



***FNQLGPPAC REGIONAL PEST MANAGEMENT  
PLAN INTEGRATION  
Stage 4 – Regional Pest Management Plan:  
the Strategies***

Report to the *Far North Queensland Local Government  
Pest Plan Advisory Committee*

**Garry Werren**

**ACTFR/School of Tropical Biology**

**James Cook University, Cairns**

**February 2004**



## TABLE OF CONTENTS

<b>TABLE OF CONTENTS</b>	<b>I</b>
Acknowledgments .....	iii
<b>EXECUTIVE SUMMARY</b>	<b>IV</b>
<b>1.0 INTRODUCTION</b>	<b>1</b>
1.1 Reasons for Regional PMP Integration.....	1
1.2 The Mission Statement of Pest Management in the FNQROC area.....	2
1.3 Interaction of Plan with Other Organisations/Organisational Arrangements .....	2
<b>2.0 PRINCIPLES OF PEST MANAGEMENT</b>	<b>4</b>
2.1 Planning and Integration.....	4
2.2 A Partnership Approach.....	5
2.3 Commitment .....	5
2.4 Duty of Care.....	5
2.5 Public Benefit.....	5
2.6 Prevention.....	5
2.7 Detection and Early Intervention.....	6
2.8 Capacity Building/Maintenance .....	6
2.9 Control Approach.....	6
2.10 Research.....	7
2.11 Monitoring and Evaluation.....	7
2.12 Enforcement .....	7
<b>3.0 OVERCOMING BARRIERS TO INTEGRATION OF REGIONAL ISSUES/PRIORITIES</b>	<b>8</b>
3.1 Responsibility Issues.....	8
3.1.1 Legal Responsibility Issues .....	8
3.1.2 Moral Responsibility Issues .....	8
3.1.3 Financial Responsibility Issues .....	9
3.2 Awareness and Education Issues .....	9
3.3 Infrastructure Cost .....	10
3.4 Survey, Mapping, Databases and Monitoring .....	10
<b>4.0 ELEMENTS OF A REGIONAL PEST MANAGEMENT PLAN</b>	<b>12</b>
4.1 Explicit Regionally Identified Pest Priorities .....	12
4.2 Implications of the Underpinning Legislation for the Development of Action Plans .....	13
4.3 Actions Directed at Controlling State-Declared Pests .....	14
4.3.1 Priorities for State-Declared Pest Plants .....	14

4.3.2	Actions/Control Measures for State-Declared Pest Plants .....	15
4.3.3	Priorities for State-Declared Pest Animals.....	15
4.3.4	Actions/Control Measures for State-Declared Pest Animals.....	15
4.4	Actions Directed at Management of Locally and/or Regionally Identified Pests.....	16
4.5	Actions to Promote Stakeholder Consultation and Involvement in Pest Management .....	17
4.6	Actions to Promote Community Awareness .....	18
4.7	Actions to Ensure Early Detection and Intervention.....	19
4.8	Actions to Prevent/Inhibit Weed Spread .....	21
4.9	Actions to Ensure Consistency within Local Government Planning and Programs .....	22
4.9.1	Local Government Development Approval and Planning.....	22
4.9.2	Cross-program Consistency .....	23
<b>5.0</b>	<b>STRUCTURE OF FNQROC REGIONAL PEST MANAGEMENT PLAN</b>	<b>25</b>
5.1	Scope of the Regional Pest Species Management Plan.....	25
5.2	The Central Objective/Vision of a Regional PMP .....	25
5.3	Proposed Organisational Arrangements .....	26
5.4	Proposed Strategies.....	27
5.4.1	Strategy 1 – Pest Priority-setting .....	28
5.4.2	Strategy 2 – Pest Prevention .....	28
5.4.3	Strategy 3 – Early Detection/Intervention .....	30
5.4.4	Strategy 4 – Prevention/Inhibition of Spread.....	31
5.4.5	Strategy 5 - Information Handling/Communication.....	32
5.4.6	Strategy 6 – Community Awareness/Education.....	33
5.4.7	Strategy 7 – Stakeholder Involvement/Extension.....	34
5.4.8	Strategy 8 – Cross Program Consistency Implementation.....	35
<b>6.0</b>	<b>SUMMARY AND RECOMMENDATIONS</b>	<b>37</b>
	<b>REFERENCES CITED</b>	<b>39</b>
	<b>ACRONYMS</b>	<b>41</b>

### ***Acknowledgments***

Compilation of this document was greatly assisted by individual Local Government representatives and information supplied by Nigel Weston (Rainforest CRC) and by accessing on-line model plans developed by personnel of the Land Protection Unit of the Department of Natural Resources and Mines (NR&M) and furnished by Vic Little of that organisation. Darren Moor and Belinda Shaw, also from NR&M, provided some particularly valuable advice and information. I am also grateful for comments offered by Matthew Hyde, Ray Byrnes, Paul Devine, Darlene Irvine and for the support of the Pest Advisory Committee *in toto*.

## **EXECUTIVE SUMMARY**

This document comprises Stage 4 of a four-stage process of integrating the individual Pest Management Plans (PMPs) across member councils of the FNQROC plus Hinchinbrook Shire Council in tropical northern and north-eastern Queensland. What follows is the substance of pest management strategies, and the rationale behind them. These have been developed within a Regional Pest Management planning framework that will, *inter alia*, form the basis of a Regional PMP for most of the Wet Tropics Bioregion and parts of three other bioregions – namely Cape York Peninsula, the Einasleigh Uplands and a portion of the northern Gulf Plains. It is further designed to provide a basis for a more comprehensive Regional PMP that will be a basic component of a Wet Tropics Region Natural Resource Management (NRM) Plan.

### **The Objective of Pest Management in the FNQROC area**

The main objective of this exercise is to identify, record, and prevent the establishment or the spread of pest plants and animals within the FNQROC area and to ensure that councils and all stakeholders meet their obligations under the *Land Protection (Pest and Stock Route Management) Act (2002)*. The Regional PMP focuses on regionally identified pest priorities and the commitment of all stakeholders to work in a strategic, collaborative and cooperative manner thus ensuring an efficient and practical outcome.

### **Reasons for Regional PMP Integration**

A Regional PMP is the desired outcome of integrating individual PMPs over the planning area. A well-developed Regional PMP will allow better use of resources available within the community and government to strategically address priority pests and provide for more efficient and cost-effective meeting of Local Government responsibilities under the *Land Protection (Pest and Stock Route Management) Act (2002)*. It will provide strengthened linkage with National NRM initiatives and various other planning layers, including strategies for Weeds of National Significance (WONS).

### **Regionally Identified Pest Priorities**

Regional pest animal and plant priorities were investigated within each individual Pest Management Plan within the Stage 2 Report (Werren 2003a).

Pest animals present within the planning area and addressed in local PMPs were assigned to three priority classes. These comprise:

- (i) high priority exotic species that are widespread and regionally significant (i.e. feral pigs, wild dogs/dingos and cats);
- (ii) medium priority exotic species that are less controllable (e.g. the cane toad), less widespread or which incur only on some parts of the planning area (e.g. rabbits in the south-west of the area); and
- (iii) certain mostly native pest species that present particular economic problems to agricultural production (e.g. cane rats to sugarcane)

production, especially along the wet tropics coast) that may warrant some degree of Local Government control assistance.

With regard to the latter, it is recognised that responsibility for native species is clearly vested in the State and arguably beyond the realm of Local Government.

Some 84 weed species from the planning area that attracted high to medium priority control attention within the PMPs were assessed.

- A total of 15 of these are recommended for attempted eradication. These comprise seven Class 1<sup>1</sup> plants – i.e. alligator weed (*Alternanthera philoxeroides*), Koster's curse (*Clidemia hirta*), limnocharis (*Limnocharis flava*), miconia (*Miconia calvescens*), mikania vine (*Mikania micrantha*), Siam weed (*Chromolaena odorata*), thunbergia vines (other than blue thunbergia – *Thunbergia annua*, *T. fragrans*, *T. laurifolia*) and a further ten weeds that are in comparatively early stages of establishing within the region - i.e. *Barleria prionotis*, *Grewia asiatica*, flacourtia (*Flacourtia jangomas*), hiptage (*Hiptage benghalensis*), Venezuelan pokeweed (*Phytolacca rivinoides*), Panama rubber (*Castilla elastica*), triplaris (*Triplaris surinamensis*) and cucumber tree (*Parmentiera edulis*) They can be considered directly comparable to Class 1 Declared weeds since in most instances, while either weed risk was not assessed prior to entry or, in the case of known invasive species, entry has not been prevented, eradication is a possible outcome.
- An additional 14 weeds (mostly WONS) ranked very highly. These comprise parthenium (*Parthenium hysterophorus*), pond apple (*Annona glabra*), blue thunbergia (*Thunbergia grandiflora*), parkinsonia (*Parkinsonia aculeata*), hymenachne (*Hymenachne amplexicaulis*), water hyacinth (*Eichornia crassipes*), salvinia (*Salvinia molesta*), lantana (*Lantana camara*), giant sensitive weed (*Mimosa diplotricha*), praxelis (*Praxelis clematidea*), brillantaisia (*Brillantaisia lamium*), cabomba (*Cabomba caroliniana*), rubber vine (*Cryptostegia grandiflora*) and chinee apple (*Ziziphus mauritiana*). These are present within the planning area as scattered to widespread infestations or occur only in certain sections of the region – i.e. either in the drier west and northern sectors or along the wet tropical coast and/or adjacent ranges. A strategic approach to infestations being contained and reduced within the planning area is a key recommendation.
- A further subset of 21 weeds is considered to warrant secondary control attention within the Regional Plan. These are sicklepods (*Senna obtusifolia* and related species), American rats-tail grass (*Sporobolus jacquemontii*), bellyache bush (*Jatropha gossypifolia*), tobacco weed (*Elephantopus mollis*), cats-claw creeper (*Macfadyena unguis-cati*), giant rats-tail grass (*Sporobolus pyramidalis*), prickly acacia (*Acacia nilotica*), mesquites (*Prosopis* spp.), Singapore daisy (*Sphagneticola trilobata*), harungana (*Harungana madagascariensis*), caltrop (*Tribulus terrestris*), annual ragweed (*Ambrosia artemisifolia*), mother-of-millions (*Bryophyllum* spp.), turbine vine (*Turbina corymbosa*), Gamba grass (*Andropogon gayanus*), yellow oleander (*Cascabela thevetia*), leucaena (*Leucaena leucocephala*), mother-in-law's tongue (*Sansevieria trifasciata*), thornapples (*Datura stramonium* and related species), spiny emex (*Emex australis*) and castor oil plant (*Ricinus communis*). In most instances, eradication is not achievable but strategic containment of infestations is recommended regionally, along with elimination of isolated infestations and appropriate follow-up treatment.
- The remaining 34 weeds receive various degrees of control priority within the ten PMPs. Of these water lettuce (*Pistia stratiotes*), prickly pears (*Opuntia* spp.), African tulip (*Spathodea campanulata*), broad-leaved pepper (*Schinus terebinthifolius*) and asparagus fern (*Protoasparagus* spp.) are State-Declared and warrant control attention commensurate with their classification. While presenting a variety of problems, both environmental and economic, Parā grass (*Brachiaria mutica*), bamboo (various species but mainly *Phyllostachys bambusoides*), Japanese sunflower (*Tithonia diversifolia*),

---

<sup>1</sup> The Act specifies three levels (classes) of pests. Class 1 (previously P1) pests whose introduction into the State is prohibited; Class 2 (P2) pests that are to be destroyed throughout the State or parts thereof; and Class 3 (P3) pests whose numbers and/or distribution are to be reduced throughout the State or parts thereof.

bauhinia (*Bauhinia monandra*), guava (*Psidium guajava*), snakeweeds (*Stachytarpheta* spp.), elephant grass (*Pennisetum purpureum*), milkweed (*Euphorbia heterophylla*), hairy senna (*Senna hirsuta*), privets (*Ligustrum* spp.), goose's foot (*Syngonium podophyllum*), aleman grass (*Echinochloa polystachya*), yellow allamanda (*Allamanda cathartica*), lion's tail (*Leonotis nepetifolia*), Navua sedge (*Cyperus aromaticus*), sensitive weed (*Mimosa pudica*), mistflower (*Ageratina riparia*), dutchman's pipe (non-native *Aristolochia* spp.), *Macrotyloma axillare*, knobweed (*Hyptis capitata*), grader grass (*Themeda quadrivalvis*), camphor laurel (*Cinnamomum camphora*), tobacco bush (*Solanum maritimum*), itch grass (*Rottboelia cochinchinensis*), giant bramble (*Rubus alceifolius*), Noogoora burr (*Xanthium occidentale*), *Caesalpinia decapetala*, Clyde road grass (*Paspalum virgatum*) and dictionara (*Brachiaria humidicola*) constitute generally low regional priorities. At the same time, control of yellow allamanda along the wet tropical coast, for example, may properly warrant higher priority within individual shires, wherein neighbouring shires are encouraged to cooperate in that regard, and it is also appropriate for Cook Shire to target the control of bauhinia as a priority since it appears particularly invasive of gallery rainforest/monsoon vine forest in certain localities. This group also includes several high utility plants, such as imported pasture and other stock forage species (e.g. leucaena) that also present high invasion risk, where control may be contentious within local constituencies.

## Plan Structure

Key elements of a Regional PMP were identified and discussed along with impediments to integrating pests management regionally. Finally a Regional PMP structure was proposed and eight constituent strategies and component actions were recommended for adoption. These are:

**Strategy 1** - Pest Priority-Setting (4 component actions)

**Strategy 2** - Pest Prevention (8 component actions)

**Strategy 3** - Early Detection & Intervention (8 component actions)

**Strategy 4** - Prevention/Inhibition of Pest Spread (10 component actions)

**Strategy 5** - Information Handling & Communication (4 component actions)

**Strategy 6** - Community Awareness & Education (7 component actions)

**Strategy 7** - Stakeholder Involvement Extension (6 component actions) and

**Strategy 8** - Cross-Program Consistency Implementation (5 component actions).

Nine component actions of the total of the 52 listed contribute to two or more strategies indicating a degree of internal coherence in the recommended Regional PMP structure.

Recommendations also include the establishment of a dedicated regional Pest Management Officer position to be associated with FNQLGPAC and supported by the new Regional NRM Board to progress regional pests management actions, along with the maintenance of a central regional pest information database immediately accessible to Local Government operatives.

## 1.0 INTRODUCTION

Pest plants and animals pose some of the most significant threats to regional assets. This document represents the fourth stage of the integration of Pest Management Plans (PMPs) for ten Local Governments<sup>2</sup> that comprise the FNQROC planning area with the view to the development of a 'Regional' PMP. The pest management integration exercise is structured as follows:

- Stage 1 - Review of Local Government Pest Management Plans (Irvine, 2003)
- Stage 2 - Development of Priorities (Werren, 2003a)
- Stage 3 - Development of Actions (Werren, 2003b)
- Stage 4 - Final Draft of Regional Pest Management Plan (this document).

A pest planning workshop of Local Government representatives and Land Protection officers of NR&M was conducted in April 2003 as part of this process. The development of 'Actions' (Stage 3) was undertaken within the framework of an integrated Regional Planning exercise as outlined below in order to facilitate the final draft of the Regional PMP (Stage 4).

### 1.1 Reasons for Regional PMP Integration

A Regional PMP is the desired outcome of integrating individual PMPs over the planning area. A comprehensive Regional PMP provides the following benefits:

- linkage with and support for:
  - a) National NRM initiatives including strategies for Weeds of National Significance (WONS);
  - b) Regional NRM Plans (i.e. the new National Heritage Trust arrangements);
  - c) Sustainable land use;
  - d) Statewide land protection strategies;
  - e) Integrated Catchment Management (ICM) strategies; and
  - f) Local Government strategic and related plans.
- a better use of resources available within the community and government throughout the region to strategically address priority pests;
- more comprehensive basis for making pest management resource allocations within a regional context;
- more efficient and cost-effective meeting of Local Government responsibilities under the *Land Protection (Pest and Stock Route Management) Act (2002)*;
- improved community appreciation of Local Government efforts and increased effectiveness in meeting community needs; and

---

<sup>2</sup> Nine LGAs form FNQROC. These are Atherton Shire, Cairns City, Cardwell Shire, Cook Shire, Douglas Shire, Eacham Shire, Herberton Shire, Johnstone Shire, and Mareeba Shire. A tenth LGA, Hinchinbrook Shire, was added for the purpose of the current study to allow easier integration into other regional planning processes.

- evidence of Local Government accountability at both State and National Levels and within the wider community.

The planning environment ranges from wet tropical to wet-dry (monsoonal) in character and is strategically located close to, or contains, several potential major pest entry points. These include (i) the Torres Strait, in the immediate vicinity of Papua-New Guinea, and (ii) ports such as Cairns City that have proven to be staging places for pests such as the crazy ant (*Anoplolepis gracilipes*). Importantly, FNQROC has a strong history of collaboration in NRM initiatives, and established facilitation and reporting protocols.

This should place the region in a strong position to obtain funding for pest management through the Natural Heritage Trust program extension funds and other potential sources of investment (Weston, pers. comm.).

### **1.2 The Mission Statement of Pest Management in the FNQROC area**

The mission statement of the Regional PMP is:

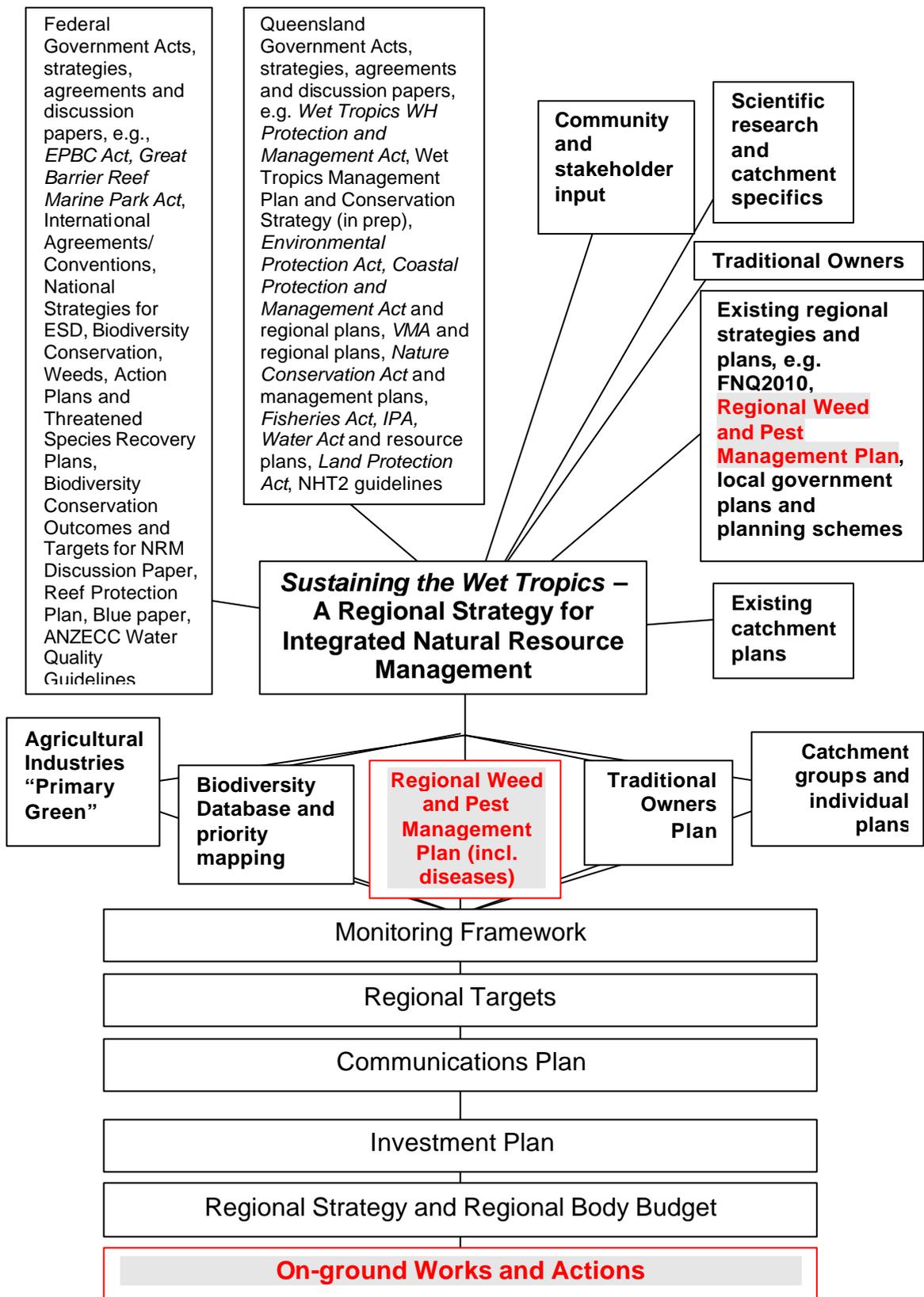
***“to identify, record, and prevent the establishment or the spread of pest plants and animals within the FNQROC area and Hinchinbrook Shire and to ensure that councils and all stakeholders meet their obligations under the Land Protection (Pest and Stock Route Management) Act (2002).”***

The Regional PMP focuses on regionally identified pest priorities and the commitment of all stakeholders to work in a strategic, collaborative and cooperative manner thus ensuring an efficient and practical outcome.

### **1.3 Interaction of Plan with Other Organisations/Organisational Arrangements**

The Regional PMP should form linkages with the pest management planning processes by State Government agencies and other major stakeholders and will form the basis for cooperation among neighbouring shires. This is facilitated by the attendance of stakeholders at Pest Management Committee meetings, attendance by LGA representatives at the Far North Queensland Local Government Pest Plan Advisory Committee meetings and by obtaining copies of all relevant stakeholder Pest Management (and/or Property Management) Plans. This regional plan will form the basis of the Pest Management component within the new Wet Tropics Regional Natural Resource Management (NRM) Plan (Figure 1) and possibly for the Cape York Peninsula NRM region. The new organisational arrangements now feature NRM Boards which determine priorities with regard to regional investments to progress pest management *inter alia*.

While the Regional NRM Plan will incorporate pest management as an integral component and will set targets in this area, this does not mean that the presiding NRM Board will be involved operationally in pest management initiatives. This will continue to remain a specific responsibility of Local Government and Land Managers and the Board's role is more appropriately to support the achievement of pest management targets through funding of priority projects/activities regionally and through appropriate liaison, lobbying and encouragement of stakeholder initiatives.



**Figure 1. New Wet Tropics regional NRM arrangements (Weston, pers. comm.)** (Note relationship of pest management planning as a precursor of a more comprehensive Regional PMP within the Region’s NRM Plan that will result in on-ground works and actions)

## **2.0 PRINCIPLES OF PEST MANAGEMENT**

Weed problems frequently cross all administrative and land tenure boundaries. A successful strategic approach to weed management requires a high degree of coordination and integration among the different stakeholders. Part of the solution to managing weeds is raising public awareness of the causes and appropriate responses to the problem. Often people are not aware of the impact weeds have on the natural environment and primary production or that they may be contributing to the problem through their own actions. A range of basic principles (DNR, 2000) are addressed within a Regional PMP. These comprise, *inter alia*:

- (i) planning and integration;
- (ii) a partnership approach;
- (iii) commitment;
- (iv) duty of care;
- (v) public benefit;
- (vi) prevention;
- (vii) detection and intervention;
- (viii) capacity building and maintenance;
- (ix) control approach;
- (x) research;
- (xi) monitoring and evaluation; and
- (xii) enforcement (re-ordered after NR&M 2000:3-4).

Consideration of these principles is vital to any effective pest management outcomes. It is, therefore, appropriate to revisit and reinterpret these principles within the current context.

### **2.1 Planning and Integration**

Planning is required that ensures that resources and efforts are targeted to identified priorities at all scales, but in particular, those that are identified with local knowledge explicitly at the regional scale, on an ongoing basis. Pest management is an integral part of the holistic management of natural resources and the Regional PMP reflects this.

Pest management planning is also a statutory requirement of Local Government as prescribed by the new *Land Protection (Pest and Stock Route Management) Act (2002)* hereafter called “the Act”. Each constituent Local Government has an individual PMP in which pest priorities have been addressed and control applied and most shires have revised these in accordance with the specified period of review (5 years). The current exercise builds upon these plans with a view to enhancing regional capacity to deal with pests.

## **2.2 A Partnership Approach**

Consultation and partnership arrangements between Land Managers, communities, industries and governments lead to sharing of responsibilities. This is the major underlying reason for this PMP integration initiative and increasingly a principle that is being required in planning instruments by Commonwealth Government funding policy. It is also recognised that it is the basic principle that has seen formation of the FNQROC and the Pest Plan Advisory Committee (FNQLGPPAC) that has commissioned the current exercise. It also underpins the formulation of every individual PMP since each was formulated in a process involving a range of stakeholder groups.

## **2.3 Commitment**

A long-term commitment from the whole community is essential for effective pest management. In fact, it was well recognised at the previously mentioned workshop of Local Government representatives and NR&M personnel, that control of certain high priority pests can only be achieved through a medium- to long-term commitment and resources to match. The present initiative has been formulated to (a) formalise Local Government commitment to integration of pest management efforts within the FNQROC area, and (b) to achieve the necessary commitment of resources to pursue appropriate pest management outcomes regionally.

## **2.4 Duty of Care**

It is an ever-increasing obligation that persons must take responsibility for their impacts on others and on the environment. Accordingly, the principle that individuals and organisations must take reasonable steps to prevent entry and establishment or to minimise the spread of pests through activities that are within our control are observed and enshrined within this Regional PMP.

## **2.5 Public Benefit**

The principle that collective action is necessary when it is in the public interest and when the problem transcends local capacity to address it adequately is well established. The control of introduced pest plants and animals is often too great a problem to be addressed simply by applying locally available resources, yet the benefits of instigating control are clearly in the public interest. Moreover effective pest management will require a greater input of effort and financial resources by many sectors of the community (including agencies and individual land managers). However, this is one area where, unless there is coordinated effort across the community, there is substantial scope for expending substantial resources with little long-term public benefit.

## **2.6 Prevention**

The adage that “prevention is better than cure” holds very much with respect to pest introductions. Preventing their entry to this country and to the State is largely a biosecurity responsibility that lies beyond the role of Local Government and resides with agencies of the Commonwealth such as AQIS and with the State of Queensland respectively. However, preventing the transport of pests or their reproductive parts through human activities or movement of livestock limits their invasion capability within the country or parts thereof. This is a principle

which is incorporated into the Regional PMP and which is currently written into certain individual PMPs. An example is in the case of vehicle washdown facilities operated by Johnstone Shire at Bingil Bay to ensure that Siam weed (*Chromolaena odorata*) is not moved beyond a localised infestation. In addition, concern was expressed at the workshop of Local Government representatives with regard to movement of weeds such as parthenium (*Parthenium hysterophorus*) with movement of stock and stock feed from Tableland sources to coastal lowlands. This is of prime importance since Pressland (pers. comm.) cites a cost-benefit ratio of 31:1 for pest prevention of entry to new areas.

## **2.7 Detection and Early Intervention**

It is very well established that early detection of pests and intervention is the most effective approach to control. That is, the best value-for-effort/cost-efficiency within a weed control program is achieved since eradication prevents further expenditure on control and involves the least environmental impact (Braithwaite and Timmins, 1999; Carter, 2000; Goodland, *et al.*, 1998; Groves, 1999). Pressland (pers. comm.) cites a cost-benefit ratio of 16:1 for early detection and eradication of incipient infestations of novel weeds. Eradication, however, is the exception rather than the rule (Groves and Panetta, 2002) and they argue that it is important to evaluate the feasibility of eradication prior to expending great effort without being able to achieve the expected. This Plan recognises this fact together with the effectiveness of acting early to prevent future problems and commends the NR&M initiative of establishing a regionally-based team to deal with incipient weed incursions.

## **2.8 Capacity Building/Maintenance**

Strengthening public awareness and knowledge of pests leads to an increased capacity and willingness of individuals to take action. In fact, this includes the ability to recognise new pests so that outbreaks can be detected early and is really instrumental in prevention of future problems. There are several ways that this principle has been incorporated into the Regional PMP. The first is to ensure that Local Government personnel are familiar with alert lists and, in particular, pest plant identification and reporting protocols. A second, and no less important objective, is to ensure that the wider community is informed as to the risks posed by pests and becomes more adept at their identification.

## **2.9 Control Approach**

Applying control techniques that are most efficient and cost-effective and which least disrupt ecological processes reinforces the resilience of natural and productive systems. Chemical pest control is comprehensively regulated by the State and underpinned by Australian National Standards. Efficient and non-invasive weed control requires a high level of scientific understanding that is obtained through research. This can, however, be a two-way process with local experience of pest control informing control efforts elsewhere.

The application of strategic and integrated control efforts are advantaged by increased cooperation across the region. There is also little benefit to be gained in strategically releasing biocontrols that predispose a weed to greater damage from another control method in a single LGA if infestations straddle administrative boundaries and neighbouring populations are not treated.

## **2.10 Research**

Research into weed behaviour, risk and control is another matter that lies primarily beyond the responsibility and resources of Local Government. This is provided for by State instrumentalities, several of which (e.g. NR&M research centres at Charters Towers and Sherwood) are dedicated exclusively to pest research and others (e.g. South Johnstone) currently engaged in weed research. It should also be noted that there is a national Cooperative Research Centre for Australian Weed Management (CRC-AWM) that similarly facilitates research and development for pest plants and another – the Pest Animal-CRC – whose charter it is to investigate vertebrate pest issues. It is also pertinent to note that there has been cooperation between the Rainforest CRC and CRC-AWM in the investigation of rainforest weed control priorities (Grice and Setter, 2003). Moreover, often Local Government pest management personnel actively collaborate with officers from these organisations to engage in weed control research. The onset of new regional NRM arrangements (1.3 above) will mean that Local Government will have an opportunity to directly influence research into pests and pest control (Weston, pers. comm.). In that regard, research considerations can be included within regional pest management planning.

## **2.11 Monitoring and Evaluation**

This principle embodies the fact that regular monitoring and evaluation can lead to continual improvement to practice. In the planning context it also provides a means through which the meeting of targets can be assessed. It is a principle that underpins the Local Government pest management planning process. Pest control, particularly chemical control methods, is constantly changing due to the ongoing research into the development of novel herbicides and application techniques. Without monitoring and evaluation of applications the adoption of appropriate techniques, that may vary in terms of the rates and types of herbicides applied from area to area and at different times during the year, may be diminished.

While monitoring and evaluation are intrinsic to pest management within each LGA, there is scope for regional assessment of pest control efforts, particularly with regard to integrated and strategic control employing biological agents (see 2.9 above). Systematic monitoring of especially vulnerable areas of the landscape in order to detect weed establishment is required. However, it is likely that this will place unreasonable burdens on individual Local Government Pest Management Unit personnel unless there is a greater involvement of State agency staff within a regional planning framework.

## **2.12 Enforcement**

Enforcement measures that are legally set help to ensure that individuals fulfil their duty of care. In most instances enforcement is a measure applied as a last resort after contact and negotiations have failed. While individual Local Governments have different approaches to enforcement, there may be opportunity for agreement on consistent application of measures within the regional planning context.

### **3.0 OVERCOMING BARRIERS TO INTEGRATION OF REGIONAL ISSUES/PRIORITIES**

There is a range of generic issues that is addressed by the Regional PMP. These span specific public liability/institutional responsibility issues to those more associated with environmental sustainability and morality in general.

Regional issues and priorities are also explicitly required within the 'background' element (or 'Regional Overview') of a Regional PMP. As previously mentioned, this is structured to include:

- a general introduction to the planning area;
- an outline of the purpose of the Regional PMP;
- the various sections contained in the Regional PMP;
- a list of priority species to be addressed regionally; and
- a summary of the planning process and actions plans embedded within, including community awareness and the involvement of key stakeholders.

The intent of the exercise at this point is to explore various issues that impinge on the pest management planning process and which can constitute barriers to effective regional integration of issues and priorities.

#### **3.1 Responsibility Issues**

In relation to pest management various issues can be identified that relate to both legal and moral responsibilities. Legal responsibilities are prescribed not only by State (as in the case of the *Land Protection (Stock Route and Pest Management) Act, 2002*) and Commonwealth legislation (cf. *EPBC Act, 2000*) but also by Common Law.

##### **3.1.1 Legal Responsibility Issues**

Three major issue areas of legal responsibility can be identified as follows:

- compliance with statutory obligations under the Act and any other relevant legislation is mandatory;
- maintenance of a Duty of Care with regard to (a) public health (e.g. allergic reactions can be affected by certain Declared plants or water quality can suffer due to Declared aquatic weed infestations), (b) public amenity (e.g. loss or reduction of access to recreation locations/facilities due to weed infestations) and (c) to the environment (although the legal basis for environmental responsibility is less tangible despite it underlying State environmental protection legislation) is required; and
- avoidance of the threat of Civil action/litigation with regard to negligence surrounding pest animal or weed outbreaks is necessary.

##### **3.1.2 Moral Responsibility Issues**

In addition to legal responsibilities that are incumbent upon Local Government, there is a range of responsibilities that are arguably moral ones. Some are even formalised in intergovernmental agreements such as the commitment to

Ecologically Sustainable Development (ESD) of the Council of Australian Governments (COAG), although these generally remain rather intangible.

The following can be regarded as pertinent moral responsibility issues:

- loss of native biodiversity within the local environment;
- visual amenity detracted as a result of weed infestations; and
- increased harbourage for feral animals that will have other disbenefits.

### **3.1.3 Financial Responsibility Issues**

It should also be noted that weeds or diseases introduced by one industrial sector may adversely affect another sector and cause financial or productivity loss. Examples are many and include imported stock pasture plants that can in turn become weeds of canefields. Where this is the case, civil action/litigation may occur in order to seek financial restitution. In any event, certain high utility plants for one sector that are invasive in another is an issue likely to pose barriers to effective regional pest management.

## **3.2 Awareness and Education Issues**

There are various issues that need to be addressed in a regional planning process that relate to community awareness and education. These range from a simple understanding of the risks posed by invasive exotic species on the environment and agriculture generally to maintaining a detailed pest database containing information on pest identification, the location and extent of pest infestations, mode of spread, registered herbicides, etc., accessible to weed control practitioners and other relevant stakeholders.

Currently there is a relatively complex system of weed and pest animal information. State Government agencies are the major repositories for a range of pest information. The lead agency is NR&M-Land Protection which maintains the 'PestInfo' database and produces collateral material, especially 'PestFacts'. Information also resides with the Environmental Protection Agency's Queensland Herbarium and QPWS (particularly with regard to pest animals and weeds of the protected area network), with the Department of Primary Industry for a subset of agricultural and pastoral pests and with a variety of scientific institutions, including two Co-operative Research Centres (CRCs) expressly concerned with weed and vertebrate pest management.

Regionally, Local Government has collaborated with agencies such as the Wet Tropics Management Authority to produce and distribute weed identification decks for the Wet Tropics and Cape York Peninsula. Quasi non-government organisations such as the Mitchell River Watershed Management Group have also collaborated with Commonwealth and State agencies to produce a brochure detailing 20 most problematic weeds for distribution to landholders within this expansive catchment which extends from the Wet Tropics to the Gulf Plains. Local Governments also provide an outlet for the distribution of 'PestFacts' and related collateral produced by the lead State agency and as a collection point for more explicit pest distributional information that is collated by the lead agency. Understanding the effectiveness of using various media for increasing pest awareness of both professional officers and the wider community is required to ensure that actions are efficient and cost-effective. Increasingly, regional NRM groups will be playing a role.

The importance of raising staff and/or contractor's awareness of facilitating weed spread associated with particular activities is also an issue to be addressed in both individual Local Government day-to-day operations and the regional planning context. To date PMPs have largely considered weed control priorities but not necessarily weed spread. Adoption of protocols to ensure that weeds are not transported into an area via landfill, mulch or on vehicles and other machinery can be explored as a regional pest management action option. Cost of staff training would be an additional issue associated with the awareness and education component.

There is also considerable scope for increasing awareness of some council staff, particularly those associated with parks and gardens, of the importance of invasive species issues and of Statutory requirements under the Act. Issues include the maintenance of Declared plants in botanical gardens and their subsequent escape or transport further afield, along with the cultivation of weedy species as ornamentals (and, by implication, the promotion of cultivating such species to the wider community) in other council parks and gardens and in urban amenity plantings of such in median strips and on footpaths. Such issues are addressed more fully as ensuring cross-program consistency in Local Government activities within section 5.9.2 below.

### **3.3 Infrastructure Cost**

Issues associated with the cost of establishing and maintaining infrastructure associated with pest management and monitoring will need to be considered within the Regional PMP. Currently each Local Government Authority (LGA) supports a Pest Management Unit (PMU) with dedicated and often specialised equipment to engage in pest suppression activities. With the exception of Cook Shire, each is maintained financially from an individual shire's coffers, with some activities (e.g. Siam weed, *Chromolaena odorata* control), from time to time, supported by external funding sources.

In some cases infrastructure such as vehicle wash-down facilities are also maintained, but associated costs and public liability issues preclude use beyond the washing-down of council vehicles and machinery. Local Government representatives also showed little interest in acquiring more strategically located facilities such as vehicle inspection stations which were used to restrict and eventually eliminate incursions of a serious horticultural pest, the papaya fruit fly (*Bactrocera papayae*) in the mid-1990s, due to cost constraints.

Collective acquisition of specialised equipment (e.g. aquatic weed harvester) and/or other infrastructure, or of a dedicated team to tackle strategic infestations, is another option worthy of consideration. Despite this, there was little support for the concept of a "trouble-shooter team" or of collective infrastructure acquisition at earlier regional Local Government pest management meetings due to cost constraints. However, this issue might be revisited in the regional context if there is interest and prospects for resourcing such.

### **3.4 Survey, Mapping, Databases and Monitoring**

Integral to pest management is the collection of data throughout the planning area regarding the distribution of pests, and in particular, weed infestations. Currently, precise knowledge of the location and extent of weed infestations is limited to species which are relatively restricted or which are novel weeds and

where there is the opportunity to search areas about those sites where initial infestations were located. At the same time, many LGAs maintain Geographic Information Systems (GIS) such as 'MapInfo' that are capable not only of storing documentation of cadastral boundaries, reticulation systems and other council assets, but also of pest distributions. Already distributional information of weed species is collected and stored as GIS files by some individual councils. While NR&M officers may obtain these data to inform and update 'PestInfo', there can be a case put for more centralisation of data that are useful regionally.

In addition, weed and pest animal data are collected according to individual shire protocols or in an *ad hoc* manner such that there may be a need to adopt regional protocols for survey, mapping and data storage. This would ensure compatibility and consistency of pest distributional information and would allow more confident assessment of weed status (including more accurate knowledge of the extent of infestations, the rate of spread, efficacy of control treatments, etc.) across the planning area. Such data are also urgently required to monitor pest management initiatives and to allow for accurate reporting to regional funding sources.

There remain issues regarding how consistency of weed survey, mapping and data storage might be achieved throughout the FNQROC area. Not the least of these is compatibility of GIS systems and data format. Another major issue concerns the location of the database, or how such might be accessed throughout the planning area, and where responsibility for database custodianship may lie. In that regard, there is a role for a Regional Pest Project Officer who can operate across administrations to collect, collate and update pest data and perform other tasks that can assist in delivering regional pest management outcomes.

## 4.0 ELEMENTS OF A REGIONAL PEST MANAGEMENT PLAN

The outcome of the current initiative is designed to be a set of recommended strategies which together comprise a comprehensive and practical Regional PMP that will provide for effective pest control throughout the planning area. Accordingly, it is imperative that constituent actions be formulated in relation to statutory requirements and address several other relevant matters of concern. These comprise (a) public awareness of pests and capacity building to tackle pest management issues generally, (b) particular initiatives to prevent pest establishment and/or inhibit spread and (c) consistent treatment of pests across Local Government programs, including those dealing with planning, development approval and other matters.

### 4.1 *Explicit Regionally Identified Pest Priorities*

Frequently there is a tripartite classification of weeds (i.e. both environmental and agricultural). Categories identified by the Kangaroo Island Natural Resources Board (KINRB) (Volkers 2003b:53), for example, comprise:

- (i) weeds that are spreading rapidly, or can be confidently expected to spread rapidly, but as yet are only found in isolated pockets or in low abundances;
- (ii) weeds found scattered through out the region, or major parts of the region, which are spreading; and
- (iii) weeds that are not spreading significantly (i.e. have reached ecological limit – may be only in isolated pockets or widespread).

In addition, Volkens (2003b:53) points to and lists candidate species in a putative fourth category – i.e. weeds that are “not known to be present but have the potential to establish”. In that plan, coastal weeds are dealt with separately “due to the different impacts to the coastal environment and the particular actions required managing these weeds” (Volkens 2003b:53).

Stage 2 of the current investigation provided a substantive basis for a similar tripartite classification of weeds found in the FNQROC planning area. In fact, a ‘triage’ system for pest control response was explored at the workshop of FNQROC pest policy representatives held earlier. Weeds/pest animals can be subdivided into the following three categories:

1. *Priority 1* – control feasible and within resources – needs little effort but achieves a high benefit or knocks out a future problem before it gets started.
2. *Priority 2* – medium priority – requires long-term commitment and recurrent funding – this is where the ranking will be crucial so as to attract the funds from funding agencies.
3. *Priority 3* – beyond our ability to control.

A fourth category emerged from the working group discussion. This was considered to comprise species that rank low priority that would require little effort and relatively minimal resources but can be either low risk (or disturbance influenced) invaders or may be high risk “sleepers” and which may be considered as a fourth priority class (Werren, 2003a:36; Cunningham *et al.*, 2003). It is, therefore, apparent that there is consistency in pest classification.

## **4.2 Implications of the Underpinning Legislation for the Development of Action Plans**

The *Land Protection (Pest and Stock Route Management) Act (2002)* provides for the control of major pest plants and animals throughout Queensland. Under this Act, landholders, Local Governments and State Government departments have clearly allocated responsibilities that will, in part, prescribe actions regarding pest management.

The subdivision of responsibility is as follows. The Act stipulates that State authorities are responsible for the following actions:

- the development and administration of PMPs for their areas of responsibility (i.e. a responsibility that has long been recognised by stakeholders as vital and which was foreshadowed formally when Local Governments were required to develop PMPs; none have yet been formulated)
- the control of declared pests on land managed by the authority; and
- participating in local government pest planning processes.

Local Governments are responsible for certain actions as follows:

- the development and administration of a PMP for their area of responsibility (all relevant Local Governments have done this and most have updated and endorsed these plans);
- administering the Act;
- the control of declared pests on council managed land; and
- ensuring effective control of declared pests on freehold/leasehold land

Individual landowners are responsible for the following actions:

- the control of declared pests on their land; and
- complying with any pest control notice served upon them, but should the landowner not comply with the direction contained in such a notice by a specified date, Local Government may authorise an appropriate person to enter the said land and carry out the requirements of the direction with the expenses thereafter incurred in carrying out this action then charged to the landowner.

Some councils also have in place Local Laws (Control of Pests). Under Local Laws councils may declare pests which are found generally within their shire and have the potential to cause environmental and or a health nuisance or harm. Local declaration might be appropriately considered to be locally informed pre-emptive action to instigate management attention and minimise negative impacts associated with plant pests that have not been accorded State priority (i.e. Declared at the State level). Local declaration may assist in preventing the cultivation and/or trading of certain weedy ornamental, “medicinal” or otherwise useful plants within an individual shire, or collectively, in the wider region. It is particularly relevant in cases where considerable effort has already been expended in the control of infestations of problematic weeds that have recognised uses, for example, cucumber tree (*Parmentiera aculeata*) which has been progressively controlled by Cairns City along lower reaches of

the Barron River but which has fruit that is used in Asian cooking that may also encourage its propagation and continued spread.

### **4.3 Actions Directed at Controlling State-Declared Pests**

Certain plants and animals are declared under the Act (refer to Section 3) and as such land managers have a responsibility to control them on their land. Apart from new incursions that equate to Class 1 pests, these State-Declared pests have the priority for control measures commensurate with their classification.

Under the newly framed Land Protection legislation there are three categories of pests. A pest is classified as Class 1 if it is not commonly present or established in the State and has the potential to cause an adverse economical, environmental or social impact in the State, other States, or part of the State or another State. Class 2 and 3 pests constitute those that have established in the State and are causing or have the potential to cause an adverse economic, environmental or social impact in the State, other State or part of the State or another State.

In deciding whether to declare an animal or plant to be a Class 2 or class 3 pest, consideration is given to:

- significance of the animal's or plant's impact or potential impact;
- the area affected or likely to be affected by the impact; and
- the extent to which the animal or plant has spread or is likely to spread.

#### **4.3.1 Priorities for State-Declared Pest Plants**

The level of priority for control will be indicated as appropriate for the pest and may range from total eradication to general public awareness. These actions are to be entered on any pest control notice issued.

The level of priority for control will be indicated as appropriate for the plant and may range from total eradication to public awareness. Pest plants may be:

1. Declared plants, which are generally not found in the planning area, but have the potential to readily establish;
2. Declared plants found generally in the planning area and it is the basic intent to eradicate the plant, over time, from the area;
3. Declared plants found in the planning area that are to be destroyed by landowners where found;
4. Declared plants found generally in planning area and are to be controlled by landowners;
5. Declared plants found generally in the planning area and information on identification and treatment by landowners is promoted; or
6. Declared plants not generally found in the planning area and do not have significant potential to establish because of climate or remoteness from existing infestations (if found, they automatically become Control Priority 1);
7. Plants not declared either at the local or State level but which also have potential to become established and adversely affect the environment and/or the health of people or animals may be candidates for local declaration and subsequent State Declaration during the revision of legislative schedules.

### **4.3.2 Actions/Control Measures for State-Declared Pest Plants**

The following control measures indicate the methods which can be used in control of Declared plants. This may include the serving of a notice, assistance from individual councils, NR&M, and landowner treatment.

1. Discuss the matter with the landowner and encourage them to take action to reduce or remove the plant. Notice is not generally served, with landowners encouraged to treat these plants. Constituent councils may serve notice where an owner neglects this general duty, to the detriment of surrounding landowners or to environmentally sensitive areas.
2. Notice is served upon owner to reduce or remove the Declared plant immediately with the aim of eradication.
3. Notice is served upon owner to control the Declared plant where they are found. It may be the aim of council(s) that plants in this category are to be eradicated from the region over a period of time.
4. The landowner is to control the Declared plant within time stipulated on notice (and a Property Pest Management Plan may be required in exceptional circumstances).
5. Due to the low probability of target plants being found in the region, pest management officers are to remain alert for presence of a weed and carry out public awareness activities as prescribed elsewhere.

### **4.3.3 Priorities for State-Declared Pest Animals**

The level of priority for control will be indicated as appropriate for the animal and may range from total eradication to public awareness. They may be:

1. Declared animals, which are generally not found in the planning area, but have the potential to readily establish;
2. Declared animals found in the planning area that are to be destroyed or surrendered when found;
3. Declared animals found generally in the planning area and are to be controlled by the landowner;
4. Declared animals not generally found in the planning area and do not have significant potential to establish because of climate or remoteness from existing infestations (if found, they automatically become Control Priority 1); or
5. animals (not Declared in this region), which have potential to become established and adversely affect the environment and/or the health of people or other animals.

Declared animals not generally found in the planning area, but which do have the potential to establish and adversely affect agriculture and the environment are to be controlled by the landowner with assistance from relevant agencies.

### **4.3.4 Actions/Control Measures for State-Declared Pest Animals**

The following criteria indicate the method to be used in control of Declared animals. This may include the serving of a notice, Council assistance, NR&M assistance and individual landowner treatment.

1. Notice is not generally served, with owners encouraged and informed to be able to identify and control target animals. Councils may serve a notice where an owner neglects this general duty to the detriment of surrounding properties and environmentally sensitive areas.
2. Notice is served upon a landowner. Councils will provide assistance in the identification and monitoring of Declared animals, with the aim of eradication.
3. A landowner is required to control animals where they are found. It is the aim of Local Government that animals in this category are to be eradicated from their area of responsibility over a period of time.
4. The landowner is required to destroy Declared animals within the time stipulated on notice (and Property Pest Management Plan may be required in exceptional circumstances).
5. Due to the low probability of particular pest animals being found in the region pest management unit personnel are to remain alert for the presence of these animals and carry out relevant public awareness activities.
6. Dependant upon the size and severity of the infestation, the following control measures may be used:
  - encouragement for landowner(s) to manage pest(s);
  - councils provision of assistance to landowner to manage pest(s);
  - sourcing of external funding to manage pest(s); and
  - requests can be made of NR&M to declare the pest(s), thus triggering statutory responsibilities.
7. Landowners are required to work in collaboration with relevant agency personnel to control an infestation.

#### **4.4 Actions Directed at Management of Locally and/or Regionally Identified Pests**

Pests, particularly pest plants, other than those Declared by the State of Queensland, have been identified regionally (see Werren 2001, Bebawi *et al.* 2002) and accorded management priority at the Local Government level in individual PMPs. In a manner comparable to the allocation of classification levels associated with the State legislation and to the ascription of control priorities, four management classes can be identified. These are set out below.

##### **1. Management Class 1: Limited or Incipient Populations**

This category includes species that have limited or incipient populations within the region. Primary management actions include:

- rapid response efforts for the eradication of pioneering populations;
- prevention of dispersal into new areas;
- issuance of alerts and educational materials to help with detection of additional infestations; and

- systematic monitoring of especially vulnerable areas of the landscape to detect additional populations.
2. Management Class 2: Established, Potential For Impact, Some Practical Control Techniques Available

This category covers species present and established in the region with known impacts (or potential for impact), which may be mitigated or controlled with appropriate management techniques. This may include species that are utilised in agriculture and managed under other protocols for commercial purposes (e.g. leucaena), but that still have known or potential impacts on native species, ecosystems, or the human use of these ecosystems.

Primary management actions include:

- prevention of further dispersal to new areas;
- control of population range;
- mitigation of impacts; and
- resource managers, researchers, and industry representatives work together to find long-term solutions for those species considered to be important for recreation or commercial purposes.

3. Management Class 3: Established, Potential for Impacts, No Known Effective or Practical Control Techniques

This category includes species established in the region, with known impacts (or potential for impact), but with no known available effective or appropriate effective management techniques. This category also includes some species that are considered to be so widespread that known control techniques may not be feasible.

Primary management actions include:

- prevention of dispersal to new areas;
- mitigation of impacts; and
- further evaluation and research of potential control methods.

4. Management Class 4: Established; Impacts Unclear

This category includes species that are established in the region and may have the potential to cause impacts, but current knowledge is insufficient to determine if control actions are warranted.

Primary management actions include:

- prevention of dispersal to new areas;
- further research to evaluate their invasive potential; and
- continued monitoring of existing populations to determine rate of spread.

#### **4.5 Actions to Promote Stakeholder Consultation and Involvement in Pest Management**

The central objective of this component of the Plan is to develop protocols that have input from and ownership of all key stakeholders.

Issues that must be addressed by actions include:

- ownership of management plans and initiatives will be achieved through concerted stakeholder consultation;
- control procedures must be workable and practical and there may be considerable untapped pest control experience within the stakeholder community;
- integration of information regarding pest distribution and responses to control is an important precursor to effective pest management;
- plans and procedures must be relevant to client/industry needs; and
- commitment from all stakeholders will maximise the chances to implement effective pest management.

Actions that are appropriate to address these issues include:

- liaise with other Local Government Weed Officers/Stock Route Supervisors, NR&M Land Protection Officers and other government agencies for assistance and information on Declared plants and any others that might constitute environmental weeds;
- contact other departments and key stakeholders to ensure procedures are consistent with relevant legislation;
- liaise with private landholders and government agencies where major declared plant infestations exist to identify current control and management practices;
- liaise with private landholders who may be affected by any district operations or projects; and
- consult contractors, Local Government and NR&M personnel to ensure procedures are practical and appropriate.

#### **4.6 Actions to Promote Community Awareness**

While the processes of stakeholder consultation and involvement will promote a certain degree of community interest and awareness, other important functions incorporated within the Regional PMP are associated with the acquisition and/or contribution of funds for and/or the facilitation of the distribution of information to promote awareness of pest management issues throughout the FNQROC area. This can be achieved by:

- display and distribution of readily available relevant Pest Facts or other collateral material produced by NR&M to promote public awareness; (Note that all councils within the FNQROC appear to already do this as a matter of course);
- production of locally appropriate public awareness material; (Note that two pocket guides for weed identification have been produced and circulated by constituent Local Governments. These are (i) *Agricultural and Environmental Weeds: Far North Queensland* collaboratively produced by the Wet Tropics Management Authority, the Far North Queensland Pest Plan Advisory Committee and NR&M with assistance from the Natural Heritage Trust and launched by Cairns City Council, and (ii) *Cape York*

*Peninsula Weed Pocket Guide* produced by Cook Shire Council with support from the Cape York Natural Heritage Trust as part of the Cape York Weeds and Feral Animals Project. In addition, weed information has been produced by non-government groups such as the brochure entitled *Weeds in the Mitchell River Watershed* produced by the Mitchell River Watershed Management Group with support from NR&M. This material may also be available for appropriate circulation.);

- support for the display of Declared pests and information at various venues;
- promotions during “Weed-Buster Week”;
- regional and local awareness programs, including field days and farm or site walks (It can also be put that the production of material such as the weed identification pocket guides already promotes such regional and local awareness.);
- media releases through appropriate outlets (Similarly, the launching of the pocket guides provided opportunities for media interaction.); and
- the operation of incentive programs.

#### **4.7 Actions to Ensure Early Detection and Intervention**

Early detection of pest plants (and, in some cases, pest animals) and subsequent eradication of incipient infestations is vital to minimise further environmental damage and economic costs (Waterhouse, 2003:34). This is demonstrably due to the fact that the probability of successful eradication decreases dramatically with the increasing size, extent and duration of infestation (Groves and Panetta, 2002).

Groves and Panetta (2002) suggest consideration of five main criteria that will determine success in weed eradication programs. These criteria are:

1. if the total area of distribution is less than 100 hectares;
2. if the weed is known to occur at three or fewer locations;
3. if the weed's location is easily accessible;
4. if the weed is readily detectable; and
5. if the species is still being traded by nurseries as seed or as established plants

The early naturalisation stage is considered to be the most effective time to attempt to reduce the ultimate impact of a weedy species (Hobbs and Humphries 1995, Williams 1997, Grice and Ainsworth 2003, Panetta and Timmins, in press).

Weed detectability is an important determinant of eradication feasibility. Groves and Panetta (2002) concluded that the ease of detection of a weed has not generally been given proper consideration in the evaluation of eradication potential. Detection is critical both in locating infestations and of locating every individual within known infestations. The ability to detect a weed is a function of its visibility and of search effort, experience and method (Harris *et al.* 2001). Usually weed detection is a slow, labour-intensive procedure that is very costly. The search rate (hours/ha) required depends upon characteristics of both the target species and the ‘matrix’ in which it is found. Based on the experience of weed inventory workers searching for a variety of weed life forms in a broad

range of vegetation types, Harris *et al.* (2001) employed a standard effort of 2 hours per 10 ha, in order to determine optimal surveillance intervals for weeds of natural ecosystems in New Zealand. Cryptic species will be the most costly to detect. Remote sensing may pick up sizeable infestations of weeds, but is unlikely to become sufficiently sensitive to detect very small numbers of plants, particularly if these occur in the understorey (Panetta and Timmins, in press).

Detectability is as much a function of the vegetation in which a weed occurs as of the characteristics of the plant (Panetta and Timmins, in press). The surveillance effort required to find both new infestations and all individuals within each infestation is inversely related to the ease of detection of a weed. Weeds that have a conspicuous flowering (e.g. Siam weed), fruiting (e.g. hiptage) or leaf-shedding (e.g. pond apple) stage may be detected relatively readily, with a low search effort. The window of opportunity for detecting such plants is a function of the duration of the conspicuous stage(s). The timing of detection in relation to plant phenology is also important. It is critical that a plant is detected and controlled before it reproduces, since reproductive escape can establish (or, more commonly, replenish) a soil seed bank and contribute to re-establishment and further spread (Panetta and Timmins, in press).

The existence of a dormant, seed phase poses particular problems for detection since seeds are largely undetectable. Species that develop persistent seed banks (e.g. sicklepod) require repeated follow-up, at a frequency that allows control of new recruits before they become reproductive.

Other major factors that determine whether eradication will be successful include an adequate level of funding for extirpation efforts and a very high degree of cooperation from local landholders and the horticultural industry.

Primary management objectives include:

- rapid response efforts for the eradication of incipient populations;
- prevention of dispersal into new areas;
- issuance of alerts and educational materials to help with detection of additional infestations; and
- systematic monitoring of especially vulnerable areas of the landscape to detect additional populations.

Regional priority actions have been identified. These are to:

- formulate a contingency plan to be adopted by each member council to deal with new weed (or feral animal) incursions;
- consider forming and resourcing a regional emergency pest management process to initiate eradication efforts, search adjacent areas and engage in follow-up monitoring;
- contact botanical garden personnel and nursery industry representatives to inform them of concerns regarding the cultivation of suspected weed species (e.g. *Piper auritum* and *Rhodomyrtus tomentosa*); and
- ensure that alerts and educational material is circulated locally to enhance capability to detect any further incursions.

#### **4.8 Actions to Prevent/Inhibit Weed Spread**

Attacking the causes of weed spread is a very efficient and cost-effective method of approaching the problem, and it reduces the later effort of managing the much greater problem of an established infestation. State Government officers have recently concluded the development of a comprehensive and strategic approach to weed infestation caused by seed spread (DNR, 2000). Major components of the Queensland Weed Seed Spread Project include:

- developing best practice procedures for cleandowns, inspections and washdown facility construction;
- developing and introducing a Voluntary Vendor Declaration (VVD) scheme for weed seed spread;
- coordinating construction of washdown facilities and their signage as part of WONS in particular parthenium;
- producing location maps;
- protocol development with industry groups, service utilities, government departments and private companies;
- establishing collaborative arrangements with other states;
- reviewing policies; and
- developing a consistent approach for internal policies (DNR, 2000).

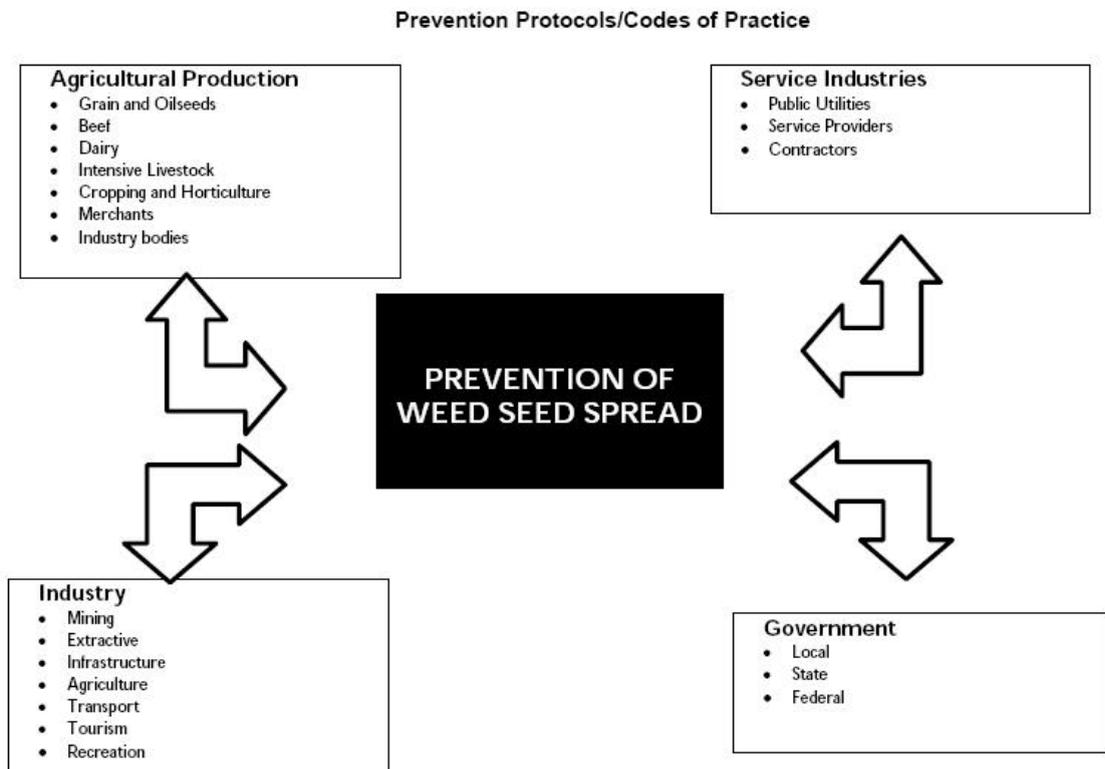
During the project, guidelines and procedures were developed in consultation with representatives of utility service providers (Figure 2). The information and materials are intended to assist industry, service utilities, and State and Local Governments to establish their own practical and effective policies and procedures that will significantly reduce the spread of weed seeds (DNR, 2000).

Apart from in certain major infrastructure projects where materials such as soil, sand, gravel and hydromulch potentially containing weed seed are moved about the landscape in large quantities and/or where such infrastructure is emplaced within areas in which significant weed infestations exist, this protocol has had little acceptance to date. However, it remains important that the regional PMP accommodates such measures where and when appropriate and allows it to inform, guide and encourage Local Government and other organisations to adopt best practice with regard to pest management.

The State strategy addresses the following objectives:

1. to raise the awareness of personnel in relation to the problems and implications associated with declared plant infestations and outbreaks; and
2. to develop competency standards for personnel in relation to the following actions:
  - increase knowledge of declared plants present in work area/district;
  - be able to identify declared plants at various growth stages;
  - map the distribution of high priority declared plant infestations;
  - report new outbreaks to works supervisor/weed officers;
  - develop the capacity to record or map new outbreaks;
  - increase knowledge of appropriate control methods, registered chemicals and rates of application to control declared plants;
  - implement control programs to eradicate isolated outbreaks in project area;

- increase knowledge of the various ways weed seeds can spread; and
- ensure that activities that involve earth works, human movement/activities, movement of machinery, equipment and materials (including contaminated grass seed), refuse disposal, slashing/mowing and cultivation are taken into consideration during development works, operations and site regeneration (DNR, 2000).



**Figure 2: Industry and other organisational components of the State Protocol for the development of codes of practice to reduce the potential for weed seed spread into and across Queensland (from DNR, 2000:2)**

#### **4.9 Actions to Ensure Consistency within Local Government Planning and Programs**

It has been noted that while pest management personnel are greatly aware of pest issues, colleagues in other sections of Local Government are often unaware of the pest potential of certain plants. Many weeds are frequently used as ornamentals. In addition, physical disruption of a site during development construction is often associated with weed outbreaks and pest plant entry and/or transfer. While pest awareness programs can partly remedy this problem, it is important that there be an effort to ensure consistency across Local Government programs, from parks and recreation amenity plantings through to planning approval processes.

##### **4.9.1 Local Government Development Approval and Planning**

Weeds are an issue that the Local Government planning system can address in the Material Change of Use (Rezoning) Development Application stages. A protocol practised in N.S.W. is to have a requirement in the Statutory

Development Control Plan to provide for the eradication of Declared weeds and encourage the growth of local native species. Planning for new areas at the Local Government level can play a part by ensuring that the issue of weeds is addressed in the rezoning studies as well as ensuring that a “Weed Eradication Plan” is submitted to the Council with a development application, for example, for a subdivision. This would outline the proposed treatment of Declared and other priority weeds for implementation prior to any disturbance of the site and prior to the implementation of any Environmental Management Plan that should also explicitly address weed control issues.

Because requests for landscaping plans and review of these plans would be too time consuming due to the amount of developments requiring landscaping, feedback suggests a more appropriate local response. This would comprise the compilation of an exclusion list (which could just be simply Declared plants [including Locally Declared species] or a more comprehensive species list) under the landscaping code in the planning scheme (Hyde, pers. comm.). Alternatively a standard condition could be drawn up that would apply to any approved developments with landscaping provisions that would exclude Declared and other unwanted plants. Both of these could be checked for compliance when the developer puts in their notice to commence use.

Frequently development applications include details of proposed landscaping that may involve the use of currently or potentially invasive species. Here there can be a requirement that applications be made in electronic as well as hard copy form. This would permit the use of an alert list of invasive species where Local Government planners or permits officers screen (electronically, if possible) relevant documents for the standard common names or scientific names of these pests. Their discovery would inform the proponent of weed risk and allow proponents to modify proposals to comply with these concerns prior to any approval being granted.

#### **4.9.2 Cross-program Consistency**

It is not only within Local Government planning and development approval processes where there is a need to address pest issues. Most constituent shires maintain a workforce that spans a range of activities from road maintenance through to landscaping and parks and gardens maintenance. On occasions, personnel within these sections of the council workforce will be oblivious to the risks posed by some of the plants that are used or recommended for use in amenity or utility plantings. Actions that might promote more consistency in dealing with invasive species can include the use of an alert list for invasive weeds. The contents of existing documents such as landscaping plans could be searched for species on that alert list to ensure that councils are not actually recommending use of species in one program (e.g. medium strip or roadside plantings) that their pest management unit is controlling or attempting to discourage cultivation.

Cairns City and Cook Shire also maintain substantial botanical gardens. Smaller botanical gardens are also maintained by Johnstone Shire at Innisfail, by Hinchinbrook Shire at Ingham and by Mareeba Shire Council at Mareeba. Some of these gardens may contain exotic ornamental species that are invasive or potentially so. Application of the precautionary principle is required and the Regional PMP should contain a protocol to ensure risks associated with

possible escape from cultivation are minimised. This has involved, and may further prompt, recommendations for the removal of individual high-risk species from collections.

In addition, Local Governments either sponsor or maintain a range of public places and/or amenities that may contain exotic pest species of both plants and animals, as in the case of exotic, mostly ornamental, fish in ponds surrounding installations. Although not covered by the Act, it is strongly recommended that these be progressively removed from contained areas and replaced by suitable native species (e.g. rainbowfish, *Melanotaenia* spp. or blueeyes, *Pseudomugil signifer*). Where this may be impractical, for example, as in the case of mosquitofish (*Gambusia affinis*) in the freshwater section of Centenary Lakes in Cairns where their removal is problematic and the likelihood of reinfestation high, their occurrence might be used as a prompt for public education through signage, brochures, etc regarding invasive species and risks associated with aquarium releases.

## **5.0 STRUCTURE OF FNQROC REGIONAL PEST MANAGEMENT PLAN**

Explicit objectives and regional priority actions are now explored to provide justification of the final Regional PMP (Figure 3). This covers various goals and strategies to achieve these goals, each involving specific objectives, implementation actions, organisational arrangements, responsibilities, performance indicators, etc..

### **5.1 Scope of the Regional Pest Species Management Plan**

This Regional PMP has been formulated to address the issues surrounding invasive species in far north Queensland – specifically the FNQROC area of responsibility, also embracing Hinchinbrook Shire. Various efforts are already underway to address pest management issues, and this document is not intended to "re-invent the wheel" or to demote the often very effective individual PMPs or the work that these proscribe. Rather, this plan notes current efforts, but also identifies areas for improvement. It can be thought of as a tool that provides a framework in which to identify additional activities and tasks needed for the effective management of pests in this region, and to provide opportunity for further coordination of the various efforts that are already underway.

Though the region currently has various funded projects targeting a number of pests, in almost all cases, the funding for these projects is considered to be "soft-money" (e.g., grants). Long-term dedicated funding sources will be needed to truly address pest management issues in the region in an effective manner.

In addition to being used to gather additional and more reliable funding, the following benefits and goals of a Regional PMP should not be overlooked:

- identification of pest management problems and methods for addressing these problems;
- increased coordination and effectiveness of involved agencies and organisations; and
- encouragement of agencies and organisations to share information, develop coordinated efforts, decrease duplication of efforts, and collaboratively support implementation actions.

### **5.2 The Central Objective/Vision of a Regional PMP**

The central objective of the Regional PMP is, through informed priority-setting and enhanced collaboration to improve organisational capability across the region, to advance pest management so that the impact of pest plants and animals on the natural environment, agriculture and general amenity is greatly reduced in the short-term and eventually minimised. The extent to which these outcomes are achieved is reliant on more, and more reliable, resources that can be directed at pest control. While pest animals can be a chronic problem within the planning region (particularly with regard to feral pigs, cats and the cane toad), exotic weeds are frequently more problematic, pervasive and costly. The primacy of the weed problem is reflected in the details of the individual strategies that are explained below.

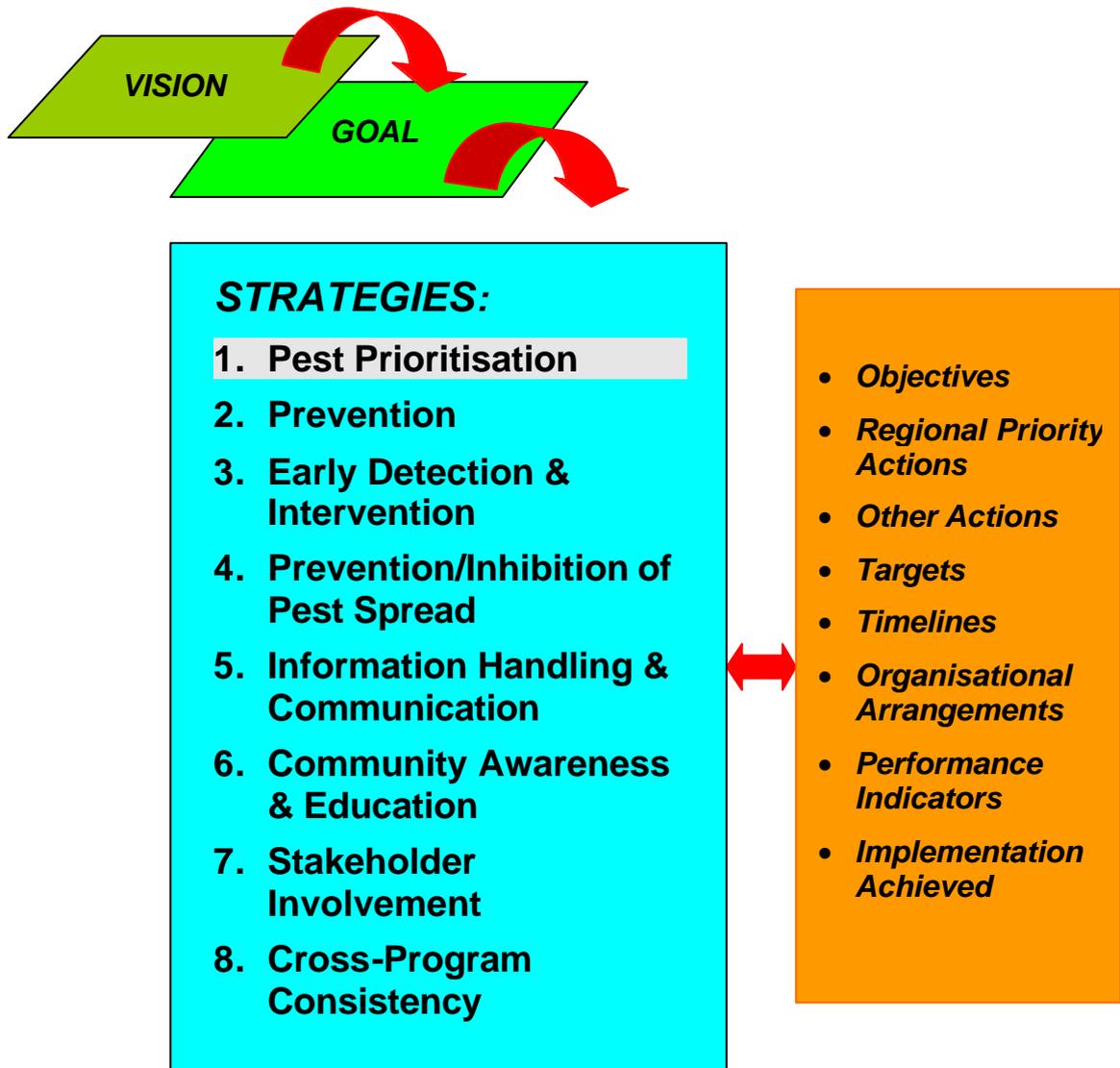


Figure 3. Structure of the FNQLGPPAC Regional PMP

### 5.3 Proposed Organisational Arrangements

It is initially important to set out recommendations for adjusting organisational arrangements. While there is already a significant degree of Local Government and interagency cooperation within the region (as is evidenced by this initiative), the existing system of pest management sees each council presiding over an often small team (Pest Management Unit - PMU) to control a suite of weed species plus predominantly pigs and wild dogs/dingos within individual LGAs. It is known that NR&M is bringing together a specialist weed incursion team (WIT) to tackle infestations of species regarded as highest priority (e.g. Siam weed) and early weed incursions (e.g. Mikania). It is usual that the relevant PMU(s) work with such teams when they are deployed. The notion of a Local Government controlled pest “troubleshooter” team being formed and maintained by FNQROC member councils did not receive significant support at the

workshop dedicated to the regional pest integration initiative, however, there is scope for further coordinating action with the new NR&M weed team.

It is also recommended that FNQROC and Hinchinbrook Shire support the appointment of a *Regional Pest Project Officer*. It is envisaged that this appointment will provide for a range of tasks to be undertaken, including supporting the Far North Queensland Local Government Pest Advisory Committee (FNQLGPAC), act as contact point for information collection, retrieval and dissemination and will support regional pest management logistics as contingencies associated with novel pest outbreaks arise. The appointee would also be responsible for reviewing annual action plans and reporting on implementation of the Regional PMP. Implementation embraces:

- eradication of incipient or existing infestations of recently arrived noxious pests,
- reduction of existing debilitating infestations of Declared species and containment of their spread,
- control of pest infestations to reduce impacts of established pests to an acceptable level,
- maintenance of awareness and extension strategies, information database and monitoring/reporting schedules, and
- facilitating the development of funding applications for projects which are aimed at tackling high priority regional pest problems.

It is inappropriate at this stage to consider the logistics associated with the appointment of the Project Officer, however, it is considered appropriate that this appointment should occur with the existing collaborative regional Local Government structure of FNQROC and, specifically, with FNQLGPPAC.

#### **5.4 Proposed Strategies**

Eight strategies are recommended as comprising the Regional PMP (Figure 3). These comprise:

1. *Pest Prioritisation*
2. *Prevention*
3. *Early Detection & Intervention*
4. *Prevention/Inhibition of Pest Spread*
5. *Information Handling & Communication*
6. *Community Awareness & Education*
7. *Stakeholder Involvement Extension, and*
8. *Cross-Program Consistency Implementation.*

Each is outlined in turn in terms of (i) objectives, (ii) related actions, (iii) responsibilities for actions, and (iv) timeline priority. Recommendations with regard to responsibilities for action may be directed at the proposed regional Pest Management Project Officer (*PMP Officer*), the newly emerging Regional NRM Board and other relevant organisations/agencies.

### 5.4.1 Strategy 1 – Pest Priority-setting

This strategy is fundamental to meeting the objective of ensuring that limited resources are directed at pests commensurate with their control priority across an extensive and diverse planning region. While priorities need ongoing review as pest status or other factors change, this strategy has largely been implemented as part of the current exercise (see Stage 2 – Werren, 2003a). Prioritisation has involved entrainment of species identified as potentially invasive in NAQS alert lists, WONS, State Declaration status and priorities established in individual PMPs across the region (Box 1).

**Box 1. Pest Prioritisation Strategy**

OBJECTIVE	ACTIONS	RESPONSIBILITY	WHEN?
To ensure resources are directed at pests commensurate with their control priority	PR1 – rank pest animals & plants occurring within the PMP region according to (i) priorities established in individual PMPs (ii) Declared status (iii) inherent risk to environment, agriculture, etc. & (iv) control feasibility	<ul style="list-style-type: none"> <li>• FNQROC Secretariat</li> <li>• Scientific Consultant</li> <li>• NR&amp;M Land Protection</li> </ul>	<ul style="list-style-type: none"> <li>• completed 2003</li> <li>• ongoing for NR&amp;M</li> </ul>
	PR2 – update pest priorities to reflect changing situations, including new pest detections, amendments to alert lists, etc. & control implementation	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> <li>• AQIS</li> <li>• Biosecurity Australia</li> </ul>	<ul style="list-style-type: none"> <li>• on annual basis</li> <li>• ongoing for Government agencies</li> </ul>
	PR3 – lobby for research that targets priority species control (including biocontrol) in region	<ul style="list-style-type: none"> <li>• FNQLGPPAC</li> </ul>	<ul style="list-style-type: none"> <li>• immediately as required</li> </ul>
	PR4 – establish electronic protocol for prioritising new species & emending status of others under review	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> </ul>	<ul style="list-style-type: none"> <li>• 2005</li> </ul>

### 5.4.2 Strategy 2 – Pest Prevention

Prevention is the first line of regional defence against pest outbreaks and relates to species that are Declared Class 1 pests or others that are known invasives (e.g. listed on the NAQS Alert List – Waterhouse and Mitchell, 1998 and/or included as “Quarantine Weeds” in Smith, 2002). The prevention of entry of invasive alien species is normally the province of the Commonwealth Government through its border biosecurity protocols, and secondly through provisions (including legislative) of the individual State or Territory. However, the fact that the region does contain a major port which has proved to be a staging point for invasives such as the crazy ant is recognised in Strategy 2. Furthermore, there may be a role for a collective regional Local Government in striking agreements with industry groups (including the nursery industry) as well as with utility industries and organisations such as the Cairns Port Authority, Department of Main Roads, QRail, etc. to ensure that weeds and pest animal entry to the region is prevented. Strategic circulation of species alert lists is considered to be integral to the implementation of this strategy (Box 2).

## Box 2. Pest Prevention Strategy

OBJECTIVE	ACTIONS	RESPONSIBILITY	WHEN?
To ensure that pests are excluded from or prevented from establishing within region	PP1 – circulate current alert lists (including identification information), “Wet/Dry Tropics Weeds” (Smith, 2002) & information on noxious weeds occurring to the south to PMU & other related shire personnel	<ul style="list-style-type: none"> <li>• AQIS</li> <li>• NR&amp;M Land Protection</li> <li>• <i>PMP Officer</i></li> <li>• individual council Pest Control Officers</li> </ul>	• ongoing
	PP2 – establish MOU with Cairns Port Authority to maintain vigilance for and report entry of pest organisms from interstate & overseas	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> </ul>	• 2005
	PP3 – establish MOU with DMR & QRail regarding regular inspection of major transport corridors to minimise likelihood of Class 1 plants already in State entering region	<ul style="list-style-type: none"> <li>• NR&amp;M Land Protection</li> <li>• <i>PMP Officer</i></li> </ul>	• 2005
	PP4 – lobby through the Local Government Association for establishment of strict State & National protocols to restrict deliberate introductions	<ul style="list-style-type: none"> <li>• NR&amp;M Land Protection</li> <li>• FNQLGPPAC</li> <li>• FNQROC</li> </ul>	• 2005
	PP5 – strike agreement to ensure that potential (sleeper) weeds are not propagated within botanical gardens or on other council property	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• FNQLGPPAC</li> <li>• NR&amp;M Land Protection</li> </ul>	• 2005
	PP6 – strike agreement with local nursery, seed & stock transport operators to guard against cultivation & distribution of potentially weedy species	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• FNQLGPPAC</li> <li>• NR&amp;M Land Protection</li> </ul>	• 2005
	PP7 – collaborate with adjacent regions on strategies to prevent pests crossing borders	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• FNQLGPPAC</li> <li>• NR&amp;M Land Protection</li> </ul>	• ongoing
	PP8 – instigate discussions with agencies to inspect dams stocked with recreational fishes to avoid aquatic weed translocation on boats (cf. <i>Mimos pigra</i> outbreak at Peter Faust Dam)	<ul style="list-style-type: none"> <li>• NR&amp;M Land Protection</li> <li>• <i>PMP Officer</i></li> <li>• FNQLGPPAC</li> </ul>	• 2005

### 5.4.3 Strategy 3 – Early Detection/Intervention

Removal of future problems by targeting species which may have limited or incipient populations within the region for eradication is the key objective of Strategy 3 (Box 3). Some 17 weed species which have already been recorded here were recognised as belonging to this highest priority category (see Table 1 - Werren, 2003a). While it has been suggested that some of these weeds are already too well established or where several disjunct infestations already occur and are sometimes difficult to detect, eradication may not be feasible, but risks posed and projected control costs require that the effort be made at this stage to tackle 15 of these. In section 5.4 above it was recommended that management actions should embrace (i) rapid response efforts for the eradication of pioneering populations; (ii) prevention of dispersal into new areas; (iii) issuance of alerts and educational materials to help with detection of additional infestations; and (iv) systematic monitoring of especially vulnerable areas of the landscape to detect additional populations.

#### Box 3. Early Detection/Intervention Strategy

OBJECTIVE	ACTIONS	RESPONSIBILITY	WHEN?
To ensure that pests (in particular weeds) in an early stage of invasion are detected & treated to minimise their chances of establishing in region	DI1 – instigate a contingency plan to investigate reported incursions (may involve MOU exchange with relevant agencies) and treat initial infestations with the view to eradicating new (category 1) pests	<ul style="list-style-type: none"> <li>• FNQLGPPAC</li> <li>• NR&amp;M SWEEP</li> <li>• <i>PMP Officer</i></li> </ul>	<ul style="list-style-type: none"> <li>• immediately</li> </ul>
	DI2 – survey & map new pest incursions such that regular site inspections and follow up treatments can take place & make appropriate interim adjustments to individual PMPs	<ul style="list-style-type: none"> <li>• NR&amp;M SWEEP/ Land Protection</li> <li>• <i>PMP Officer</i></li> <li>• individual LGA PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>• as required</li> </ul>
	DI3 – systematically monitor areas (e.g. suitable habitats) vulnerable to invasion so as to detect possible additional pest populations	<ul style="list-style-type: none"> <li>• PMU officers</li> <li>• NR&amp;M SWEEP/ Land Protection</li> <li>• EPA &amp; other agency personnel</li> </ul>	<ul style="list-style-type: none"> <li>• on a regular basis</li> </ul>
	DI4 – systematically monitor localities (e.g. Kuranda Julatten, Miallo & Mission Beach) known to have been sources of new weed outbreaks	<ul style="list-style-type: none"> <li>• PMU officers</li> <li>• NR&amp;M SWEEP/ Land Protection</li> </ul>	<ul style="list-style-type: none"> <li>• on a regular basis</li> </ul>
	DI5/PP1 – issue targetted pest alerts and identification kits to assist personnel/community members to detect outbreaks	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• PMU officers</li> <li>• NR&amp;M Land Protection</li> </ul>	<ul style="list-style-type: none"> <li>• immediately as required</li> </ul>
	DI6 – lobby NR&M & relevant LGAs for a containment line approach with respect to parthenium, parkinsonia, pond apple & similar species so treatment of outlier infestations beyond lines can be given high priority in works programs	<ul style="list-style-type: none"> <li>• new Regional NRM Body</li> <li>• FNQLGPPAC</li> <li>• NR&amp;M Land Protection</li> </ul>	<ul style="list-style-type: none"> <li>• 2004/5</li> </ul>

DI7 – enforce landholder compliance with regard to control of high priority Declared pest outbreaks	<ul style="list-style-type: none"> <li>individual LGA PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>immediately as required</li> </ul>
DI8 – establish a regional “Weed Watch” program to engage informed people and groups such as SGAP	<ul style="list-style-type: none"> <li>PMP Officer in association with CRC-AWM</li> <li>NR&amp;M Land Protection</li> <li>FNQLGPPAC</li> </ul>	<ul style="list-style-type: none"> <li>2004/5</li> </ul>

#### 5.4.4 Strategy 4 – Prevention/Inhibition of Spread

Specific actions associated with (i) washdown facilities/signage, (ii) introduction of Voluntary Vendor Declaration (VVD) schemes and protocols with industry groups, utilities, government departments and private companies to minimise weed seed spread, (iii) the production of pest location maps, (iv) establishing collaborative arrangements with other states, (v) a review of Government policies, and (vi) the development of a consistent approach for internal policies, were recommended by the State as appropriate for the prevention or inhibition of weed spread (DNR, 2000). At the regional level, actions to prevent or inhibit pest spread are set out in Box 4. It is notable that many constituent actions are consistent with those specified in other strategies.

#### Box 4. Prevention/Inhibition of Spread Strategy

OBJECTIVE	ACTIONS	RESPONSIBILITY	WHEN?
To ensure that pests do not spread in an uncontrolled manner in the region	PS1 – adopt & put in place elements (including washdown facilities where required, VVD scheme & protocols with industry groups, etc.) of pest (weed) spread protocol developed by DNR (2000)	<ul style="list-style-type: none"> <li>PMP Officer</li> <li>FNQLGPAC</li> </ul>	<ul style="list-style-type: none"> <li>2004/5</li> </ul>
	PS2/DI6 – lobby NR&M & relevant LGAs for containment line approach with respect to parthenium, parkinsonia, pond apple & similar species so treatment of outlier infestations beyond lines can be given high priority in works programs	<ul style="list-style-type: none"> <li>FNQLGPPAC</li> <li>NR&amp;M Land Protection</li> <li>PMP Officer</li> </ul>	<ul style="list-style-type: none"> <li>2004</li> </ul>
	PS3/DI7 – enforce landholder compliance with regard to control of high priority Declared pest outbreaks	<ul style="list-style-type: none"> <li>individual LGA PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>immediately as required</li> </ul>
	PS4/CE4 – develop a system to include relevant pest sheets into rates/other council notices to targetted property-owners	<ul style="list-style-type: none"> <li>FNQLGPPAC</li> <li>NR&amp;M Land Protection</li> <li>PMP Officer</li> </ul>	<ul style="list-style-type: none"> <li>bi-annually or as set by individual LGA</li> </ul>

	PS5/CE5 – develop financial &/or similar incentive programs (e.g. supply of herbicides) to foster pest control in strategic areas	<ul style="list-style-type: none"> <li>• Individual Local Governments</li> <li>• NR&amp;M Land Protection</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• 2005</li> </ul>
	PS6/DI8 –establish a regional “Weed Watch” program to engage informed people and groups such as SGAP	<ul style="list-style-type: none"> <li>• PMP Officer in association with CRC-AWM</li> <li>• FNQLGPPAC</li> <li>• NR&amp;M Land Protection</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• 2005</li> </ul>
	PS7 – effect on-ground priority pest control in a manner consistent with National & State Strategies	<ul style="list-style-type: none"> <li>• PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>• ongoing</li> </ul>

#### **5.4.5 Strategy 5 - Information Handling/Communication**

For pest management to be effective it needs to be reliably informed. Therefore, a strategy to improve information handling and communication across the region is a vital component of a Regional PMP. Currently, individual LGAs generally maintain individual pest databases. Occasionally information from neighbouring LGAs will be amalgamated to produce single pest species maps. An example of this is in mapping undertaken by the EPA of current and potential distribution of pond apple along the central wet tropics coast which takes in parts of Cairns City, Johnstone and Cardwell shires. NR&M also produces similar maps of pest animal species - e.g. rabbit density in Queensland after Berman *et al.*, 1998 and included in the *Queensland Rabbit Management Strategy 2001-2006* (NR&M, 2002a). Despite this, there are real advantages in local production and regional ownership of pest distribution and abundance information. Accordingly, it is highly recommended that funds be sought through the new regional NRM Board to put in place and maintain a database that contains such information for the region. This database might be built upon an existing LGA system where such capacity already exists. It is important, however, that each constituent Local Government has equitable access to this so its pest management actions can be optimised, particularly with regard to strategic containment and progressive reduction of infestations. The strategy that addresses this need is detailed in Box 5.

### Box 5. Information Handling/Communication Strategy

OBJECTIVE	ACTIONS	RESPONSIBILITY	WHEN?
To ensure optimal access to current regional pest data	IC1 – establish & maintain a central GIS pest database for the region that can incorporate individual LGA information from the DCDB	<ul style="list-style-type: none"> <li>• PMP Officer</li> <li>• PMU personnel</li> <li>• NR&amp;M Land Protection</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing</li> </ul>
	IC2 – devise a system of regular reporting of regional distribution & population trends of pest species	<ul style="list-style-type: none"> <li>• PMP Officer</li> <li>• NR&amp;M Land Protection</li> <li>• PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing at regular intervals</li> </ul>
	IC3 – maintain involvement in FNQPAF & similar fora along with regular attendance at PMP Working Group meetings	<ul style="list-style-type: none"> <li>• individual LGA representatives</li> <li>• PMU personnel</li> </ul>	<ul style="list-style-type: none"> <li>• ongoing</li> </ul>
	IC4 – establish a formal conduit for updating & disseminating NR&M pest control information to each constituent LGA	<ul style="list-style-type: none"> <li>• NR&amp;M Land Protection</li> <li>• FNQLGPPAC</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing at regular intervals</li> </ul>

#### 5.4.6 Strategy 6 – Community Awareness/Education

The importance of making the wider community aware of pest issues, enabling them to identify problem species and generally educating them on matters of pest control is considered fundamental to effective pest management. Since pests range across most boundaries and infest land under very different tenure it is essential that pest can be identified and pest issues be understood by the wider community.

‘Awareness and education’ is the first of five components of the *Queensland Weeds Strategy 2002-2006* (NR&M, 2002b) and is recognised internationally as crucial to regional pest management (e.g. SPREP, 2000). It greatly enhances understanding and builds a regional capacity to address pest issues. This strategy should provide the basis for achieving a vital outcome where “awareness, knowledge and ownership of weed [or ‘pest’ *sens. lat.*] management by all stakeholders are significantly increased and contribute to cost efficiencies and successful control” (NR&M, 2002b:7). Elements of this strategy are set out in Box 6.

### Box 6. Community Awareness/Education Strategy

OBJECTIVE	ACTIONS	RESPONSIBILITY	WHEN?
To ensure wide understanding of pest issues within the region including pest identification & control responsibilities	CE1 - display and distribute Pest Facts & other collateral material (e.g. Weed-decks) in Local Government outlets to promote public awareness & reporting of infestations	<ul style="list-style-type: none"> <li>• individual Local Governments</li> <li>• FNQLGPPAC</li> <li>• NR&amp;M Land Protection</li> </ul>	<ul style="list-style-type: none"> <li>• existing &amp; ongoing</li> </ul>
	CE2 – develop local/regional awareness programs that includes use of local media & promotion in schools to alert community to pest issues	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> <li>• PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing</li> </ul>
	CE3 – develop involvement in promotions during “Weed-Buster Week” or at community gatherings/festivals	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> <li>• PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>• annually</li> </ul>
	CE4 – develop a system to include relevant pest sheet(s) into rates/other council notices to targeted property-owners	<ul style="list-style-type: none"> <li>• FNQLGPPAC</li> <li>• NR&amp;M Land Protection</li> <li>• <i>PMP Officer</i></li> </ul>	<ul style="list-style-type: none"> <li>• bi-annually or as set by individual LGA</li> </ul>
	CE5 – improve public signage for weed risk areas, control needs and cooperative control programs	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> <li>• PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing</li> </ul>
	CE6/PS5 – develop financial &/or similar incentive programs (e.g. supply of herbicides) to foster pest control in strategic areas	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• FNQLGPPAC</li> <li>• Individual Local Governments</li> <li>• NR&amp;M Land Protection</li> </ul>	<ul style="list-style-type: none"> <li>• 2005</li> </ul>

#### 5.4.7 Strategy 7 – Stakeholder Involvement/Extension

The strategy to maintain a strong stakeholder involvement in pest management generally as well as ownership of related plans and regional initiatives is intimately connected to the previous strategy (i.e. Community Awareness and Education) since the community at large is the major stakeholder in any NRM management initiative. Effective pest management can only be achieved with the involvement of all relevant stakeholders. Furthermore, consultation with stakeholders can not only facilitate adoption of any given PMP and provide a sense of direct ownership, it can also lead to synergies in pest control efforts where there is direct collaboration and involvement of a range of stakeholders. This strategy is outlined in Box 7.

## Box 7. Stakeholder Involvement/Extension Strategy

OBJECTIVE	ACTIONS	RESPONSIBILITY	WHEN?
To ensure maximum stakeholder inclusion in pest management planning & related activities	SI1 – collate & maintain a current regional directory of stakeholders &/or industry organisations	<ul style="list-style-type: none"> <li>• FNQLGPPAC</li> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> <li>• ICM/other community groups</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing</li> </ul>
	SI2 – establish links & maintain active exchange with traditional owner groups regarding pest management issues	<ul style="list-style-type: none"> <li>• FNQLGPPAC</li> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> <li>• PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing</li> </ul>
	SI3 – establish clear points of contact at all levels for access to information	<ul style="list-style-type: none"> <li>• FNQLGPPAC</li> <li>• <i>PMP Officer</i></li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing</li> </ul>
	SI4 – establish links & maintain active exchange with ICM & related community groups	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• PMU personnel</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing</li> </ul>
	SI5/CE5/PS5 – develop financial &/or similar incentive programs (e.g. supply of herbicides) to foster stakeholder involvement in strategic pest control	<ul style="list-style-type: none"> <li>• FNQLGPPAC</li> <li>• <i>PMP Officer</i></li> <li>• individual Local Governments</li> <li>• NR&amp;M Land Protection</li> </ul>	<ul style="list-style-type: none"> <li>• 2005</li> </ul>
	SI6 – conduct public field inspections of significant infestations in strategic locations to build stakeholder capacity to identify & control significant weeds	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> <li>• PMU officers</li> </ul>	<ul style="list-style-type: none"> <li>• 2004 &amp; ongoing</li> </ul>

### **5.4.8 Strategy 8 – Cross Program Consistency Implementation**

Achievement of consistency to pest management policy and across the various programs that operate within Local Governments is the major objective of the last of the strategies to be formulated. It is, however, an issue that falls directly within the realm of Local Government and arguably a matter of moral responsibility for which Local Government alone is accountable. Problems arise when the conduct of one department such as the planning or parks and gardens section sanctions the cultivation of weedy ornamentals while PMU personnel implementing community awareness actions as specified by the individual PMP are discouraging this amongst the wider community. Mixed and/or conflicting messages can be a major hindrance to achieving effective pest management outcomes and should be avoided. This might be achieved by implementing those component actions within Strategy 8 (Box 8).

### Box 8. Cross Program Consistency Implementation Strategy

OBJECTIVE	ACTIONS	RESPONSIBILITY	WHEN?
To ensure that there is a consistent approach to pests across all Local Government programs/policies	PC1 – develop & seek individual council endorsement of a regional policy of cross-program consistency with regard to pests	<ul style="list-style-type: none"> <li>• FNQLGPPAC</li> <li>• <i>PMP Officer</i></li> <li>• NR&amp;M Land Protection</li> </ul>	• 2005
	PC2 – devise an electronic filtering system within the Planning department to check in urban planting/landscaping components of the Shire or Town Plan	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• Planning department officers</li> </ul>	• 2005
	PC3 – devise an electronic filtering system within the Planning department to check that no weed species are listed in landscaping & environmental management plans associated with rezoning &/or development applications & require weed eradication plans as part of the approval process	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• Planning department officers</li> </ul>	• 2005
	PC4/PP5 – establish a protocol to ensure that potential (sleeper) weeds are not propagated within botanical gardens or on other council property	<ul style="list-style-type: none"> <li>• <i>PMP Officer</i></li> <li>• PMU Officers</li> <li>• FNQLGPPAC</li> </ul>	• 2004
	PC5 – progressively remove weedy ornamentals from council land to discourage their cultivation & to ensure that there are no conflicting messages regarding amenity plantings	<ul style="list-style-type: none"> <li>• PMU personnel</li> </ul>	• 2004-2008

## 6.0 SUMMARY AND RECOMMENDATIONS

This report represents the final stage of a four-stage process of integrating the individual Pest Management Plans (PMPs) across member councils of the FNQROC plus Hinchinbrook Shire Council. The report sets out recommended pest management strategies together with action plans and explains the rationale behind them. These will form the basis of a Regional PMP for most of the Wet Tropics Bioregion and parts of three other bioregions – namely Cape York Peninsula, the Einasleigh Uplands and a portion of the northern Gulf Plains. It is designed to provide a direct input into a comprehensive Regional PMP that will be a basic component of a Wet Tropics NRM Regional Plan and for that for Cape York Peninsula.

The main objective was to identify, record, and prevent the establishment or spread of pest plants and animals within the FNQROC area and Hinchinbrook Shire and to ensure that council and all stakeholders meet their obligations under the *Land Protection (Pest and Stock Route Management) Act (2002)*. The Regional PMP focuses on regionally identified pest priorities consistent with level of pest declaration under the Act and/or other considerations regarding pest risk and the commitment of all stakeholders to work in a strategic, collaborative and cooperative manner thus ensuring an efficient and practical outcome.

Regional pest animal and plant priorities were specified by integrating individual PMPs within the Stage 2 Report (Werren, 2003a). Pest animals present within the planning area and addressed in local PMPs were assigned to three priority classes comprising: (1) highest impact species (i.e. feral pigs, wild dogs/dingos, cats); (2) medium priority exotic species that are widespread but less controllable, less widespread or which incur only on some parts of the planning area (e.g. cane toad, rabbits); and (3) certain native pest species that present particular economic problems to agricultural that may warrant some degree of Local Government control assistance.

Eighty-four weed species from the planning area attracted high to medium priority control attention within the PMPs. These are ranked into different management categories in Table 1.

Thereafter, key elements of a Regional PMP were identified and discussed. Barriers to integrating pests management actions were explored and appropriate actions to overcome these were investigated. Finally a Regional PMP structure was proposed and eight constituent strategies were recommended for adoption. These comprise:

- Strategy 1 - Pest Prioritisation
- Strategy 2 – Pest Prevention
- Strategy 3 - Early Detection & Intervention
- Strategy 4 - Prevention/Inhibition of Pest Spread
- Strategy 5 - Information Handling & Communication
- Strategy 6 - Community Awareness & Education
- Strategy 7 - Stakeholder Involvement Extension, and
- Strategy 8 - Cross-Program Consistency Implementation.

**Table 1. Regional weed management categories**

<b>MANAGEMENT CATEGORY</b>	<b>SPECIES</b>
<b>Category 1: To be eradicated</b>	alligator weed ( <i>Alternanthera philoxeroides</i> ), Koster's curse ( <i>Clidemia hirta</i> ), limncharis ( <i>Limncharis flava</i> ), miconia ( <i>Miconia calvescens</i> ), mikania vine ( <i>Mikania micrantha</i> ), Siam weed ( <i>Chromolaena odorata</i> ), thunbergia vines (other than blue thunbergia – <i>Thunbergia</i> spp.) <i>Barleria prionotis</i> , <i>Grewia asiatica</i> , flacourtia ( <i>Flacourtia jangomas</i> ), hiptage ( <i>Hiptage benghalensis</i> ), Venezuelan pokeweed ( <i>Phytolacca rivinoides</i> ), Panama rubber ( <i>Castilla elastica</i> ), triplaris ( <i>Triplaris surinamensis</i> ), cucumber tree ( <i>Parmentiera edulis</i> )
<b>Category 2: To be contained &amp; reduced with a long term view of eventual elimination from the region if possible</b>	parthenium ( <i>Parthenium hysterophorus</i> ), pond apple ( <i>Annona glabra</i> ), blue thunbergia ( <i>Thunbergia grandiflora</i> ), parkinsonia ( <i>Parkinsonia aculeata</i> ), hymenachne ( <i>Hymenachne amplexicaulis</i> ), water hyacinth ( <i>Eichornia crassipes</i> ), salvinia ( <i>Salvinia molesta</i> ), brillantaisia ( <i>Brillantaisia lamium</i> ), praxelis ( <i>Praxelis clematidea</i> ), lantana ( <i>Lantana camara</i> ), giant sensitive weed ( <i>Mimosa diplotricha</i> ), cabomba ( <i>Cabomba caroliniana</i> ), rubber vine ( <i>Cryptostegia grandiflora</i> ), chinee apple ( <i>Ziziphus mauritiana</i> )
<b>Category 3: Isolated outbreaks to be eliminated, populations reduced &amp; spread suppressed</b>	sicklepods ( <i>Senna obtusifolia</i> and related species), American rats-tail grass ( <i>Sporobolus jacquemontii</i> ), bellyache bush ( <i>Jatropha gossypifolia</i> ), tobacco weed ( <i>Elephantopus mollis</i> ), cats-claw creeper ( <i>Macfadyena unguis-cati</i> ), giant rats-tail grass ( <i>Sporobolus pyramidalis</i> ), prickly acacia ( <i>Acacia nilotica</i> ), mesquites ( <i>Prosopis</i> spp.), Singapore daisy ( <i>Sphagneticola trilobata</i> ), harungana ( <i>Harungana madagascariensis</i> ), caltrop ( <i>Tribulus terrestris</i> ), annual ragweed ( <i>Amrosia artemisifolia</i> ), mother-of-millions ( <i>Bryophyllum</i> spp.), turbine vine ( <i>Turbina corymbosa</i> ), Gamba grass ( <i>Andropogon gayanus</i> ), yellow oleander ( <i>Cascabela thevetia</i> ), leucaena ( <i>Leucaena leucocephala</i> ), mother-in-law's tongue ( <i>Sansevieria trifasciata</i> ), thornapples ( <i>Datura stramonium</i> and related species), spiny emex ( <i>Emex australis</i> ) and castor oil plant ( <i>Ricinus communis</i> )
<b>Category 4: Control to be effected consistent with level of Declaration &amp;/or local adverse impact</b>	water lettuce ( <i>Pistia stratiotes</i> ), prickly pears ( <i>Opuntia</i> spp.), African tulip ( <i>Spathodea campanulata</i> ), broad-leaved pepper ( <i>Schinus terebinthifolius</i> ), asparagus fern ( <i>Protoasparagus</i> spp.), Parā grass ( <i>Brachiaria mutica</i> ), bamboo (various species but mainly <i>Phyllostachys bambusoides</i> ), Japanese sunflower ( <i>Tithonia diversifolia</i> ), bauhinia ( <i>Bauhinia monandra</i> ), guava ( <i>Psidium guajava</i> ), snakeweeds ( <i>Stachytarpheta</i> spp.), elephant grass ( <i>Pennisetum purpureum</i> ), milkweed ( <i>Euphorbia heterophylla</i> ), hairy senna ( <i>Senna hirsuta</i> ), privets ( <i>Ligustrum</i> spp.), goose's foot ( <i>Syngonium podophyllum</i> ), aleman grass ( <i>Echinichloa polystachya</i> ), yellow allamanda ( <i>Allamanda cathartica</i> ), lion's tail ( <i>Leonotis nepetifolia</i> ), Navua sedge ( <i>Cyperus aromaticus</i> ), sensitive weed ( <i>Mimosa pudica</i> ), mistflower ( <i>Ageratina riparia</i> ), dutchman's pipe (non-native <i>Aristolochia</i> spp.), <i>Macrotyloma axillare</i> , knobweed ( <i>Hyptis capitata</i> ), grader grass ( <i>Themeda quadrivalvis</i> ), camphor laurel ( <i>Cinnamomum camphora</i> ), tobacco bush ( <i>Solanum maruritianum</i> ), itch grass ( <i>Rottboelia cochinchinensis</i> ), giant bramble ( <i>Rubus alceifolius</i> ), Noogoora burr ( <i>Xanthium occidentale</i> ), <i>Caesalpinia decapetala</i> , Clyde grass ( <i>Paspalum virgatum</i> ), dictionara ( <i>Brachiaria humidicola</i> )

In order to render more efficient and cost-effective pest control measures across the region, it is highly recommended that that the proposed plan structure with its eight constituent strategies be considered, emended where required, and adopted by all 10 Local Governments. Recommendations also include the establishment of a dedicated regional Pest Management Officer position to be associated with FNQLGPPAC, supported by the newly emerging Regional NRM Board, to progress regional pests management actions, along with others including the maintenance of a central regional pest information database.

## REFERENCES CITED

- Berman, D., Robertshaw, J. and Gould, W. (1998) Rabbits in Queensland: Where have they been, what have they done and where are they now?, Proceedings of the 11th Australian Vertebrate Pest Conference, Bunbury.
- Braithwaite, H. and Timmins, S. (2002) Weed surveillance – how to do it? (in Virtue, J.G. (ed.) *Proceedings: 1st International Workshop on Weed Risk Assessment*. CSIRO, Adelaide:111-113.
- Carter, R. J. (2000) Principles of regional weed management (in Richardson, R. G. and Richardson, F. J. (eds) *Australian Weed Management Systems*. CRC for Weed Management Systems/R.G & F. J. Richardson, Meredith: 83-104.
- CHPMG (2000) *Upper Fitzroy Pest Management Strategy 2000-2003*. Central Highlands Pest Management Group, Rockhampton:32pp..
- Cunningham, D. C. , Woldendorp, G., Burgess, M. B. and Barry, S. C. (2003) Prioritising sleeper weeds for eradication: selection of species based on potential impacts and feasibility of eradication. Bureau of Rural Sciences, Canberra:24pp..
- Department of Natural Resources (2000) *Queensland Guideline for Limiting Weed Seed Spread*. Queensland Weed Seed Project, Department of Natural Resources, Brisbane:10pp. + apps.
- Goodland, T. C. R., Healy, J. R. and Binggeli, P. (1998) Control and management of invasive alien woody plants in the tropics. *School of Agriculture and Forest Science Publication No. 14*. University of Wales, Bangor:37pp..
- Grice, A.C. and Ainsworth, N. (2003). Sleeper weeds – a useful concept? *Plant Protection Quarterly* 18, 35-9.
- Grice, A. C. and Setter, M. J. (eds) (2003) *Weeds of Rainforests and Associated Systems*. Cooperative Research Centre for Tropical Rainforest Ecology and Management, Rainforest CRC, Cairns:106pp..
- Groves, R. H. (1999) Sleeper weeds. (in) Bishop, A. C., Boersma, M. and Barnes, C.D. (eds) *Proceedings of the 12th Australian Weed Conference*. Tasmanian Weed Society Inc., Hobart:632-636.
- Groves, R. H. and Panetta, F. D. (2002) Some general principles for weed eradication programs. (in) Spafford Jacob, H., Dodd, J. and Moore, J. H. (eds) *13th Australian Weeds Conference Papers and Proceedings*. Perth: 307-310.
- Harris, S., Brown, J. and Timmins, S. (2001). Weed surveillance – how often to search? *Science for Conservation 175*, Department of Conservation, Wellington, New Zealand.
- Hobbs, R.J. and Humphries, S.E. (1995). An integrated approach to the ecology and management of plant invasions. *Conservation Biology* 9, 761-70.
- Irvine, D. (2003) *Stage One: Review of local Government Pest Management Plans*. Report presented to the Far North Queensland Local Government Pest Plan Advisory Committee, FNQROC, Cairns:79pp..

- IUCN (2000) IUCN Guidelines for the prevention of biodiversity loss caused by alien invasive species. Report prepared by the Invasive Species Specialist Group of Species Survival Commission and endorsed by the 51st Meeting of the International Union for the Conservation of Nature Council, Gland, Switzerland: 19pp..
- NR&M (2002a) *Queensland Rabbit Management Strategy 2001-2006*. Natural Resources & Mines (Land Protection Branch), Brisbane:16pp.
- NR&M (2002b) *Queensland Weed Strategy 2002-2006*. Natural Resources & Mines (Land Protection Branch), Brisbane:28pp.
- Panetta, F. D and Timmins, S. M. (in press) Evaluating the feasibility of eradication for terrestrial weed incursions. Paper submitted to *Plant Protection Quarterly*.
- Smith, N. M. (2002) *Weeds of the Wet/Dry Tropics of Australia: A Field Guide*. Environment Centre NT, Darwin:112pp..
- SPREP (2000) *Invasive Species in the Pacific: A Technical Review and Draft Regional Strategy*. [edited by G. Scherley] South Pacific Regional Environment Program, Apia, Samoa:190pp..
- Volkers, A. (2003a) *Integrated Natural Resource Management Plan for Kangaroo Island*. Draft for Consultation, Kangaroo Island Natural Resources Board, Kingscote, S.A.:152pp..
- Volkers, A. (2003b) *Integrated Natural Resource Management Plan for Kangaroo Island*. Appendix to Main Plan, Kangaroo Island Natural Resources Board, Kingscote, S.A.:70pp..
- Waterhouse, B. M. (2003) Rainforest weeds: detecting and managing new incursions. (in) Grice, A. C. and Setter, M. J. (eds) *Weeds of Rainforests and Associated Systems*. Cooperative Research Centre for Tropical Rainforest Ecology and Management, Rainforest CRC, Cairns:34-38.
- Werren, G. L. (2001) *Environmental Weeds of the Wet Tropics: Risk Assessment and Priority Ranking*. Report prepared for the Wet Tropics Management Authority, Rainforest CRC, JCU, Cairns:76pp. + apps.
- Werren, G. L. (2003a) *FNQROC Regional Pest Management Plan Integration: Stage 2 Report – Establishing Priorities*. Report to the Far North Queensland Pest Plan Advisory Committee, ACTFR/School of Tropical Biology, James Cook University, Cairns:62pp..
- Werren, G. L. (2003b) *FNQROC Regional Pest Management Plan Integration: Stage 3 Report – Development of Action Plans*. Report to the Far North Queensland Pest Plan Advisory Committee, ACTFR/School of Tropical Biology, James Cook University, Cairns:41pp..
- Williams, P.A. (1997). Ecology and management of invasive weeds. *Conservation Sciences Publication No. 7*, Department of Conservation, Wellington, New Zealand

## ACRONYMS

<b>AQIS</b>	Australian Quarantine Inspection Service
<b>COAG</b>	Council of Australian Governments
<b>CRC</b>	Cooperative Research Centre
<b>CRC-AWM</b>	Cooperative Research Centre for Australian Weed Management
<b>DNR</b>	Department of Natural Resources
<b>ESD</b>	Ecologically Sustainable Development
<b>FNQLGPPAC</b>	Far North Queensland Local Government Pest Plan Advisory Committee
<b>FNQPAF</b>	Far North Queensland Pest Advisory Forum
<b>FNQROC</b>	Far North Queensland Regional Organisation of Councils
<b>GIS</b>	Geographic Information System
<b>ICM</b>	Integrated Catchment Management
<b>LG</b>	Local Government
<b>LGA</b>	Local Government Authority
<b>NRM</b>	Natural Resource Management
<b>NR&amp;M</b>	Natural Resources and Mines
<b>PMP</b>	Pest Management Plan
<b>PMU</b>	Pest Management Unit
<b>QPWS</b>	Queensland Parks and Wildlife Service
<b>VVD</b>	Voluntary Vendor Declaration
<b>WIT</b>	Weed Incursion Team
<b>WONS</b>	Weeds of National Significance