# Weed Risk Management in South Australia


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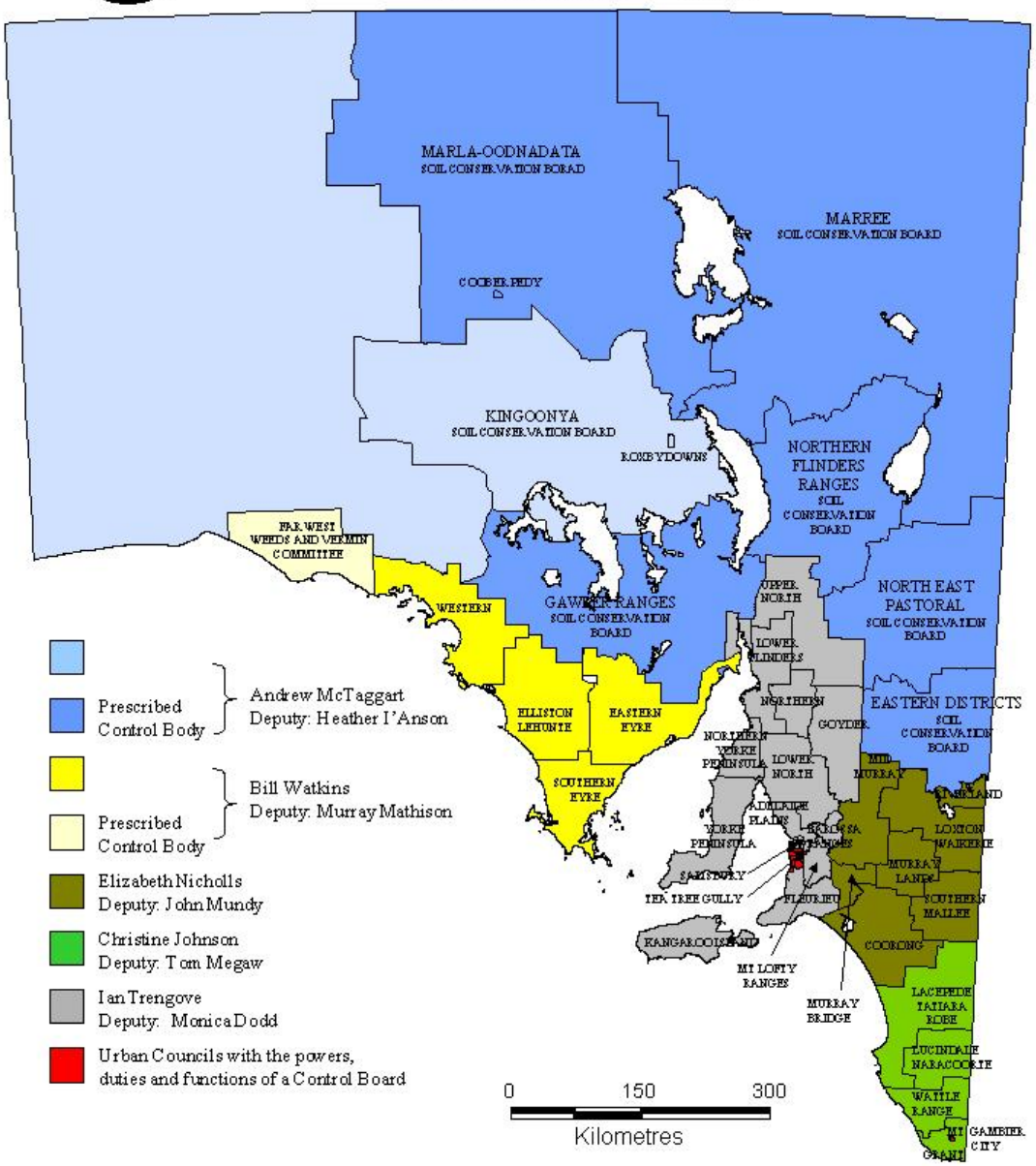
# South Australia (SA) & Weeds

- **SA has a mediterranean to arid climate**
- **Southern agricultural zone predominantly dryland cropping/grazing**
  - localised horticulture and forestry
  - large & small areas of native vegetation
  - extensive coastline
- **Northern is rangelands with a mix of grazing, conservation & indigenous uses**
- **Few (permanent) freshwater ecosystems**
- **Most people in Adelaide & coastal towns**

# ANIMAL AND PLANT CONTROL BOARDS AND COMMISSIONER REGIONS

**FROM 7 DECEMBER 2001**




Prepared by
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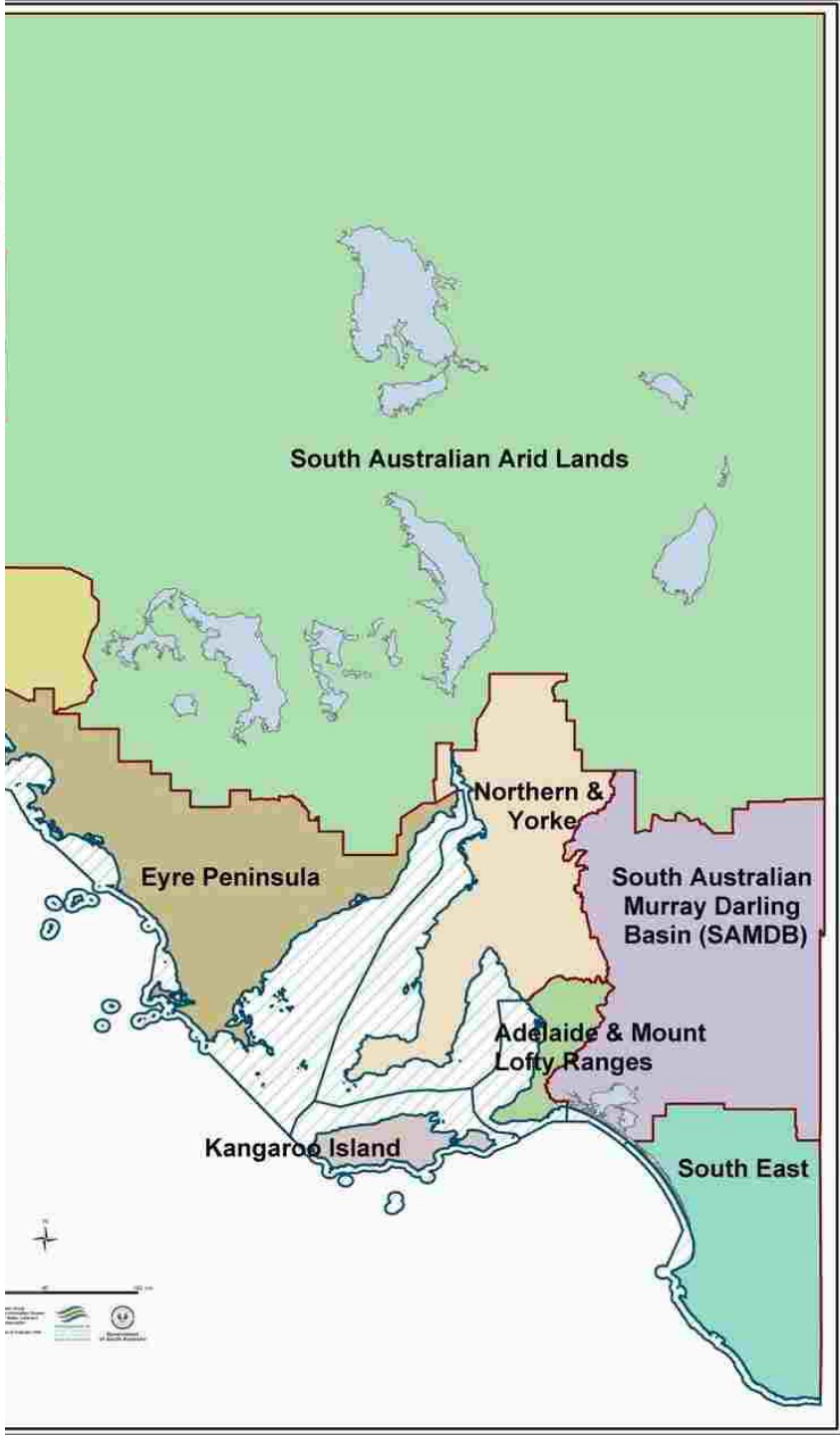


# The need to prioritise weeds....

- **Too many declared weeds in SA to effectively contain/eradicate them all**
- **Some regions were focusing on widespread species for various reasons**
  - long history of enforced control
  - visually obvious → political pressure
  - perceived impacts
  - shared financial burden of control
  - familiarity with species
  - agricultural bias
- **But early intervention is most cost effective**

# SA Weed Risk Management System

**Comparative Weed Risk =**

**Invasiveness** (0-10)
×
**Impacts** (0-10)
×
**Potential Distribution** (0-10)

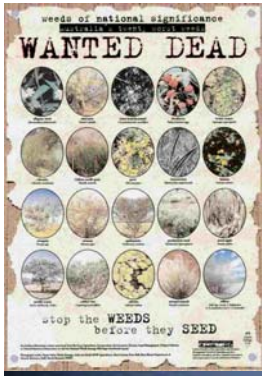
**Feasibility of Containment =**

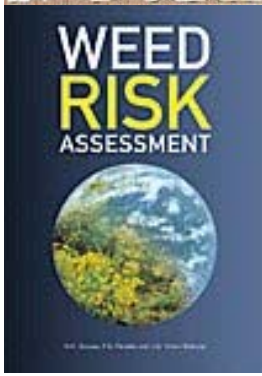
**Control Costs** (0-10)
×
**Current Distribution** (0-10)
×
**Persistence** (0-10)

# Origins of SA WRM System

- **Consultancy to develop Weeds of National Significance criteria (1998)**
- **1st Int. WRA Workshop (1999)**

➔ fostered various state WRA systems




- **For SA wanted a means to prioritise weed species for regional control programs & state declarations**
  - developed weed risk component with Animal & Plant Control Boards (1998➔)

# Origins of SA WRM System

- **Weeds CRC had national WRA meeting (2002)**

  **➔ National Post-border WRM Protocol**

  - used that process to develop criteria for feasibility of control component in SA WRM
    - *(esp. Panetta & Timmins 2004 paper on feasibility of terrestrial weed eradication)*

# SA WRM System

## Basic requirements:

- Generic questions that can apply to any weed at any scale for any land use
- Simple but logical mathematics
- Questions readily understood and terms commonly used by weed managers
- As few questions as possible whilst still enabling robust species comparisons
- Low subjectivity and not value-driven
- Able to use knowledge & observations

# SA WRM System

- **Weeds are assessed within land uses**
  - avoids/reduces arguments about relative values (economic, environmental, social)
  - aquatic
  - non-arable grazing
  - crop/pasture rotation
  - irrigated crops/pastures
  - perennial horticulture
  - forestry
  - urban
  - native vegetation
- **Multiple-choice questions (e.g. high/medium/low)**
  - definitions for each level, which reduces subjectivity

# SA Weed Risk Management System

- **From the guide:**

| **1. What is the weed's ability to establish amongst existing plants?** | | *SCORE* |
|---|---|---|
| ☐ **very high** | "Seedlings" readily establish within dense vegetation, or amongst thick infestations of other weeds. | *3* |
| ☐ **high** | "Seedlings" readily establish within more open vegetation, or amongst average infestations of other weeds. | *2* |
| ☐ **medium** | "Seedlings" mainly establish when there has been moderate disturbance to existing vegetation, which substantially reduces competition. This could include intensive grazing, mowing, raking, clearing of trees, temporary floods or summer droughts. | *1* |
| ☐ **low** | "Seedlings" mainly need bare ground to establish, including removal of stubble/leaf litter. This will occur after major disturbances such as cultivation, overgrazing, hot fires, grading, long-term floods or long droughts. | *0* |
| ☐ **don't know** | | *?* |

**Please refer to the Weed Assessment Guide for help in answering questions**

| WEEDS: | Alkali sida | Bathurst burr | Bifora |
|---|---|---|---|

# A) INVASIVENESS

Answer all questions with the landuse in mind, except for question 5(a)

| | | | | | |
|---|---|---|---|---|---|
| 1. | **What is the weed's ability to establish amongst existing plants?** | 3 = very high<br>2 = high<br>1 = medium<br>0 = low<br>? = don't know | **1** | **1** | **2** |
| 2. | **What is the weed's tolerance to average weed management practices in the landuse?** These practices (or lack thereof) can be listed in the above landuse assumptions. | 3 = very high<br>2 = high<br>1 = medium<br>0 = low<br>? = don't know | **2** | **2** | **2** |
| 3. | **What is the reproductive ability of the weed:** | | | | |
| (a) | **Time to seeding?** | 2 = 1 year<br>1 = 2-3 years<br>0 = >3 years / never<br>? = don't know | *1* | *2* | *2* |
| (b) | **Seed set?** | 2 = high<br>1 = low<br>0 = none<br>? = don't know | *2* | *1* | *2* |
| (c) | **Vegetative spread?** | 2 = fast<br>1 = slow<br>0 = none<br>? = don't know | *2* | *0* | *0* |
| | | **TOTAL:** | ***5*** | ***3*** | ***4*** |
| | | **SCORE FOR 3:**<br>3 = total of 5 or 6<br>2 = total of 3 or 4<br>1 = total of 1 or 2<br>0 = total of 0 | **3** | **2** | **2** |

# Assessing Weed Risk

## Define land use & existing weed control

- **What are the outputs of the land use?**
- **Risk is the potential threat a weed poses if not targeted for a control program**
- **So agree on current, routine weed management practices (e.g. physical control, herbicides, soil cultivation)**
- **Then analyse how different weed species will perform under these existing practices**
  - means that land uses that have intensive weed control tend to score lower weed risk

# Assessing Weed Risk

## **INVASIVENESS** (~ rate of spread)

***"A relative index measure of the likely rate of spread of a naturalised plant species, being a function of the species' establishment, reproductive and dispersal abilities"***


[HB 294:2006 National Post-Border Weed Risk Management Protocol]

# Assessing Weed Risk

## INVASIVENESS (~ rate of spread)

1. **Establish amongst existing vegetation ?**
2. **Tolerance to average weed management practices ?**
3. **Reproductive ability ?**
   - time to seeding, seed production, veg. spread
4. **Natural dispersal ?**
   - birds, ground animals, wind, water
5. **Human-aided dispersal ?**
   - intentional, accidental, produce, stock

# Assessing Weed Risk

**IMPACTS** (why it's a weed)

*"The (usually negative) economic, environmental and/or social effects of a weed"*


[HB 294:2006 National Post-Border Weed Risk Management Protocol]

# Assessing Weed Risk

**IMPACTS (why it's a weed)**

1. **Reduce establishment of desired plants?**
2. **Reduce yield of desired vegetation?**
3. **Reduce quality of products/services?**
4. **Restrict physical movement?**
5. **Effect health of animals/people?**
6. **Effect environmental health?**

   - food/shelter, fire, nutrient levels, salinity, soil stability, water table

# Assessing Weed Risk

## POTENTIAL DISTRIBUTION

**(where it could grow)**

***"The geographic area that a weed could occupy if allowed to spread unhindered"***


[HB 294:2006 National Post-Border Weed Risk Management Protocol]

# Assessing Weed Risk

## POTENTIAL DISTRIBUTION

**(where it could grow)**

1. **Percentage of landuse at risk**
   - i. **Use CLIMATE prediction**
     - temperature & rainfall matching
   - ii. **CLIMATE × soil tolerances × landuse**
     - in ArcGIS using SA data layers
   - iii. **Interpet the map output ➔ % at risk**
     - broad increments (e.g. 20-40%) to cater for uncertainties in modelling

# Assess Feasibility of Containment

## Define targeted controls for species

- **Weed risk looked at species' potential under current routine management**
- **For feasibility of containment now consider how a weed species performs under targeted control practices**
  - Define what will do to control infestations of the weed (e.g. physical control, herbicides)

# Assess Feasibility of Containment

## CONTROL COSTS (per infestation)

1. **How detectable is the weed?**
   - to find new infestations
   - to delimit known infestations
2. **General accessibility of known infestations?**
3. **How expensive to control?**
   - operating costs
   - labour costs
4. **Likely level of cooperation from landholders?**

# Assess Feasibility of Containment

## CURRENT DISTRIBUTION (where is it now?)

***"The geographic area over which a weed can be found at present"***


[HB 294:2006 National Post-Border Weed Risk Management Protocol]

# Assess Feasibility of Containment

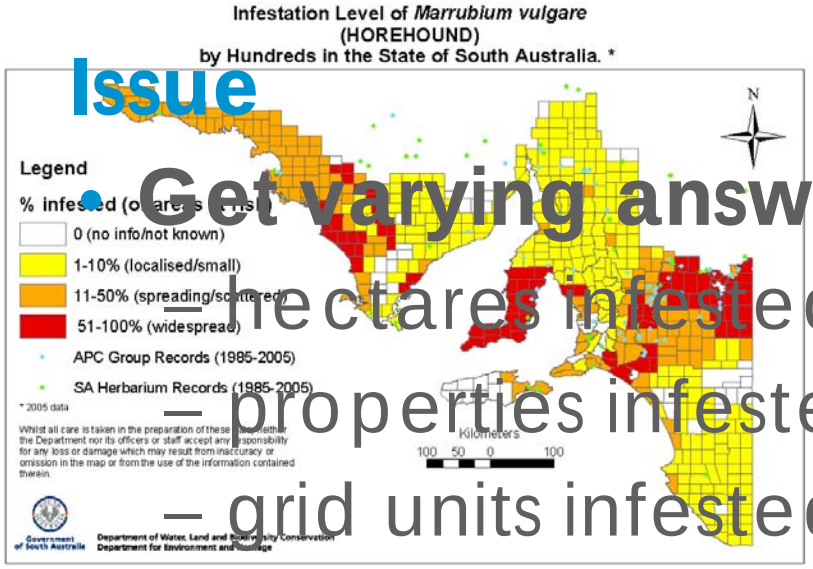
## CURRENT DISTRIBUTION (where is it now?)

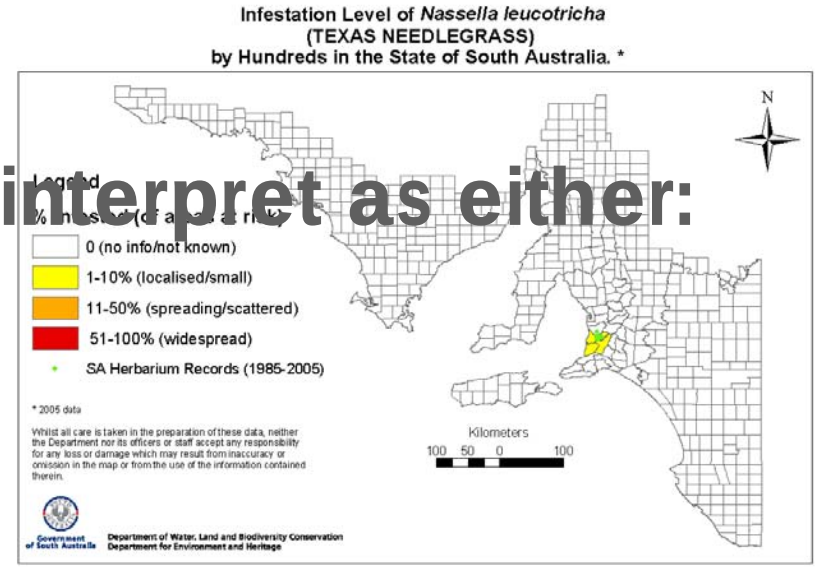
**1. Proportion (%) of landuse currently infested?**

**2. What is the pattern of the weed's distribution across the region ?** (e.g. widespread, restricted, scattered)

**Issue**

- **Get varying answers if interpret as either:**
  - hectares infested
  - properties infested
  - grid units infested



# Assess Feasibility of Containment

**PERSISTENCE (how many years?)**

1. **How effective are targeted controls ?**
2. **Minimum time to reproduction ?**
3. **Maximum longevity of propagules ?**
4. **Likelihood of ongoing dispersal ?**
   - natural dispersal
   - in cultivation

# SA Weed Risk Management System

**Comparative Weed Risk =**

**Invasiveness** (0-10)

×

**Impacts** (0-10)

×

**Potential Distribution** (0-10)

***Mimics:***

**$ / Year =**

**Ha (Year $_{i+1}$) / Ha (Year $_{i}$)**

×

**$ / Ha / Year**

×

**Ha**

# SA Weed Risk Management System

**Feasibility of Containment =**

**Control Costs** (0-10)
×
**Current Distribution** (0-10)
×
**Persistence** (0-10)

***Mimics:***

**$ =**

**$ / Ha / Year**
×
**Ha**
×
**Years**

# Determining Priorities

**To determine regional priorities and appropriate management actions:**

***Comparative Weed Risk***

**vs.**

***Feasibility of Containment***

# Priorities ➔ Management Actions

| PEST RISK | FEASIBILITY OF CONTAINMENT | | | | |
|---|---|---|---|---|---|
| | ***Negligible >113*** | ***Low >56*** | ***Medium >31*** | ***High >14*** | ***Very High <14*** |
| ***Negligible <13*** | NO ACTION | NO ACTION | NO ACTION | NO ACTION | MONITOR |
| ***Low <39*** | NO ACTION | NO ACTION | NO ACTION | MONITOR | PROTECT SITES |
| ***Medium <101*** | MANAGE SITES | MANAGE SITES | MANAGE SITES | PROTECT SITES | CONTAIN SPREAD |
| ***High <192*** | MANAGE WEED | MANAGE WEED | PROTECT SITES | CONTAIN SPREAD | DESTROY INFESTATIONS |
| ***Very High >192*** | MANAGE WEED | PROTECT SITES & MANAGE WEED | CONTAIN SPREAD | DESTROY INFESTATIONS | ERADICATE FROM REGION |

ALERT

# Management Actions → Policies

## E.g. DESTROY INFESTATIONS

- **Aims to significantly reduce the extent of the weed species in the region**
  - Detailed surveillance and mapping to locate all infestations
  - Destruction of all infestations, aiming for local eradication at feasible sites
  - Prevention of entry to region and movement and sale within
  - Must not grow
  - Monitor progress towards reduction

# Uses of the SA WRM System

- **Natural Resource Management Boards**
  - species priority setting
  - new declarations
  - investment plans
- **Coastal weeds in Adelaide**
- **Revegetation & forestry plants**
- **Adapted for NT & NSW**


# SGO DE MALEZA COMPARATIVO

## INVASIVIDAD

e todas las preguntas teniendo en mente el uso de la tierra, excepto
so de la pregunta 5(a)

**¿Cuál es la habilidad de la maleza para establecerse entre las plantas existentes?**

3 = muy alta
2 = alta
1 = media
0 = baja
? = no sé (=0)

**3**

**¿Cuál es la tolerancia de la maleza para promediar las prácticas de manejo de malezas en el uso de la tierra?**

Estas prácticas (o carencia de ésta) pueden ser mencionadas en las suposiciones arriba indicadas sobre el uso de la tierra.

3 = muy alta
2 = alta
1 = media
0 = baja
? = no sé (=0)

**1**

**¿Cuál es la habilidad reproductiva de la maleza?:**

**¿Tiempo de producir semillas?**

2 = 1 año
1 = 2-3 años
0 = >3 años / nunca
? = no sé (=0)

*2*

**¿Producción de semillas?**

2 = alta
1 = baja
0 = ninguna
? = no sé (=0)

*2*

**¿Diseminación vegetativa?**

2 = rápida
1 = lenta
0 = ninguna
? = no sé (=0)

*0*

**TOTAL:** ***4***

**ESCALA de 3:**

3 = total de 5 o 6
2 = total de 3 o 4
1 = total de 1 o 2
0 = total de 0

**2**

# Issues & Criticisms…..

- **Who does the assessments?**
  - individual vs. group
  - literature vs. observation
  - centralised vs. regional
  - technocrat vs. on-ground operator
- **How complex should WRM systems be?**
  - time invested vs. rigour
    - what $ are at stake
  - mathematical modelling vs. understanding
    - logic & transparency of math functions
    - keep it (relatively) simple
  - dealing with uncertainties, esp. knowledge

# Issues & Criticisms…..

- **How to adequately incorporate values?**
  - at present prioritise weeds within landuses, as difficult to combine landuses
  - economic vs. environmental vs. social value
  - due to lower potential distribution, get lower weed risk for species of uncommon habitats and industries
  - need a mix of “weed-led” and “site-led” programs


*Coming soon.....*
Botanic Gardens Weed Risk Assessment
1. WEED HISTORY
2. COMPETITION
3. HEALTH
4. MOVEMENT
5. ENVIRONMENTAL EFFECTS
6. EASE OF CONTROL
7. HARDINESS
8. REPRODUCTION
9. NATURAL SPREAD
10. HUMAN SPREAD