

WORKSHOP NOTES
1ST INTERNATIONAL WORKSHOP ON WEED RISK ASSESSMENT
ADELAIDE 16-18TH FEBRUARY 1999

SESSION 2 - IMPACTS

IMPACTS

Greg Cock

FACTORS	COMMENTS
Significance of area invaded:	* Thought to be too broad a topic *
- ecological	- reasonably easy to recognise
- economic	- need co-operation between
- amenity	- agencies that have data
	- policy and research
	- need consistency of data collection, quality and recording
Change to structure, function and competition of nature, communities	- at best educated guesswork
- loss of biodiversity	- a need to open up data sources
Social	- need to look elsewhere
- health/fire risk	
Genetic corruption of benign species	*this was too broad a topic* to work on
Impacts where introduced elsewhere	There is information on this
	- watch for corruptible species
	- very realistic
	- information is there to be used and the bigger the impact the more likely we are to hear about it
	- networking, databases, the WWW
Loss of markets	- generally can predict this, probably not secondary effects however
	- proclamations elsewhere are a good indicator
Impacts on economic activity	- Well documented: general "in hand"
	- need some standardisation of benefit: cost analysis
Potential distribution and speed	- based on modelling
Transience	- modelling occurring: models help the argument
	- useful, first screen
Linkages to disturbance regimes	- related to all species info
	- need for information sharing

- Social impact weighting
 - effect on indigenous communities
 - health
 - aesthetics
 - property values
 - ability to navigate water courses (aquatic weed infestations)
 - ability to irrigate
- ✓✓✓ How can the different measures of impact (environment, economic, social) be compared with each other?
- ✓ Ecosystems services – impact on clean air, clean water
- ✓✓ Bioindicators of weed impacts – can we identify any for use?
- Environmental resistance to invasion eg in a system without trees, one tree species invader has a major impact – presence of vacant niches
- ✓ Weed driven changes to disturbance regime (eg. in Northern Australia, introduced perennial grasses change the fire regime)
- ✓✓✓✓✓ Changes to ecosystem functions – eg. changes to the hydrology of a region
- Timescale / duration of impact
 - is the weed a climax species long term impact or a ruderal species short term impact?
- ✓✓ "Invasional meltdown"
 - critical mass required for a change from an environment with weeds, to an exotic dominated flora
- ✓✓✓✓✓✓ Irreversibility (of weed impact, or the environment)
- Need to know where you are in the continuum (impact of the invader, in the environment) to see and understand the (potential) impact of the next invader (ie is the ecosystem still robust enough to withstand another invasion, or will it totally collapse?)
- Beneficial weed impacts – useful for soil conservation, agricultural production, ornamental plant sales (\$), enjoyment in growing, nitrogen fixation – a lack of information on this, for cost: benefit analysis
- Visibility of the problem – eg with some aquatic plants, the problem may only be noticed once the water body has been covered by the weed; eg. tussock grasses "look native"

∴ Most important factors to assess weed impact:

- economic impact measures (various - 8 different ones listed)
- irreversibility of impact on the environment/ecosystem
- environmental impacts (various measures, specifically singled out number of threatened species, impact on wildlife habitat)
- changes to ecosystem functions

ISSUES

- how can the different measures of impact be compared with each other? (relativity/weighing of environmental, economic and social impacts?)
- How are we defining "factors" – are they characteristics of the:
 - weed?
 - environment?
 - impact level/size?
- Where do we draw the line between having all the desirable/necessary research information to make the best/ultimate decision, and having enough information to start making worthwhile decisions now on exclusions/inclusions
- Measures of weed abundance can be difficult to get in practical terms (limiting factors include accuracy of data, having the "people power" to do it, having adequate physical resources, money and time, detectability of the weed)
- Marine weeds > need to remember and include these (in discussion, policy, research etc)
- How to compare the different measures of impact? How to relate (or get relativity between) the environmental, economic and social impacts (need G.U.T. = general unification theory!)

EASE OF USING THESE FACTORS

- Economic impact/cost of control
 - easier to do, more work has already been done on this
- Environmental impacts
 - difficult, some species behaviour is unpredictable, or unknown for particular ecosystems
- Irreversibility
 - difficult
 - it's a concept, and will be difficult to communicate (to policy makers) and incorporate into policy

- Ecosystems function
- possible
- can measure the loss/value of tangibles (eg water resources); examples of damage exist; can look at size of impact of functional groups on ecosystems

RESEARCH NEEDS

- Need to use a different term so that funders don't turn off (eg "Adaptive Management"?)
- Need lots of information on weed impact in different environments/ecosystems
- Traits/patterns of species invasions and impacts use GIS to look for spatial patterns associated with different factors
- Channel existing information on weed distributions, impacts etc. into an accessible data base (out of heads and into records/published literature)
- Case studies developed for ecosystems services issues (will help translate research into policy - \$ impact)
- Look at human perception of impact vs "real" impact (> can perceptions be used as a reliable indicator?)

POLICY NEEDS

- Information on cost of control relative to value (productivity) of the land
- Relationship between weed impact, sustainable land and water management and international trade
- Look at the problem of level of scale – eg. in Australia the states can have differences in policy on impacts
- Look at who has responsibility to control and pay costs
 - landowner/manager (regulation) vs. government (controls standard of control achieved)

**IMPACT
SESSION 2
GROUP NO. 5
MARK WILLIAMS**

IMPORTANT FACTORS

1. Canopy dominant spp
2. Allelopathy
3. Parasitism
4. Ability to change structure and function of ecosystem
5. Potential distribution
6. Known impacts elsewhere
7. Amenity/Cultural
8. Change herbicide susceptibility (see Danny)
9. Human/Animal Health
10. Potential off-target damage from control

RATIONALE

(Following numbers from Important Factors)

1. Architecture leaf area can determine impact
2. - Fire regime - hydrology - N fixation - Stabilisation
3. - distribution - Pop. density - Unit damage
6. Agriculture, Forestry, Biodiversity etc

HOW READY CAN BE USED IN WEED ASSESSMENT

(Following numbers from Important Factors)

1. Data can be collected can be used in WRA
2. Measurable difficulty in using a factor
3. Data available/models
4. Can be used
5. Can be measured based on significant spp. overseas - ecological release from natural enemies
6. Can be readily measured and included
7. Uncertain
8. Models available - further research required
9. Yes – some – based on overseas experience
10. Difficult

GAPS

- Ability to assess ecological / economic damage
- Lack of taxonomic keys

- Lack of distribution maps
- Community education
- Database of cost effective strategies

RESEARCH AND POLICY IMPLICATIONS – FURTHER ACTION TO PROGRESS

- Policy makers have a dollars focus on decision making process
- Ecologists need to be involved in decision making process resulting from WRA
- Needs to strengthen links between field experience and ecological theory
- Needs to be better integration of information from Researchers and policy makers
practical decision tools

IMPACTS
GROUP 1
Rebecca Lang

ISSUES

- Almost impossible to predict accurately
- Do we need a mathematical model that is definitively accurate OR do we need something to calculate probability?
- The needs of WRA aren't being met by theoretical modelling
- Impact
 - is a human value
 - is rarely quantified in the literature, so we're working with perception and gaps in information
- Because of the 'value' there are competing impacts
- We know more (but still very little) about 'post' impact than we do about 'pre' impact
- There is a gap between our knowledge of individual factors and a calculation of probability/risk

WHAT DO WE KNOW ABOUT BOTH PRE AND POST-INTRODUCTION ?

- The biological and ecological species characteristics that effect impact include:
 - Growth habit
 - Its weediness elsewhere – literature searches etc
 - Persistence
 - Distribution – global/local
 - known and potential
 - Ecological range
- Effect on species composition (can be readily measured)
- What effect it has on system processes – what are the things impacted on, what are the consequences?
 - The effect it has on a system is the key for environmental weeds
- Human health
- Tourism
- Aesthetics
- Genetic pollution
- Animal Health

- Biodiversity
- Agricultural cost
- For post-introduction, other predictive characteristics include:
 - Rate of increase (individuals, area covered, etc)
 - Interactions with other species
- For post-introduction, consequences include:
 - Economic factors
 - Capacity to control/weed control mechanisms available

ISSUES

- The distinction between pre- and post- is about the quality of the data available, which influences the ability to predict
 - best predictor today is still whether it has caused impact elsewhere
- We need a predictive ability with plants that haven't been recorded as impact elsewhere; for that, go back to biological and ecological characteristics for invasiveness.

WHAT DO WE DO ?

- Make what is known available in a 'standard' format (eg a simple scoring system) that is simple and understandable
- Continue the debate about defining impact - economic, social, environmental
- Continue debate about who/what is risk assessment for?
- Define Impact – a suggested definition:

$$I_{\text{impact}} = R_{\text{range}} \times A_{\text{abundance}} \times E_{\text{effect}}$$

- Both **R** and **A** are 'relatively' straight forward/easy to measure
- **E** – lots of things to measure so need to choose what to measure
- For **E** – are there generic categories that we can measure?
- Lots of information on biological attributes – if it's got these attributes it will produce an effect, but not sure what the effect will be.

Need to work from this towards the equation. To continue work on effect (**E**) begin with what's happening where you are then elsewhere, then biological characteristics;

work on a system with scientific foundation, looks at known invasive species to predict – relative risk assessment.

IMPACT

GROUP 4

Vicki Linton

IMPORTANT FACTORS

- use cost:benefit later, use risk (analogy, fear) early
- resource availability
 - eg. hydrological cycles, nutrient cycles, erosion
- land use (including amenity values)
- money
- biodiversity (genetic through to community)
- fire regime
- social perceptions
- hosts for diseases, pests and natives
- distribution
- injurious to humans and animals
- production

GAPS

Identify needs at early stages

NON-PLANT INTRINSIC FACTORS

- also important
- cost of control
- feasibility of control
- policy
- social values – land – resources

- harvesting
- conflict of interest (industry)
- established industries

UNDERPINNING ISSUES

- poor measures
- predicative powers weak
- what was the ecosystem?
- relationship between damage and density
- grandfather syndrome (learning the wrong things / but we've always controlled it)
- lack of visual impact
- scale dependant.

EMERGING THEMES

- difficult to measure
- control not driven by substantive hypothesis
 - eg. no monitoring or evaluation of response other than killing the weeds
- when/if get return on money
- start on sleepers not concentrate on established.

HOW READILY USED IN RISK ASSESSMENT

- easy at one level with yes/no answer, beyond that have problems
- okay for barrier protection, difficult for prioritising
- needs to be comparative, peer support, qualitative
- relative importance changes with different situations

WHAT TELLS US ABOUT USING IMPACTS IN WEED RISK ASSESSMENT

- got to be in it (makes it a weed)

- For barrier = easy
- Priority = subjective, qualitative

RESEARCH / POLICY – FURTHER ACTION

- Need to know when to jump in?, cut off?
- Spread of money between barrier and priority weeds
- Will direct funding not background knowledge is rubbery
- Need solid scientific studies on impacts on weeds
- Risk assessment specific for land use.

FACILITATORS COMMENTS

- Impact outside plant-based "comfort zone"
 - therefore difficult to define focus
 - getting into more social factors
- Key differences whether system is for barrier control or prioritising weeds

IMPACT

Mary Reiger

FACTORS

1. Impact elsewhere
2. Combined factor - rate of spread, invasiveness elsewhere, potential range and abundance
3. Scale and type of damage,
 - ie. environmental damage, impact on human health
4. Invasiveness elsewhere, how readily controlled
5. Irreversibility of impact
 - type of harm
 - not being able to control

ARE THESE FACTORS USEFUL AND USEABLE?

1. Impact elsewhere ✓✓
 - good factor, but the agricultural environment is easier to assess than the natural environment
 - makes assessment of impact difficult if we don't have climate information, or information on the ecosystem, pests, competitors etc
1. Rate of spread etc.
 - good factor but need to use experience and literature.
1. Scale and type of damage
 - information on this is not readily available
 - assumptions need to be made to gain information from small populations
 - need time
 - some species the information is not available
 - need experience and need to talk to experts.
1. Invasiveness elsewhere ✓
 - need experience and literature.
1. Irreversibility of impact
 - not easy to gain information on
 - experience elsewhere is valuable
 - assess control techniques or even change the technique.

POLICY RESEARCH

- Policy makers need values attached to things
 - ie. a benefit/cost ratio
 - but these estimates ignore irreversible damage and social issues
- Values can underestimate a problem
- Long-term impacts are undervalued compared with short-term impacts
- “Precautionary principle”

SUMMARY FOR IMPACTS (From Thursday lunch butchers paper)

1. IMPORTANT FACTORS TO CONSIDER TO ASSESS WEED IMPACT

- Canopy dominant species
- Allopathy
- Parasitism
- Ability to change structure / function / composition / genetic integrity of ecosystem (eg. N fixation)
- Potential distribution
- Known impacts elsewhere
- Risk, early in process (analogy to fear); cost:benefit later
- Resource availability eg hydrogeological cycles, nutrient cycles, erosion
- Land use (including amenity values)
- Money
- Biodiversity, number of threatened species
- Changes to disturbance regimes eg fire
- Social impacts – health, aesthetics, indigenous community, property values, ability to access resources
- Injuries to animals
- Social perceptions
- Hosts for diseases, pests, native flora and fauna
- Significance of area invaded (ecological, economic, amenity)
- Genetic corruption of benign species
- Loss of markets
- Impact on economic activity – loss of markets, production losses, rising costs
- Rate of spread
- Transcience
- Links to disturbance regimes
- Range x abundance x per capita (weed) impact
- Cost of control and education
- Effectiveness of control methods
- Adaptation of changing land use patterns
- Bioindicators
- Environmental resistance (or lack of) to invasion
- Time scale of impact (climax species vs ruderal species)
- Invasional meltdown - where are you in the continuum (critical mass, opening up plant community to further invasions)
- Irreversibility
- Beneficial weed impacts – soil conservation, ag products, ornamentals, nitrogen fixation
- Visibility / detectability of the problem
- Invasiveness elsewhere
- Scale of damage

2. HOW READILY CAN THESE FACTORS BE USED IN RISK ASSESSMENT

Readily useable:

- Impact elsewhere (agricultural easier to assess than natural environment)
- Rate of spread (need experience and literature)
- Invasiveness elsewhere
- Economic impact, cost of control
- Parasitism
- canopy dominance
- Ability to change structure and function of ecosystems
- Amenity/cultural effects
- Human/animal health impacts

Not readily useable:

- Scale and type of damage
- Irreversibility
- Environmental impacts
- Effects on ecosystems functions
- Allopathy
- Off-target damage from control

3. EMERGING ISSUES/NEEDS

- Almost impossible to predict impact accurately
- Where do we draw the line between having all the research info necessary for a decision, and having some information to start making worthwhile decisions now on exclusions/inclusions
- The needs of weed risk assessment aren't being met by the theoretical modelling
- Marine weeds not dealing with these in discussion, policy, research
- How do we compare the different measures of impact (relativity between environmental, economic, social impacts (G.U.T.) – need to continue the debate!
- Gap between knowledge of individual factors and calculation of probability / risk
- Need a solid scientific studies on impacts of weeds
- Impact assessment will direct funding allocation, but the background knowledge is rubbery ie. impact assessment for barrier decisions is easy, but for priority decisions is subjective and qualitative
- Need a lot more information on weed impact in different ecosystems
- Need to channel existing information into an accessible data base

- Need case studies
- Attempts to put value / cost on a problem can underestimate the impact
- Research into "human perception" as a measure of impact (could it be used as a reliable indicator?)
- Need a predictive ability with plants that haven't been recorded as having an impact elsewhere (> do we go back to biological and ecological characteristics of invasiveness?)
- Gap between knowledge of individual factors and a calculation of probability/risk