

UNDERSTANDING LOCAL KNOWLEDGE AND PERCEPTIONS ABOUT
INVASIVE ALIEN PLANTS: A CASE STUDY OF THE UPPER ILLOVU
WORKING FOR WATER PROJECT

NANDIPHA THERESSA BHENGU

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Master of Environment and Development, Centre for Environment, Agriculture and
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University of KwaZulu-Natal

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ABSTRACT

For decades, South Africa has been heavily infested by invasive alien plants. As a result there is concern over the increasing rate at which the alien plants are replacing indigenous vegetation. Another concern regarding the invasive alien plants is the indirect stress they pose on the environment due to their excessive water consumption. As a result of this, government of South Africa, through the Conservation of Agricultural Resources Acts (43 of 1983) and other environmental legislation, mandates and encourages the removal of invasive alien plants from the landscapes of South Africa.

The need for removal of these invasive alien plants led to the formation of the Working for Water Programme (WfW), which is based on a novel approach to environmental management. It contends that the invasion of ecosystems by invasive alien plants could have detrimental effects on water yields from catchment areas, and that employing people to deal with the problem could both protect this vital resource and provide employment and upliftment in poor rural communities. It has been suggested that the supply of information to the public about invasive alien plants is generally poor, to the extent that many people are the causal agents of these plants entering their communities (McNeely 1999). If this lack of awareness is the case, then understanding the drivers of local knowledge which will feed into public awareness is essential to change public perceptions and values surrounding invasive alien plants. It is important to understand local knowledge in order to determine gaps in information transfer and enable them to make decisions that are grounded in local cultural interpretations of place and their environment (Ebohon *et al* 2000). It is also important to

understand what the local communities know and what they need to know about these invasive alien plants.

This study is premised on developing an understanding of local knowledge and perceptions about invasive alien plants. The assumption is that those involved in the programme would display positive values towards the environment. It is also assumed that those involved in the programme have developed their local/traditional knowledge of invasive alien plants through the educational component of WfW programme.

A case study approach of Upper Illovo Working for Water project was adopted. The research was carried out by means of questionnaire interviews. The respondents were drawn from Indaleni community in Richmond, KwaZulu-Natal. Thirty respondents were interviewed and this was inclusive of the field workers, contractors, project manager and people who were not involved in the project but from the same community. Those not involved in the project were used as a control group. Five objectives were utilized to investigate the aim of this study.

They were to:

- a) Determine the respondents' relationship to, and perceptions of the Upper Illovo WfW project
- b) Establish the respondents' understanding and perceptions about the levels of invasive alien plants in the area
- c) Determine the respondents' knowledge and perceptions pertaining to prevention of the spread of invasive alien plants

- d) Establish the respondents' competencies in controlling and managing invasive alien plants and
- e) Establish the respondents' perceptions about the project's ability to deliver on its objectives.

The results of this study indicate that most of the respondents were aware of the Upper Illovo WfW project and its ecological and social upliftment objectives. The pattern of the responses was such that those that did not participate in the project (control group) were for the most part not sure about their responses. Although those who participated in the project displayed better knowledge of issues concerning invasive alien plants, there were many occasions when they failed to provide some responses without being prompted – given clues or examples.

To conclude, there was, therefore, a significant knowledge gap about invasive alien plants and information pertaining to them between the two groups. The implications are that those involved with the project must have received some form of information through public awareness about invasive alien plants. That is their traditional knowledge about these invasive plants has been developed by the education from the programme, WfW. But most importantly, the programme remains a key for economic reasons from the perspective of the participants. The need for constant improvement and development of local knowledge regarding these invasive alien plants is important in dealing with their spread and management of their effects on the environment.

DECLARATION

The research described in this mini-dissertation was undertaken at the Centre for Environment, Agriculture and Development (CEAD), University of KwaZulu-Natal, Pietermaritzburg, under the supervision of Professor Rob Fincham and Dr Nyambe Nyambe.

I declare that this mini-dissertation represents the original work of the author and has not been submitted in any form for any degree or diploma at any University. Where use has been made of others' work, it is duly acknowledged in the text.

Miss N. T. Bhengu

Date

Prof. RJ Fincham

Date

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DEDICATIONS

I would like to dedicate this work to relatives who have since passed on, my husband, Sidima Lutherpree Ntsonga and my brother, Sibusiso Sydney Bhengu.

ABBREVIATIONS

IAS	INVASIVE ALIEN SPECIES
IAP	INVASIVE ALIEN PLANTS
IAV	INVASIVE ALIEN VEGETATION
DWAF	DEPARTMENT OF WATER AFFAIRS AND FORESTRY
DEAT	DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM
WfW	WORKING FOR WATER PROJECT
GISP	GLOBAL INVASIVE SPECIES PROGRAMME
IUCN	WORLD CONSERVATION UNION
UNEP	UNITED NATIONS ENVIRONMENTAL PROGRAMME
WWF	WORLD WIDE FUND FOR NATURE
WCS	WORLD CONSERVATION SOCIETY
WCED	WORLD COMMISSION ON ENVIRONMENT & DEVELOPMENT
CSD	COMMISSION ON ENVIRONMENT & DEVELOPMENT
CARA	CONSERVATION OF AGRICULTURAL RESOURCE ACT
CBD	CONVENTION ON BIOLOGICAL DIVERSITY
WWSN	WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT
NVFA	NATIONAL VELD AND FIRE ACT
NEMA	NATIONAL ENVIRONMENTAL MANAGEMENT ACT
NWA	NATIONAL WATER ACT
NGO	NON-GOVERMENTAL ORGANIZATION
RDP	RECONSTRUCTION AND DEVELOPMENT PROGRAMME
DA	DEPARTMENT OF AGRICULTURE

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Chapter 1 Introduction

1.1 Background to the study

This dissertation aims to provide an understanding of local knowledge and perceptions about invasive alien plants in South Africa by way of a case study of the Upper Illovo Working for Water Project. The WfW programme is a South African government inter-departmental initiative established in 1995 to fight against invasive alien plants and rehabilitate affected ecosystems (Wynberg 2002). The programme also advances the government's empowerment, transformation and poverty eradication agenda (*ibid.*). All respondents were drawn from the study area. This focus is as a result of suggestions that ignorance remains a major contributor to the introduction, spread and tolerance of invasive alien plants by South Africans (Magadlela and Mdzeke 2004). The dissertation is founded on the assumption that long-term measures to control and manage invasive alien plants should involve eradication in an environment where legislative, scientific and institutional responses are sufficiently integrated and supported by adequate local knowledge and perceptions as the foundations of public awareness.

South Africa, alongside many countries in the world, faces environmental problems presented by invasive alien plants (McNeely 1996). A common feature of invasive alien plants is their threat to native species (Williamson 1996 in Camarda *et al.* 2000). Generally, they out-compete native species for space, nutrients, water and environmental requirements necessary for growth. Often, the results include a significant transformation of an ecosystem due to high levels of infestation and considerable reduction in the population of native species (Coleman

1999). In this way, the ecological integrity of an ecosystem is compromised and could lead to eventual collapse of the system if not addressed (van Wilgen *et al.* 1999).

Besides biodiversity concerns, South Africa places considerable emphasis on water loss related impacts of invasive alien plants (DWAF 2000a). This is because South Africa is an arid country with above 60% of the country receiving annual rainfall of less than 500mm, normally regarded as the minimum required for successful farming (Clarke and Holt-Biddle 2002). Almost a fifth of the country receives less than 200mm (Huntley *et al.* 1989). The situation is exacerbated by the fact that the rainfall is highly variable, droughts are common, and the high evaporation rate means that the natural water balance is almost always in deficit (Clarke and Holt-Biddle 2002).

A major impact on South African ecosystems over the last 100 years has been their invasion by alien vegetation, especially in the riparian zones (Henderson and Wells 1986). Alien vegetation has a significant effect on the abstraction of surface and groundwater. The conduit function of riparian corridors, combined with exposure to periodic human and natural disturbance, the perennial availability of moisture, reliable dispersal by water and the role of stream banks as a seed reservoir have been scientifically shown to aid the spread of invasive alien plants (Forman and Gordon 1986; Henderson and Wells 1986).

The proportion of water lost to invasive alien plants is nearly equal to water that is used by people and industries in South Africa's major urban and industrial centres (McNeely *et al.* 2001). It has been found that the removal of riparian wattle and its replacement by indigenous herbaceous plants could result in significant reductions in annual evapo-transpiration, and could very likely lead to stream-flow enhancement (Dye *et al.* 2001). River bank erosion has been associated with certain invasive alien plants (MacDonald and Richardson 1986). According to Rowntree (1991), some invasive alien plants have shallow rooting systems which are unable to maintain stability during floods, and could be ripped out and thus cause bank collapse.

Thus, South Africa's natural water deficit is compounded by the presence of invasive alien plant species, especially in riparian areas where their presence is favoured by a combination of available moisture and their ability to out-compete the indigenous vegetation due to a lack of pests and diseases. Invasive alien plants place additional demands on an already stressed water resource without offering much in return (Versfeld *et al.* 1998), hence the need for strategic measures to curb their impacts.

1.2 Problem statement

Clearing invasive alien plants is a strategic component of the overall vision for the sustainable management of South Africa's water resources and attempts to meet the balance between the provision of water for all, and conserving the functioning of river ecosystems

(DWAF 2000b). However, resolving problems of invasive alien plants calls for measures that go far beyond the immediate mission of clearing such plants (Magadlela and Mdzeke 2004).

Measures for effective and sustainable means of eradicating invasive alien plants cannot be developed entirely without prior understanding of local knowledge and perceptions about invasive alien plants. In fact, some invasive alien plants found their way into the country on the back of ignorance and perceptions that were favourable to illegal transportation and use of such plants, for example, for ornamental purposes (McNeely 1996). It is therefore important that local knowledge and perceptions are continuously explored to identify barriers and possible leverage points for intervention (Magadlela and Mdzeke 2004). In this particular study, local knowledge and perceptions of community members of the Illovu area where there has been a Working for Water Project are understood. Project participants and non-participants alike were engaged in the study to determine in part whether exposure to the project helped shape appropriate perceptions and local knowledge in any way.

The importance of legislation and scientific technology in fighting invasive alien plants is critical, and a great deal has happened on both fronts (MacDonald 2004). Despite this progress in fighting invasive alien plants, such initiatives are by no means sufficient to guarantee a South Africa free of alien plants. Neither can they change on their own the current situation of heavy invasive alien plant infestations, as local knowledge, perceptions and practices play a critical role in the spread of invasive alien plants (Magadlela and Mdzeke 2004). It is important that all affected communities understand the importance of controlling

and managing invasive alien plants and the resultant benefits in terms of biodiversity and sustainable management of water resources (Versfeld *et al.* 1998). It is equally important that communities have an understanding of the negative impacts of invasive alien plants and their obligations as outlined in the legislation so that they can refrain from propagating these invasive alien plants. The authorities, too, ought to have an explicit understanding of the perceptions of affected local communities so that they can develop and communicate the approaches and tools required to facilitate sound management and control of invasive alien plants and to promote the protection of the water resources (MacDonald 2004).

1.3 Justification of the study

Despite the widespread recognition of the problem posed by invasion, the contention of this study is that local knowledge and understanding of risks associated with these invasive plants is still lacking (Versfeld *et al.* 1998). Therefore, one measure that could play a critical role in fighting invasive alien plants is the understanding of local knowledge and perceptions which will feed into public awareness. Education and awareness creation are critical in developing the necessary understanding of the challenges presented by alien invaders (Magadlela and Mdzeke 2004). Importantly, such education should promote knowledge of appropriate actions at both site and policy levels. Sound education and awareness creation can provide an important platform of partnering efforts of government agencies with those of the communities and civil society in general.

Moreover, even when considered historically, the introduction of invasive alien plants in South Africa partly occurred because people were not well-informed about the invasive alien plants (IAPs) and their effect on the ecosystem (McNeely 1996). Many of the deliberate introductions of invasive species relate to human interest in nurturing such species for agricultural, forestry, economic, ornamental or even psychological value (*ibid.*). Therefore, people remain an important factor in the introduction and spread of invasive alien plants. It can be anticipated that ignorance will continue playing a critical role in the spread of invasive alien species in the foreseeable future; hence the importance of understanding the local knowledge regarding these invasive alien plants. Importantly, a critical mass of local knowledge which will feed into public awareness is therefore needed if there is to be any realistic hope of sustained control and management of invasive alien plants (Magadlela and Mdzeke 2004).

Therefore, regarding the focus chosen for this study – understanding of local knowledge and perceptions regarding invasive alien plants, a major justification is that the Working for Water (WfW) programme recognises its importance and already has initiated activities in this respect. Initiatives in this regard include an alien plant school educational pilot project and environmental education activities, incorporating educational campaigns, posters, brochures and pest identification days (Magadlela and Mdzeke 2004). This study is important, given the complexity of effecting essential changes in beneficiaries' perceptions, attitudes and behaviour due to the limited individual's short exposure to the programme. The duration of the programme is 24 months in each community (van der Byl *pers. comm.* 2005).

Concerns have been expressed in respect of WfW environmental education programmes for attempting to do too many things at the same time (MacDonald 2004). Such criticisms raise questions about whether education and public awareness initiatives are integrated enough into the rest of the WfW programme or sustained enough to bring about changed public perceptions, knowledge and attitudes towards invasive alien plants. Hence, this study was conceptualised and undertaken at the local scale to understand local knowledge creation issues around invasive alien species, perceptions of local people and how they perceived their relationship with the WfW project operating in the area.

1.4 Aim and objectives

The aim of this study is to document and understand local knowledge and perceptions about invasive alien plants in an existing WfW project. The intention is to find out to what extent do local people promote alien plant infestations due to lack of knowledge. The other intention is to understand how the educational component of WfW has managed to develop that local knowledge about the spread and detrimental effects of invasive alien plants.

The objectives of the study are to:

- Determine the respondents' relationship to, and perceptions of the Upper Illovo WfW project
- Establish the respondents' understanding and perceptions of invasive alien plants in the area

- Establish respondents' knowledge and perceptions pertaining to prevention of the spread of invasive alien plants.
- Establish the respondents' competencies in controlling and managing invasive alien plants.
- Establish the respondents' understanding of perceptions about the project's ability to deliver

1.5 Methodology

This study was conducted in an area known as Upper Illovu, a project area for the WfW in KwaZulu-Natal. The respondents were from Indaleni community. Knowledge signifies cognition of an object by a person, (Fishbein and Ajzen 1975). While local knowledge can be interpreted as "traditional knowledge, indigenous knowledge and traditional environmental knowledge" (Encyclopedia 2008:2), in this case the focus will be on knowledge about invasive alien plants and their effects on the environment. This knowledge encompasses the wisdom, knowledge and teachings of these communities.

The study is comprised of a literature review for generating the theoretical context. Primary data collection was obtained through interviewer administered questionnaires. Other forms of data were gathered through a review of reports and other published and unpublished material deemed relevant to underpinning the field work, and observations during site visits. Further details on methodology are provided in Chapter 3.

1.6 Limitations of the study

The WfW programme is a national initiative with projects scattered all over South Africa. However, this is a single case study involving the Upper Illovu WfW project. The reasoning is that it is an in-depth study with less ability to be generalized to other WfW programmes. But it does give the researcher the ability to ‘drill down’ and get a good picture of what is being studied (**Senge 2006**). **Policy makers** could learn a lot from this approach (*ibid.*).

1.7 Structure of dissertation

This dissertation comprises five chapters. Chapter one is an introduction to the study, highlighting the problem statement, study justification and other introductory material. Chapter two consists of a literature review on selected material relevant to the study. Chapter three explains how the study was conducted including a justification of the selection of the study area, data collection and data analysis. Chapter four provides the results and discussion of the study. Tables and charts are provided to further highlight the findings of the study. Lastly in chapter five, bearing in mind the case study approach, research implications are drawn and recommendations are made. The intention of the recommendations is to alert policy makers and implementation to create public awareness in the fight against invasive alien species.

Chapter 2 Awareness and management of invasive alien plants as an increasing global environmental concern

This chapter reviews literature on invasive alien species in general and invasive alien plants in particular. Three major parts make up this chapter. The first provides some background on the evolution of environmental concerns at the global level, and within that context locates the issue of invasive alien species (IASs). It ends with the identification of the Global Invasive Species Programme (GISP) as an initiative that seeks to fight invasive species through a network of specialists. GISP has provided global leadership in the fight against invasive alien plants through research, policy advice, modelling the spread of invasive alien plants as well as developing best practice.

The second part of the chapter provides a discussion of invasive alien plants (IAPs) in a South African context, highlighting their impacts on water resources and government efforts (legislative and institutional) to eradicate them. In addition to legislation and policy responses, the South Africa government's recognition of the impact of IAPs is attested by the support it gives to the Working for Water (WfW) programme – an innovative, inter-departmental initiative seeking to control invading alien species and rehabilitate ecosystems, incorporating economic empowerment and transformation (Wynberg 2002). This aspect of the South African responses to IAPs is also discussed.

The third part provides a background on Working for Water and public awareness to promote local knowledge. What the local knowledge and perceptions are and how they feed back into

public awareness is discussed. Public awareness is necessary if there is to be a realistic hope of sustained control and management of invasive alien plants. As a result of this, what the programme does in terms of educating and training the public in issues related to invasive alien plants, is discussed. The last part of the chapter deals with partnerships the programme has formed, which are important aspects of any public awareness strategy. Partnerships are essential to detect and control the most serious invasive alien plants threats, but are not adequate on their own (MacDonald 2004).

2.1 Contextual background

It is important to begin this review by providing a context in which the fight against IASs has evolved. This is because the fight against IASs should be viewed in the context of the global environmental movement and concerns. In other words, the fight against IASs is a product of a suite of initiatives at various scales that have been developed with environmental sustainability as the guiding principle or goal (Coleman 1999).

Landscapes have for a long time been under severe threat from over-use and abuse of resources by society. This has led to depletion of natural resources and degradation in various forms, e.g. soil erosion, siltation and acidity of soil and water contamination. Over the years, certain developments have challenged and partially helped to put in place supportive perceptions and actions aimed at fighting environmental degradation. These developments have happened in many forms, e.g. international conventions, national legislations and

advocacy as a result of growing recognition of environmental degradation and its far reaching implications (Shine *et al* 2000 in McNeely 1996).

Concerns for managing the environment are largely a product of the 1970s, though significant events took place between 1970s and 1980s. Prior to this decade, environmental matters did not receive much attention (Fischer and Schott 1993). As environmental issues gained greater attention, awareness at international and national levels also grew. Considerable strides have been recorded, since the 1970s, in the form of new legislation for environmental protection and related initiatives (*ibid.*). As scientific and technical knowledge relating to cause and effect of environmental issues has grown, so too have many actors become involved. Other factors leading to calls for action on environmental issues include media and pressure group attention, cultural expectation and the structure and approach of political and administrative systems (Hajer 1996).

The interplay of all these factors has facilitated increased awareness of environmental issues from a cross-section of society. Internationally, the United Nations Conference on the Human Environment and the Club of Rome's *Limits to Growth* report demonstrated official confirmation of the importance of the environment in 1972 (Fisher and Schott 1993). The conference on the Human Environment marked the beginning of what was to be a growing set of initiatives at various levels to combat environmental concerns.

Much later, the World Conservation Strategy (WCS), *jointly* put together by the World Conservation Union (IUCN), the United Nations Environmental Programme (UNEP) and the Worldwide Fund for Nature (WWF) became the first Global Framework for Conservation (Amman et al. 1995). As has been argued, "The WCS offered the first exposition of 'sustainability' – [a term] that effectively linked human welfare, now and for the future, to sustainable management of the planet's patrimony" (Reed 1992: 29). Sustainability is taken to mean the long-term health of global ecology (Barton *and Bruder* 1995). Following from the WCS was the World Commission on Environment and Development (WCED 1987) which brought into the spotlight the concept of sustainable development. The WCED principles and understanding of sustainable development have had a profound effect on what was to follow later.

A particular influence of the WCED was the first Earth Summit or Rio Conference of 1992. The Earth Summit facilitated the signing of several conventions including the following: Convention on Climate Change, Convention on Biodiversity Conservation, the Earth Charter, Agenda 21 (action programme to promote sustainability) and in addition the UN Commission on Sustainable Development (CSD) was created. Since 1992, various international symposia have been held targeting at a host of environment and development issues. The World Summit on Sustainable Development held in Johannesburg in 2002 reflected on how the world was performing against the original Rio Declaration principles and set new milestones for action. The above, coupled with international law, have greatly helped to promote environmental consciousness around the world.

One of the key environmental issues faced globally is water resource management. Increasingly, there has been a focus on how riparian zone conditions and practices within the riparian zone, affect both the quantity and quality of water. There is also increased attention to the notions of catchment management and integrated water resources management as dynamic and appropriate ways of promoting sustainable water resources management (IUCN 2000). Within this scope, attention is given to how the presence of IASs and various land uses, e.g. farming, can impact on flow rates of a river and its consequent health. An initiative specifically relevant to IASs and this study was launched five years after the Rio Conference, namely the Global Invasive Species Programme (McNeely *et al.* 2001).

2.2 The Global Invasive Species Programme

The foregoing discussion has contextualized the evolution of the global environmental movement in general terms. It is within the context of the above described evolution that the issue of alien species and their impacts on ecosystems have gained recognition. Previously, efforts to combat alien species failed (DWAF 2004), because they were often carried out in local context without a broad-based understanding of the global context in which such infestation need to be understood. The situation changed with the establishment of Global Invasive Species Programme (GISP) in 1997 to address the global threats caused by invasive alien species (McNeely *et al.* 2001). Amongst the many aims of GISP, three are important for this study:

- To enhance the ability to manage IAS;

- To strive to develop public education about the IAS, improving the understanding of their ecology; and
- To develop capacities to employ early warning and rapid assessment and response systems (McNeely 1996.)

The main objective of GISP is to conserve biodiversity and sustain human livelihoods by minimising the spread and impacts of IASs (McNeely *et al.* 2001). To realise this objective, GISP operates through a “Partnership Network” which is made up of scientific and technical experts on IASs around the globe (*ibid.*). Some of the services provided by GISP Partnership Network include:

- Raising awareness of the IASs problem and the potential solutions through relevant organisations and frameworks at national and international levels.
- Devising educational programmes and training courses for relevant staff and policy makers.
- Building potential to conceptualise and implement educational programmes which are directed at empowering communities (McNeely 1996).

These initiatives encourage countries that they are not alone and cannot solve IASs problems by working solely within their own borders. IASs are an international problem and GISP aids by bringing governments and other institutions together in efforts to address national and regional IASs problems. At the turn of the century, GISP had compiled 10 strategic responses to address IASs problems as well as inputs provided by scientific experts (McNeely *et al.* 2001). However, while GISP has been reasonably successful in developing technical

information for resource managers, the supply of information on IASs to the general public remains generally poor, to the extent that most people have little or no idea about which species are invasive, what their impacts on the environment are, and appropriate methods there are to control them (McNeely 1996). In the absence of such information, inappropriate responses can be expected. It is with the above in mind that the present study was conceived.

Over 40 international conventions, agreements and guidelines have been endorsed for addressing the problem of IASs, and many more are still being prepared (Shine *et al.* 2000 in McNeely 1996). Governments, also to express their concern about the problem of IAS, have ratified and signed the Conventions on Biological Diversity (CBD). These agreements call on all the parties to avert the introduction of IASs and control or eradicate those that are detrimental to ecosystems, habitats and species.

2.3 Invasive alien species

Every ecosystem is associated with native species, i.e. those plants, animals and other living organisms naturally associated with a given ecosystem (van Wilgen *et al.* 2000). Such species under normal circumstances survive without causing any significant disturbance to the host ecosystem or any of its components. In fact, the presence of native species in a given ecosystem is appropriate as they form part of the ecological processes. Native species and their ecosystem co-exist because of the natural presence of pathogens and co-evolved invertebrates (*ibid.*).

For a variety of reasons, however, some plants, animals and other living organisms have been found in habitats in which they do not normally exist and they are broadly known as alien species. Such species are plants or animals introduced to a host country from another country, or continent (Davies and Day 1986). Some alien plant species tend to thrive in their host country in areas of similar climate and soil conditions to their country of origin, because they are not under the same utilization stresses as in their country of origin (van Wilgen *et al.* 1999). As a result of the lack of predation, they often out-compete native species in both growth and reproduction. When plants that portray these traits, i.e. rapid reproduction and coverage and out-competing native species for survival requirements, they are known as invasive alien plants (IAPs). When IAPs succeed and become dominant in host communities, they are said to have become invasive (van Wilgen *et al.* 1999; MacDonald 2004). IAPs are part of the wider concept of invasive alien species (IASs). They are also part of the broader categorization of invasive alien vegetation (IAV).

A variety of reasons can be advanced for the presence of plants in areas or habitats where they do not naturally occur. Human beings are usually responsible for this unnatural occurrence. Reasons such as aesthetics have also been responsible for the introduction of IAPs, but in the majority of cases, there is a direct or indirect economic reason (McNeely 1996). For example, plantations of acacia and pine, in the context of South Africa, have largely been associated with economic reasons, i.e. forestry. Certain grass species, e.g. vetiva species were introduced for the stabilization of sandy substrata (Versfeld *et al.* 1998). The introduction of alien species has had major implications for some of the hosting habitats and ecosystems.

According to Mark (1996), alien plants may be categorized as transient and naturalized. The latter leave persistent descendants that become part of the native flora while the former do not. Alien species of concern are the ones termed invasive, that is, those that naturalize. Such species tend to have numerous consequences for the host habitat or ecosystem. While they compete for the same resources with native species such as light, nutrients and water, they acclimatize e.g. by developing deeper roots to out-compete native species in terms of accessing water, and spread often covering the landscape (densification) (Luken and Thieret 1996). Concerns centre on the comparative advantage in terms of access to water, light and nutrients that IAPs tend to enjoy over native species (*ibid.*).

Two considerations are important in relation to IAPs: the process of invasion and the susceptible or preferred invasion habitats. The process of invasion may be categorized as expansion or densification (Versfeld *et al.* 1998; Boucher 1995). Expansion involves dispersal from existing invasion and the creation of satellite colonies in the process whereas densification denotes increase in density of existing population on the same patch (*ibid.*). Densification begins as a slow process but it eventually, if left uncontrolled, leads to exponential growth manifesting itself in thick patches or a high rate of cover (Boucher 1995). Susceptibility of habitats is important as it can direct management attention towards more effective monitoring of certain habitats. Moist terrestrial landscapes and riparian areas are two of the major preferred invasion sites (Versfeld *et al.* 1998). Moist terrestrial landscapes generally provide expansion opportunities. Often, such areas are characterized by sufficient amount of rainfall and water bodies to support IAPs. Riparian areas tend to be associated with the process of densification as IAPs tend to concentrate on the moist river banks and alluvial

soils. Closely linked to riparian areas are flood plains where rich moist alluvial soils permit densification. In flood plains, colonization fast proceeds from sparse to heavy thickets (Versfeld *et al.* 1998).

2.3.1 Impacts of invasive alien plants

Generally, the presence of some plants, animals and other living organisms that are naturally not a part of a given ecosystem occurs at a premium to the environment (Luken and Thieret 1996). The scientific literature supports the link between alien infestations and reduced aquatic ecosystem integrity and hydrological yield. A common feature of IAPs, regardless of the ecosystem in which they have been introduced, is their threat to native species (Williamson 1996 in Camarda *et al.* 2000). Generally, IAPs out-compete native species for space, nutrients, water and other necessities. Often, the end results include a significant transformation of an ecosystem due to high levels of infestation and considerable reduction in native species population. In this way, the ecological integrity of an ecosystem is compromised and could lead to eventual extermination of native species.

Specific to IAPs, their impact may be summed up in terms of two considerations: biodiversity conservation and water consumption. IAPs comes second to direct habitat destruction as a threat to biodiversity conservation (DWAF 2000b). Biodiversity is central to the functioning of ecosystems and their associated ecological goods and services (Upton and Bass 1996). Large canopies of IAPs deny enough light from reaching overshadowed native plants, reducing their chances for survival (Luken and Thieret 1996).

Research has also shown that in the riparian areas, species-richness is considerably affected by invading species (Samways 1999). The biodiversity impact of IAPs arises from a mix of different aspects: displacement reduced structural diversity, increased biomass and disruption of prevailing vegetation types (van Wilgen *et al.* 1999; DWAF 2000). Certain species are known as transformer species due to the way in which they transform environments (Coleman 1999). They can change the structure, composition and functioning of the ecosystems and interfere with their capacity to deliver a range of benefits, ecological goods and services. Negative impacts associated with IAPs can be summarised as follows:

- Threatening “the ecological integrity of the natural systems by reducing runoff from watersheds through water uptake from soil and subsequent transpiration” (Wilgen *et al.* 1996: 5).
- Stands of IAPs increase the intensity and strength of fires because the stands are both denser than natural vegetation and the wood is more resinous (Versfelt *et al.* 1998). Costs of fire protection and damage in wildfires are as a result high.

Furthermore, there are negative impacts that are related to the loss of livelihood opportunities due to the impact of IAPs on water quality. For example, fishing opportunities may be affected as would be the opportunity to harvest reeds and other riverine vegetation due to heavy colonisation of habitats by IAPs. Other problems associated with IAPs include sedimentation, siltation of dams and estuaries, clogging of waterways and depletion of oxygen in the water (Frazee 1999).

A major global concern about invasive alien plants is the stress they put on the limited fresh water resources which comprise less than 1% of the earth's water, the rest being sea water, ice or ground water (Barlow 1999). Estimates indicate a doubling in the amount of water consumption in the world every 20 years (*ibid.*). Unprecedented demands for fresh water resources are being experienced for growing populations and expanding economies.

Research suggests a negative correlation between stream flow and the presence of IAPs (Bosch 1979; Bosch and Hewlett, 1982; le Maitre *et al.* 1996; Scott and Smith 1992; Van Lill *et al.* 1980; Wicht 1965). Eradication of IAPs has been found to improve stream flow and runoff (Versfeld *et al.* 1998; van Wilgen *et al.* 2000). A study which analysed data for a 40-year (1940 to 1980) afforestation cycle in the South Western Cape Province of South Africa, found a decrease in stream flow in catchments planted with *Pinus radaita* (van Wyk 1987).

Some invasive woody tree species have been reported to increase biomass above the surface of the ground by as much as 3 to 10 fold (Versfeld and van Wilgen 1986 in Le Maitre *et al.* 1996). This increase in the above ground biomass decreases streamflow as a result of an increase in transpiration and evaporation of intercepted rainfall (Le Maitre *et al.* 1996). Besides this major impact on the water resource, there are a number of other negative impacts associated with invasive plant species such as loss of biodiversity and ecosystem resilience; loss of potential productive land; loss of grazing potential and livestock production; poisoning of humans and livestock; increased costs of fire protection and damage in

wildfires; erosion following fires in heavily invaded areas and siltation of dams (van Wilgen *et al.* 1999).

Economic costs resulting from the impact of invasive alien plants have been reportedly substantial. The economic significance is partly shown by the considerable amounts of damage they cause. According to the Working for Water Programme (DWAF 2004) invasive species caused R10 billion worth of damage in Australia and R750 billion damage in the USA in 1998.

2.4 The South African context

2.4.1 Extent of spread of invasive alien plants

Nearly a decade ago, estimates of alien plants infestation in RSA stood at 403 000 ha of land as heavily infested, 232 000 ha medium infestation and 1 074 000 ha lightly infested (Jelinek and Breen 1997). By the mid 1980s between 780 and 790 IAPs had been recorded in South Africa (Richardson *et al.* 1997). These invasive alien plants destroy the capital value of this country's agricultural sector by billions of rand (Huntley *et al.* 1989). The total number of species introduced into the country is 161: 38 herbaceous, 23 succulent and 100 woody (DWAF 2000b), illustrating the fact that although woody plants are in the majority, there is still a strong need to pay attention to non-woody species. All the recorded or known IAPS are regarded as invasive and forty-four species among them are toxic and laws reinforce their removal, while the rest (31) are regarded as invaders which need to be controlled (*ibid.*). The invading vegetation grows at a rate of 5% annually, implying that if no control were carried

out, their impact would double in 15 years (Versfeld *et al.* 1998). Compounding the situation further is the fact that South Africa was never richly endowed with indigenous forests as only about 4% of the land area was historically covered with indigenous forest (Rabbie and Fuggle 1994). However, this has now been reduced to approximately 0.25% of the country (Cooper 1985). This scenario is important to understand because some individuals have opted to bring IAPs into the country for ornamental purposes, and with the reduction of indigenous forests, the temptation to plant IAPs may worsen.

The most important types of invasive plants in South Africa are woody plants. The most common species are *Acacia mearnsii* (Black wattle), which is mainly found in Mpumalanga, KwaZulu-Natal and Eastern Cape (Versfeld *et al.* 1998). Other major problem species include *Acacia cyclops*, *Protopis* species, *Acacia saligna*, *Solanum mauritianum*, *Pinus* species, *Opuntia* species, *Melia azedarach*, *Lantana camara*, *Hakea* species and *Eucalyptus* species.

2.4.2 An overview of impacts of invasive alien plants

Although alien invasive animals undoubtedly have a negative impact on the functioning and biodiversity of aquatic ecosystems (Davies and Day 1986), it is the uncontrolled spread of invasive plants that is a more immediate threat to the water resources of South Africa (Versfeld *et al.* 1998). The enormity of the challenges posed by invasive alien species in

South Africa is widely documented. The following quotation, synthesising views of various authors partially illuminates the extent and seriousness and impact of IAPs in South Africa:

“Alien invasive species pose one of the greatest threats to South Africa’s biodiversity. An estimated 8%, or 10 million hectares, of South Africa has been invaded by about 161 different alien species, and all seven of South Africa’s terrestrial biomes suffer alien plant invasions to varying degrees. In some biomes, such as the species-rich fynbos, infestations of up to 14% of the total area have caused extensive transformation. Almost 900 of South Africa’s 3435 ‘Red Data’ species are threatened wholly or in part by alien invading plants, which have also been shown to alter the diversity of insect species. Invading alien plants use about 3.3 billion m³ of water annually, accounting for 6.7% of the water that would otherwise flow in South Africa’s rivers, and reducing water availability “.(Wynberg 2002: 236).

The focus on the water dimension of the impact of invasive plants is not strange considering that South Africa is a water stressed country. Invasive plants have had a negative impact on the mean annual runoff of the country (Versfeld *et al.* 1998). It is estimated that the IAPs cause a 7% (about 3 300 million cubic metres) loss of annual flow in South Africa’s rivers (*ibid.*). This is nearly as much water as used by people and industries in South Africa’s major urban and industrial centres.

With at least two-thirds of South Africa classified as arid and with an annual rainfall of 502mm and annual runoff of 42mm, it is likely that water shortages will increasingly limit future national development (Hosking and du Preez 1999). Coupled with a current demand of 3% of water the country may reach its usable freshwater within the first fifty years of this century (Jelinek and Breen 1997). It has been predicted that total water demand in South Africa will increase by 50% by 2030 (DEAT 1999). This demand is linked to abstraction of water for industry, domestic use and agriculture, among others, and at this scale could lead to

the complete degradation of aquatic ecosystems vital to life (IUCN 2000). Aside from the impacts on water resources, research has shown that half of South Africa's endemic species are threatened by extinction because of the shading of their territory by IAPs such as the black wattle (DWAF 2002).

These above facts underscore the need for the sustainable management of the water resource of South Africa as a priority (Davies and Day 1986). Such management should incorporate all aspects of the resource, including riparian zones. Because of this, a major element for maximizing water supply and ensuring ecological integrity in the country is the removal of invasive alien vegetation (Rowlinson 1999). There is, therefore, a need for concerted efforts from government, NGOs and the community to combat the spread of invasive alien plants. If for instance public administration and rural deforestation efforts cleared 700 000 and 300 000 ha respectively, at almost no cost, in another 10 years an increase of about 1.00 billion cubic metres of water would result which would meet the current rate of increasing demand, which is 3% (Jelinek and Breen 1997). However, the water savings gained from removal of alien woody vegetation from riparian zones can only be sustainable if areas that are cleared are rehabilitated with species indigenous to the particular habitats cleared.

2.4.3 The legislative context of managing invasive alien plants

An important step taken by the South African government in respect of fighting invasive alien plants is the drafting of new legislation and the amendment of existing legislation with a

focus on the eradication and the control of alien plants. There are various pieces of legislation relevant to the fight against invasive alien plants. Such legislation includes the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA), the National Veld and Forest Act (Act 101 of 1998) (NVFA) Section 28 of the National Environmental Management Act - NEMA (No. 107 of 1998) (DEAT 1998) and the National Water Act - NWA (DWAF 1998). Of these, CARA is more specific to invasive alien plants, but it is important to first briefly look at what the Constitution says about environmental management in South Africa. The Constitution of South Africa (Act 108 of 1996: 11), states that “Everyone has the right:

- to an environment that is not harmful to their health or well-being; and
- to have an environment protected for the benefit of present and future generations through reasonable legislative and other measures that –
 - i. prevents pollution and ecological deprivation;
 - ii. promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic; and
 - iii. social development.”

The thinking exhibited in the Constitution which integrates social, economic and ecological considerations reverberates in a range of other legislation passed since 1994, including NEMA and NWA. Both of these Acts have contributed to the management, control of invasive alien plants and management of aquatic resources in South Africa (DWAF 1998).

The underlying principles of the NWA were aligned firmly with the new constitution that water is a national resource, that equal access is the right of all citizens and that it is the

government's responsibility through integrated management to protect its quality and ensure its sustainable and equitable use. Thus, the Act redefines appropriate water rights and uses, with implications for people throughout the country. The Act sets out specific guidelines regarding the control, management, utilization and conservation of South Africa's water resources. Sustainability and equity are identified as central guiding principles. The Act specifies only one right to water in law, that of the notion of the Reserve. It consists of two parts:

- **the basic human needs reserve** – includes water for drinking, food preparation and personal hygiene; and
- **the ecological needs reserve** – includes the water required to sustain the aquatic ecosystems and must be determined for all or part of any significant water resource.

The NWA also provides for the formation of institutional structures to undertake the management of the water resources of the country at various levels. For example, there are 19 declared Water Management Areas (WMAs) in South Africa. These are based on a single catchment; a logical grouping of catchments or other functional units (DWAF 2000b). Other structures include Catchment Management Agencies and Water User Associations. The Act spells out the responsibilities for these structures which include the effective management of the water resource in their jurisdiction, an object which is arguably unachievable without due recognition of, and control of invasive alien plants.

As part of the Act, a national water resource strategy is implemented and is a requirement by law. The national water resource strategy is the framework where all the different strategies that are needed to manage water resources sustainably can be integrated (DWAF 2000a). This strategy includes the eradication of invasive alien plants from riparian areas. Within this scope, areas at high risk of infestation and those already infested by invasive alien plants have been identified and projects are under way to remove invasive alien plants. The main objective of removing invasive alien plants is to promote biological integrity in affected ecosystems so they can perform their ecological functions sustainably. Reducing water loss due to the effects of invasive alien plants is an integral objective of the efforts to remove invasive alien plants.

NEMA states that everyone has the right to an environment that is not harmful to his or her health or well being, and that everyone has the right to have the environment protected. An effective invasive alien plants control programme is therefore an integral part of NEMA in ensuring that the environment is protected, and will help in guaranteeing an environment that is not harmful. As with all legislation, it is easy to see the influence of the Republican constitution on the scope and aspirations of both the NWA and NEMA. Regarding invasive alien plants, the Conservation of Agricultural Resources Act, Act 43 of 1983 (CARA) is more specific. It sets out the controls and regulations pertaining to invasive alien plants. It explicitly declares invasive alien plant species as either weeds or invaders and calls for either eradication or effective control wherever invasive alien plants occur. 'Recognised' weeds and invaders are listed by CARA and updated on a regular basis (van Wilgen *et al.* 1999).

CARA was amended on 30 March 2001 to introduce further measures in the fight against invasive alien plants. The amended regulations categorise invader plants into three categories (Government Gazette Vol. 429 No. 22166) summarised in Table 2.1 below. CARA also obliges landowners to clear invasive alien plants from their properties. Where land owners are not willing to co-operate in clearing invasive plants from their land, the amended legislation empowers the recognised authorities to clear them without the owner's permission, for which the owner will be charged (DWAF 2000b).

Table 2.1. Conservation of Agricultural Resources Act 43 of 1983 categories as amended 30 March 2001

Category 1	Category 2	Category 3
This is the strictest category. These plants may not occur on any land or inland water surface other than in a biological control reserve. Except for the purposes of establishing a biological control reserve, one may not plant, maintain, multiply or propagate such plants, import or sell or acquire. Propagating material of such plants except with the written exception of the executive officer	These are plants with a commercial application and may only be grown in demarcated areas (or biological control reserves). Other provisions of Category 1 applies.	The regulations regarding these plants are the same as for category 1, except that plants already in existence at the time of the Commencement of these regulations are exempt, unless they occur within 30 metres of a 1:50 year flood line of river, stream etc

Another important piece of legislation is the Biodiversity Act, Act 10 of 2004 which seeks to create an enabling regulatory framework for integrated management of South Africa's biodiversity resources. One of the objectives of the Act is to provide for co-operative governance in the management and conservation of biodiversity. The Act is categorical on the following aspects relevant to controlling and eradicating IAPs:

- preventing, where possible, the introduction and spread of invasive alien species,
- protecting ecosystems and habitats where they do not naturally occur;
- managing and controlling invasive alien species to prevent or minimize harm to the environment and to biodiversity in particular; and eradicating invasive alien species from ecosystems and habitats where they may harm those systems or areas.

The Biodiversity Act provides for the establishment of a National Biodiversity Institute to serve as an institution that could assist in overseeing alien and invasive species control. The Institute is given as one of its functions the responsibility for coordinating programmes for the prevention, control or eradication of listed invasive species.

2.4.4 The Working for Water Programme (WfW)

In general terms, the NWA creates various institutions in whose jurisdiction the management of South Africa's water resources is exercised. The Working for Water Programme is not one of these institutions. It has no legal basis, but its founding and continued existence is firmly based on its integration of ecological, economic and social imperatives. It is arguably a demonstration of the South African government's continuing recognition of the need to forestall the impacts of invading alien plants. The urgency to deal with alien plants and the need to invest heavily in their eradication was aptly summarised in the WfW 2003/04 annual report:

“These alien invasive plants threaten our life supporting systems in ways that can only increase poverty, conflict and destruction. To make matters worse we have to deal with these problems or they deal with us. And the longer we leave them, the greater the cost will be” (DWAF 2004: 3).

The WfW programme was initiated with the dual function of controlling IAPs and providing social upliftment (Magadlela and Mdzeke 2004). It is a labour intensive programme that has the following objectives through the control of invading alien plants to:

“enhance water security; improve the ecological integrity of natural systems; invest in the most marginalized sectors in South Africa and enhance their quality of life through job creation; restore the productive potential of the land and develop economic benefits from wood, land, water and trained people” (DWAF 2000b: 1).

In this way, it can be considered as a development programme in some senses. Development programmes are an attempt to produce change that will improve the quality of life in a given community (Sakala 2004). The WfW programme was conceptualised in the context of the Reconstruction and Development Programme (RDP) which was drafted by the majority party within Government and contains five key programmes which aim to improve the standard of living and quality of life of all South Africans (African National Congress 1994). The RDP is based on the following principles (ANC1994: 4-7 in Liebenberg and Steward 1997):

“that it is a coherent programme that builds the nation, that it is people-driven, that it provides peace and security for all, links reconstruction and development and that it democratises the state and the society”. These

principles seem to be based on three areas: participation, empowerment, economic and institutional transformation towards equity and stability.

The WfW programme reports to three Government Departments with mandates relating to the prevention and control of IAPs:

- Environmental Affairs and Tourism (DEAT) – which has an overall responsibility for the development of policies relating to the conservation and management of the environment. It is also responsible for guaranteeing that no new species that could be harmful are brought into South Africa.
- Agriculture (DoA) – is responsible for policies relating to all aspects of Agriculture, including the protection of natural resources, such as soils and natural vegetation. It is also responsible for the legislations and regulates the rule that controls the release of biological control agents.
- Water Affairs and Forestry (DWAF) – is responsible for the funding of the programme through its Poverty Alleviation programme (Preston in DWAF 2004).

This co-operation between government departments is important because in communities that are predominantly poor, isolated, have limited education and welfare dependent, the best way of effective community capacity building is through partnerships and collaborations (Millar and Kilpatric 2005). The partnership and collaboration between communities and development programmes can improve social capital formations and foster genuine

community development while also facilitating re-engagement with learning in disadvantaged communities (*ibid.*). The WfW programme is, therefore, a developing example of how partnership can be crafted at the inter-departmental level in government (Haigh 2001). Importantly, the partnership is not limited to public institutions alone. Non-governmental organisations, parastatals and a host of quasi-public institutions and even private institutions are in partnership with the WfW programme in its efforts to deliver on its multi-faceted objectives.

2.4.4.1 Achieving the purpose

The stated purpose of the Working for Water Programme is to implement an IAPs control programme through which it aims to contribute to South Africa's strategic objectives on poverty alleviation, water resources management and community empowerment. The purpose is consistent with the programme's Mission Statement:

“The Working for Water programme will sustainably control invading alien species, to optimise the potential use of natural resources, through a process of economic empowerment and transformation. In doing this, the Programme will leave a legacy of social equity and legislative, institutional and technical capacity” (DWAF2000b: 1)

The objectives of the programme (**Box2.1**) include ecological, economic and social imperatives. The ecological dimension of WfW programme objectives seeks to address the biophysical outcomes of invasive alien plants. These include: excessive water consumption,

soil erosion, siltation in water courses, rivers and dams, outcompeting of indigenous plants that form part of South Africa's natural heritage and tourism industry (Versfeld et al 1998).

- To determine the nature, extent and distribution of alien invaders at a national scale in South Africa;
- To assess the impacts which these invaders may cause on the water resource
- To evaluate the costs of managing the current problem of alien invaders and the costs of maintaining the landscape in a condition where invasive species are kept under control;
- To assess the costs of failure to bring alien invaders under control, i.e. to assess the
- Implication and costs of unchecked further invasion;
- To establish the time it will take to achieve satisfactory control;
- To priorities the areas that should be targeted first in a national programme to control alien invaders;
- To develop a vision for the future with regard to the eradication of IAPs
- To utilize scenario planning in assessing how to take the invader control programme forward into the long-term future;

Box 2.1: Objectives of the Working for Water Programme

Source : Versfeld et al 1998

The social and economic objectives are closely linked and are directed at acknowledging and addressing the high levels of poverty and unemployment in the country. While social objectives are designed to ensure optimisation of social benefits, economic objectives seek to

promote economic benefits especially to the needy, the unemployed (McDonald 2004). The social and economic objectives of the programme have led to initiatives that are aimed at benefiting those that participate through job creation and development of entrepreneurial capabilities. The programme has up to this point been labour intensive. Poor members of the communities in areas infested with IAPs are afforded the opportunity to participate in the programme by working for those hired as contractors, who are the beneficiaries. A major benefit for those hired under the auspices of the programme is that they earn an income for the duration of the programme in the area. Unemployment, is, therefore one of the major socio-economic challenges which the programme seeks to address (Magadlela and Mdzeke 2004).

2.4.5 The Working for Water Programme and public awareness

2.4.5.1 Local knowledge, perceptions and public awareness

Local knowledge which is probed in this study can also be known as traditional environmental knowledge and distinguishes one community from another (Encyclopaedia 1998). The traditional environmental knowledge refers to “a particular form of place-based knowledge of the diversity and interactions among plant and animal species, landforms, watercourses and other qualities of the biophysical environment in a given place (Peria 2005, pg 98 in Encyclopaedia 1998). In this instance, it is the effects of invasive alien plants at Indaleni community. This traditional knowledge as explained in Methodology in Chapter 1, may be acquired through an external source or may be improved through experience (*ibid.*).

While perceptions are complicated processes which we experience in our everyday life (Bell *et al* 1996). Environmental perceptions include both an assessment of what is in a scene and an evaluation of the good and bad elements of one's surroundings (*ibid.*). Perceptions of the environment are largely influenced by the personal circumstances of households, especially their socio-economic circumstances and previous knowledge (Ebohon *et al* 2000). That is why it was important to probe the background of the respondents at the beginning of the questionnaire in Chapter 4. Furthermore, understanding of environmental perceptions about a programme can inform on policy formulation especially where such policies are aimed at influencing and re-orientating communities towards acceptable environmental behaviour (*ibid.*). The environmental acceptable behaviour in this study is that, local communities will stop planting IAPs instead help in preventing their spread. It may be possible that as local communities come to recognize the importance of environmental issues, they would be more willing to support environmental management programmes (Ebohon *et al* 2000), in this case the Upper Illovo WfW programme. It is hoped that the perceptions and local knowledge will feed back into public awareness that WfW programme is developing.

While public awareness, involves raising awareness of the importance of eradicating alien invasive plants. Turpie *et al.* 2006 describes public awareness as involving experts in the area of invasive alien plants to provide information to the landowners and the public regarding the dangers of not managing infestation. Public awareness regarding IAPs involves learning about the biology, ecology and control of these invasive plants (Thorpe & Godwin 1999). In a study done by Steele *et al.* 2006 public awareness was conceptualized in two ways, namely 1) whether landowners had heard or read information about invasive alien plants in their area

and 2) whether they were aware of plants on their own properties that they considered undesirable for any reason. Furthermore, it is believed that responsible land management will only stem from an understanding of the severity of the threats posed by these alien plants, as the lack of public awareness has been identified as an obstacle to the implementation of effective management of biological invasions and the ways in which involvement of individual groups could help to alleviate this problem (Richardson *et al.* 2006) The involvement of groups of learners in public awareness programmes should involve continuous activities throughout the state and should be broad enough to reach the general public, including persons with disabilities, and should include a variety of methods for disseminating information. These should include, posters, pamphlets, display, toll free numbers, web sites, TV, radio, newspaper releases, advertisements, (Blanchard & Holmes 2008).

An important part of disseminating information about invasive alien plants is “alien plant identification” (Thorpe & Godwin 1999; 13). A school project in KZN is being developed with the aim of using schools as an avenue for spreading information on the threats posed by invasive alien plants to biodiversity, water and the agricultural potential of land (*ibid.*). Another essential educational initiative to spread the word about IAPs is a *National Hack Day*. The aim of the Hack Day is to mobilise communities, schools, businesses, labourers and government to join in the fight against IAPs and to increase awareness around this crisis (DWAF 2000a). Political leaders, celebrities and the general public are encouraged to “hack” invasive alien plants on this day. A Hack-Attack Pack for schools has been developed which has proved very popular and helpful in the classroom (*ibid.*). The hope is

that people will learn to recognise the invasive alien plants and pull them out of their yards. This pulling out of invasive alien plants is considered the first step in recovering natural vegetation structure and plant species richness and diversity (Blanchard & Holmes 2008).

Furthermore an *Alien Buster Campaign* was initiated in 2000 by the WfW programme in an attempt to communicate to a broad South African public the urgent national responsibility for the control of IAPs. It utilized strategies that are drawn from advertising and marketing in an attempt to persuade people to change attitudes and behaviour towards IAPs (Richardson *et al.* 2006).

As the above mentioned information becomes more widely publicized and the impacts of IAPs become more evident, it is postulated that the attitudes of the general public towards these plants will also change (Le Maitre *et al.* 2004).

2.4.6 Training

In addition to facilitating the actual eradication of invasive alien plants, the WfW programme also provides a range of training and education opportunities. This is in line with the requirements of the poverty relief programme – the source of funding for the WfW programme. For this reason, WfW has provided training that has taken many forms including occupational skills, environmental awareness, and reduction of drugs, alcohol dependence

and life skills (DWAF 2004). According to Magadlela and Mdzeke (2004) training has concentrated on three main areas:

- Training in work related activities - the development of skills in machine and herbicide use and worker safety issues
- Training in health - with a focus on HIV/AIDS and contractor development
- The programme proposes eventually to develop projects in which all team members will undergo training for 48 days in a two-year employment cycle. This will be in fulfilment of a requirement of poverty relief funding.

The programme has also implemented community development projects which have resulted in activities such as crèches, subsidized food for children, training centres and sporting facilities (DWAF 2004). Another development, although reportedly slow to take off, has been the creation of small secondary industries, for example, production of charcoal, building materials and nurseries for vegetation rehabilitation industries (*ibid.*). It has been observed, however, that there is a need for improved training so that beneficiaries are in a position to take up gainful employment after their time with the programme ends (MacDonald 2004). This was pointed out as being essential for long-term and social upliftment and consistent with the funding source – the Poverty Relief Programme.

2.4.7 Partnerships

The formation of a partnership between WfW programme and other institutions is the most promising route to effective eradication programmes. The programme itself is a partnership

involving several government institutions in addition to the three main departments. A partnership of this kind has been made with Rhodes University (van der Byl *pers. comm.* 2005). The university is offering an environmental management course with alien invasive plants as one of its modules (*ibid.*). A major educational thrust in 2000/01 was the establishment of an integrated environmental education initiative in schools, “The Green Schools Programme”, with strong support from the Department of Education (DWAFF 1999). This seeks to ensure that all learners are informed about the threats of invasive alien plants so as to learn to identify and control those that are problematic in their areas. The programme is also in the process of formulating a nursery accreditation initiative, whereby those nurseries not selling or propagating invasive alien plants are recognised and are awarded “green stamps” (*ibid.*).

Partnerships are also being formed with NGOs, although this option has not been established fully yet due to the lack of awareness and education of the programme (DWAFF 2004). At another strategic level, the WfW programme has formed partnerships with countries that have a history of fighting invasive alien species. Partnerships have been formed with Australia and the USA and in keeping with these partnerships, the programme now incorporates initiatives started in some of these countries, e.g. the Australian-led concept of Weedbuster 8-15 October, an annual event, in an effort to heighten levels of awareness around the threats of IAPs (Magadlela & Mdzeke 2004).

2.5 Summary

This chapter has reviewed the relevant literature on invasive alien species in general and invasive alien plants in particular, perceptions and local knowledge and how they feed into public awareness, and has therefore served to provide a framework for undertaking the empirical work of the study. The review was done in three components. The first component covered the introduction, a background to the evolution of the environmental movement in the world and a focus on invasive alien species and their impacts. The second component outlined the South African context regarding invading alien species, highlighting government responses in terms of legislation and the WfW programme – an innovative national programme aimed at controlling invasive alien species and the rehabilitation of affected ecosystems. The last section deals with local knowledge and perceptions and how they relate to Working for Water and public awareness. Furthermore, partnerships the programme has formulated with other institutions are also discussed.

It is important to realize that successfully fighting invasive alien plants cannot be achieved without involving local communities. Also, this community involvement cannot only be limited to physical clearing of affected sites. Rather, they ought to be made aware of the different implications of invasive alien plants on the natural environment, local livelihoods as well the potential effects on the economy. An integral element of local knowledge that needs developing is about legal obligations and related duties on the part of citizens. Lastly, it is imperative that efforts are made to train the local people to identify the various invasive alien plants. In this way, they would be prepared to take the necessary remedial measures, e.g. uprooting invasive plants in their fields, reporting the presence of invasive alien plants to the

relevant authorities or advising fellow community members on appropriate actions. The next chapter outlines the study that was undertaken to realize the study's objectives.

Chapter 3 Context and study methodology

This chapter describes where the study was conducted (context), the study methodology and how the research was carried out in the field. The study methodology is of importance to enhance the understanding of the nature of the research process, because it describes the fundamental values of the study as well as processes leading to formulating criteria for data collection, interpretation and reaching conclusions (Neuman 2000). To this end, this chapter comprises the following sections: choosing the study area; respondents; research design and approach, methods and data collection, data analysis and lastly, limitations of the study.

3.1 Choosing the study area

Careful consideration was taken in choosing the study area. First, was the imperative of the area being a project site of the WfW Programme. Second, the area had to be situated in an area that was faced with problems of invasive alien plants. The second criterion was relatively easier to employ as the whole of KwaZulu-Natal, the region in which my University is situated, is a high rainfall area, with a high density of perennial rivers and streams in the province. Moreover, the conduit function of riparian corridors has also facilitated the spread of invasive alien plants (Forman and Gordon 1986). Therefore, a study site in KwaZulu-Natal is appropriate for the study as it is one of the provinces with riparian areas that are highly infested by alien species (van Wilgen *et al.* 1998).

Following consultations with experts at the provincial conservation agency (Ezemvelo KwaZulu-Natal Wildlife), the provincial Department of Agriculture and Environmental Affairs and the WfW provincial office, various potential sites were identified. A decision was ultimately made to carry out the study in Upper Illovu, one of the project sites of the WfW programme in KwaZulu-Natal. Among the reasons for this choice was easy accessibility from the University, as the project site is located in Richmond Municipality, South of Pietermaritzburg (**Figure 3.1**). Another reason was the respondents' willingness and enthusiasm to participate in the study. This was realized during a reconnaissance visit to the area with the WfW Project Manager.

More importantly, Upper Illovu provided the opportunity to find respondents who participated (study sample), and those who did not participated but used a control group to the WfW programme activities living in the same local community (Indaleni) – an essential requirement for undertaking this study. Upper Illovu also met the second criterion in that it is situated in a coastal area, and therefore quite moist, with relatively high rainfall. It is also warm, thus sub-tropical and therefore ideal for rapid growth of plants without competitors. This municipality is therefore susceptible to invasion by alien plants, particularly along within its riparian areas. (See **Figure 3.1**).

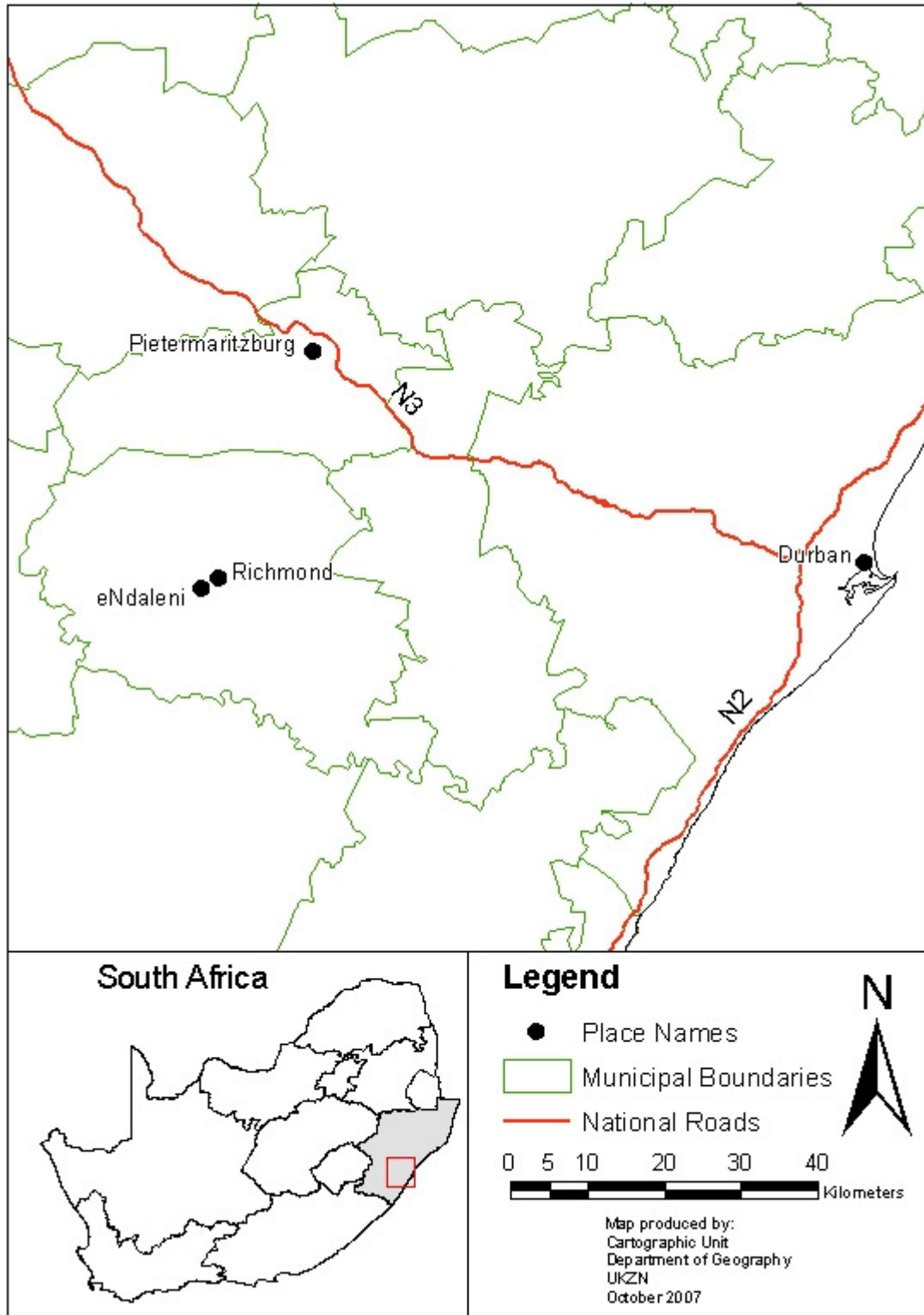


Figure 3.1: Map of KwaZulu-Natal, identifying the study area

3.2 Respondents

A sample size of 30 respondents was chosen within the operational area of the Upper Illovo WfW project. The respondents comprised both those working (the contractors and the field workers) on the WfW project and those not involved but who had just heard about it; but all from the same community, Indaleni. The key issue was the intention to get a control group that was not exposed to the WfW project. In the end twenty one (70%) of the respondents were involved in the Upper Illovo WfW project and nine (30 %) were used as the control. This disproportional representation of respondents (working on the project and the control group who were not) was not critical as the intention of the study was to gather qualitative rather than quantitative information. The two groups were intended to highlight possible differences between those involved and those not involved. It must be noted that although the sample size in qualitative research may be relatively small, it usually consists of information-rich cases (Holloway 1997), as was the case in this study. Despite the small sample size, it is representative of a homogenous group of people (the Indaleni people) and each group (those on the project and the control group) brought different perspectives to the study.

Each session of data collection (done through interviewer-administered questionnaires) was preceded by confirmation (by the researcher to the respondent) that participation was on the basis of informed consent and an assurance that the respondents' right of privacy was to be upheld as suggested by Neuman (2000). Meetings took place in respondents' homesteads and on the project site. Data collection sessions were interspersed with days for data management, specifically making time for the coding of the completed questionnaires. A maximum of four appointments were set per data collection day. This interspersing and setting a limit on

number of sessions was important in order to allow the checking and coding of questionnaires while the information was still relatively fresh in the researcher's mind.

While not a part of the core-group of respondents, a few key informants were consulted. These included the KwaZulu-Natal WfW programme Manager and experts from academia and Ezemvelo KwaZulu-Natal Wildlife. These experts were engaged for clarification purposes during the early stages of the study. Their input was used to develop a better understanding of the issues that needed to be investigated in the study, as well as the development of the questionnaire. Hence, their views are not presented here as they are not directly relevant to the study's aim and objectives.

3.3 Research design and approach

A case study approach was chosen as the most appropriate method for this research because of its descriptive nature. A case study is a single social unit which is located in one physical place, comprised of people making up the social unit (Payne and Payne 2004). A case study is an approach that is based on enquiry and experiment and investigates a contemporary issue within its real life context (Yin 1984). Through a case study approach, the researcher analyses in-depth the factors under which the social phenomenon is happening but does not have control of the variables and context of the phenomenon (Payne and Payne 2004)

A weakness of the case study approach becomes apparent when its findings are generalized as representing the state of the contemporary (Payne and Payne 2004). This means that it becomes a problem when the research findings of a single case study are used for coming to a wider theoretical conclusion about a phenomenon, in this case Upper Illovo WFW project. Because of this argument Lewis-Beck *et al.* (2004) came to a conclusion that instead of using case studies as a baseline for reaching generalized conclusion, researchers should concentrate only on the distinctiveness of the case being studied and nothing more. In a parallel view, it has been noted that results from case studies can inform and reform existing theories through elucidating the particularities in a single case study (Yin 1984).

3.4 Methods and data collection

Methods are central to data collection. They denote the specific research techniques or tools used to gather data (Bailey 1982). Their use is normally influenced by the research questions and nature of the study (Bless and Higson-Smith 2000). Data is empirical evidence or information which is both qualitative and quantitative in nature, that one gathers carefully according to rules or procedures specified by the nature of the research (Neuman 2000). Data was collected in the form of a semi-structured questionnaire and from secondary sources through a review of literature deemed relevant.

Secondary sources or literature were particularly helpful in conceiving a theoretical framework for the study. The literature review provided a framework for establishing the importance of the planned study as well as a benchmark for comparing results of the study

with the findings from other researchers (Creswell 1994). In this regard, published and unpublished materials relevant to the research topic were reviewed. The literature review also helped to expose me, as a novice researcher, to both past and current issues and concepts in the area of invasive alien plants.

The semi-structured questionnaire (**Appendix 1**) was interviewer-administered in order to expedite the process of data collection and avoid prospects of receiving incomplete questionnaires. The decision to use an interviewer-administered questionnaire was also reached as a measure of averting the effects of illiteracy¹. Another advantage of using an interviewer-administered questionnaire was the immediacy of clarifications where necessary. Importantly, using a semi-structured questionnaire makes provision for both open-ended and closed-ended question and consistency of interpretation.

Closed-ended questions are also referred to as structured or fixed response questions. The closed questions were used where specific and explicit responses were required. The respondents were required to choose from the fixed list, making it easy to compare and standardize responses during data analysis. In the attached questionnaire (**Appendix 1**), an example of a closed-ended question was the question relating to the gender of the respondent which simply required noting the gender (male or female) of the respondents.

¹ While this was not confirmed for the study area, it was anticipated to be the case given that it is normal to find low literacy levels in rural black areas of South Africa.

Open-ended questions are unstructured questions or free response questions. These types of questions were used in this research to allow respondents to express their views freely without any restrictions. In short, open-ended questions enable respondents to communicate their experiences and opinions without being restricted.

There are other aspects regarding the questions that were used in the questionnaire worth noting. The study raised a number of issues that were to be opinion rated, and with the use of the Likert scale, respondents were able to show their opinion on the positions formulated, e.g. how good they felt at identifying invading alien plants. Further, responses to some closed-ended questions were public knowledge. In such cases, what was expected was simply to check if the respondents answered the question without being prompted. Those who managed their responses were marked as unprompted – meaning no clue or aid was provided. In other cases, however, some could only answer upon being prompted – in which case the response was marked as prompted. The categorical responses technique was also employed. This technique was useful with questions deemed closed-ended but to be of a sensitive nature or where an opinion was required. This allowed the respondents to place themselves in categories rather than to give exact answers. The respondents were expected to choose from a pre-determined list of possible options. In some questions, the multiple response option was allowed in which case this was noted and accordingly reported in the findings (**e.g. see Table 4.2 in the next chapter**).

Many questions probed both local knowledge levels and perceptions of competencies in controlling and managing invasive alien plants. Local or traditional knowledge as explained in the literature review in Chapter 2 refers to the long-standing traditions and practices of certain regional local community (Encyclopaedia 1998), in this case, the Indaleni community. Perceptions are the materialization of what people distinguish and are capable of interpreting from diverse environmental phenomenon (Freeman 2003 in Gaspar 2008). In this case perceptions refer to skills and ability pertaining to performing tasks associated with invasive alien plants eradication and control. For example, respondents were asked to rate themselves as “very good”, “good”, “not good” and “bad” at identifying an invasive alien plant.

3.5 Data analysis

Data analysis refers to the search for patterns in data, recurring behaviours, objects or body language (Neuman 2000). The analysis of data was mainly through data reduction and visual displays. According to Miles and Huberman (1994) the benefit of data reduction is that it gives a clear indication of what data chunks to code and which to pull out. More importantly, it identifies evolving stories, themes, and patterns that best summarize a number of data chunks, whereas the advantage of using a visual format is that it presents the information systematically. Data reduction organizes and compresses the information and makes it easy and possible to draw valid conclusions. To this end, each response was analyzed and grouped based on the themes that emerged from the responses. After this, data was coded accordingly and systematically entered onto a spreadsheet to obtain the percentages of the variables in particular categories, such as household size and household income. These themes were then

displayed in the form of tables and charts. This way of presenting data provides a succinct picture of the sampled data for non-specialists and is appropriate when the sample is too small (as is the case in this study) to warrant complicated statistical analysis (Creswell 1994).

3.6 Limitations of the study

Considering the purpose of the study, and the sample size, it is evident that the study sample is by no means statistically representative. Furthermore, only a few individuals participated among those not working in the project but from the same community. That is, only nine (30%) of the respondents were not involved in the project but were used as a control group. Bearing this in mind, the representativeness of the sample cannot be guaranteed, and therefore, the perceptions and the views expressed may not be generalized to other WfW projects.

Having said the above by no means implies that the opinions and perceptions raised should be considered null and void. Rather, it means that caution should be taken when interpreting the findings, taking into account the scope of the study. It may therefore be necessary to conduct a similar study on a bigger scale with sufficient financial resources to obtain representative results.

3.7 Summary

This chapter has outlined the methodology of the study. It has also described the area where the study was conducted and the reasons why it was selected. The data collection tools used

and the reasons for their choice as well as the process of data analysis were also set out. The next chapter will give the results of the field work.

Chapter 4 Results and discussions

This chapter has a dual purpose: to present the findings and discussion of the study. Five objectives were set out for the study: to determine the respondents' relationship and perceptions of the Upper Illovo WfW project, to establish the respondents' understanding and perceptions of invasive plants in the area, establish the respondents' knowledge and perceptions pertaining to prevention of the spread of invasive alien plants, to establish the respondents' competencies in controlling and managing invasive alien plants and to establish the respondents' understanding of perceptions about project's ability to deliver on its objectives. First, respondents' background information was probed, namely, sex, age, marital status, level of education, employment and monthly income.

4.1 Respondents' background information

Invasive alien plants exist in areas settled by communities, or used in one form or another for their benefit, for example, grazing land, water provision and related benefits enjoyed by communities. Inadequate eradication of invasive alien plants can, therefore, not be pursued without some appreciation of the socio-economic circumstances of the affected communities. Hence, as in most studies of this nature, background information of respondents is important. This was particularly important in this study as their traditional knowledge and perceptions were probed about the environment, in this case, invasive alien plants. In this particular study, two main reasons necessitated the need to collect background information:

- to develop a socio-economic profile of the respondents, and
- to use the respondents' profile to inform the analysis of the findings.

The background information pertaining to this study was gender, age, marital status, level of education, employment status and monthly income.

The gender distribution was almost split in half: fifty three percent (16) female and forty seven percent (14) male. Only thirty three percent (10) of the respondents were married. The majority sixty percent (18) were single. Seven percent (2) were widowed. Age-wise, forty percent (12) of the sample were in the 21-30 age group (**Table 1**). The average age was 24.5 years. The oldest and youngest respondents were 62 and 17 respectively. Overall, the sample was skewed towards the young people (between 16 and 40 years old). Generally, this age group constitutes the economically active population of most countries.

Table 1: Respondents' age distribution

Respondents Age	Age Distribution. No. (%)	Employment Status No. (%)	Unemployment Status No. (%)
Below 20	2 (7)	1(3)	1(3)
21-30	12 (40)	12(40)	0
31-40	9 (30)	8(27)	1(3)
41-50	4 (13)	0	4(13)
Above 51	3 (10)	0	3(10)

Education levels attained were as follows: sixty percent (18) completed secondary education and thirty three percent (10) attained primary education. The rest of the respondents were (2) seven percent individuals, one with tertiary education and the other not having attended school at all.

Although the majority of the respondents considered themselves employed; fifty seven percent (17) (**Figure 1**) - they were actually referring to their jobs with the Upper Illovo WfW project. This was not the case with all of them: only one was not sure whether he was employed or not. One of those who claimed to be self-employed was involved with the WfW project as a contractor. Monthly incomes were generally low, with forty seven percent (14) earning between R501-R1000. Three percent (1) reported salaries of above R2000, while seven percent (2) reported salaries of between R1000-R1500. These incomes are low because according to the Rhemchannel survey of May 2007, the basic salary for an average employee is R 2 622p.m. throughout South Africa (WSU HR, *pers comm.* 2007). A sense derived from questions eliciting employment status and income was the heavy reliance on the Upper Illovo WfW project as a source of income and employment. However, this is a project with a clear start and end, and upon its expiry, the existing employment opportunities might become more limited or cease. The respondents were not concerned with the finite nature of the project, they were just happy with the opportunity of earning an income.

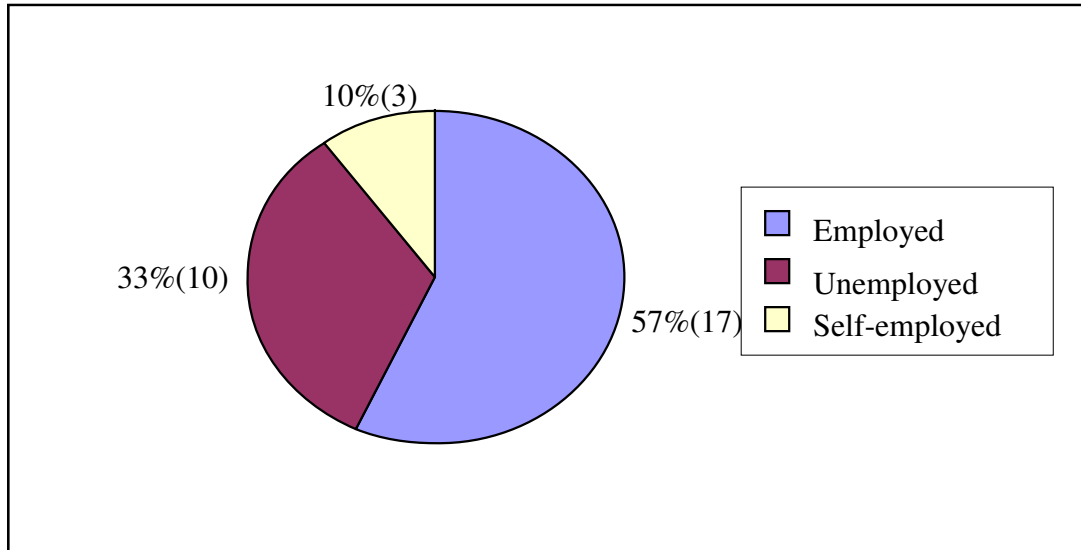


Fig 1 Employment status of the respondents

The above socio-economic profile reveals respondents generally fall under the low income bracket, with unstable employment and limited education backgrounds – mainly primary and some secondary education. This scenario is quite common in most rural areas of South Africa (WSU, HR pers.com 2007). Collectively, these characteristics illustrate the relevance of the project to the local community members of Upper Illovu area since they are mainly not employed. Limited education backgrounds underscore the importance of tailoring awareness activities to the existing situation on the ground. In this case for example, traditional awareness materials such as pamphlets and other written media may not be suitably while popular theatre and involving the local people in physical removal provides hands-on experience.

4.2 Respondents' relationship and perceptions of the Upper Illovu WfW project

This section addresses the first objective: *establishing the respondents' relationship to and perceptions of the Upper Illovu WfW project*. The first part of the objective (i.e. relationship

with the project) was simply meant to establish if a respondent was employed by the project. The second part, regardless of the respondents' relationship with the project sought to understand each respondent's perceptions about the project's activities and rationale.

4.2.1 Understanding of relationship and perceptions about the project

In terms of the relationship with the project, it is important to explain that two levels exist. The first level of engagement is that of contractors. These are individuals hired by WfW to provide the required services. Normally, every WfW project only has a limited number of contractors who are supposed to be operating a legally registered business entity. The second level is known as beneficiaries. This is a concept used by the WfW programme to describe individuals hired by contractors to work as field workers in its various projects. Technically, beneficiaries are employees of respective contractors; their hiring and management is the responsibility of a contractor. All contractors operate under the management of respective WfW project executants, either hired by WfW programme, or as individuals or institutions with requisite skills. In short, one's relationship with a WfW project can be that of a contractor/ beneficiary, or one that is neither of these two.

In this particular study, seventy percent (21) of the respondents were directly related with the Upper Illovu WfW project. Of these, sixty percent (18) were beneficiaries, while the remaining ten percent (3) were contractors. The remaining thirty percent (9) were not involved in WfW project activities and therefore had no direct relationship with the project as such.

The above disaggregation of the respondents was necessary in order to compare the results of local knowledge about invasive alien plants in the area between the project participants and those who were not involved in project activities.

An attempt to understand the levels of perceptions about the aspirations of the respondents towards the project was made (**Figure 2**). Aspirations in this specific regard refer to the broad ambitions, not stated as such but which nonetheless provided ideas for what the project sought to achieve. At face value, the results almost correlated with participation in the project as thirty three percent (10) indicated low/no perceptions about the project's objectives. Close scrutiny of the data, however, revealed that ten percent (3) of the non-project participants had a 'high' level of perceptions of the project's objectives. An equal proportion expressed low/no perceptions despite being beneficiaries of the project. However, while this finding might appear interesting, it cannot be viewed as 'significant' as the sample size is simply too small. Moreover, as explained in the methodology chapter, the study is not seeking to conduct a statistical analysis, but to use the case study to compare perceptions about invasive alien plants between those involved with the project (field workers and contractors) and those not involved (the control group).

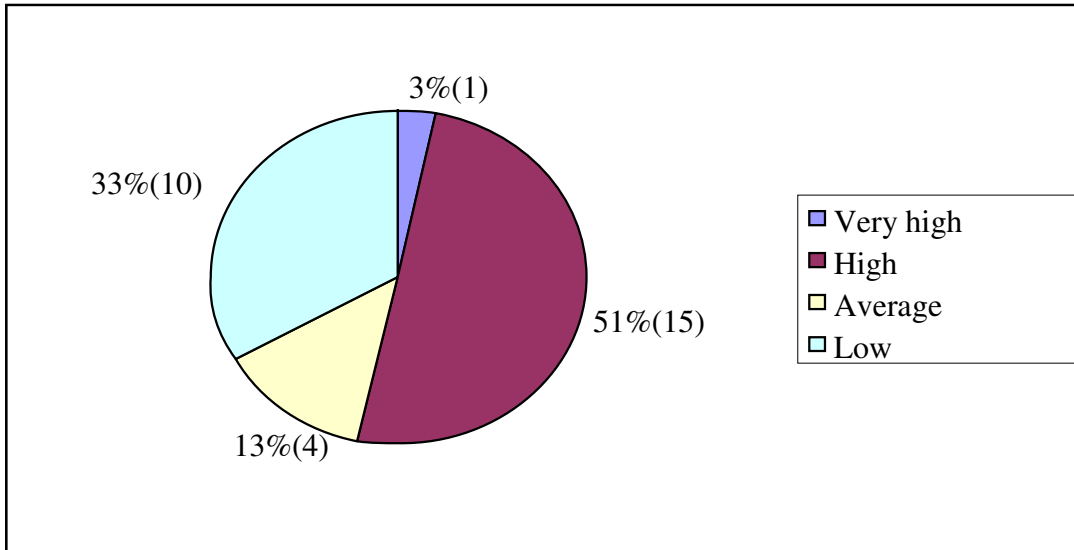


Figure 2. Levels of awareness about the Upper Illovu WfW project's aspirations

4.2.2 Perceptions of the project's objectives

While **Figure 2** shows claims about respondents' perceptions of the project's objectives, these responses were broad claims by respondents without any detail attached to them. To get more information, respondents were specifically requested to outline in detail (i.e. to give a rich account of their views on the matter and probing was used where necessary to encourage the respondents to express themselves) their interpretation of the Upper Illovu WfW project's objectives. This was important because objectives are an expression of intentions and priorities by defining and delimitating areas around which a project is mandated to spend resources and engage stakeholders. A good project, therefore, has to ensure that stakeholders such as communities have a clear understanding of its rationale, and by extension, its objectives which ought to be specific, achievable, result oriented and time bound.

Individually considered, the ecology-related objectives ranked lower than job creation (a socio-economic objective) if considered from a frequency perspective. Perhaps this arose because there was provision for different types of ecology-related objectives in the questionnaire. It is important, however, to note that ecology-related objectives were in the majority in terms of incidence (**Table 2**). This seems to suggest acknowledgement and appreciation of some of the negative ecological impacts of the invasive alien plants.

Another point worth noting is the view about the sheltering of criminals in thickets caused by alien plants. It may be in the minority but it illustrates the depth and width of perspectives the local people brought to this study. A good proportion raised similar concerns but on a different question about the dangers of invasive alien plants (See **Table 6**).

Table 2. Opinions about the main objectives of the Upper Illovo WFW project

Statements relevant to objectives	Responses (%)	Responses No.
Job creation	(57)	17
Eradication of alien plants	(43)	13
Improvement in water supply	(40)	12
To clean our environment	(23)	7
Conserve biodiversity	(17)	5
Do not know project objectives at all	(7)	2
Reduce soil erosion	(3)	1
To create community awareness of alien	(3)	1

plants		
Removal of big trees which shelter criminals	(3)	1

NB: Percentages do not add up to 100% because multiple responses were permitted

The above findings suggest that the respondents' interpretation of the project's objectives is generally consistent with the WfW programme's espoused objectives. The prominence of job creation may be attributed to KwaZulu-Natal's unemployment level of 40% (DWAF 2004). The project site (Upper Illovu) is realistically not an exception from this provincial scenario (Van der Byl *pers. comm.* 2005). Importantly, this information about the participants suggests that they are very poor, a factor which must be the key reason for working on the project. It is to be expected that any initiative in the area is likely to be perceived or even evaluated in terms of its potential contribution to job creation even when its mandate is not necessarily job creation. Job availability is arguably more directly relevant to immediate household and personal needs because of its power to inject cash into the local economy. This study has shown just how low income levels are amongst those that participated in the study, and although they claimed to be employed, their jobs are temporary and some were referring to their employment on the WfW project which, for all intents and purposes, is a short term initiative.

4.3 Respondents' understanding and perceptions about the levels of invasive alien plants in the area

This section addresses the second objective: *establish the understanding and perceptions about the levels of invasive alien plants in the area*. Understanding of invasive alien plants was found to be better among field workers and contractors than among non-participants (**Figure 3**). In fact, the majority of the non-participants, twenty three percent (7) out of thirty percent (9)) categorised their understanding as below average compared with three percent (1) of the seventy percent (21) of field workers and contractors.

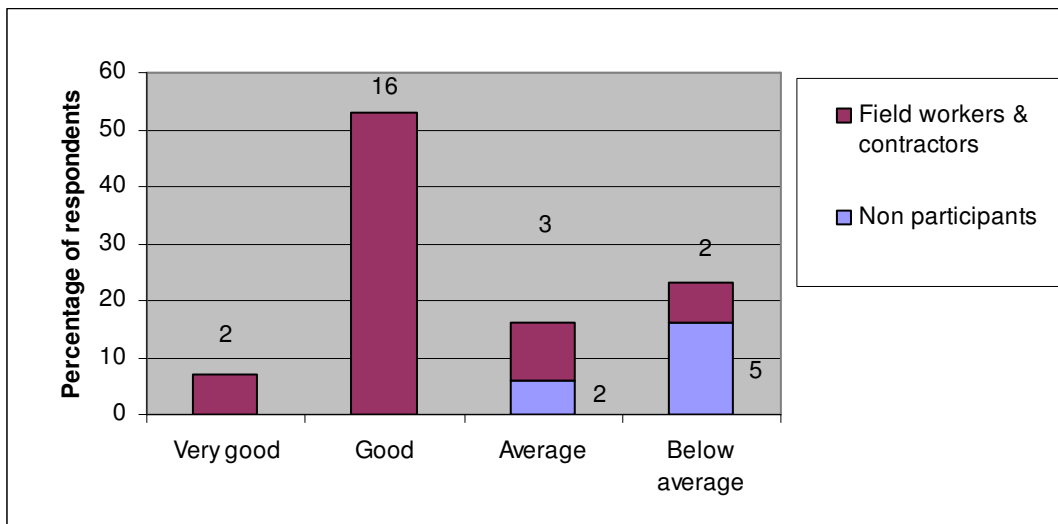


Figure 3. Respondents' understanding of invasive alien plants

It was important to go further in evaluating the understanding and perceptions of invasive alien plants by the respondents. This testing was based on questions regarding some basic facts pertaining to invasive alien plants. Eleven statements were developed and respondents were to indicate a true/false or not sure response (**Table 3**). The statements covered basic

facts on issues such as obligations of land owners regarding invasive alien plants, effects of invasive alien plants, means of preventing the spread and benefits of their eradication, etc.

The pattern of the responses was such that those not involved with the project (control group), were for the most part not sure about their responses. In eight out of eleven statements, all the respondents not involved with the project were not sure. However, some field workers were also not sure about some of the statements. For example, twenty seven percent (8) of the field workers were not sure that failure to follow legislation² concerning invasive alien plants could lead to prosecution.

Table 3. Respondents' opinions about selected statements about invasive alien plants

	True No.(%)	Not sure No. (%)	False No.(%)
Invasive alien plants naturally do NOT belong to this country	20(66)	10(34)	
	N =1(3); FW=17(57); C=2(7)	N= 8(27); FW=2(7)	
Invasive alien plants displace local plants and trees	19(63)	11(36)	
	FW=18(60); C=1(3)	N=9(30); FW=1(3); C=1(3)	
Invasive alien plants intensify wild	17(56)	13(43)	

fires and erosion	FW=16(53); C=1(3)	N=9(30); FW=3(10); C=1(3)	
Invasive alien plants use more nutrients than local plants	21(70)	9(30)	
	N=2(7); FW=17(56); C=2(7)	N=7(23); FW=2(7)	
Invasive alien plants use more water than local plants	21(70)	9(30)	
	N=2(7); FW=17(56); C=2(7)	N=7(23); FW=2(7)	
Selling invasive alien plants is NOT allowed	18(60)	11(36)	1(3)
	FW=17(57); C=1(3)	N=9(30); FW=1(3); C= 1(3)	FW=1(3)
Transporting invasive alien plants is NOT allowed	18(59)	11(36)	1(3)
	FW=17(56); C=1(3)	N=9(30); FW=1(3); C=1(3)	FW=3(1)
Invasive alien plants grow along water courses and in wetlands	20(67)	10(33)	
	FW=19(63); C=1(3)	N=9(30); FW=1(3)	
Benefits of removing alien plants are more than the advantages of keeping them	20(67)	10(33)	
	FW=18(60); C=2(7)	N=9(30); FW=1(3)	
Failure to follow legislation	13(43)	17(57)	

concerning invasive alien plants can lead to prosecution	FW=11(36); C=2(7)	N=9(30); FW=8(27)	
Invasive alien plants can shelter disease causing pests	16(53)	14(47)	
	FW=14(46); C=2(7)	N=9(30); FW=5(17)	

C = Contractor, FW = Field worker & N = Not employed by the project

¹ This is an important issue in the awareness campaigns against invasive alien plants in South Africa.

² This is an important issue in the awareness campaigns against invasive alien plants in South Africa.

An important issue arising from the above results is the need to emphasise different elements for effective management and control of invasive alien plants. Both groups seem to struggle about the legislative issues regarding invasive alien plants. People with limited education may be at a disadvantage on more sophisticated issues such as legislative imperatives. This point to the need to really make the constitution live for all.

4.4 Respondents' knowledge and perceptions pertaining to prevention of spread of invasive alien plants

This section addresses the third objective: *to establish the respondents' knowledge and perceptions pertaining to prevention of spread of invasive alien plants.*

Respondents were further asked to identify activities helpful in the prevention of the spread of invasive alien plants (**Table 4**). Again, the issues expected of them were basic aspects commonly highlighted in publicity materials on fighting invasive alien plants.

Table 4. Respondents' identification of activities necessary to prevent the spread of IAPs

Activity	Unprompted No. (%)	Prompted No. (%)
Gain awareness of invasive alien plants	5(17)	25(83)
Clean equipment before and after entering water/ river	5(17)	25(83)
Reporting infestations (mass)	12(40)	18(60)
Removal of infestations (small)	12(40)	18(60)
Avoid use of invasive alien plants in fields and homesteads	1(3)	29(97)
Report organizations displaying or selling declared weeds	1(3)	29(97)

The highest and lowest unprompted responses stood at forty percent (12) and three percent (1) respectively. This suggests a low level of understanding of activities and measures critical in mitigating the spread of invasive alien plants. In other words, the majority of the respondents failed to identify the activities on their own, that is, without being prompted. Furthermore, despite providing options for respondents to identify other activities helpful in

mitigating the spread of invasive alien plants, the respondents were unable to mention any such activities, for example, seeking expert opinion if unsure about a particular plant prior to avoiding the use of invasive alien plants in fields and homesteads or reporting organisations displaying or selling declared weeds. Hence the prompted response was very high - ninety seven percent (29), in some cases.

Within the scope of knowledge and perceptions on controlling or managing invasive alien plants, it was important to gain some understanding of the respondents' knowledge on three additional issues: the benefits of removing invasive alien plants, the dangers of invasive alien plants and methods used to remove/kill invasive alien plants. The former was generic while the latter was specific to the study area and respondents were requested to list the dangers in order of priority.

Benefits of removing invasive alien plants

Topping the list of unprompted responses of the benefits of removing invasive alien plants was improved water flow sixty percent(18) followed by protection of the environment fifty percent(15) (**Table 5**). On the prompted responses, tourism, ninety seven percent (29) and increased grazing land eighty percent (24) were the top two.

Table 5. Benefits associated with the removal of invasive alien plants

Benefits	Unprompted No. (%)	Prompted No. (%)
Water flow/supplies	18 (60)	12 (40)
improvement	FW= 16(53); C=2(7)	FW=5(17); N=6(20); C=1(3)
Protection of natural	15(50)	15(50)

environment	FW=13(43); C=2(7)	FW=8(27); N=6(20); C=1(3)
Tourism	1(3)	29(97)
	C=1(3)	FW=21(70); N=6(20); C=1(7)
Increased grazing land	6(20)	24(80)
	F=3(10); C=3(10)	FW=18(60); N=5(17); C=1(3)
Others(s): makes the environment looks better	FW= 1 (3)	

C = Contractor, FW = Field worker & N = Not employed by the project

Ideally, since the majority of the respondents have some association with the WfW project, they were in a position to demonstrate knowledge of removing invasive alien plants. This should have translated into higher unprompted scores. However, the highest unprompted score was only 60% (all by contractors and beneficiaries, in respect of increased water flow). This is perhaps not entirely surprising because WfW programme has strongly linked its activities to water provision (for the environment and people). The fact that other benefits were recalled only after being prompted (e.g. tourism and increasing grazing land) suggests that the information exists but perhaps was not sufficiently explicit to be remembered without prompting. This could be indicative of a need for information on the ecological benefits of removing invasive alien plants.

Dangers of invasive alien plants

The main dangers of invasive alien plants, in order of priority in the study area showed water depletion as number one (seventy percent (21) (**Table 6**). The second placed item (danger to indigenous plants) stood at forty percent (12).

Table 6. Main dangers of invasive alien plants in order of priority in study area

Dangers	Responses No. (%)
Water depletion	21(70)
	FW= 16(53); N=2(7); C=3(10)
Dangerous to indigenous species	12(40)
	FW=9(30); N=1(3); C=2(7)
Used as shelter by criminals	7(23)
	FW=7(23)
Have no knowledge of invasive alien plants*	7(23)
	FW=1(3); N=6(20)
Others**	5(17)
	FW=4(13); C=1(3)

C = Contractor, FW = Field worker & N = Not employed by the project

*Not necessarily a danger but these respondents gave this reason for failing to answer the question.

**This included reasons such as wildfires, harmful to people and livestock, disease carriers, reduction in grazing land and unsightly overgrown vegetation – in all cases, they were responses by an individual respondent.

An important feature on this question was the recurring trend of lack of information/knowledge by those not involved in the project to provide categorical responses. In this case, for example, twenty percent (6) out of a total of thirty percent (9) of those not employed by the project, that is, (66%) claimed to have no knowledge about the dangers of invasive alien plants. Further, while no prompting was done regarding the dangers of invasive alien plants, it was logical to expect all respondents to mention water depletion as a consequence of invasive alien plants since the matter was reported in the previous question (on the benefits). Despite this, some of the respondents (40%) did not mention water depletion and far fewer of the respondents mentioned the dangers of invasive alien plants to indigenous species – especially plants. This suggests limited awareness of the dangers of invasive alien plants.

Methods used to remove/kill invasive alien plants

An important feature about the WfW programme is the publicity and awareness around the methods of removing/ killing invasive alien plants. Participants in any WfW project are made aware of the different methods, both in theory and practice, with the latter arising from the fact that they are trained in the use of those methods to destroy invading plants (van Wilgen *et al* 2004). On account of this, a question to assess awareness of the different methods used in destroying invasive alien plants was raised.

For the majority of respondents, biological methods could only be identified through prompting – ninety seven percent (29) (**Fig4**). Herbicides/chemicals were the most common method identified without prompting - seventy percent (21). Unprompted responses for mechanical removal stood at thirty percent (9). None of the unprompted responses came

from non-participants of the project, that is, the control group. It is difficult to understand the reasons that may have led to such a low unprompted response rate for mechanical removal of invasive alien plants from the participants, especially since this mechanical removal is the most common method and is often used alongside the other two methods. This is a key piece of evidence to show that learning is not taking place as a result of training- they only know what they use. The respondents need to be taught more than one way to remove these invasive alien plants. Therefore, an integrated approach to removal of these plants should form part of their awareness programmes.

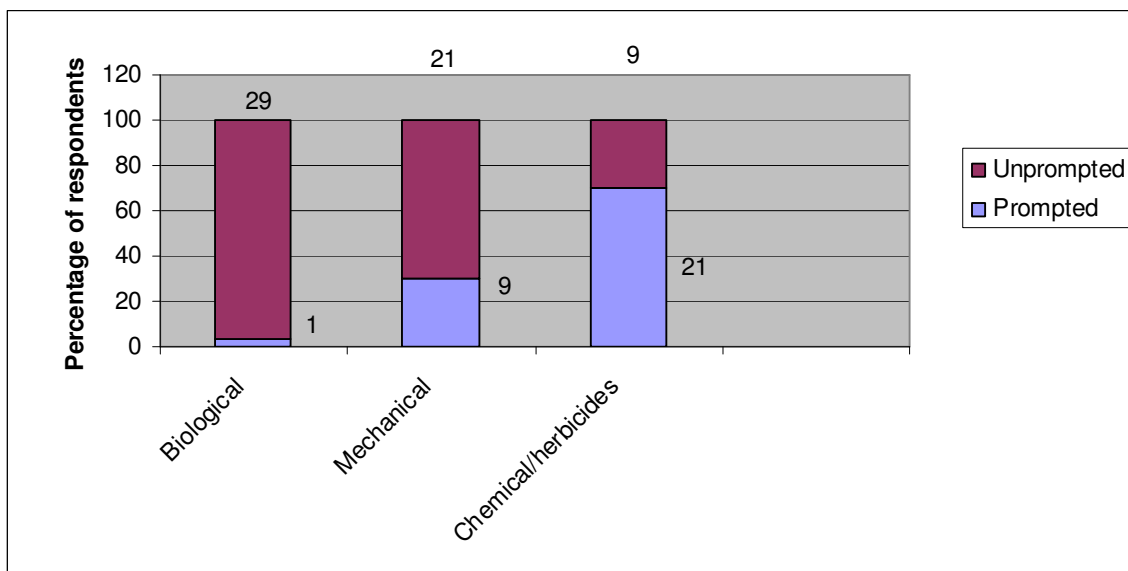


Figure 4. Respondents' awareness of methods of removing invasive alien plants

Spread of invasive alien plants

The spread of invasive alien plants is largely associated with human activities – both what they choose to do or neglect. This means that the very activities that aided this spread can be

used to reduce or stop the spread of invasive alien plants if people are made aware about the dangers. Such awareness enables them to make conscious decisions not to engage in such activities in the first instance. It was important as part of knowledge assessment of this study to examine the respondents attitudes towards certain human activities which are known ways through which invasive alien plants are tolerated or even appreciated for short term gains against their long-term ecological effects. (Table 7) summarises the respondents view on different activities that are thought to have the potential to spread the invasive alien plants.

Table 7. Respondents' opinions/ reactions to statements on human activities through which invasive alien plants are tolerated

Statement	Strongly support No.(%)	Moderate support No.(%)	No support No.(%)	Do not know No.(%)
Planting invasive alien plants to feed my stock	-	1(3)	21(70)	9(30)
	-	C=1(3)	FW=19(63); C=7(20)	N=8(27)
Planting invasive alien plants for shed/shelter/shade?	-	1(3)	20(67)	9(30)
	-	C=1(3)	FW=18(60); C=2(7)	N=9(30)
Planting invasive alien plants for making	-	1(3)	20(67)	9(30)

ornaments	-	C=1(3)	FW=18(60); C=2(7)	N=9(30)
Planting invasive alien plants for food	-	1(3)	20(67)	9(30)
	-	C=1(3)	FW=18(60); C=2(7)	N=9(30)
Planting invasive alien plants for timber	-	-	21(70)	9(30)
	-	-	FW=18(60); C=3(10)	N=9(30)
Planting invasive alien plants for fuelwood	-	1(3)	20(67)	9(30)
	-	C=1(3)	FW=18(60); C=2(7)	N=9(30)

C = Contractor, FW = Field worker & N = Not employed by the project

The knowledge gap between the two groups of respondents was conspicuous in that the entire control group (not employed by the project) did not know about activities that have the potential to spread invasive alien plants. Consistency was noticeable in the pattern of responses in the sense that those respondents not employed by the project expressed ignorance about the implications of the identified activities. Out of ignorance, this scenario could lead to actions such as planting invasive alien plants for ornamental purposes or for feeding livestock. However, the scenario was different for the respondents who are either contractors or fieldworkers on the WfW project. These respondents showed some

appreciation of the implications of invasive alien plants in the environment as their responses were in all cases not supportive of planting of aliens or of using them to feed stock.

The above findings suggest that invasive alien plants are likely to be planted by those not aware of their associated dangers because of lack of knowledge on the impacts of invasive alien plants on the environment. The opposite is the case with field workers and contractors who in the course of their association with the WfW project have acquired some knowledge and appreciation of the ecological impacts of invasive alien plants. By extension, it is logical to argue that limited or lack of awareness about invasive alien plants in the broader society is a challenge that needs addressing. Awareness creation is therefore of great significance as a way of providing relevant information and linking the spread of invasive alien plants to day-to-day threats such as reduction of grazing lands.

4.5 Respondents' competencies in controlling and managing invasive alien plants.

This section deals with questions raised under or relevant to the fourth objective: *to establish the respondents' competencies in controlling and managing invasive alien plants*. This objective was partly premised on the view that participants in any WfW project would have some reasonable knowledge about invasive alien plants on aspects such as their impacts, sources, ways of controlling their spread and identification. This view emanated from the WfW programme's commitment to ensuring provision of information, education, communication and training (Magadlela and Mdzeke 2004).

4.5.1 Understanding of perceptions of competence levels attained regarding invasive alien plants

Competence means having the necessary skills, knowledge and ability to perform a task. In this case, the concept of ‘competence’ has been used in reference to the skills, knowledge and ability related to performing tasks associated with the eradication and control of invasive alien plants. It is realistic to anticipate that sufficient exposure to a WfW project would enable one to be able to identify alien plants, use different methods to destroy invasive alien plants, communicate/teach others about invasive alien plants and determine the appropriateness of a removal method in a given situation. All these attributes are important in building the capacity of civil society to fight invasive alien plants. Hence, the respondents were asked to rate their standing in respect of each of the above aspects (**Table 8**).

Table 8. Respondents’ competencies regarding invasive alien plants control and management

Activity	Positive		Negative	
	Very good	Good	Not good	Bad
	No. (%)	No. (%)	No.(%)	No. (%)
Identification of invasive alien plants	2(7)	12(40)	7(23)	9(30)
	C=2(7)	FW=12(40)	FW=4(13); N=3(10)	FW =3(10); N=6(20)
Use different methods	2(7)	7(23)	17(57)	4(13)

of invasive alien plants removal	C=2(7)	FW=7(23)	FW=10(33); N=7(23)	FW=2(7); N=2(7)
Teach other community members about invasive alien plants	2(7)	18(60)	6(20)	5(17)
	C=2(7)	FW=17(57); C=1(3)	N=4(13); FW=2(7)	FW=1(3); N= 4(13)
Determine appropriateness of removal method	3(10)	11(36)	11(36)	5(17)
	FW=2(7); C=1(3)	FW=10(33); C=1(3)	FW=7(23); N=4(13)	FW=1(3); N=4(13)

FW=Field Worker; C=Contractor; N=Not employed by the project;

The responses were in two categories: *positive* (very good and good) and *negative* (not good and bad). Only one of the activities attracted positive³ responses in excess of fifty percent (15), namely – teaching community members about removal of invasive alien plants sixty percent (18). The rest were all below fifty percent (15) with the lowest being the ability to use different methods in the removal of invasive alien plants – thirty percent (9). Three of the activities, namely, identification of invasive alien plants, using different methods to remove

³ The percentages here were arrived at by adding the ‘very good’ and ‘good’ responses in the relevant row of Table 8.

invasive alien plants and determining appropriateness of a removal method – scored more negative⁴ responses, and in all case above the fifty percent (15).

The above findings are important because they suggest a lack of competence in dealing with invasive alien plants among the respondents, including those who have been exposed to the project for some time. More concerning, however, is that some, respondents who were field workers but claimed to be ‘not good’ in the identification of alien invasive plants - thirteen percent (4) because this is one of the most basic elements to learn for field workers. In other words, the identification of invasive plants is a prerequisite to their effective control and management.

Against such a background, it is logical that one of the main objectives of the WfW project, is to teach participants how to identify invasive alien plants. Accordingly, the respondents were asked to name some of the invasive alien plants in the study area, noting that some of the major invasive plants in South Africa are found in KwaZulu-Natal province (DWAF 2004).

Six types of invasive alien plants were named (**Table 9**) representing about 5% (out of 88 invasive alien plants in KwaZulu-Natal) of the most aggressive invading species of the southern region of South Africa (DWAF 1997). Prominent among these invasive alien plants is *Solanum mauritianum* (Bug weed), named by all respondents including those not involved

⁴ The percentages here are arrived at by adding the ‘not good’ and ‘bad’ responses in the relevant row of Table 8.

with the project. Bug weed is the most common in terms of condensed and total area in KwaZulu-Natal (Versfeld *et al.* 1998). The rest of the invasive alien plants were poorly known, as the second most named was American bramble, forty percent (12) which is particularly a problem in the moister grassland areas of the interior of the province from Pietermaritzburg to the Drakensburg (DWAF 2004). The rest were all below thirty percent (9), with a tie at twenty percent (6) of three of the plants and the least named being the Mauritius thorn thirteen percent (4).

Table 9. The most identified common invasive alien plants in the Upper Illovo area

Invasive alien plant	Respondents No.(%)
<i>Solanum mauritianum</i> (Bug weed, umbhanga-bhanga, umbhangazi)	30(100)
	FW=18(60); N=9(30); C=3(10)
<i>Rubus cuneifolius</i> (American bramble, ujikijolo)	12(40)
	FW=7(23); N=4(13); C=1(3)
<i>Acacia mearnsii</i> (Black wattle, uwatela)	7(23)
	FW=6(20); N=1(3)
Eucalyptus species (gum tree, ugamtriya).	6(20)
	FW=(5)17; N=1(3)
<i>Lantana camara L.</i> (Lantana, ilantana)	6(20)
	FW=3(10); C=3(10)

<i>Caesalpinia decapetala</i> (Mauritius Thorn, ubhici, gom,ubobo)	4(13)
	FW=4(13)

FW= Field worker N=Non participant C=Contractor

Acacia mearnsii (Black wattle) was identified by twenty three percent (7) of the respondents. This species is among the top ten invading species in South Africa and there is a great concern with respect to the potential of this species with regard to the threat to the indigenous biodiversity of the affected region and the issue of water loss (de Neergaard *et al.* 2005). It is important in KwaZulu-Natal because of its wide occurrence. *Eucalyptus grandis* (Saligunum) is widely distributed concentrated in forestry areas and was identified by twenty percent (6) of the respondents. Other invading plants, *Lantana camara L.* (Lantana) and *Caesalpinia decapetala* (Mauritius Thorn) were identified by twenty percent (6) and thirteen percent (4) of respondents respectively.

One of the main objectives of the project is social upliftment, through skills training in order for the employees to be in a position to find employment when they leave the programme. Respondents were, therefore, probed on the skills they had acquired since the beginning of the project. All those involved with the project claimed to have gained one or more skills of some sort; sixty three percent (19), knowledge of invasive alien plants, thirty three percent (10), use of chemicals (**Table 10**). A point worth noting is that none of the control group claimed to have gained any skill.

Table 10. Skills gained since the beginning of the Upper Illovo WFW project

Skill	Respondents No. (%)
Knowledge of invasive alien plants	19(63)
	FW=18(60); C=1(3)
Use of different chemicals	33(10)
	FW=10(33)
Not involved with the project*	10(30)
	N=10(30)
Project Management	4(13)
	FW=1(3); C=3(10)
Contracting skills	10(3)
	FW: 2(7); C=1(3)
No skills yet	2(7)
	FW=2(7)
Health and Safety	1(3)
	FW=1(3)

*Some respondents gave this reason for failing to answer the question.

The success of all WfW projects depends on collaboration of various stakeholders. One of the areas in which collaboration is required, is in monitoring areas previously cleared of invasive alien plants for possible re-growth. Monitoring for re-growth of invasive alien plants once an area has been cleared is supposed to be a community-based activity and especially

championed by land owners. This view was shared by the respondents – especially those exposed to the project (**Table 11**). Respondents not involved with the project had to be prompted, but even in their case, the majority of them highlighted communities and landowners.

Table 11. Opinions on whose responsibility it is to monitor land cleared of invasive alien plants for re-growth

	Unprompted % (No.)	Prompted % (No.)
Community	21(70)	9(30)
	FW=19(63); C=2(7)	M=1(3); N=8(27)
Land owner	20(67)	10(33)
	FW=18(60); C=2(7)	M=1(3); N=9(30)
Upper Illovo project	20(67)	10(33)
	FW=18(60); C=2(7)	M=1(3); N=9(30)
Government	20(67)	10(33)
	FW=18(60); C=2(7)	M=1(3); N=9(30)
Other	-	-

4.6 Understanding of perceptions about the project’s ability to deliver on its objectives

This section deals with the fifth and last objective: *establish the understanding of perceptions about the project's ability to deliver on its objectives*. As with most community-based projects, the success of the Upper Illovo WfW project partly hinges on the perceptions held about it by the people in the area. In this regard, the project received favourable remarks for

its work as follows: ‘very positive’ twenty three percent (7) and ‘positive’ sixty three percent (19) making an overwhelming majority of more than eighty percent (24) (**Table 12**). A close analysis of the findings revealed that all those working for the project either as contractors or beneficiaries were optimistic about the project’s ability to deliver. This suggests a positive correlation between those employed by the project. The rest of the respondents from the control group were non-committal by remaining neutral on the matter. The positive perceptions were attributed to the fact that the people of Upper Illovu are pleased with the opportunities that the project has brought to the area, particularly regarding job creation. KZN has the highest unemployment rate in the country (40%) and this is inclusive of a high proportion of people with post-matriculation qualifications (DWAf 2004). The rising unemployment levels have created a need for job creation which in this particular case has enabled the WfW programme - as a community based initiative - to become attractive (Magadlala and Mdzeke 2004).

Table 12. Elaboration on the overall opinion of the Upper Illovu WfW project in terms of its work in the area

Rating	Respondents (%)	Respondents No.
Job creation	(56)	17
Environmental/ natural resources conservation	(43)	13
Protecting/ improving our water supply	(36)	11
Do not know	(20)	6

NB: Percentages do not add up to 100% because multiple responses were permitted

Respondents were asked to give their opinions regarding the potential of the Upper Illovo WfW project to contribute to selected imperatives consistent with the WfW programme goals and rationale. A close examination of the findings showed a sense of optimism among the respondents (**Table 13**).

Table 13. Opinions about the Upper Illovo WfW project potential in contributing towards selected imperatives

Selected imperatives	Very strong No. (%)	Strong No. (%)	Weak No. (%)	Do not know No. (%)
Job creation	8 (27)	18 (60)	1 (3)	3 (10)
	FW=5(17); C=2(7); N=1(3)	FW=13(43); N=5(17)	FW=1(3)	N=3(10)
Improving water supply	4(13)	9(63)	1(3)	6(20)
	C=2(7); FW=2(7)	FW=17(57); N=7(2)	FW=1(3)	N= 6(20)
Biodiversity conservation		18 (60)	3(10)	9(30)
		FW=16(53); C=1(3); N=1 (3)	FW=3(10)	FW=1(3) N= 8(27)
Reducing soil erosion		18(60)	3(10)	9(30)

		FW= 15(50); C=2 (7); N=1(3)	FW=3(10)	FW=1 (3); N=8(27)
Improving knowledge	2(7)	18(60)		10(33)
about alien invasive plants	FW=2(7)	FW=16(53); C=2(7)		N=10(33)

C = Contractor, FW = Field worker & N = Not employed by the project

Job creation attracted the most optimism, with eighty seven percent (26) of the respondents being optimistic about the potential of the project. Of these twenty seven percent (8) described the potential as ‘very strong’ while sixty percent (18) described it as “strong”. Imperatives related to environmental sustainability (water supply, biodiversity conservation and reducing soil erosion) received favourable consideration as did the prospect of improving knowledge about invasive alien plants.

These results showed an appreciation of the multiple objectives pursued by the national WfW programme in general and the Upper Illovo WfW project in particular. It is worth noting, however, that most of the ‘do not know’ responses were presented by respondents not involved with the project (control group). This suggests a positive relationship between those employed by the project, either as participants or beneficiaries compared to those not employed by the project. This positive image of the project underscores the need to widen the involvement of local people so that there is wider appreciation of WfW project aspirations and objectives.

4.7 Summary

This chapter has described the results of the study. The study has clearly demonstrated that the category of respondents not employed by the project have less understanding of the effects of invasive alien plants. Throughout, the study has demonstrated a variance in the knowledge levels of the project participants (field workers and contractors) and non-participants. A logical proposition from this study is that one way of promoting public awareness would be to improve communication of the problem by the programme. The next chapter outlines the conclusion of the study.

Chapter 5 Conclusions

The main aim of the study was to understand local knowledge about invasive alien plants, the respondents' perceptions of the management methods employed to eradicate invasive alien plants and their willingness to participate in WfW project. The intention is to inform approaches to WfW programme information, education and communication or public awareness activities at a broader scale whilst also setting the basis for a practical WfW project management plan at a local scale.

The problem of invasive plants, with their serious implications for negatively impacting on biodiversity and water supply, is a growing concern in South Africa. Seen as a major environmental challenge in the country, the South African government established WfW programme as a programmatic response to that challenge. Among the key issues faced in the implementation of the programme have been low levels of understanding or knowledge about invasive alien plants by the affected communities.

Thus, this study was undertaken with five guiding objectives:

- Determine the respondents' relationship to, and perceptions about invasive alien plants in the Upper Illovo area
- Establish the respondents' understanding and perceptions about the level of invasive alien plants in the area
- Determine the respondents' knowledge and perceptions pertaining to prevention of spread of invasive alien plants
- Establish the respondents' competencies in controlling and managing invasive alien plants, and

- Establish the respondents' understanding of perceptions about the project's ability to deliver on its objectives

There were 30 respondents from Indaleni community that were used in the study. There were twenty one (70%) who were active participants (study sample) and nine (30%) who were not participants (a control group) to the WfW programme activities but all living in the same community. This was an essential requirement for undertaking this study as the researcher wanted to understand the different perspectives each group would bring. These findings cannot be generalized to other WfW programmes as the sample size was small. Therefore, the perceptions and the views expressed cannot be representative of the views of all WfW projects. It may therefore, be necessary to conduct a similar study on a more representative sample of all WfW projects. Nevertheless, it does give the researcher the ability to drill down and get a good picture of what is being studied.

There were a number of key issues that came out of this research. Firstly, is that respondent especially the control group were not aware of issues pertaining to invasive alien plants. There was therefore a significant gap in knowledge and perceptions between the two groups (those who were participants in the WfW programme and those who were not). This indicated that the programme has had a positive impact on the participants. The concern however, is that the impact has had limited impact on the community. This means that the impact has only been on those participating in the programme. This also means that the participants see the WfW programme as a way of earning income and are not interested in

talking to other people about invasive alien plants. This means more research is still needed on a bigger scale to promote the environmental consequences of the programme.

Secondly, the relevancy of WfW project was not fully appreciated by the community because of the lack of ability to link the programme to the key community issues. In this case, loss of grazing potential for their cattle and destruction of agricultural potential of their land are crucial. This means the link of effects of invasive alien plants to what they can see and understand fully is not explained explicitly in the educational aspects of the programme.

Thirdly, another key issue was the need to emphasize the integrated approach to removal of invasive alien plants. Local people need to be taught all the methods, that is (biological, chemical and mechanical methods) not only what they use. There is, therefore, a need for improved training and education so that people are capacitated to such an extent that they are able to identify different invasive alien plants, use different methods to eradicate invasive alien plants and ensuring that communities discontinue activities associated with the spread of the plants. This is important for long-term ecological sustainability of local environments as the locals become stewards of their environment and takes decisions based on informed understanding about invasive alien plants.

Finally, what is needed are awareness programmes that are based on local people's existing knowledge base. Community involvement cannot only be limited to physical clearing of

affected communities. Their perceptions and indigenous knowledge needs to be developed. An integral element of local knowledge that needs developing is legal obligations related to duties on part of the citizens.

The fact that different people have different perceptions and attitudes about the impacts and benefits caused by invasive alien plants should be considered in any decision making process regarding their management particularly when developing appropriate educational and informative programme.

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APPENDIX 1

KNOWLEDGE, ATTITUDES AND PERCEPTIONS ABOUT UPPER ILLOVU WORKING FOR WATER (WfW) PROJECT

1. RESPONDENTS' BACKGROUND INFORMATION (COMMUNITY MEMBERS)

1.1 Age: > 20 21-30 31-35 36 – 45 46 - 55 Above 56 years Don't know

1.2 Sex: Male Female

1.3 Marital status: Single Married Other.....

1.4 Education? (The highest level attained)

None Primary Secondary Tertiary Other

(specify):.....

1.5 Are you presently employed? Yes No *(If No, skip to 1.9)*

1.6 Please describe your present employment.

.....

1.7 How would you describe your income from your current job?

Very satisfactory Satisfactory Not satisfactory

1.8 Please, give an estimate of your monthly income.

≥ R500 R501-R1000 R1001-1500 R1501-2000 Above R 2001

1.9 Since you are unemployed, how do you earn income?

.....

.....

2. ESTABLISH THE RESPONDENTS' UNDERSTANDING OF RELATIONSHIP TO, AND PERCEPTIONS ABOUT THE ILLOVU WFW PROJECT

2A. The respondents' level of awareness and relationship to the project

2.1 Are you a participant in Upper Illovu WFW project?

Yes No (If No, skip to 2.2)

2.1.1 If Yes, how have you been involved?

Project Manager Contractor Team worker Other

2.2 How would you rate your level of awareness of the Upper Illovu WFW project?

Very high High Average Low/None Not aware

2B. The respondents' understanding of the project's objectives

2.3 What do you understand to be the main objectives of the Illovu WFW project?

.....

.....

.....

3. ASSESSMENT OF THE RESPONDENTS UNDERSTANDING AND PERCEPTIONS ABOUT THE LEVELS OF INVASIVE ALIEN PLANTS IN THE AREA.

3A Understanding of knowledge levels about invasive alien plants relative to the project area

3.1 How would you describe your knowledge about invasive alien plants?

Very good Good Average Below average Poor

3.2 What is your view about each of the following statements?

	True	False	Not sure
Invasive alien plants naturally do NOT belong to this country			
Invasive alien plants displace local plants and trees			
Invasive alien plants intensify wild fires and erosion			
Invasive alien plants use more nutrients than local plants			
Invasive alien plants use more water than local plants			
Selling invasive alien plants is NOT allowed			
Transporting invasive alien plants is NOT allowed			
Invasive alien plants grow along water courses and in wetlands			
Benefits of removing alien plants are more than the			

advantages of keeping them			
Failure to follow legislation on invasive alien plants can lead to prosecution			
Invasive alien plants can shelter disease causing pests?			

4. UNDERSTANDING OF KNOWLEDGE AND PERCEPTIONS PERTAINING TO PREVENTION OF THE SPREAD OF INVASIVE ALIEN PLANTS.

4A. Understanding of knowledge pertaining to prevention of the spread of invasive alien plants

4.1 What should you do to ensure that the invasive alien plants do not spread?

Activity	Unprompted	Prompted
Gain awareness of invasive alien plants		
Clean equipment before and after entering water/ river		
Reporting infestations (mass)		
Removal of infestations (small)		
Avoid use of invasive alien plants in fields and homesteads		
Report organisations displaying or selling declared weeds		
Other(s):.....		

4.2 What benefits do you associate with the removal of alien invasive plants?

	Unprompted	Prompted
Water flow/ supplies improvement		
Protection of natural environment		

Tourism		
Increased grazing land		
Other(s):.....		

4.3 What are three main dangers of invasive plants to this area in order of their priority?

.....

.....

.....

4.4 What methods are used to remove/ destroy invasive alien plants?

Activity	Unprompted	Prompted
Biological		
Mechanical		
Chemical/herbicides		
Other(s):.....		

4.5 What is your opinion about each of the following statements?

	Strongly Support	Moderately support	No support	Don't know
--	---------------------	-----------------------	---------------	---------------

Planting invasive alien plants to feed my livestock				
Planting invasive alien plants for shade				
Planting invasive alien plants for timber				
Planting invasive alien plants for making ornaments				
Planting invasive alien plants for food				
Planting invasive alien plants for fuel wood				

5. UNDERSTANDING RESPONDENTS' COMPETENCES IN CONTROLLING AND MANAGING INVASIVE ALIEN PLANTS.

5.1 How would you describe yourself in regard to the following?

Activity	Very good	Good	Not good	Bad
Identification of invasive alien plants				
Use different methods of invasive alien removal				
Teach other community members about invasive alien plants				
Determine appropriateness of removal method				

5.2 Give an example of the most common alien invasive plant in this area?

.....

5.3 What skills have you gained since the beginning of the Illovu WFW project?

.....

5.4 In your opinion, whose responsibility is it to monitor land cleared of alien invasive plants in Illovu in case of re-growth?

	Unprompted	Prompted
Community		
Land owner		
Illovu project		
Government		
Other(s).....		

6. ESTABLISHING THE RESPONDENTS' PERCEPTIONS ABOUT THE PROJECT'S ABILITY TO DELIVER

6.1 How would you describe the Upper Illovu WFW project potential in contributing towards the followings?

Activity	Very strong	Strong	Weak	Do not know
Job creation				
Improvement				

in water supply				
Improvement in biodiversity				
Improvement in soil erosion				
Improvement in knowledge about alien invasive plants				

Your co-operation in responding to these questions is highly appreciated

Thank you.