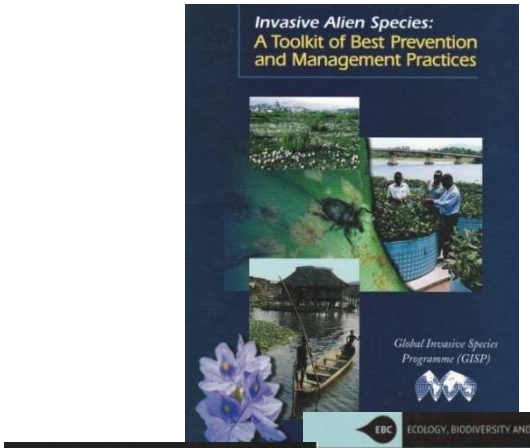
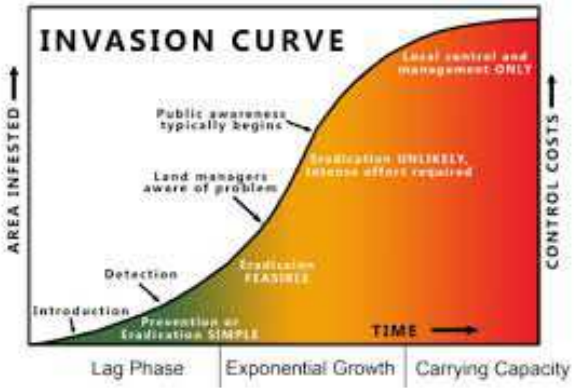
Invasive alien species management

- Control methods (manual, mechanical, chemical, biological, IPM…) and strategies (from eradication to containment and mitigation)
- Prevention, detection & surveillance (biosecurity/quarantine measures, WRA, monitoring…)
- Legislation (laws, rules, codes of conduct, « noxious » species/« black » lists…)
- Research (biology, ecology, genetics, economy, social sciences…)
- Communication & education (public awareness, curricula, media…)





Invasive plants vs animals control

- Plants don't move!
- Plants don't think!
- Plant's don't scream!
- Plants are not furry and funny!

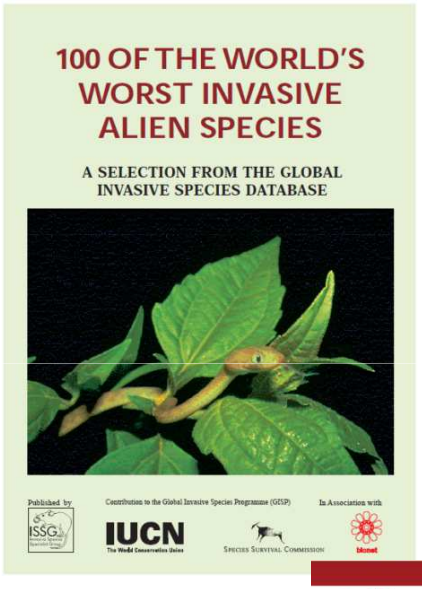
- Vegetative reproduction (cuttings, resprouts, bulbils …)
- Strong reproductive capacity (up to millions of seeds/yr)

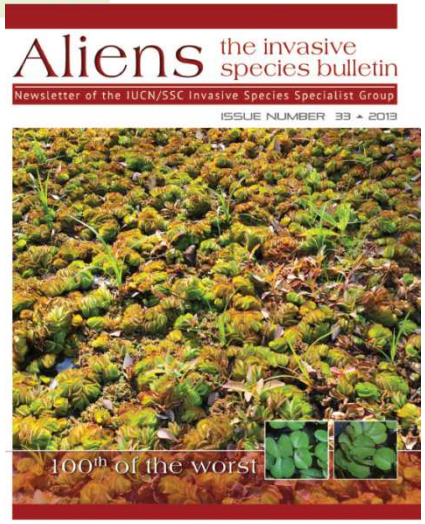
BUT…

- Long-distance dispersal (minute seeds, spores, winged-seeds, pappus-bearing achenes…)
- High seed longevity/life span (> 10-100 yrs)
- Beautiful and/or useful!

They represent a high proportion of IAS

37% of aquatic and land plants





ISSG
Invasive Species
Specialist Group

The cause homogeinization of island biota

Critical issues and new challenges for research and management of invasive plants in the Pacific Islands

JEAN-YVES MEYER[1]

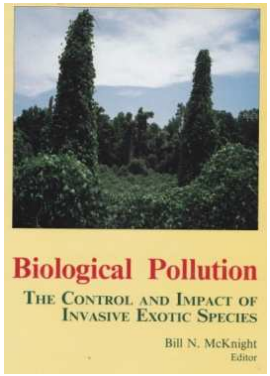


Table 1. Comparison between native and alien flora (flowering plants and ferns) in selected Pacific tropical islands (by size of terrestrial area) and number of naturalized and invasive alien plants (including dominant or major IAP).

Island or island group	Area (km²)	Native flora (number of indigenous species)	Alien flora (number of introduced species)	Naturalized alien plant species	Invasive alien plant species	Dominant IAP
New Caledonia	19 060	3 261[a]	2 008[b]	597[b]	97[c]	67[b]
Fiji	18 270	1 622[d]	977[d]	461[d]	107[e]	30[f]
Hawai'i	16 880	1 138[g]	8 134[h]	1 104[i]	469[i]	86[j]
Galápagos	7 900	550[k]	870[l]	229[l]	109[l]	22[l]
French Polynesia	3 519	885[m]	> 1 700[n]	593[n]	-	57[n]
Cook Is.	238	296[o]	997[o]	333[o]	76[p]	12[q]
Rapa Nui (Easter Island)	166	48[r]	370[s]	180[s]	-	36[s]
Wallis et Futuna	142	351[t]	338[u]	151[u]	-	18[u]

[a]Jaffré *et al.* 2004, [b]Meyer *et al.* 2010, [c]Hequet *et al.* 2009, [d]Brownlie 1977 and Smith 1996, [e]GISD, [f]Meyer 2000, [g]Wagner *et al.* 1999, [h]Staples and Herbst 2005, [i]Staples and Cowie 2001, [j]Smith 1985, [k]Mauchamp 1997, Trueman *et al.* 2010, [m]Florence *et al.* 2007, [n]Fourdrigniez and Meyer 2008, [o]McCormack 2007, [p]Space and Flynn 2002, [q]Meyer 2004, [r]Dubois *et al.* 2013, [s]Meyer 2008, [t]Morat *et al.*, [u]Meyer *et al.* 2010

[1]Délégation à la Recherche, Government of French Polynesia, B.P. 20981 Papeete, Tahiti. jean-yves.meyer@recherche.gov.pf

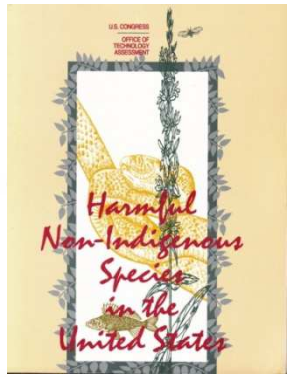
PACIFIC CONSERVATION BIOLOGY Vol. 20(2): 146–164. Surrey Beatty & Sons, Sydney. 2014.

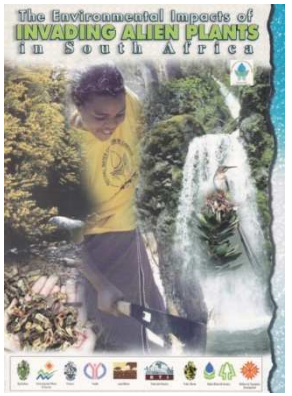
They cause huge economical costs

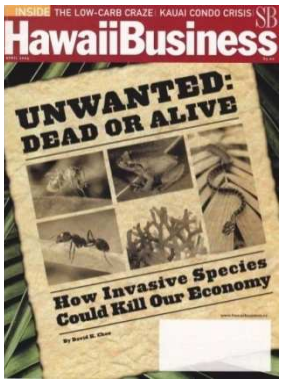
BOX 5

INDICATIVE COSTS OF SOME INVASIVE ALIEN SPECIES (COSTS IN US$)

SPECIES	ECONOMIC VARIABLE	ECONOMIC IMPACT	REFERENCE
Introduced disease organisms	Annual cost to human, plant, animal health in USA	$41 billion per year	Daszak et al., 2000
A sample of alien species of plants and animals	Economic costs of damage in USA	$137 billion per year	Pimentel et al., 2000
Salt Cedar	Value of ecosystem services l ost in western USA	$7-16 billion over 55 years	Zavaleta, 2000
Knapweed and Leafy spurge	Impact on economy in three US states	$40.5 million per year direct costs $89 million indirect	Bangsund, 1999; Hirsch and Leitch, 1996
Zebra mussel	Damages to US and European industrial plants	Cumulative costs 1988-2000 =$750 million to 1 billion	National Aquatic Nuisances Species Clearinghouse, 2000
Most serious invasive alien plant species	Costs 1983-92 of herbicide control in Britain	344 million/year for 12 species	Williamson, 1998
Six weed species	Costs in Australia agroecosystems	$105 million/year	CSIRO, 1997 cited in Watkinson, Freckleton and Dowling 2000
Pinus, *Hakeas*, and *Acacia*	Costs on South African Floral Kingdom to restore to pristine state	$2 billion	Turpie and Heydenrych, 2000
Water hyacinth	Costs in 7 African countries	$20-50 million/year	Joffe-Cooke, cited in Kasulo, 2000
Rabbits	Costs in Australia	$373 million/year (agricultural losses)	Wilson, 1995 cited in White and Newton-Cross, 2000
Varroa mite	Economic cost to beekeeping in New Zealand	$267-602 million	Wittenberg et al,, 2001







They can transform natural ecosystems

Fire regime

Light availability & soil erosion

Light & water regime

Nutrient cycling

Plant succession

Water flow & quality

…and it's just the beginning!

Twelfth Australian Weeds Conference

SLEEPER WEEDS

Richard Groves
CSIRO Plant Industry and CRC Weed Management Systems,
GPO Box 1600, Canberra, ACT 2601

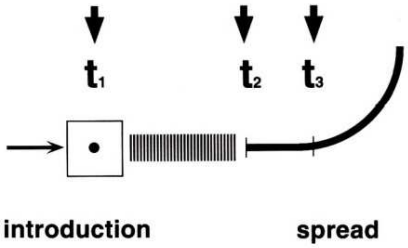


Fig. 1. The process of biological invasions including two kinds of lag phases: *(a)* the period between the first introduction to an area and the first spread (t2-t1), *(b)* the period preceding the switch to a significantly higher rate of population growth (t3-t2).

Diversity and Distributions, (Diversity Distrib.) (2004) 10, 333–347

BIODIVERSITY RESEARCH

Beautés fatales: Acanthaceae species as invasive alien plants on tropical Indo-Pacific Islands

Jean-Yves Meyer* and Christophe Lavergne†

Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean)

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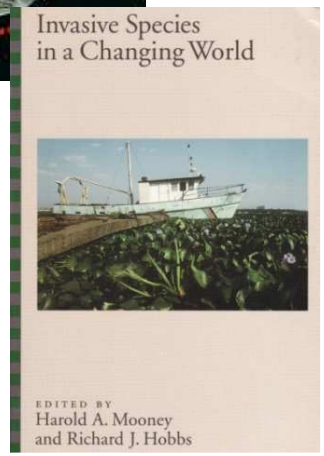
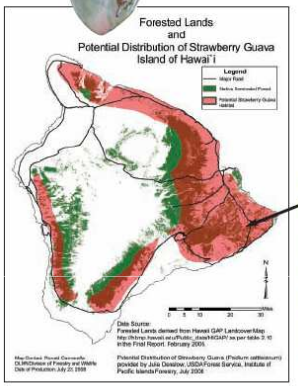


They are a source of conflicts…

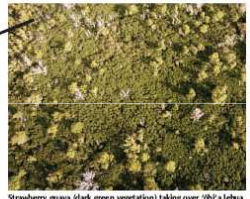


CALL TO ACTION

Scientists and land managers are preparing to release a Brazilian scale insect, *Tectococcus ovatus*, to help slow the spread of invasive strawberry guava (*Psidium cattleianum*), also known as *waiawī*, in Hawai'i. Since its introduction in 1825 as an ornamental plant, strawberry guava has invaded Kaua'i, O'ahu, Moloka'i, Maui, Lāna'i, and Hawai'i, smothering our native forests, reducing the amount of water flowing to our aquifers, and spreading fruit flies to vulnerable crops.

There are no natural controls in Hawai'i for strawberry guava. With conventional management tools alone proving insufficient to contain it, strawberry guava has become one of the most serious threats to our quality of life in Hawai'i, affecting countless rare and endangered species, essential watersheds, the Native Hawaiian culture, our agricultural industry, as well as public access for subsistence gathering and recreation.

Can we continue to use strawberry guava while limiting the damage it is causing? Yes. Extensive tests conducted over 15 years in both Hawai'i and strawberry guava's native habitat, Brazil, indicate that we can safely and economically slow the vigorous growth of strawberry guava with the help of one of its native parasites, *T. ovatus*, without causing harm to other species, or threatening our valuable food crops.



Strawberry guava (dark green vegetation) taking over 'Ohi'a lehua and other native trees at Wao Kele O Puna. Photo by: G. Asner

Strawberry guava is a threat to 90% of remaining forested lands statewide

samoaobserver

November 7, 2017

16 SOCIETE

LA PLAINE-DES-PALMISTES DU 4 AU 6 JUIN

Le goyavier fait la fête

La fête des goyaviers déménage. Elle se déroulera du 4 au 6 juin sur le nouveau site du Bassin Cadet, à La Plaine-des-Palmistes. Plus de place, moins d'embouteillages et davantage d'animations.

Fervent défenseur du goyavier, Jean-Luc Saint-Lambert faisait hier l'éloge de l'emblème de sa commune, lors d'une conférence de presse. D'abord, il présente le nouveau cadre de la manifestation : le site du Bassin Cadet, près de la salle des fêtes, avec vue imprenable sur la cascade Biberon.

Ensuite, il rappelle que l'association Goyavier, cultures et traditions fait des mains et des pieds pour promouvoir une filière en devenir. Il rappelle que des étudiants se sont penchés sur la mise en place d'une unité de production de pulpe et de pré-transformation. « Ce fruit rapporte davantage que la canne. Une tonne de goyaviers rapporte mille euros ! » insiste le maire. Mais il ne voit pas que le volet économique puisque c'est l'occasion pour son village d'accueillir des visiteurs de toute l'île. Il se vend des tonnes et des tonnes de fruits pendant ces journées festives qui cette années auront lieu du 4 au 6 juin.

Un plateau artistique de choix a été concocté avec la part belle aux artistes locaux encore méconnus mais qui selon les organisateurs attirent un public nouveau. Manèges, rencontres sportives, produits du terroir seront à l'honneur pendant les trois journées.

L'édition n'est même pas entamée que déjà le maire se prend à rêver de celle de l'année prochaine qu'il verrait bien devenir « indianocéanique » avec une invitation de Maurice et de Madagascar.

M. L.

La fête des goyaviers : l'occasion pour le maire de promouvoir ce fruit qui représente pour lui une filière d'avenir pour son village. (Photos M.L.)

IUCN

Guidelines on Biofu
Invasive Species

USDA Forest Service

INSTITUTE OF PACIFIC ISLANDS FORESTRY

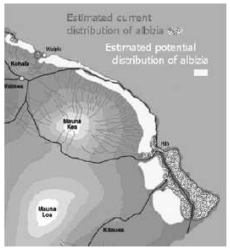
Comfort Sumida, Flint Hughes, Kathleen Friday

ALBIZIA

THE TREE THAT ATE PUNA

November 2005

(Falcataria moluccana; synonyms *Albizia falcataria, Paraserianthes falcataria)*



Distribution of albizia on the island of Hawaii (above). The trees are most readily identified as those forming the "tree tunnel" near Lava Tree State Park (below).

Invasive species could be turned into renewable energy

By Ioana Tupa'i , 31 October 2017

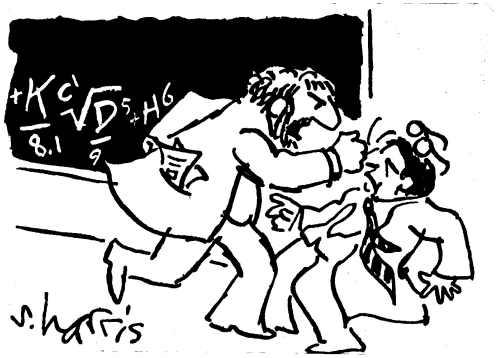
…and scientific debates!

Ecology, 86(1), 2005, pp. 42–55

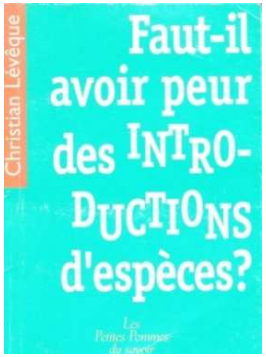
ARE INVASIVE SPECIES THE DRIVERS OR PASSENGERS OF CHANGE IN DEGRADED ECOSYSTEMS?

ANDREW S. MACDOUGALL[1] AND ROY TURKINGTON

Department of Botany, University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada



« Ah, tu veux une preuve ?
Tiens, en voilà une, de preuve ! »



BIOLOGICAL CONSERVATION 141 (2008) 2969–2983

available at www.sciencedirect.com

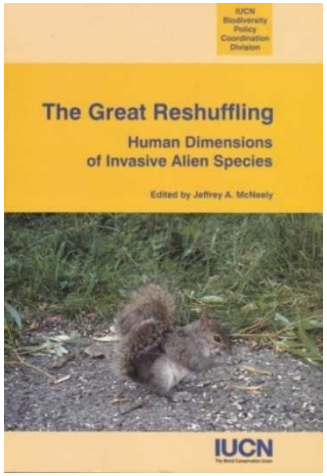
ScienceDirect

journal homepage: www.elsevier.com/locate/biocon

Social perceptions of the impacts and benefits of invasive alien species: Implications for management

Marina García-Llorente, Berta Martín-López, José A. González, Paloma Alcorlo, Carlos Montes*

Social-Ecological Systems Laboratory, Department of Ecology, c. Darwin, 2, Edificio de Biología, Universidad Autónoma de Madrid, 28049 Madrid, Spain



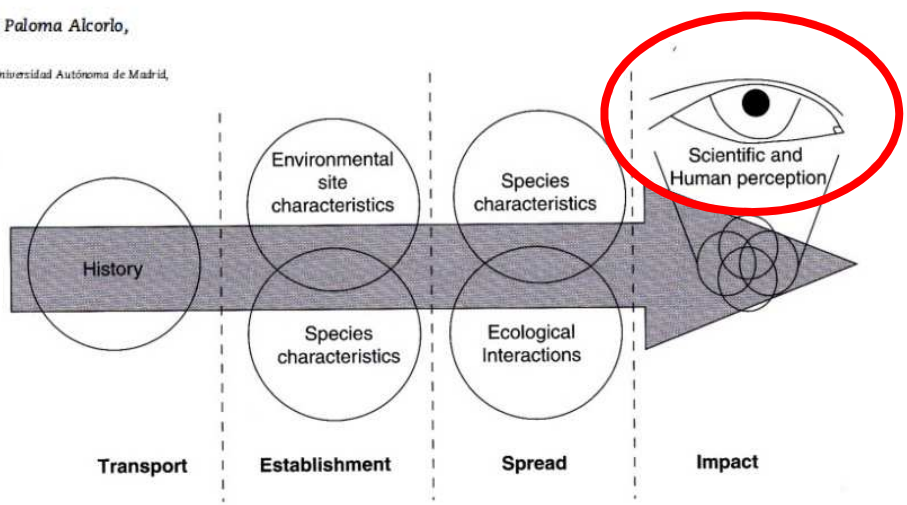


Figure 10.4 **Success at each stage may depend on several types of factors, may affect subsequent stages, and will affect impact. Final impact is also dependent on our perception. This figure combines the Venn diagram of Figure 10.1 and the concepts from Equation 7.3.**

A forester engages in efforts to eradicate the velvet tree *Miconia calvescens* in Hawaii.

Don't judge species on their origins

Conservationists should assess organisms on environmental impact rather than on whether they are natives, argue **Mark Davis** and 18 other ecologists.

154 | NATURE | VOL 474 | 9 JUNE 2011

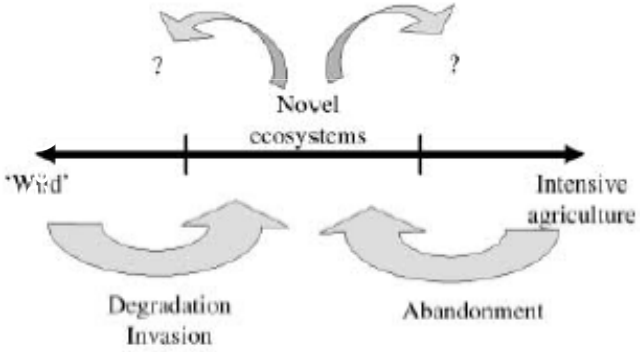
Novel ecosystems: a new paradigm in ecology?

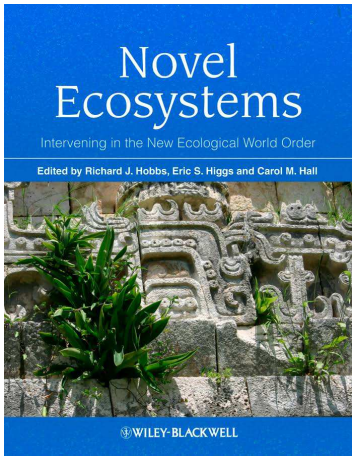
Global Ecology and Biogeography, (Global Ecol. Biogeogr.) (2006) **15**, 1–7

ECOLOGICAL SOUNDING

Novel ecosystems: theoretical and management aspects of the new ecological world order

Richard J. Hobbs[1]*, Salvatore Arico[2], James Aronson[3], Jill S. Baron[4], Peter Bridgewater[5], Viki A. Cramer[1], Paul R. Epstein[6], John J. Ewel[7], Carlos A. Klink[8], Ariel E. Lugo[9], David Norton[10], Dennis Ojima[4], David M. Richardson[11], Eric W. Sanderson[12], Fernando Valladares[13], Montserrat Vilà[14], Regino Zamora[15] and Martin Zobel[16]

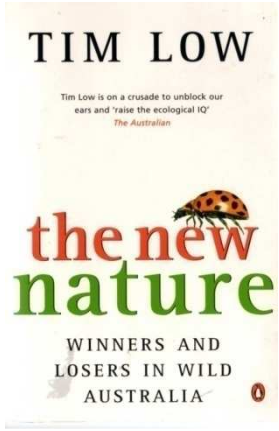




THE NEW NORMAL

As though working through the five stages of grief, more and more ecologists are reluctantly accepting that we live in a human-dominated world. And some are discovering that patchwork ecosystems might even rival their pristine counterparts.

Conservation Magazine • Vol. 11 No. 2 | April–June 2010



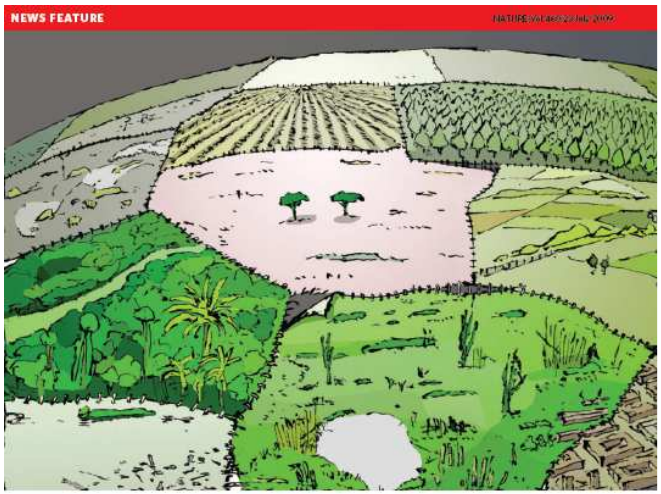
Conservation Biology

Review

The Potential Conservation Value of Non-Native Species

MARTIN A. SCHLAEPFER,*† DOV F. SAX,‡ AND JULIAN D. OLDEN§

*State University of New York, College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210, U.S.A., email mschlaepfer@esf.edu
†INRA, Ecologie et Santé des Ecosystèmes, 35042 Rennes, France
‡Department of Ecology and Evolutionary Biology, 80 Waterman Street, Brown University, Providence, RI 02912, U.S.A.
§School of Aquatic and Fishery Sciences, University of Washington, Box 355020, Seattle, WA 98195, U.S.A.

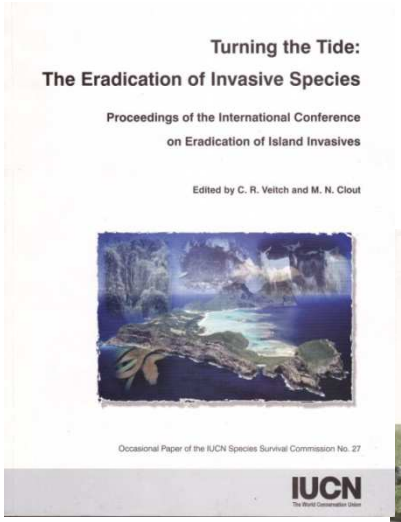


RAGAMUFFIN EARTH

A small group of ecologists is looking beyond the pristine to study the scrubby, feral and untended. **Emma Marris** learns to appreciate 'novel ecosystems'.

They are difficult to eradicate!

- Remote and inaccessible areas
- Persistent soil seed bank =>Re-establishment
- Re-invasion by other weeds!



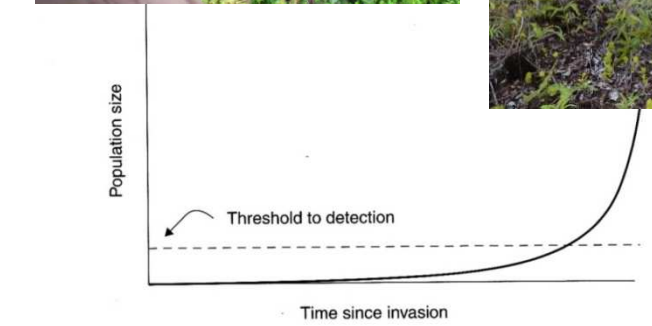
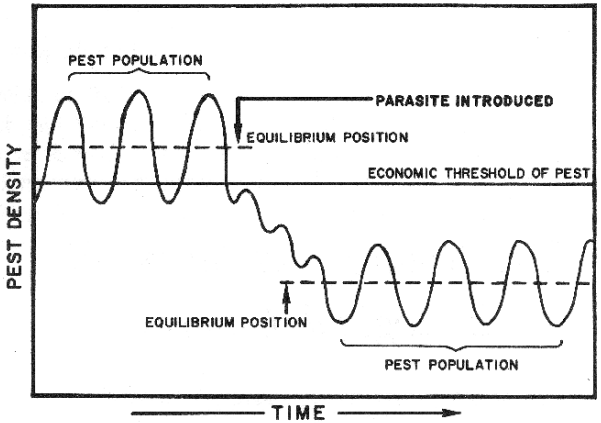


Figure 8.8 **Illustration of how geometric/exponential population growth can lead to a lag time. The time between arrival and the surpassing of the detection threshold is the lag. Notice that a constant per capita rate of increase may take a long time to reach noticeable proportions (threshold population size) and then appears to explode. The dynamics are the same at all points, but the abundance of organisms makes per capita growth much more noticeable after many years.**

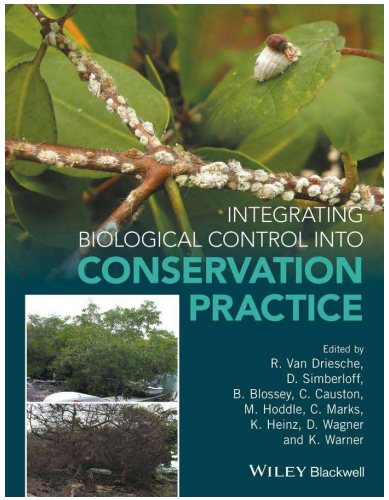
Is biological control safe (and better)?

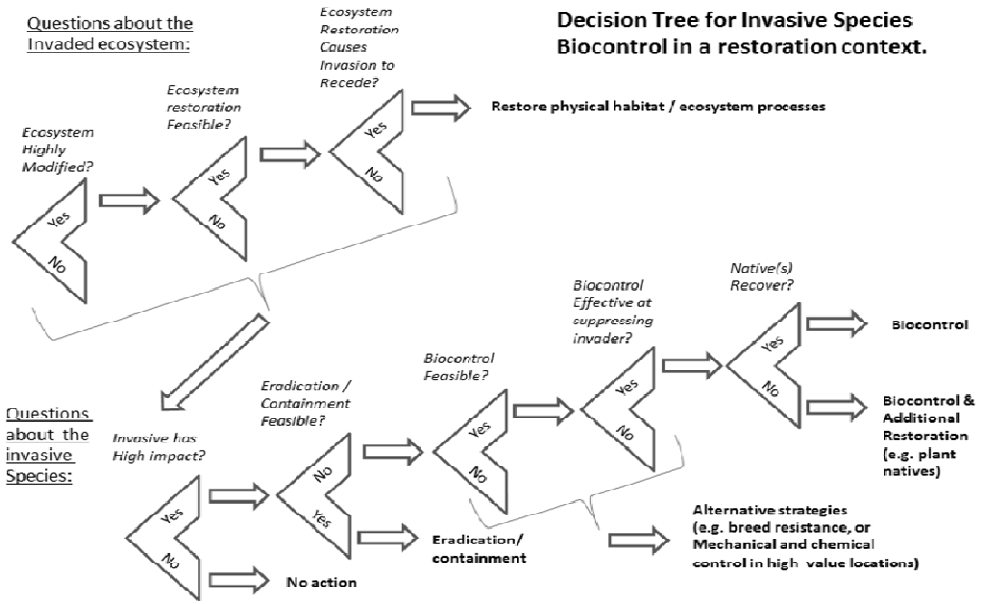


BioControl
DOI 10.1007/s10526-011-9419-x

Fighting pathophobia: how to construct constructive public engagement with biocontrol for nature without augmenting public fears

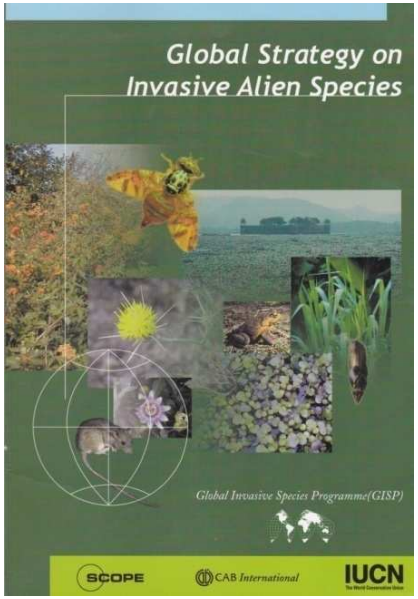
Keith Douglass Warner

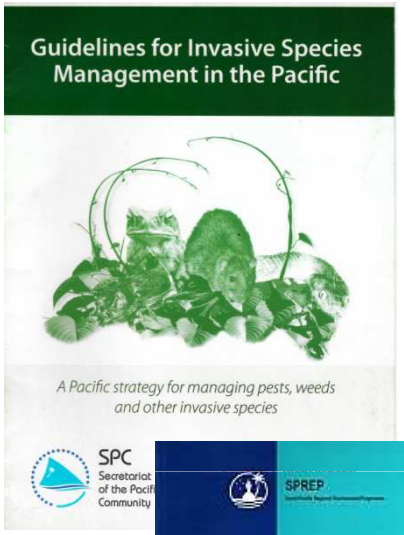


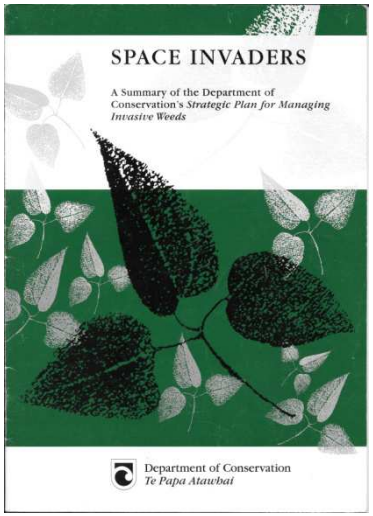


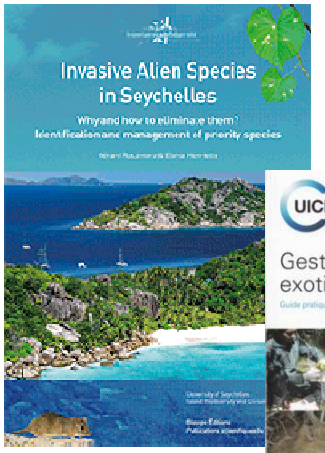
Decision Tree for Invasive Species Biocontrol in a restoration context.

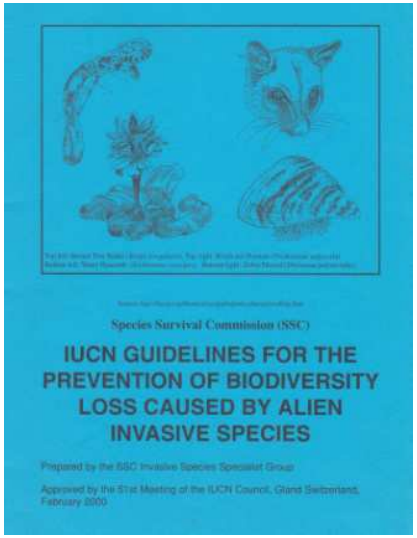
We have strategies & guidelines

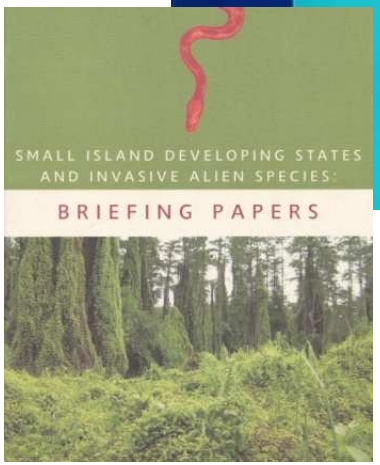


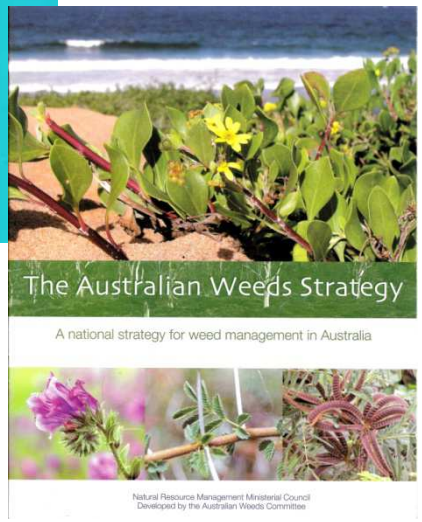




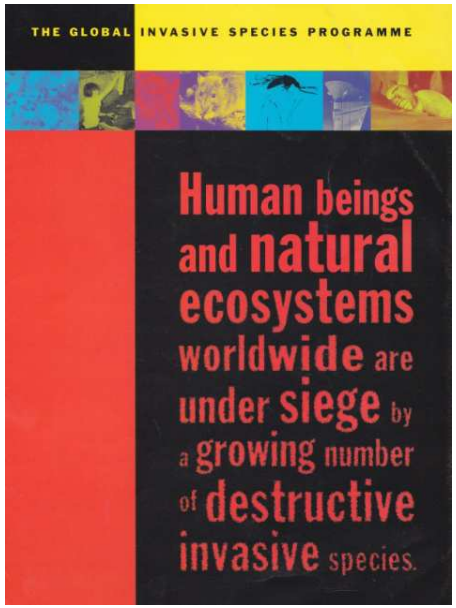


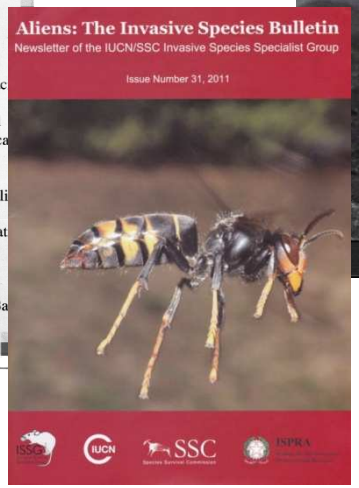


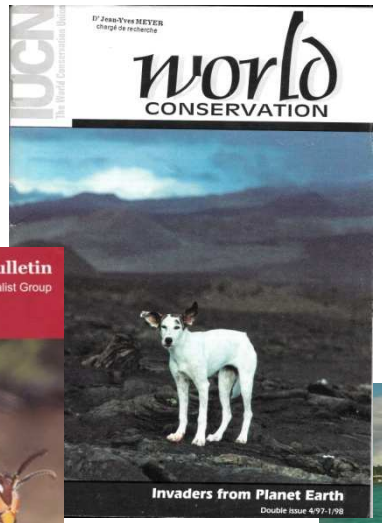


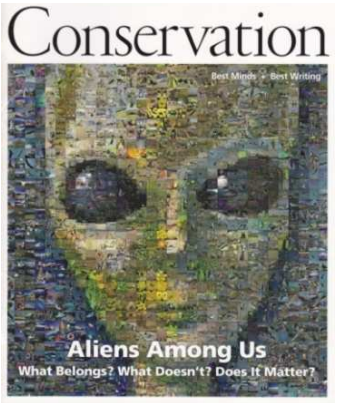


We are connected (networks & newsletters)









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SPREP

PACIFIC INVASIVES LEARNING NETWORK PILN

Pacific INVASIVES INITIATIVE

We have the info (databases & websites)

What did we learn and what do we need?

- Prioritization (target species, areas and ecosystems) is essential
- Long-term funding support is crucial
- People's commitment is paramount
- Collaboration between researchers and managers is important

- We need a better understanding of island ecosystem dynamics (natural and human disturbances, biotic interactions…)
- We need more studies on their ecological/socio-economical/health impacts (e.g. cost-benefit analysis)
- We need to integrate invasive species management to ecosystem restoration and global changes projects
- We need to have the full support of local communities and authorities!

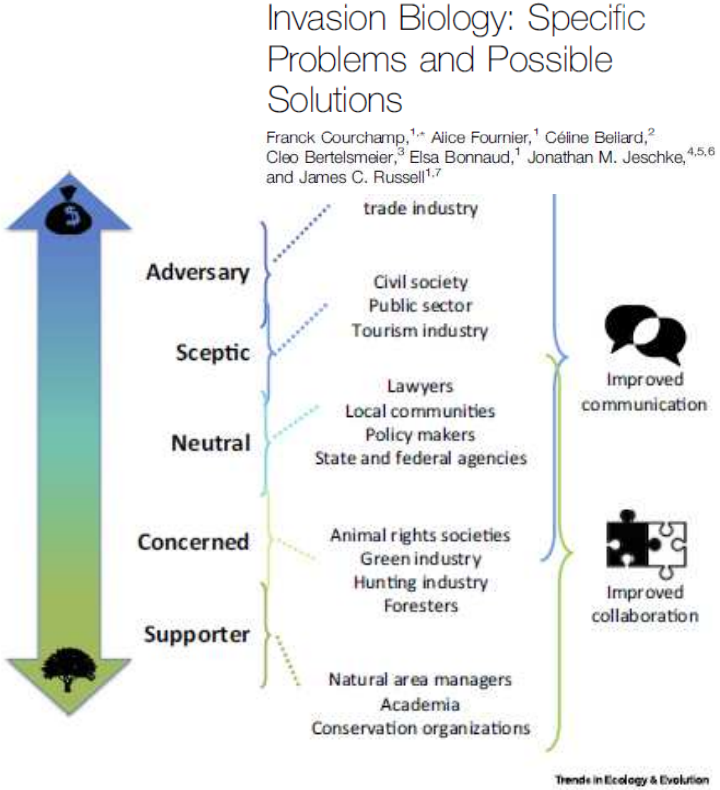

Figure 2. Different Types of Stakeholders with which Invasion Biologists Interact. Their position regarding biological invasions is not always in consensus and can be context-specific.