

NSW NORTH COAST **BITOU BUSH** MANAGEMENT STRATEGIES



Tim Scanlon February 2001
for the North Coast Weeds Advisory Committee

NSW North Coast

BITOU BUSH MANAGEMENT STRATEGY

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For the **North Coast Weeds Advisory Committee**

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1.0 AIM

To reduce the impacts of bitou bush on the NSW North Coast environment.

2.0 THE CHALLENGE

Bitou bush (*Chrysanthemoides monilifera subsp. rotundata*), a native plant of South Africa, is a major threat to natural, cultural and recreational values of the NSW North Coast. It is listed as a Weed of National Significance (WONS), a threatening process under the NSW Threatened Species Conservation Act and a W3 declared Noxious Weed in all but one coastal Council in New South Wales.

Bitou bush now infests approximately 90% of the NSW North Coast coastline. It threatens a range of habitats and if left uncontrolled, is predicted to become more abundant and spread to new areas.

Within the region, bitou bush can reach maturity within 12 months, producing large quantities of seed that can remain viable for up to 10 years. There are a number of techniques which can successfully control the plant and these are being used by a range of stakeholders including many community groups. Unfortunately co-ordination between stakeholders in many areas has been lacking and funding is limited.

The importance of an integrated co-ordinated approach to management is made even more vital with the threat of other weeds, some of which are harder to control than bitou bush, invading the space left after control of the weed. It is therefore vital that control includes replacement with local native species through either natural regeneration or planting.

3.0 EXECUTIVE SUMMARY AND KEY OUTCOMES

The NSW North Coast Bitou Bush Strategy is an initiative of the North Coast Weed Advisory Committee (NCWAC) who have recognised that the bitou bush problem is of such magnitude that a regional strategic approach is required in order to reduce the impacts of the plant.

Bitou bush poses a serious threat to biodiversity, aesthetic values, community access and coastal infrastructure within the region. It currently infests approximately 90% of the region's coastline and was predicted by Love (1984) to infest almost all of the region's natural coastal areas by 2010.

There are a number of stakeholders involved in the control of bitou bush including many community groups. The strategies have been developed to improve co-ordination between them and promote the use of best management practices. The strategies expand and compliment the Regional Weed Control Plan produced by the North Coast Weed Advisory Committee.

Use of appropriate control techniques, restoration of native habitats and regular follow up is vital to ensure that bitou bush is not replaced by other weeds. The production of maps highlighting the distribution and abundance of bitou bush are an important component of the plan so that appropriate strategies can be utilised in each area.

To achieve the aims of the project, strategies have been developed to:

1. Coordinate management between stakeholders and compile all relevant information;
2. Raise community awareness and involvement, and;
3. Implement on-ground integrated management.

The key outcomes of the project are:

- Production of bitou bush distribution and abundance maps for the region;
- Establishment of a regional framework and co-ordinated approach, overseen by the Bitou bush Taskforce;
- Strategies which encourage community groups and seek involvement from the wider community;
- Lists of priorities to which management should be targeted;
- Strategies to ensure that control is targeted to priority areas;
- Strategies to improve co-ordination at the local level including the compilation of information to ensure that benefits of control are maximised;
- A framework for the update and review of the strategies;
- Lists and contact details of key stakeholders, and;
- Lists of relevant publications.

4.0 BACKGROUND TO BITOU BUSH

Bitou bush and boneseed (*Chrysanthemoides monilifera subsp. monilifera*) are native plants of the South African coastline. Bitou bush is a serious weed of NSW and South East Queensland whilst boneseed, initially introduced to Australia as a garden plant, is now a serious weed of southern Australia.

4.1 Weed Biology



Bitou bush is a low shrub that grows up to 1-2m tall and 2-6m wide. When growing in shade it has more of a scrambling habit where it can climb up to 10m high into trees.

Leaves are glossy green, fleshy and 3-8cm long by approximately 2cm wide (see plate 1). They have an oval shape with a tapering base and irregular teeth along the edge (Vranjic, 2000). Young leaves have a cottony down (Dyason, 1989).

Plate 1: Leaves of bitou bush.
Source: Steenbeeke (1999)



Being a member of the Asteraceae family, flowers are characteristic bright yellow daisies up to 2.5cm in diameter with 11-13 petals (see plate 2). It can flower throughout the year, with a maximum between April and July when plants are heavily laden with flowers.

Plate 2: Bitou bush flowers.
Source: Steenbeeke (1999)

Bitou bush can start producing seeds within 12 months on the north coast. Each mature plant is capable of producing up to 48,000 seeds per year (Weiss et. al. 1998). Fruits are green, becoming glossy black when ripe in Winter and Spring, and contain one seed. Fruits are eaten and hence the seeds spread by a number of bird species as well as foxes, rabbits, cattle and emus (Dodkin and Gilmore, 1984). Bitou bush plants are also capable of vegetative regrowth (Dyason, 1989).

Bitou bush readily outcompetes most native species within the coastal environment due to such factors as:

- the large number of seeds produced per plant;
- the longevity of seed survival in the soil;
- high germination rate;
- fast growth;
- adaptability to a range of habitats and conditions;
- dispersal by a number of fauna species and ability to reproduce vegetatively;
- allelopathic affects on other species;
- hardiness, and;
- lack of natural predators in Australia.

Plate 3 (see next page) summarises the life cycle of bitou bush and the stages of growth and reproduction at which control is targeted.

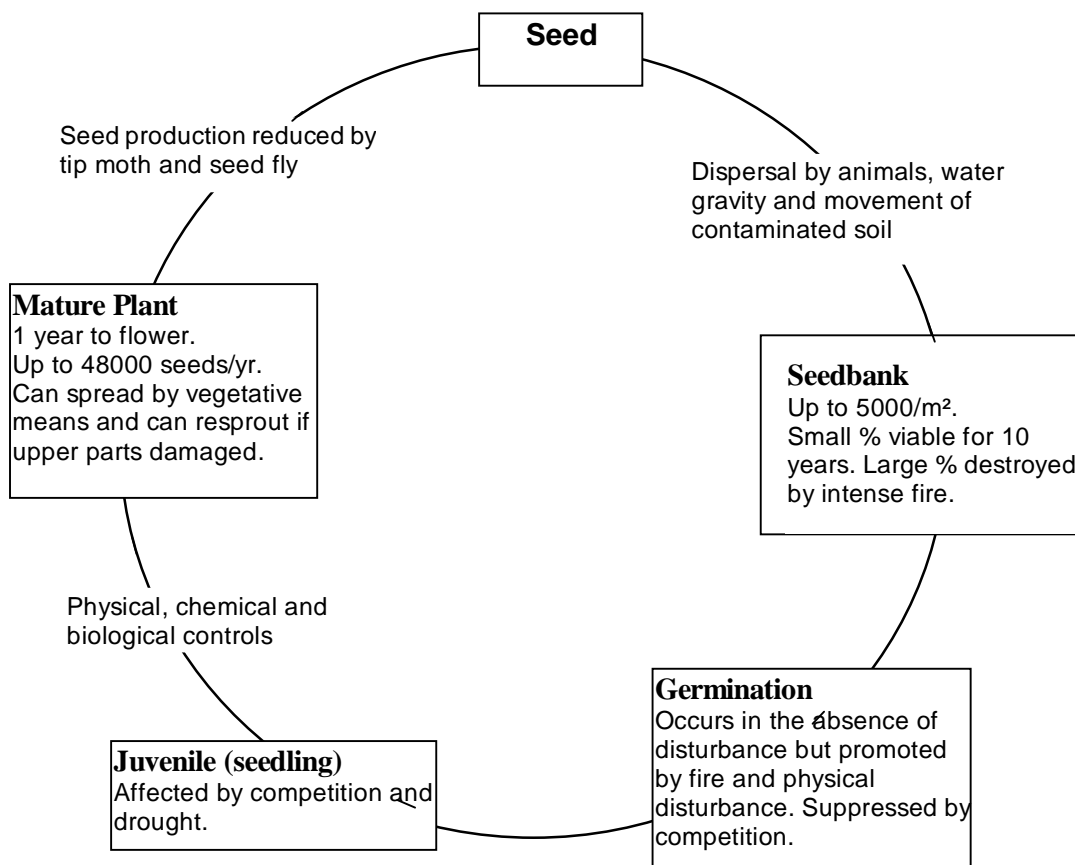


Plate 3: Life cycle of bitou bush. Adapted from: NWSEC (in press)

Hybrids displaying intermediate characteristics between bitou bush and boneseed have been recorded in New South Wales (Weiss et. al. 1998).

4.2 History of spread

Bitou bush is believed to have been first introduced to Australia at Stockton, near Newcastle in 1908. Between 1946 and 1968 it was deliberately planted for erosion control and revegetation following sand mining by Soil Conservation Service of NSW. The first state-wide survey of bitou bush distribution and abundance was undertaken by helicopter in 1981 and 1982. Bitou bush was recorded on 58.7% of the coastline (Love 1984). Within the north coast region, bitou bush was recorded over at least 80-85% of the coastline and was “very common” over approximately 35% of that area.

Bitou bush now covers an area of approximately 70,000 ha (Vranjic 2000) and is found from such diverse locations as Melbourne, Victoria and Menindee Lakes in western NSW where it was planted for sand stabilisation.

Mapping undertaken as part of this project and recent mapping undertaken by Greater Taree, Hastings, Kempsey, Nambucca and Bellingen Councils (see page 10) indicates that bitou bush is now present over approximately 90% of the north coast coastline. It is estimated to be heavy over approx. 60% of the coastline, indicating a dramatic increase in abundance of the species. Table 1 lists the abundance of bitou bush within each Shire.

LGA	% of coast infested	Area of Shire infested		
		Light (ha)	Medium (ha)	Heavy (ha)
Tweed	97	162	293	315
Byron	84	67	47	175
Ballina	91	209	154	398
Richmond V.	90	123	171	395
Maclean	92	643	228	231
Pristine Waters	90	164	100	187

LGA	% of coast infested	Area of Shire infested		
		Light (ha)	Medium (ha)	Heavy (ha)
Coffs Harbour	82	839	251	156
Bellingen	100	1517	106	134
Nambucca	100	1977	243	68
Kempsey	95	2393	814	303
Hastings	98	2319	538	494
Greater Taree	89	364	228	88

Table 1: Abundance of bitou bush in each LGA. NOTE: Mapping from Bellingen to Greater Taree has involved considerably more ground truthing to date (see page 10).

Bitou bush mostly occurs within a thin coastal strip, sometimes as narrow as 100m or less on and behind the foredune. It is also increasingly being found adjoining creeks, rivers, on coastal islands and inland areas. It occurs as far as 25km inland at Lawrence in the Clarence catchment.

Bitou bush heavily infests most of the Tweed Shire coastline, however, it has almost been eradicated from Queensland following early detection, control and regular follow up (Toms, pers. comm).

Bitou bush abundance reduces further south along the NSW coastline and recent mapping undertaken as part of the South Coast Bitou Bush Strategy found that it infests only 38% of that region's coastline (AEIA, 2000).

Lord Howe Island supports isolated infestations, predominantly on headlands and cliffs, and annual control programs are being undertaken (Olsen, pers. comm.).

Bitou bush has the potential to greatly increase in distribution and abundance. Love (1984) estimated that bitou bush would be "very common" over almost the entire north coast coastline by 2010.

4.3 Impacts

Bitou bush dominates the coastal environment, invading and reducing the habitat values of a wide variety of ecosystems within the region. Ecosystems at risk from the plant include dry open and closed heath, grassy low heath, headland heath, headland woodland, open forest, coastal low forest and scrub, dune grassland, grassy headlands, coastal woodland, littoral rainforest (a significant ecosystem protected through State Environmental Planning Policy 26), swamp forest and swamp sclerophyll forest (Dodkin and Gilmore, 1984, Gerrand, pers. comm. and Thomas, pers. comm.).

Several plant species listed on the Threatened Species Conservation Act that occur within the region are directly threatened by bitou bush such as *Zieria prostrata*, *Thesium australe*, *Cynanchum elegans*, *Chamaesyce psammogeton*, *Cryptocarya foetida*, *Acronychia littoralis* and *Senna acclinis*. The World Heritage listed Iluka Nature Reserve is also directly threatened by invasion of the species. A number of other rare plant and animal species are also adversely affected by bitou bush.

Bitou bush fruits are eaten and spread by a number of fauna species. As bitou bush has a tendency to form monocultures, this leads to degradation of the habitat of most other fauna species.

The monocultures formed by bitou bush have a negative impact on the visual amenity of the coastline. As it readily takes over tracks and physical infrastructure there is a need for continual maintenance of these areas. Dieback of older plants leads to increased erosion and blowouts. Large amounts of money and voluntary labour are spent controlling the species throughout the region.

4.4 Management

Control of bitou bush first began over 30 years ago and was limited to small-scale programs due to a lack of suitable control measures, adequate funding and community and government support. A range of mechanical / physical, chemical and biological techniques have developed over time and summarised in various publications (e.g Dyason, 1989). The Best Practice Management Guide for bitou bush produced by Weeds CRC summarises the most successful techniques being used today and is included as Appendix C.

When controlling bitou bush it is best to use an integrated approach, where a range of techniques are used in combination. The techniques chosen will depend on the individual situation and site characteristics.

As with other weeds, it is very important to consider what will replace bitou bush once it is controlled. As the main impact of bitou bush is on native habitats, very little is gained if it is simply replaced by other weeds such as Glory lily (*Gloriosa superba*), *Asparagus spp.*, introduced *Ipomoea spp.*, *Senna spp.* or Lantana (*Lantana camara*). Glory lily, in particular, is very invasive and extremely hard to control. The threat of other weeds increases the need for either follow up seeding or planting of local native species where few native species are present (either growing or within the seed bank).

Priorities

As there are limited resources available for control of bitou bush and other environmental weeds, resources need to be targeted to where they can be most effective. Priority for control should therefore be given to the following locations:

- Land adjoining the Queensland border due to the lack of bitou bush in that State;
- Previous work areas capable of success;
- Isolated infestations and areas dominated by native species;
- Recently burnt areas;
- Significant environmental, cultural and visually prominent areas;
- Areas linking previous / current work areas;
- Areas with good access;
- Areas with combined stakeholder support, and;
- Access tracks and surrounding physical infrastructure.

The most commonly used control techniques are summarised below.

Mechanical / physical control can vary from hand pulling of seedlings to slashing heavy infestations. Great care must be taken when removing the root systems of mature plants due to the amount of soil disturbance that can occur. This method is mainly used by dunecare and other community groups and is best used for controlling small infestations and/or younger plants where there is good access or near significant environmental areas.

Slashing can be a useful tool to help gain access to heavy infestations where there are few native species present. Bitou bush plants that are slashed will generally resprout and exposed stems should be either immediately painted with herbicide or the regrowth sprayed within 3 to 6 months. Slashers should not be used in exposed foredune situations due to the threat of erosion.

Chemical (or herbicide-based) control methods have been researched widely over the past 20 years and a number of successful application techniques are now utilised. Glyphosate, applied by backpack or from a utility or truck at low rates (1:200) in winter, successfully controls bitou bush and has minimal impact on most native species although more research is required on a number of species such as terrestrial orchids and aquatic / rock platform species.

Aerial application of very low rates of herbicide by helicopter in winter has also been found to control bitou bush and have minimal impacts on most native plant species. Cut-and-paint is an effective control technique for large bitou bush plants.

Metsulfuron methyl-based herbicides are now also being widely used. Metsulfuron methyl does not adversely affect grasses such as *Themeda australis*, however, it displays different characteristics in different conditions. Movement within the soil is affected by the organic matter content, pH, temperature and soil moisture (Sarmah et. al. 1998). It shows substantial leaching potential in sandy alkaline soils and hence increased persistence in alkaline subsoils lacking in organic matter and biological activity (Sarmah et. al. 1998). On current available knowledge, metsulfuron methyl is therefore best used in locations such as headlands with clay soils where *Themeda australis* is present and not on sandy alkaline soils.

Before using herbicides it is important to consider any possible non-target environmental impacts. In certain situations herbicide spraying is not appropriate.

Biological control Six biological control agents, or natural predators of bitou bush from South Africa, have been introduced to Australia. The Bitou tip moth (*Comostolopsis germana*) and Bitou seed fly (*Mesoclanis polana*) are now widespread within the region. In one location the Bitou seed fly has resulted in a reduction in seeding by up to 95% (Holtkamp, pers. comm.).

The Leaf roller moth (*Tortrix spp.*) was released in June 2000 at Broadwater and Bundjalung National Parks. Its release has been most eagerly awaited due to the widespread damage it causes to bitou bush plants in South Africa (Holtkamp, pers. comm.).

Although the biological control agents released are quite mobile, the effect of herbicide on them is still not fully known (Ainsworth and Holtkamp, 1999). It is therefore recommended to not spray some bitou bush plants when undertaking control to help maintain local populations.

Other techniques

Intense fire could be a useful tool in the control of bitou bush as it kills most plants and seeds in the upper soil profile and leads to germination of many of the seeds further down in the soil profile. Intense fire can be a difficult tool to manage and the impacts on native species are still not fully known. It is therefore recommended to only use this technique in trial situations where there are few native or other introduced species (apart from bitou bush), little chance of erosion and where there will be follow up control and replanting or seeding with local native species. Bitou bush infestations that are affected by wildfire should be given a high priority for control so that the mass germination of seedlings that results can be controlled, leading to a substantial reduction in the soil seedbank.

Cattle will eat bitou bush and hence are an effective control in agricultural areas.

4.5 Socio-economic factors affecting management

As most bitou bush is found on public land and there is little opportunity for sponsorship or industry support, there is a need for land managers to target additional resources to weed control. The lack of resources can be assisted through improved co-ordination and more combined stakeholder control programs. In the case of control by LCAs, there is also a need to divert resources in some situations to the control of non-declared weeds and planting of local native species, otherwise funding spent on control could be wasted. Bitou bush can act as beneficial short-term stabiliser in potential / active erosion areas. These areas must be identified prior to control. Threat of erosion can be reduced by starting control at the furthest point away from the frontal dune, although advice may be required from DLWC staff or other land managers. Environmental weed and basic bush regeneration training of noxious weeds officers will assist in selection of appropriate control techniques. LCAs will also require assistance from other departmental stakeholders, the Bitou bush Taskforce and community-based control groups.

As the vast majority of community-based control groups are focused on areas adjacent to where they live, it is important that awareness-raising activities be focused at the local community level. By broadening the focus of education initiatives, encouraging full community involvement in weed control / restoration activities and involving them in the development and implementation of local strategies, they're increased knowledge, pride and interest will enable groups to achieve more.

For all stakeholders to implement the strategies contained in this document there is a need for local, state and federal governments to commit to the long-term provision of adequate resources.

5.0 BACKGROUND TO THE STRATEGIES

5.1 Reason for the plan and process followed

Bitou bush is a W3 declared noxious weed in all coastal Councils within the region. The declaration requires that "the weed must be prevented from spreading and its numbers and distribution reduced".

Many dunecare groups, most LCA's and a number of other government departments such as NPWS and DLWC are actively controlling bitou bush within the region. Often these stakeholders have been working in isolation, with little communication with other stakeholders working nearby.

To effectively control bitou bush, it is vital to have accurate, up-to-date maps of its distribution and abundance. The last mapping undertaken for bitou bush within the region was in 1982 and it has spread dramatically in a number of areas since that time.

This strategy / mapping project is part of the Camphor laurel, bitou bush and environmental weed strategy being developed for the North Coast Weed Advisory Committee (NCWAC). The NCWAC is a regional committee that includes all local weed control authorities, government departments and other stakeholders involved in weed control within the NSW North Coast. The project has been funded through the State Noxious Weed Advisory Committee as part of a Regional Weed Action Program.

Bitou Bush Taskforce

As part of the project a taskforce has been established comprising experts and stakeholders from throughout the region and elsewhere. The taskforce's role is to have direct input into the strategies and oversee their implementation into the future.

Public consultation

The development of the strategy has involved extensive public consultation including 13 public workshops and numerous on-site meetings with stakeholders.

Mapping

Mapping of the distribution and abundance of bitou bush between Coffs Harbour and the Queensland border was undertaken using 1:10,000 aerial photographs and information supplied by stakeholders. Limited ground truthing was undertaken by stakeholders and the Project Officer before final maps were produced at 1:50,000 scale. More detailed mapping between Bellingen and Taree LCAs was undertaken by Daintry Gerrand (and Geoff Williams in the case of Greater Taree City Council), with assistance from stakeholders, under contract to each individual Council. The methods used were those developed during the Taree Bitou Bush Strategy and have since been used to produce distribution and abundance maps for the NSW South Coast region. Plate 4 below illustrates how different abundances were identified. The bitou bush maps were digitised by NPWS Northern Zone.

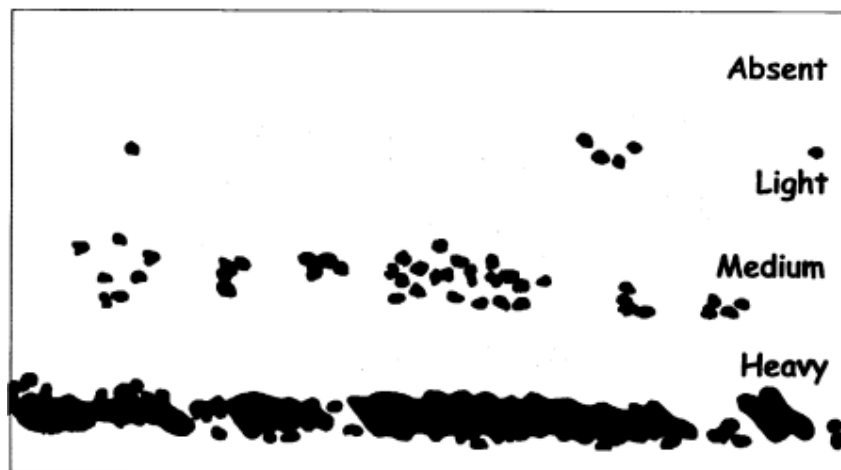


Plate 4: Abundance categories of bitou bush. Source: Gerrand (2000)

5.2 Principles underpinning the plan

This plan is based on the recognition and acceptance of the four principles of the National Weeds Strategy:

1. Weed management is an essential and integral part of the sustainable management of natural resources and the environment, and requires an integrated multi-disciplinary approach.
2. Prevention and early intervention are the most cost effective techniques that can be deployed against weeds.
3. Successful weed management requires a coordinated national approach, which involves all levels of government in establishing appropriate legislative, educational and coordination frameworks in partnership with industry, landholders and community.
4. The primary responsibility for weed management rests with landholders/land managers, but collective action is necessary where the problem transcends the capacity of the individual landholder / landmanager to address it adequately.

5.3 Relationship to other strategies

Strategies for the control of bitou bush have either recently been developed or are in the process of being developed at several levels.

National Weeds Strategy

As bitou bush and boneseed are listed as one of 20 weeds of national significance, national strategies have been developed and are soon to be released. The strategy aims to deliver three desired outcomes:

- The further introduction and spread of bitou bush and boneseed is prevented;
- The adverse impacts of bitou bush and boneseed on biodiversity are minimised, and;
- The national commitment to the co-ordination and management of bitou bush and boneseed is maintained.

State Biodiversity Bitou Bush Project

Due to the impact of bitou bush on biodiversity, its listing as a threatening process on the Threatened Species Conservation Act and the need to co-ordinate management at the state level, NSW NPWS employed Jeff Thomas as the State Biodiversity Bitou Bush Project Officer on a temporary basis. His role is to:

- Develop a state-wide strategy, including extensive public consultation;
- Co-ordinate mapping of the distribution and abundance of bitou bush in NSW, and;
- Establish 3 demonstration sites in different parts of the State that have local support.

South Coast Bitou Bush Strategies

This strategy focuses on the control of bitou bush, lantana and boneseed in the coastal environment. Distribution and abundance maps and regional strategies have been produced to help improve coordination. Local 'Shire-wide' 'Action Plans' and more detailed mapping and ground truthing is now being produced as part of the project.

Regional and Local Bitou Bush Control Plans

Regional Control Plans are produced by regional weed advisory committee's before seeking funding for control from NSW Agriculture. The Bitou Bush Regional Control Plan produced for NCWAC and for MNCWAC, describe what actions are required by LCAs and

other organisations to control it over the next 5 years. Individual LCAs can then either produce Local Control Plans or combine with other LCAs to produce Group projects.

Other weed and natural resource management strategies at a national level

- National Weeds Strategy;
- National Strategy for the conservation of Australia's biological diversity;
- National Strategy for ecological sustainable development.

Other weed / natural resource management strategies at a state level

- New South Wales Weed Strategy;
- NSW Biodiversity Strategy.

Other weed / natural resource management strategies at regional / shire / catchment level

- Shire-wide Bitou bush management strategies;
- Regional Vegetation Management Plans;
- Catchment Management Strategies.

Other weed and natural resource management strategies at a local level

- Park and reserve Management Plans;
- Community control project Management Plans.

6.0 STRATEGY

6.1 Coordinate management between stakeholders and compile all relevant information

Background

Due to the limited resources available for management of bitou bush it is important that stakeholders work together to combine their resources. The key element to improving co-ordination at a regional level is the Bitou Bush Taskforce. The members bring together a good knowledge of issues, opportunities and current management in each local area and hence, can circulate new information back to their respective organisations / groups and local communities.

As most implementation will occur at a local level it is important that stakeholders develop strategies on how they will manage the problem in each local area. This allows all stakeholders to develop strong ownership of the strategies as in Greater Taree City where their strategy is currently being implemented. The identification of significant environments and other threatening weeds is a vital part of the development of local strategies to ensure that resources spent on control are not wasted.

Performance indicators

- Regional maps highlighting bitou bush distribution and abundance are circulated;
- The number of combined stakeholder projects is increased;
- Significant environmental and cultural areas are identified;
- Other threatening weeds occurring with bitou bush are identified.

Objective 6.1.1: Establish a coordinated approach to management at the regional level			
Strategy	Actions	Responsibility	Priority
Coordinate management between stakeholders at the regional level	Expand the Regional Bitou bush Taskforce to include representatives from all Shire's / LCAs.	Bitou Bush Project Officer	1
	Update the Regional Bitou Bush Control Plan.	Bitou Bush Project Officer	1
	Monitor implementation of the strategies.	Bitou Bush Taskforce	1
	Circulate information between stakeholders about current and future projects and their issues, changes to funding, new management techniques and opportunities.	Bitou Bush Taskforce, NCWAC, MNCWAC	1
	Circulate regional maps of bitou bush distribution and abundance.	Bitou Bush Taskforce, NCWAC, Coastcare facilitators, Dunecare coordinators, Councils, DLWC	1
	Investigate and promote ways of increasing the number of combined stakeholder management projects.	Bitou Bush Taskforce, NCWAC	1
	Promote use of best management practices commencing in high priority areas.	Bitou Bush Taskforce, NCWAC, Dunecare coordinators, Coastcare facilitators, DLWC	1
Seek long-term commitments from major funding sources to implement the strategies.	NCWAC, Bitou Bush Taskforce, Coastcare facilitators, NSW Agriculture, DLWC	1	
Incorporate strategies into other regional programs	Consider bitou bush and other threatening coastal weeds when setting priority objectives, management targets and when producing other regional strategies.	RVMC's, CMB's, DLWC	1
Liaise with stakeholders in adjoining regions	Liaise with stakeholders in South East Qld, Central and South Coast of NSW to ensure control programs are complimented.	NCWAC, Bitou Bush Taskforce, LCAs – especially GTCC, TSC, FNCW	1

Objective 6.1.2: Establish a coordinated approach to management at the local level			
Strategy	Actions	Responsibility	Priority
Produce and implement local management plans	Establish Local Working Groups in each LCA area.	Bitou Bush Taskforce, LCAs, NPWS, DLWC, Dunecare co-ordinators, Coastcare facilitators, Councils, Community groups	1
	Identify and apply for funding through appropriate bodies such as Coastcare, Environmental Trust etc.	Local Working Groups	1
	Work with all stakeholders and the community to further produce local management plans in a standard format.	Local Working Groups, Local Management Plan Project Officer	1
	Identify other threatening weeds and potential / active erosion areas on bitou bush distribution maps.	Local Management Plan Project Officer, LCAs, land managers	1
	Identify rare/ threatened species/ habitats and significant cultural areas that require specific management on bitou maps.	Local Management Plan Project Officer, Local Working Groups, NPWS	1
	Liaise with NPWS and Local Aboriginal Land Councils to determine appropriate management of significant environmental and cultural areas.	Local Management Plan Project Officer	1
	Utilise fire maps to target control in recently burnt areas.	Local Management Plan Project Officer, Local Working Group	1
	Implement actions according to timelines, commencing in identified priority areas.	All stakeholders	1
Support strategies through other initiatives	Include all threatening weeds in LEP restricted plant lists.	Councils	1
Circulate lists of local native species and encourage their collection and use in planting projects	Compile and circulate lists of local native species for each catchment.	Coastcare	1
	Provide information regarding seed collection methods.	Coastcare facilitators, Dunecare coordinators, Greening Australia, LCA/ LGA contact person, DLWC	1
	Encourage seed collection, propagation and use of local native species collected in the local area in all planting and seeding projects.	Coastcare facilitators, Dunecare coordinators, Bitou Bush Taskforce, NCWAC, NPWS, DLWC, LCAs	1

6.2 Raise stakeholder awareness and involvement

Background

Education of stakeholders is required as there are constantly new environmental weeds invading the region, some of which require specific management techniques. Training in bush regeneration techniques is essential for key stakeholders as they are often the most successful at restoring native habitats when controlling weeds in natural areas.

There is significant potential to expand on the many community-based control projects as bitou bush predominantly occurs on the coast, where most population resides. Some community groups within the region have been working for over 18 years whilst some other groups have inadequate resources such as tools, are not aware of latest control techniques and are working in isolation to other key stakeholders. By identifying a contact person in each local area there is an opportunity to encourage community groups and combine resources to expand management.

The vast majority of work undertaken by community groups is near their place of residence. Strategies aimed at encouraging greater participation, therefore, need to target local communities. As pulling out or spraying weeds is not for everyone, awareness-raising activities need to focus on a broad range of issues, all of which are related to the importance of the restoration process. When community members / groups are involved in developing local strategies and setting local priorities there will be more opportunity to work with other stakeholders in managing bitou bush infestations in high priority areas.

Success of community control / restoration projects can be maximised through preparation of project management plans which include neighbourhood and departmental (particularly with the land owner / manager) consultation, mapping of all threatening weeds, setting of priorities and achievable goals. *Information regarding community project management plans can be found in the 1997 DLWC publication "Volunteers working on the coast".*

Performance indicators

- Opportunities for stakeholder training in bush regeneration and environmental weed identification are increased;
- A bitou bush contact person is identified and promoted in each LGA or LCA area;
- Community-based groups are provided with more adequate support and resources;
- Community awareness-raising activities in local communities are increased;
- At least one demonstration site is established within the region, and;
- The number of groups and the length of coastline actively managed is increased.

Objective 6.2.1: Educate key stakeholders and operational staff			
Strategy	Actions	Responsibility	Priority
Train noxious weeds officers and other stakeholders	Train noxious weeds officers in basic bush regeneration and environmental weed identification.	NSW Agriculture, NPWS, NCWAC, Councils, LCAs	1
	Promote bush regeneration and environmental weed identification courses at TAFE, ACE and other institutions for all stakeholders and the general community.	NSW Agriculture, NPWS, NCWAC, LCAs, Bitou Bush Taskforce, Councils	1

Educate operational staff	Train operational staff to minimise impacts on vegetation and reduce the spread of weed seeds through Roadside Environment Training.	NSW REC, Councils, Greening Australia, NPWS, Telstra, North Power	2
Objective 6.2.2: Encourage and assist community groups undertaking control			
Strategy	Actions	Responsibility	Priority
Provide support to community-based control groups	Identify a person in each LGA / LCA area to act as contact person regarding all bitou bush enquiries.	Bitou Bush Taskforce, LCAs, Councils, Dunecare coordinators, Coastcare facilitators, DLWC	1
	Provide contacts with all relevant information to circulate to community groups and individuals including contact details of staff that can assist with preparation of funding applications.	Bitou Bush Taskforce, Coastcare, DLWC, LCAs, NPWS, NSW Agriculture, Dunecare coordinators	1
	Ensure that community groups have adequate resources such as clear identification information of bitou bush and other weeds, tools, herbicide application equipment and safety vests where required.	Dunecare coordinators, Coastcare facilitators, LCAs, Councils, DLWC	1
	Encourage community groups to produce management plans for their work areas in-conjunction with land managers and neighbouring communities.	Coastcare facilitators, Dunecare coordinators, DLWC, NPWS, Councils, LCAs	1
	Assist in the establishment of community nurseries.	Councils	3
Acknowledge community-based control works	Publicise successful control projects undertaken by community groups.	Dunecare, Coastcare, LCAs, Councils, DLWC	2
	Ensure adequate signage indicates areas being worked by community groups.	Dunecare, Coastcare, Councils, DLWC	2
Address vandalism of restoration projects	Document all reports of vandalism to coastal vegetation and infrastructure.	Councils, LCAs, community groups	2
	Educate and warn residents opposite vandalised vegetation that it will not be tolerated.	Councils, LCAs	2
	If vandalism is repeated consider erecting large signs or black plastic until the vegetation has re-established.	Councils, LCAs	3

Objective 6.2.3: Raise awareness and seek community support for control			
Strategy	Actions	Responsibility	Priority
Educate and encourage community involvement at the local level	Hold regular field days in community venues that focus on a diverse range of issues such as coastal processes, native flora and fauna, weed identification and control methods.	LCAs, Coastcare facilitators, Landcare coordinators, NPWS, DLWC, community groups	1
	Seek community group assistance to undertake seed collection for aerial seeding or local planting projects.	LCAs, NPWS, DLWC, Dunecare co-ordinators, Coastcare facilitators	2
	Encourage local community control groups to organise “clean our beach” work days following field days. Seek involvement from service groups, surf clubs, schools, fishermen, scouts and other beach users.	LCAs, Dunecare co-ordinators, Coastcare facilitators, community groups, DLWC	2
	Display weed identification information and contact details of local community control groups on coastal noticeboards.	Dunecare co-ordinators, Coastcare facilitators, Councils, LCAs, NPWS	2
Establish demonstration sites	Select at least one location in the region for a demonstration site of best management practices. Consider closeness to population, community support and ability to maintain the site.	State coordinator, Bitou Bush taskforce, LCAs, Councils, NPWS, DLWC, community groups	1
	Trial a range of chemical and non-chemical techniques including fire and planting of local native species where appropriate.	LCAs, Councils, NPWS, DLWC, community groups	1
	Monitor and evaluate each technique in regards to control of bitou bush, presence of other weeds and regeneration of native species.	LCAs, Councils, NPWS, DLWC, community groups	1
	Clearly signpost each technique trialed.	LCAs, Councils, NPWS, DLWC, community groups	2
Increase awareness of bitou bush and other weeds in schools	Prepare course notes on a range of coastal issues for different age groups.	Durroughby Environmental Education Centre, Bitou Bush Taskforce	2
	Circulate course notes to all coastal schools within the region.	Durroughby Environmental Education Centre, Bitou Bush Taskforce	2
	Encourage school groups to “adopt an area” where adequate support and supervision is available.	Community groups, Dunecare Co-ordinators	3

6.3 Implement on-ground integrated management

Background

Extensive research has been undertaken over the past 2 decades to improve bitou bush control techniques, culminating in the production of the Best Practice Management Guide for bitou bush (see Appendix C). The guide, like most other weed management guides and strategies, focuses on integrated management where a range of techniques are used and techniques are chosen depending upon the individual situation.

As resources do not allow for the complete control of bitou bush at this time, it is important that resources are directed to where there is the most to be gained and/or the best chance of success. Priority areas are listed on page 7. Significant environments are given a high priority to ensure that they are not further degraded. Isolated plants and infestations are targeted to reduce the spread of bitou bush. Controlling, restoring and following up control of bitou bush and all threatening weeds, starting in high priority areas, will ensure that negative environmental impacts are reduced. Biological control agents must be considered in all control programs as they can reduce reinvasion and reinfestation and potentially severely damage plants. The effectiveness and impacts of all control techniques should be monitored, assessed and reviewed so that any problems can be detected, improvements made and new methods developed over time.

Performance indicators

- All isolated and new infestations are eradicated;
- Biological control agents are continued to be assessed, introduced and monitored;
- Commencing in high priority areas, core infestations are reduced and native vegetation restored;
- Control trials on glory lily are continued and expanded;
- The effectiveness of control and restoration strategies are regularly monitored and reviewed.

Objective 6.3.1: Prevent the spread of bitou bush			
Strategy	Actions	Responsibility	Priority
Fulfil legal obligations	Ensure all legal obligations are met regarding the Noxious Weeds Act and other legislation.	All stakeholders undertaking control	1
Monitor and eradicate new and isolated infestations.	Undertake inspections of areas adjoining known infestations at least annually.	LCAs, NPWS, DLWC, Community groups	1
	Eradicate all isolated bitou bush plants before they seed and control other threatening weeds where possible.	LCAs, NPWS, DLWC, Community groups	1
	Document locations for follow up control.	LCAs, NPWS, DLWC, Community groups	1
	Eradicate, document, publicise and send any boneseed or hybrid plants found to the Royal Botanic Gardens, Sydney.	All stakeholders	1

Control all light and visually prominent infestations	Control all light, visually prominent and readily accessible infestations. Control other weeds where possible. Monitor and follow up control annually.	LCAs, NPWS, DLWC, Community groups	1
Objective 6.3.2: Reduce the abundance and adverse impacts of bitou bush			
Strategy	Actions	Responsibility	Priority
Assess, introduce, and monitor biocontrol agents	Encourage and assist research into new biocontrol agents.	Bitou Bush Taskforce, all stakeholders	1
	Monitor the distribution, abundance and impacts of current and future biocontrol agents.	NSW Agriculture, LCAs, Community groups	1
Control infestations in or near significant environments	Use experienced or qualified practitioners. Protect non-target species and encourage regeneration. Control bitou bush and other weeds where possible. Sow or plant and maintain local native species where required. Monitor and follow up control annually.	Contract bush regenerators, LCAs, NPWS, DLWC, Community groups with experienced or qualified practitioners	1
Control medium infestations not near significant environments	Control bitou bush and other weeds where possible. Leave some areas unsprayed to allow biocontrol agents to persist. Aerial seed or plant and maintain local native species where required. Monitor and follow up control annually.	LCAs, NPWS, DLWC, Councils	2
Control heavy infestations not near significant environments	Control bitou bush and other weeds where possible. Leave some areas unsprayed to allow biocontrol agents to persist. Monitor and follow up control annually.	LCAs, NPWS, DLWC, Councils	3
Objective 6.3.3: Implement other aspects of best management control			
Encourage the control of other threatening weeds	Control other weeds wherever possible when undertaking control of bitou bush.	All stakeholders	1
	Undertake further control trials on weed species such as glory lily and circulate results through the Bitou Bush Taskforce and relevant publications etc.	NPWS, NSW Agriculture, LCAs, Research Institutions, Community groups	1
Monitor, assess and review control methods	Monitor, assess and review impacts and effectiveness of controls. Report findings to local Working Groups and the Bitou Bush Taskforce.	All stakeholders	1

7.0 REVIEW OF THE STRATEGY

An important component of any strategy is to evaluate the success of its implementation. As the strategies aim to reduce the impacts of bitou bush on the environment, it is also important that changes to the health of the environment be monitored. The strategies need to be updated at least every 5 years, however, some strategies will need to be updated more regularly as new techniques are developed.

Performance indicators listed in each section will give a good guide as to whether the strategies are being implemented. These need to be noted by all stakeholders. In addition to this, the Bitou Bush Taskforce and North Coast Weed Advisory Committee is responsible for updating information such as mapping and reviewing of the strategies. To ensure that they have all relevant information, all stakeholders including community groups can report on the implementation of the strategies to the Taskforce and Committee via local working groups. Review of the strategies can be summarised under two headings:

Update and analyse new information

- Update maps highlighting distribution and abundance of bitou bush and other threatening environmental weeds;
- Note changes in abundance of bitou bush and other environmental weeds, particularly in high priority areas;
- Liaise with Weeds CRC, NWSEC, NSW Agriculture and research institutions regarding new control techniques.

Review and update strategies

- Review control practices and their impacts on bitou bush, other weeds and native species diversity including regeneration, particularly in priority areas;
- Target future control in high priority areas where control has not been adequate;
- Monitor the numbers of active community groups involved in management and update community-awareness strategies as required.

8.0 ROLE OF STAKEHOLDERS

NCWAC

- Promote and assist co-ordination between key stakeholders;
- Promote use of best management practices and implementation of the strategies;
- Encourage training of noxious weeds officers and other stakeholders;
- Assist in the review and updating of the strategies.

Bitou Bush Taskforce

- Oversee and monitor implementation of the strategies;
- Circulate information between the taskforce and key organisations and local areas;
- Review and update the strategies.

Local Working Groups

- Ensure that all stakeholders are represented;
- Produce local bitou bush strategies;
- Encourage best practice management including combined-stakeholder programs;
- Review implementation annually and report to the Bitou Bush Taskforce.

Local Weed Control Authorities (LCAs)

- Locate and map other threatening environmental weeds;
- Control bitou bush and other weeds where possible using best management practices and commencing in high priority areas (see page 7);
- Work with and encourage community involvement.

NPWS

- Digitise maps of bitou bush distribution and abundance;
- Provide information and advice regarding significant environmental and cultural areas and their management;
- Assist LCAs to locate and map other threatening environmental weeds;
- Maintain and enhance funding where possible for the control of bitou bush and other environmental weeds and continue and expand glory lily control trials.

DLWC

- Encourage and work with community groups to develop management plans;
- Assist LCAs to encourage more community involvement;
- Incorporate strategies into the “Coasts & Estuaries” program.

Coastcare

- Provide lists of suitable local native species for seeding and planting projects and information regarding seed collection;
- Continue to support and encourage the development and implementation of local management plans;
- Reduce the complexity of funding applications where possible.

Councils

- Train and support staff in ways to reduce the spread of bitou bush and other weeds;
- Assist in the development of local management plans;
- Restrict the distribution of environmental weeds through the LEP;
- Assist and promote community control projects and address vandalism.

NSW Agriculture

- Provide resources for the training of noxious weeds officers;
- Provide information regarding control techniques for other weeds;
- Encourage and promote control of both declared and non-declared weeds;
- Continue to assess, release and monitor biological control agents.

Community-based groups such as dunecare and landcare

- Produce management plans in-conjunction with land managers and the community;
- Undertake control in high priority areas where possible;
- Undertake seed collection for use in local seeding / planting projects.

Landcare / Dunecare coordinators

- Distribute information between the Taskforce and community groups;
- Ensure groups have adequate support and resources;
- Encourage seed collection by local community groups;
- Encourage more community involvement;
- Encourage use of best management practices commencing in high priority areas where possible;
- Monitor the success of landcare / dunecare projects.

Labour market programs

- Promote an integrated approach to management;
- Work in-conjunction with other stakeholders wherever possible;

- Ensure that participants have adequate training and supervision before working in significant environments.

Contract bush regenerators and trained practitioners

- Undertake control of all priority weeds and encourage natural regeneration, area-by-area, particularly in significant environments.

Research institutions

More research is required on such topics as:

- Control techniques and weed biology of other weeds such as glory lily;
- Effects of herbicide techniques on a range of native flora, fauna, insects etc.;
- Effects of herbicide techniques on biological agents;
- Effects of fire and spray-burn-spray techniques on native species;
- More clarification of the longevity of metsulfuron methyl-based herbicides in various coastal ecosystems.

Greening Australia

- Provide information regarding seed collection, propagation and seeding / planting;
- Encourage the involvement of all operational staff in roadside environment training.

Regional Vegetation Management Committee's

- Support and encourage implementation of the strategies;
- Consider threatening environmental weeds when developing management strategies.

Catchment Management Boards

- Consider the importance of control of bitou bush and other environmental weeds in the coastal environment and utilise maps of bitou bush distribution and abundance when setting priority objectives and management targets.

DUAP

- Assist in the identification of significant environmental areas.

NSW REC

- Facilitate roadside environment training of operational staff on the north coast.

Telstra, North Power and other operational staff

- Train and support staff in ways to reduce the spread of bitou bush and other weeds.

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10. ABBREVIATIONS / GLOSSARY

CMBs	Catchment Management Boards
DLWC	Department of Land and Water Conservation
DUAP	Department of Urban Affairs and Planning
FNCW	Far North Coast Weeds (formerly Far North Coast County Council)
GTCC	Greater Taree City Council
LCAs	Local weed control authorities
LEP	Local Environmental Plan
LGA	Local Government Area
NCWAC	North Coast Weed Advisory Committee
NPWS	NSW National Parks and Wildlife Service
NSW REC	NSW Roadside Environment Committee
NVMCs	Native Vegetation Management Committees
NWSEC	National Weeds Strategy Bitou Bush and Boneseed Executive Committee
TSC	Tweed Shire Council
Weeds CRC	Cooperative Research Centre for Weed Management Systems

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Jamie Love and Anni Blaxland Fuad contributed many hours (that they did not have!) in digitising and printing out the bitou bush distribution and abundance maps.

Thankyou. Keep up the good work!

APPENDIX A..... CONTROL TECHNIQUES FOR DIFFERENT SITUATIONS

Light infestations	Hand pull, spot spray and/or cut and paint in most situations. Control other weeds where possible. Protect non-target species and minimise impact, particularly in significant environments. Encourage regeneration. Sow or plant and maintain local native species where required. Monitor and follow up control annually.
Medium infestations in or near significant environments	Use experienced or qualified practitioners. Hand pull, spot spray and/or cut and paint in most situations. Hand pull and/or cut and paint only adjacent to waterways. Start control near remnant trees wherever possible and encourage regeneration. Sow or plant and maintain local native species where required. Ensure that remaining vegetation is not exposed to excessive salt spray and strong winds. Control other weeds where possible. Monitor and follow up control annually.
Medium infestations not near significant environments	Start control near remnant trees wherever possible. Spot spray or aerial spray in most situations. Leave some areas unsprayed to allow biocontrol agents to persist. Ensure that remaining vegetation is not exposed to excessive salt spray and strong winds and encourage regeneration. Aerial seed or plant and maintain local native species where required. Control other weeds where possible. Monitor and follow up control annually.
Heavy infestations in or near significant environments	Use experienced or qualified practitioners and start control near remnant trees wherever possible. Provide access by slashing only where significant environments will not be adversely affected. Spot spray. Aerial spray or trial use of spray-burn-spray only where protection of the significant environment can be ensured (not near rainforest), regeneration is encouraged, adequate planting / seeding and maintenance of local native species is to be undertaken and other factors make it appropriate. Leave some areas unsprayed to allow biocontrol agents to persist. Ensure that remaining vegetation is not exposed to excessive salt spray and strong winds. Control other weeds where possible. Monitor and follow up control annually.
Heavy infestations not near significant environments	Start control near remnant trees wherever possible. Provide access by slashing where appropriate. Spot spray. Aerial spray only where adequate planting / seeding and maintenance of local native species is to be undertaken. Trial use of spray-burn-spray where other factors make it appropriate. Leave some areas unsprayed to allow biocontrol agents to persist. Ensure that remaining vegetation is not exposed to excessive salt spray and strong winds. Control other weeds where possible. Monitor and follow up control annually.

APPENDIX B KEY STAKEHOLDERS AND THEIR CONTACT DETAILS

Regional Bitou bush Taskforce

For 2001, care of:

Daintry Gerrand, Secretary, Wharf Road, Johns River 2443, or "duck@midcoast.com.au"

For 2002, care of:

Jeff Thomas, Secretary, NPWS, P.O 361, Grafton 2460, or "jeff.thomas@npws.nsw.gov.au"

Later years: TBA

Members:

Terry Schmitzer	Project Officer, Mid-north Coast Weed Advisory Committee. Fmr. Hastings Council.
Daintry Gerrand	Environmental Consultant to Hastings, Kempsey, Nambucca and Bellingen Councils. Fmr. Greater Taree City Council.
Mike Dodkin	Pest Species Officer, NPWS, Port Macquarie.
Lachlan Whetham	Coastcare Facilitator – Port Stephens-Bellingen.
Colin Matthews	Landcare/Dunecare co-ordinator, Bellingen Shire.
Ken Hayes	Chief Noxious Weeds Officer, Coffs Harbour City Council.
Frank McLeod	Reserves Management Officer, DLWC, Grafton.
Jeff Thomas	State Bitou bush Co-ordinator, Fmr. Pest Species Officer, NPWS, Grafton.
Ian Tye	Chief Weeds Officer, Clarence Valley Weeds Authority.
Rus Glover	Coastcare Facilitator – Coffs Harbour-Tweed.
Royce Holtkamp	Senior Entomologist, NSW Agriculture, Tamworth.
Tim Scanlon	Fmr. North Coast Bitou Bush Project Officer.
Rodney Keevers	Recreation Services, Tweed Shire Council

Local Weed Control Authorities

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