times the yield of the Berg River Dam. However, "yield" (availability for productive use) is only one measure of the value of the water saved by clearing invasive alien plants. The importance of the work for meeting in-stream flow requirements, water for ecological functioning of natural systems, water quality, turbidity, thermal pollution, eutrophication, flooding, blockages in rivers, damage to bridges and other infrastructure, damage to river banks, soil erosion, siltation of dams (meaning less storage of water) and destruction of estuaries is very significant, albeit difficult to calculate in meaningful economic terms.

References

Adapted from

- Wildy, E. 2005. *Field Guide: Management & Control of Invasive Alien Plants in KwaZulu-Natal*. Alien Invader Plants Project. Share-Net (WESSA-KZN), Howick.
- Hendricks, L. (Minister of Water Affairs and Forestry). 2006. Challenges of Invasive Alien Plants in South Africa. Modified speech given at Wesbank No. 1 Primary School, Delft, Western Cape.



WORKING FOR WATER CAMPAIGN

Minister of Water Affairs and Forestry, L. Hendricks.

Modified speech given at Wesbank No. 1 Primary School, Delft, Western Cape, 2006.

“ In order to combat alien invasive plants the government established the Working for Water Campaign in 1995 to clear our country of these plants. This campaign was started in 1995 with a grant of R25-million from the then Reconstruction and Development Programme (RDP) Fund. Professor Kader Asmal, the Minister of Water Affairs and Forestry at the time, was the inspiration behind the Programme.

As the Programme grew, its social focus broadened. It seeks to benefit the poorest of the poor, and this has led to a particular focus on single-parent households. It has provided work opportunities to those living with HIV and Aids, thereby restoring their dignity and respect. It has also endeavoured to provide opportunities to victims of crime, as well as to those that live in areas of violence and intolerance, and those that foster orphans.

All of this has been done without compromising the Programme's focus on controlling invasive alien plants. The Programme has provided training and work opportunities to tens of thousands of South Africans who had previously been denied the dignity and hope that employment brings. It has sought to work with partner departments in being a sensitive provider of training and work opportunities, with many social interventions.

Twenty thousand people are employed annually in the Programme, of which 52% are female, 19% youth and 1% disabled. During 2004/2005, 142 417 initial and 507 139 hectares follow-up clearing were completed. The benefits from clearing the invasives have been shown time and again with improved water flow, better fire control management, less risk of mud slides, better water quality, and greater biological diversity.

With the widespread prevalence of poverty, we should remember that the natural environment is a powerful ally in our efforts to create jobs and create a better life for our people. Not only are we creating jobs through clearing the invasive aliens and empowering the people who work in the programme, but there are also opportunities for using the wood and plants that have been cleared to make furniture, coal and woodchips. The improved natural environment also creates tourism opportunities and prevents job losses that would have inevitably resulted from an area being overrun by invasive alien plants. ”



CHALLENGES OF INVASIVE ALIEN PLANTS IN SA

Minister of Water Affairs and Forestry, L. Hendricks.

Modified speech given at Wesbank No. 1 Primary School, Delft, Western Cape, 2006.

“ Invasive alien plants have invaded over 10 million hectares of South Africa, and because they multiply so fast - if left unchecked - this could double in the next 15 years. As learners and our future generation, you need to be more aware of these plants so that you can help to take responsibility for removing them and protecting our natural resources.

There is no dispute - invasive alien vegetation is a real challenge to us in protecting our natural heritage. There is enough evidence that if we do not deal with the scourge of invasives now, the price we will have to pay in the future will be devastating to our country's development. These problems will arise because of the damage invasive species cause to the environment and the economy:

- Invasive alien plants degrade our rich biological diversity by crowding out indigenous species. Invasive alien organisms are regarded as the second largest threat to biodiversity after direct habitat destruction.
- Invasive plants damage the ecological integrity of our natural systems and also create problems for planting of crops. People depend on these natural systems for their livelihoods and our country cannot do without food production. They can also increase soil erosion.
- Invasive alien plants fuel the wild fires that cause havoc in our country and they make fire management difficult as they increase the speed and heat of fires.
- Invasive alien plants reduce the amount of water that would normally be available in any given area for indigenous species, thus depriving the surrounding plants of water and reducing their growth rate. Estimates indicate that these plants use up to 5% more of the annual run-off. If nothing is done, this will get worse.

The Western Cape and Alien Invasive Plants

Table Mountain National Park alone has over 2 100 indigenous plant species - which is more than Canada or the United Kingdom has for their entire country. Invasive alien plants threaten this diversity, particularly because many of the invasive species are very fire-prone. The Western Cape makes up 10% of South Africa's landscape and boasts one of six floral kingdoms in the world - the Cape Floristic Kingdom. The Cape Floristic Kingdom contains one of the highest levels of species richness, with 5 880 species and 68% of species that occur nowhere else in the world (known as *endemism*). A study in 1998 estimated that 4.84% of the Western Cape was invaded by invasive alien species. The species that mostly invade the Western Cape are *Acacia* sp. and *Eucalyptus* sp.

Conclusion

By far, the most powerful tool for dealing with the problem revolves around educational and awareness initiatives. Being able to identify invasive alien vegetation is not enough - we need to empower ourselves to also identify those indigenous plants which alien vegetation replaces. What we do in our gardens is perhaps the best barometer to judge this awareness. I would like to challenge all citizens to start the battle in their backyards, by identifying and removing invasives and planting indigenous species, in order to protect our natural heritage. From our backyards we must move to clearing community parks and gardens of invasives; and there are a number of ways to do this, for example, by initiating or joining a volunteer hacking group. ”



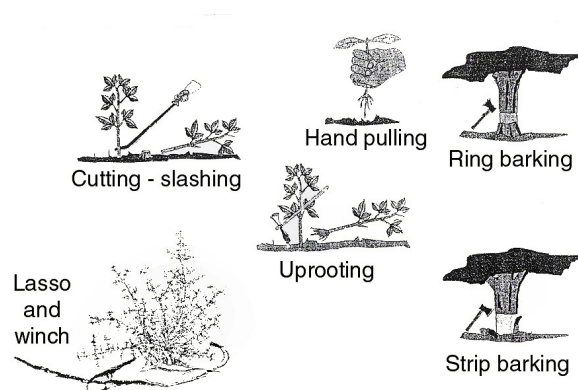
ERADICATION STRATEGIES FOR INVASIVE WEEDS

Control methodologies can be grouped into five basic categories:

1. **Mechanical or physical control** methods involve the direct removal of species by hand, or with appropriate tools, instruments and machines.
2. **Chemical control** involves using herbicides to control target species.
3. **Biological control** involves the intentional use of populations of natural enemies of the target invasive alien species or other methods that negatively affect the population of the target species.
4. **Habitat management** involves measures such as burning and grazing.
5. **Integrated pest management (IPM)** involves a combination of the methods above based on ecological research, regular monitoring, and careful co-ordination.

An important point to remember is that controlling or eradicating alien weeds and invader plants is not a management goal in itself, but only a means to achieve higher goals, such as the conservation of biodiversity, protection of human health, and the prevention of economic loss. Elements of these goals may include habitat restoration, reintroduction of indigenous species, and establishment of sustainable use of ecosystem services for local people. Our future and the future of our environment are closely linked.

Manual/mechanical method of control



Some form of force is used to control the target weeds e.g. uprooting (including hand-pulling), slashing, mowing or felling, ring-barking (removing every trace of bark and cambium in a 30cm

wide band around the stem at a height of about 50 cm) or strip-barking (stripping off all the bark from about waist height to below the surface of the soil). A highly effective tool is the tree popper (see photo)



Golden rules

1. Break the seed (reproductive) cycle.
2. Follow up on previously cleared areas.
3. Don't clear more than you can handle.

which pulls the tree out by the roots, without much effort. This is particularly effective when removing *acacia mearnsii*.

Advantages include: little training/supervision needed; simple tools required and only target species treated; with care the environment is unharmed; (e.g. close holes, press down loose soil and spread grass/leaf litter over the exposed area). This method is ideal for gardens. **Disadvantages** include: physically demanding; slow and costly for large areas or dense infestations where it is seldom completely successful and requires repeated follow-up operations; any soil disturbance can promote germination of undesirable weed seeds and can lead to soil erosion on slopes; in dense infestations indigenous/desirable species are often mistakenly destroyed.

Eradication Strategy

Alien weeds and invader plants are determined to stay! They will always be a nuisance in the landscape and will continue to threaten our environment. To increase the chances of success for an eradication programme, a strategy needs to be formulated that takes into account the target species, the geology and topography of the land, and the ultimate goal of the eradication programme, i.e. **why are you clearing?**

Start by assessing the extent of the problem. The key questions are: where should control start and how to ensure all alien plants are killed? To achieve success, an integrated, ongoing control programme should be carefully planned, because of the inherent complications of effective alien weed and invader plant control.

Start by removing weeds in the least affected areas and work towards the heavier weed infestations. By doing this, you can rapidly safeguard relatively large areas of indigenous vegetation. Next identify areas where vigorous indigenous bush meets weedy areas and carefully work outwards from "Goodies" to "Baddies". If possible, always start at the highest point and work downwards.

Remove weeds carefully and cover exposed soil with cut vegetation or leaf litter that is free of weed seeds and that will not regrow if in contact with the soil. *Press any loosened soil down lightly taking care not to damage native plants, and mulch with plant material where possible.* This will help stop exotic weeds from filling the gaps left by weeding.

Wherever possible try to prevent weeds from producing seeds or fruit by cutting back before they flower. Do not transport seeds, fruit, bulbs, tubers, stems that root easily away from the area. It is advisable to burn the pieces "on site" if at all possible.

Follow-ups are Essential!

Monitor cleared areas on a regular basis until the supply of viable invasive seeds is finished and indigenous plants are again re-establishing themselves. You might need to reintroduce and replant certain species to restore a well-balanced and healthy ecosystem that is once again able to support the variety of creatures dependent on it to feed, breed, nest and rest! The danger of not doing the necessary follow-up control is that the environment could go back to how it was before.

Don't Forget Rehabilitation!!

The control and eradication of alien invader plants is beginning to receive the attention it requires. The ultimate goal of every strategy in the control and eradication of alien invader plants must be the restoration or rehabilitation of the land. Two forms of rehabilitation are generally identified, namely: rehabilitation and restoration. Rehabilitation is defined in terms of making the land useful again. This may be achieved by creating a useful, productive or attractive plant cover such as a pasture for the grazing of livestock and also by stopping or avoiding further degradation on surrounding land. Restoration is where the objective is to return the land as close as possible to its original condition. For example, such a strategy may involve planting indigenous pioneer tree species in a degraded forest.

Whichever is decided upon, follow-up control is essential. Follow-up control requires a monitoring programme to detect and remove alien seedlings until the viable invasive seed bank is exhausted and indigenous plants are once again naturally re-establishing.

Reference

Adapted from Wildy, E. 2005. *Field Guide: Management & Control of Invasive Alien Plants in KwaZulu-Natal*. Alien Invader Plants Project. Share-Net (WESSA-KZN), Howick.



BLACK WATTLE

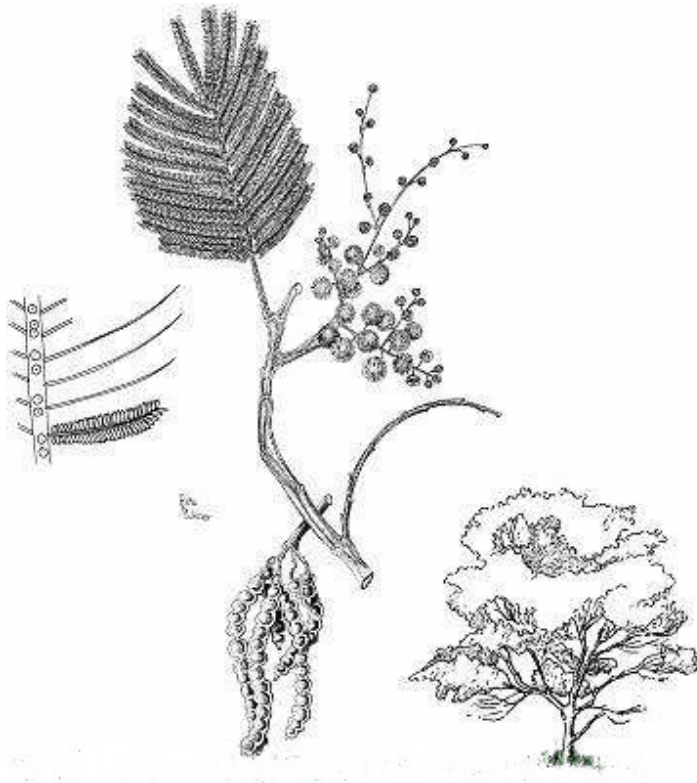
Acacia mearnsii

Pea Family (*Fabaceae*)

Afrikaans: *swartwattel*

Zulu: *uwatela*

CARA Category: 2



CONTROL: Seedlings may be hand-pulled if practical – remember to press down any disturbed soil. The tree popper can be used for young wattle trees. You will need to cut the bigger trees down with a saw. If they start coppicing make sure to remove the growing vegetation.

DESCRIPTION: Evergreen tree, up to 15m high, with slightly hairy young branches displaying golden growth tips. Dark olive-green compound feather-like leaves with raised glands along the entire length of the midrib. Dark brown seed pods, usually constricted between the seeds. Pale yellow or cream globular flower heads in large fragrant sprays. Flowers: August to October.

ORIGIN: Australia

REASON FOR INTRODUCTION: For shelter, firewood, and tanning.

WHERE FOUND/PROBLEMS CAUSED: Throughout KwaZulu-Natal, but typically only forms dense stands where water is plentiful. Black Wattle invades grassland, forest gaps, roadsides and watercourses, successfully competing with and replacing indigenous vegetation. The species encroaches into grassland rapidly reducing the carrying capacity of agricultural land.

DID YOU KNOW? Seeds of Black Wattle remain viable for over 50 years!

Reference

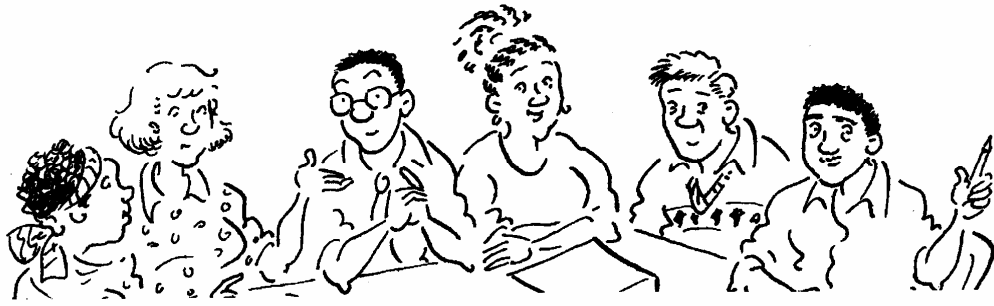
Catchment Action: 28 Alien Plant Invaders in KwaZulu-Natal. Share-Net, Howick, 2005

RECORDING SHEET

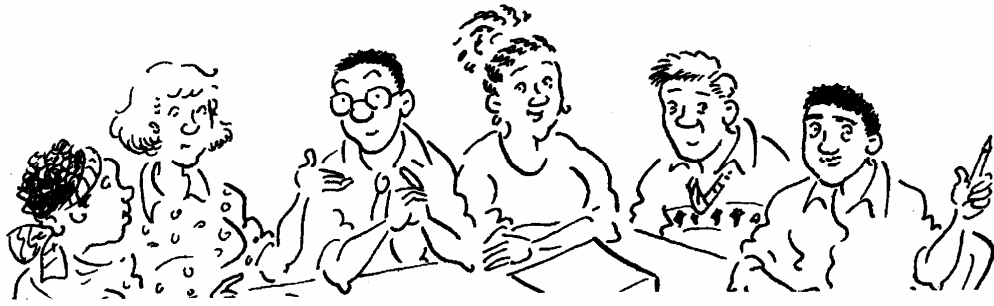


Knowledge & activity support material 6

[illegible]



NOTES



NOTES



Handprint resource books available from Share-Net

TITLE	LEARNING AREAS COVERED (BROADLY)
 1. Reusing Shower and Bath Water	Language Natural Sciences Technology
 2. The Buzz on Honey Bee Economics	Language Natural Sciences Social Sciences Technology Economics & Management Sciences
 3. Have you Sequestered your Carbon?	Language Natural Sciences Technology Mathematics
 4. Did you Grow your Greens?	Language Natural Sciences Social Sciences Life Orientation Arts & Culture
 5. Clearing Invasive Weeds	Language Natural Sciences Technology
 6. The Secret of a Spring	Language Natural Sciences Social Sciences Life Orientation Technology Mathematics
 7. The Secret of the Disappearing River	Language Life Orientation Social Sciences Economics & Management Sciences
 8. Creative Garden Design	Language Natural Sciences Technology
 9. Recycling, Waste Reduction and Creative Re-use	Language Social Sciences Life Orientation Arts & Culture Technology Economics & Management Sciences
 10. Worming Waste	Language Natural Sciences Technology
 11. Growing Mother-tree Seedlings	Language Natural Sciences Technology
 12. Rooibos: a Biodiversity Economy at Risk	Language Natural Sciences Economics & Management Sciences

Many more Handprint resource books are in the planning stages. These resource books and many others for teacher educators and teachers are available electronically in pdf format on www.tessafrica.net. The Handprint resource books can also be downloaded from www.handsforchange.org.

The adaptive use of these resource books for educational purposes is encouraged. Anyone wishing to develop their own resource or adapt one, can contact Share-Net sharenet@wessa.co.za for a version in Microsoft Word.



This handprint is of a 10-year-old girl, Srija, from a school in Hyderabad, India, who was involved in a project taking action for sustainability. Her handprint can be taken as a symbol for positive action.

Increase your handprint. Decrease your footprint.

Human impact on the Earth has tripled since 1961 and our human footprint is now 25% bigger than the planet can support. In other words we are using 25% more natural resources and services than the planet can create and provide. The 'Ecological Footprint' is one way to measure what area of land and water the whole human population requires to produce the resources it consumes and to absorb its wastes, and we now need 25% more area than is available on the whole planet. This means that the planet is simply being damaged beyond what it can repair, and this cannot continue without causing very serious threats to all life, including our own.

Education is a key way to achieve the changes we need to live in a manner that the planet can support. Environment and Sustainability Education (an environmentally focussed approach to Education for Sustainable Development – ESD) is a move away from seeing education just as a means of producing the skills to carry on doing what we are doing. It develops the abilities needed to address the big issues affecting the planet, and builds the capacity in communities to make important decisions about their future. Environment and Sustainability Education calls for action.

The Handprint is one measure of Environment and Sustainability Education action. The idea is to decrease the human footprint and to make the world more sustainable. The Handprint is a new approach or 'tool' being developed by the Centre for Environment Education (CEE), in Ahmedabad India, with many partners across the globe. The purpose of the Handprint is to help measure **positive action for change** at different levels. We all need to decide **what we can do** at the individual, community, national and global level in order to increase our Handprint, and decrease our Footprint.

“Through our actions, we add substance and vigour to the quest for sustainable living.”

The Ahmedabad Declaration 2007: A Call to Action, 4th International Conference for Environmental Education

