Invasive Narratives and the Inverse of Slow Violence: Alien Species in Science and Society

Article *in* Environmental Humanities · January 2015

DOI: 10.1215/22011919-3616317

CITATIONS
38

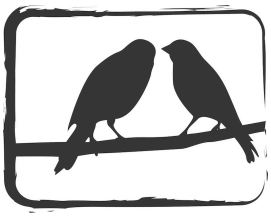
READS
363

5 authors, including:

Simon West
Stockholm Resilience Centre
24 PUBLICATIONS **1,027** CITATIONS
SEE PROFILE

Tania Katzschner
University of Cape Town
5 PUBLICATIONS **69** CITATIONS
SEE PROFILE

Environmental Humanities, vol. 7, 2015, pp. 1-40
www.environmentalhumanities.org
ISSN: 2201-1919



Invasive Narratives and the Inverse of Slow Violence: Alien Species in Science and Society

Susanna Lidström
Division of History of Science, Technology and Environment, KTH Royal Institute of Technology, Sweden

Simon West
Stockholm Resilience Centre, Stockholm University, Sweden

Tania Katzschner
Department of Architecture, Planning and Geomatics, University of Cape Town, South Africa

M. Isabel Pérez-Ramos
Division of History of Science, Technology and Environment, KTH Royal Institute of Technology, Sweden

Hedley Twidle
Department of English Language and Literature, University of Cape Town, South Africa

ABSTRACT Environmental narratives have become an increasingly important area of study in the environmental humanities. Rob Nixon has drawn attention to the difficulties of representing the complex processes of environmental change that inflict 'slow violence' on vulnerable human (and non-human) populations. Nixon argues that a lack of "arresting stories, images and symbols" reduces the visibility of gradual problems such as biodiversity loss, climate change and chemical pollution in cultural imaginations and on political agendas. We agree with Nixon that addressing this representational imbalance is an important mission for the environmental humanities. However, we argue that another aspect of the same imbalance, or representational bias, suggests the *inverse* of this is also needed—to unpack the ways that complicated and multifaceted environmental phenomena can be reduced to fast, simple, evocative, *invasive* narratives that percolate through science, legislation, policy and civic action, and to examine how these narratives can drown out rather than open up possibilities for novel social-ecological engagements. In this article we demonstrate the idea of invasive narratives through a case study of the 'invasive alien species' (IAS) narrative in South Africa. We suggest that IAS reduces complex webs of ecological, biological, economic, and cultural relations to a simple 'good' versus 'bad' battle between easily discernible 'natural' and 'non-natural' identities. We argue that this narrative obstructs the options available to citizens, land managers and policy-makers and prevents a more nuanced understanding of the dynamics and implications of biodiversity change, in South Africa and beyond.

Introduction

> [It] is time to reclaim our country! We need the public to join us in our fight to rid the planet of these deadly invaders! We need as many people [as possible] out there to become AlienBusters![1]

This call to arms comes from a media representation of a public campaign encouraging South African citizens to unite in a 'war' against particular plant and animal species in their area.[2] The AlienBusters campaign was conceived by the South African Department of Water Affairs and Forestry and developed by the interdepartmental public works programme Working for Water as a means of combatting so called 'invasive alien species' (IAS), considered a primary threat to native biodiversity, cultural heritage, national water supplies and economic prosperity.[3] The AlienBusters name plays on the 1984 movie *Ghostbusters*, a story about a group of eccentric scientists who, escaping the restrictions imposed by their university department, embark on a mission to eradicate supernatural intruders. The *Ghostbusters* narrative of industrious and well-meaning scientists seeking to 'save' society from an advancing, spectral threat is particularly telling, not just as the inspiration of the AlienBusters campaign but also of the construction of the IAS narrative more generally.

Environmental 'threats' such as biodiversity loss, climate change and chemical pollution are often understood to be complex, difficult to pin down, and related to systemic vulnerabilities and uncertainties.[4] In the past several decades, complexity perspectives from a range of theoretical traditions and disciplines have explored how environmental problems emerge (or are 'co-produced') from dynamic, non-linear and cross-scale interactions between social, ecological, technological, economic and political relations.[5] Knowledge in this context

---

[1] The South African Ministers of Environmental Affairs, Agriculture, and Water Affairs and Forestry, quoted in the *Saturday Star*. "War Declared on Aliens," *Saturday Star TGW Region Gauteng*, 14 October 2000, 20.

[2] Sally-Ann Murray, "Working for Water's 'AlienBusters': Material and Metaphoric Campaigns against 'Alien Invaders,'" *Critical Arts: North-South Cultural and Media Studies* 19, no. 1-2 (2005): 127-149.

[3] Department of Water Affairs and Forestry (DWAF), "Working for Water Alien Buster Week Proposal" [Unpublished document], 2000; J.A. Binns, P.M. Illgner and E.L. Nel, "Water Shortage, Deforestation and Development: South Africa's Working for Water programme," *Land Degradation and Development* 12 (2001): 341-355; A. Neely, "'Blame it on the Weeds': Politics, Poverty, and Ecology in the New South Africa," *Journal of Southern African Studies* 36, no. 4 (2010): 869-887; B.W. van Wilgen *et al.,* "Invasion Science for Society: A Decade of Contributions from the Centre for Invasion Biology," *South African Journal of Science* 110, no. 7/8 (2014): 1-12.

[4] Ulrich Beck, *Risk Society: Towards a New Modernity* (London: Sage, 1992); Donald Ludwig, "The Era of Management Is Over," *Ecosystems* 4 (2001): 758-764; Andreas Duit and Victor Galaz, "Governance and Complexity—Emerging Issues for Governance Theory," *Governance: An International Journal of Policy, Administration, and Institutions* 21, no. 3, July (2008): 311-335.

[5] Simon A. Levin, "Ecosystems and the Biosphere as Complex Adaptive Systems," *Ecosystems* 1 (1998): 431-436; Fikret Berkes, Carl Folke and Johan Colding, eds., *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience* (Cambridge: Cambridge University Press, 1998); Fikret Berkes, Johan Colding and Carl Folke, eds., *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change* (Cambridge: Cambridge University Press,

is replete with uncertainty and tends to resist formation into easily comprehensible narratives.[6] In the environmental humanities, Rob Nixon has recently drawn attention to the ways in which traditional (Western) narrative forms favoured in media and political realms obscure the 'slow violence' that is both the cause and effect of many complex environmental problems.[7] Nixon argues in *Slow Violence and the Environmentalism of the Poor* that some of the most profound contemporary environmental challenges are underrepresented in media and politics because they are not easily adapted to established patterns of sensation-driven news reports or to the localized and individualized narratives through which we tend to make sense of our surroundings. Consequently, these concerns become underrepresented in public and political debates, and often compound inequitable distribution of risks and vulnerabilities. For Nixon it is imperative that the environmental humanities address the skewed relationship between widespread modes of environmental communication, such as news headlines and political rhetoric, and slow and incremental forms of environmental harm. A key challenge is representational—"how to devise arresting stories, images and symbols adequate to the pervasive but elusive violence of delayed effects."[8]

We agree that this is a vital mission. However, we wish to add to Nixon's argument by drawing attention to the inverse of the representational bias he describes, namely the ways that "arresting stories" about environmental change can also reduce complexity in unhelpful and even misleading ways, often exacerbating rather than solving the environmental 'problems' they seek to ameliorate. Describing and framing complex environmental phenomena, in everything from media reports to policy documents and scientific discourses, inevitably entails the creation of particular narratives or 'stories,' by establishing particular delimitations of space and time, causal relationships, prioritized values, implicit or explicit assumptions about desired end-states, and dimensions of (un)certainty. As Melissa Leach and colleagues have shown, certain stories about complex environmental change often become 'dominant' at the expense of others, sometimes drowning out emergent and potentially emancipatory forms of ecological engagement and obscuring structural and systemic violence.[9] Attempts to establish such narratives as 'authoritative' or 'objective' often position science at the centre of environmental controversies, expatiating scientific observations into objective 'truths' about human-environment relations, rather than inviting discussion of disparate points of views on, and motivations for, desired change and outcomes.[10]

2003); Melissa Leach, Ian Scoones and Andy Stirling, *Dynamic Sustainabilities: Technology, Environment, Social Justice* (London: Earthscan, 2010).

[6] George Lakoff, "Why it Matters How We Frame the Environment," *Environmental Communication* 4, no. 1 (2010): 70-81; Andy Stirling, "Keep it Complex," *Nature* 468 (2010): 1029-1031; K.H. Rogers *et al.*, "Fostering Complexity Thinking in Action Research for Change in Social-Ecological Systems," *Ecology and Society* 18, no. 2 (2013): 31.

[7] Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Cambridge, MA: Harvard University Press, 2011).

[8] Nixon, *Slow Violence,* 3.

[9] Leach, Scoones and Stirling, *Dynamic Sustainabilities.*

[10] Roger A. Pielke, Jr., *The Honest Broker: Making Sense of Science in Policy and Politics* (Cambridge: Cambridge University Press, 2007); Daniel Sarewitz, "How Science Makes Environmental Controversies Worse," *Environmental Science & Policy* 7, no. 5, October (2004): 385-403.

Scientific accounts of change can also promote particular narratives. For instance, Andy Stirling argues that dominant scientific narratives about global environmental change, where a unified humanity is portrayed on the verge of collapse, obviate the 'messy realities' of local engagements of humans with the world around them and obscure small-scale and plural forms of local stewardship.[11] Stirling maintains that the solutions proposed by this narrative of environmental change—'sound science,' curtailments of democracy, technology fixes—embody a 'fallacy of control' where it is imagined that complex change can be unilaterally navigated by knowledgeable authorities.[12] In response to recognized changes in biodiversity richness and distribution around the world, concerned biologists and ecologists have occasionally suggested that 'catchy metaphors' and simple narratives—easily translated into and amplified in legislative, policy and media realms—are necessary to prompt ameliorative action.[13] However, as Stirling's analysis helps to make clear, those simplified accounts of ecosystem dynamics and biodiversity change often seem to favour particular control measures and legislation over other forms of potential adaptation and evaluation.

The concept of 'invasive alien species'—and associated terms such as 'invasional meltdown'[14] or 'biotic homogenization'[15]—represents a particularly successful environmental narrative of recent decades.[16] The IAS concept was intended to draw attention to significant biodiversity change and the rapid movement of species around the world as a result of increasing global trade and travel.[17] However, IAS has been increasingly critiqued for condensing species movement into a simple 'good' versus 'bad' battle between easily discernible 'natural' and 'non-natural' identities, in ways that may actually obstruct rather than enable understanding of complex change.[18] While the stark binaries evoked by IAS may, as Jodi Frawley and Iain McCalman point out, assist "both community members and scientists to

---

[11] Andrew Stirling, "Emancipating Transformations: From Controlling 'The Transition' to Culturing Plural Radical Progress," STEPS Centre Working Paper 64 (Brighton: STEPS Centre, 2014).

[12] See also Mark Beeson, "The Coming of Environmental Authoritarianism," *Environmental Politics* 19, no. 2 (2010): 276-294.

[13] Brendan Larson, *Metaphors for Environmental Sustainability: Redefining our Relationship with Nature* (New Haven: Yale University Press, 2011); Henrik Ernstson and Sverker Sörlin, "Ecosystem Services as Technology of Globalization: On Articulating Values in Urban Nature," *Ecological Economics* 86 (2013): 274-284.

[14] Daniel Simberloff and Betsy Von Holle, "Positive Interactions of Nonindigenous Species: Invasional Meltdown?" *Biological Invasions* 1 (1999): 21-32.

[15] Michael L. McKinney and Julie L. Lockwood, eds., *Biotic Homogenization* (New York: Kluwer Academic/Plenum Publishers, 2001).

[16] Larson, *Metaphors for Environmental Sustainability*.

[17] Daniel Simberloff, *Invasive Species: What Everyone Needs to Know* (Oxford: Oxford University Press, 2013); Mark A. Davis, *Invasion Biology* (Oxford: Oxford University Press, 2009); Robert I. Colautti and Hugh J. MacIsaac, "A Neutral Terminology to Define 'Invasive' Species," *Diversity and Distribution: A Journal of Conservation Biology* 10, no. 2 (2004): 135-141.

[18] See for example Paul Robbins, "Comparing Invasive Networks: Cultural and Political Biographies of Invasive Species," *The Geographical Review* 94, no. 2 (2004): 139-156; Mark Davis *et al.*, "Don't Judge Species by Their Origins," *Nature* 474 (2011): 153-154; Larson, *Metaphors for Environmental Sustainability*.

frame responses to invasion,"[19] these responses are almost inevitably formed in terms of 'control' and 'eradication,' which produce simplistic understandings of biodiversity and often do surprisingly little to practically conserve it.[20] Nevertheless the narrative of IAS continues to thrive, "reified" in the field of invasion biology (e.g. the journal *Biological Invasions*), and, to a lesser extent, the broader disciplines of ecology and conservation biology.[21] This persistence in scientific discourse and consequent amplification in policy and media documents is, we suggest, at least partly due to the structure of the concept itself.[22] The narrative components of IAS, in contrast to those of 'slow violence' detailed by Nixon, draw on clearly recognizable temporal and spatial ('invasive' and 'alien') imagery that, as Charles Warren points out, "make[s] intuitive sense in our heads" and is readily translated into public agency and political clout.[23] Moreover, the IAS narrative has—noticeably in South Africa but also in other countries around the world—drawn on and become entangled with pervasive cultural and historical concerns about identity, belonging and boundedness, adding further to the emotive and motivational components that propel the story.[24]

In this paper we thus seek to illuminate the inverse of the failure to represent slow violence—namely the ways in which complex environmental concerns are sometimes reduced to fast, simple, evocative, *invasive* narratives. By defining this process in relation to the concept of slow violence, we suggest that the *over*representation that we explore and the *under*representation that Nixon describes are really expressions of the same phenomenon, namely a representational bias that means that the communication of and response to environmental changes depends at least in part on how well they are incorporated into readily

---

[19] Jodi Frawley and Iain McCalman, "Invasion Ecologies: The Nature/Culture Challenge," in *Rethinking Invasion Ecologies from the Environmental Humanities*, ed. Jodi Frawley and Iain McCalman (New York: Routledge, 2014), 3-14, 10.

[20] Brian W. van Wilgen *et al.,* "An Assessment of the Effectiveness of a Large, National-Scale, Invasive Alien Plant Control Strategy in South Africa," *Biological Conservation* 148 (2012): 28-38; Chris D. Thomas and G. Palmer, "Non-Native Plants Add to the British Flora without Negative Consequences for Native Diversity," *PNAS* 112, no. 14 (2015): 4387-4392.

[21] Lawrence B. Slobodkin, "The Good, the Bad and the Reified," *Evolutionary Ecology Research* 3 (2001): 1-13.

[22] For policy and media discussion see: Clare Shine, *A Toolkit for Developing Legal and Institutional Frameworks for Invasive Alien Species* (Nairobi: Global Invasive Species Programme, 2008); European Parliament, "Parliament Backs EU-wide Plans to Stem the Spread of Invasive Alien Species," press release, 16 April 2014, accessed 24 March 2015, http://www.europarl.europa.eu/news/en/news-room/content/20140411IPR43471/html/Parliament-backs-EU-wide-plans-to-stem-the-spread-of-invasive-alien-species; Claire Marshall, "EU Blacklist to Stop Spread of Alien Species," *BBC News Online*, 16 April 2014, accessed 24 March 2015, http://www.bbc.com/news/science-environment-27039714.

[23] Charles Warren, "Perspectives on the 'Alien' versus 'Native' Species Debate: A Critique of Concepts, Language and Practice," *Progress in Human Geography* 31, no. 4 (2007): 427-446, 437.

[24] Jean Comaroff and John L. Comaroff, "Naturing the Nation: Aliens, Apocalypse and the Postcolonial State," *Journal of Southern African Studies* 27, no. 3 (2001): 627-651; Murray, "Working for Water's 'AlienBusters'"; Libby Robin and Jane Carruthers, "National Identity and International Science: The Case of *Acacia*," *Historical Records of Australian Science* 23 (2012): 34-54; Lance van Sittert, "'Our Irrepressible Fellow-Colonist': The Biological Invasion of Prickly Pear (*Opuntia ficus-indica*) in the Eastern Cape c.1890-c.1910," *Journal of Historical Geography* 28, no. 3 (2002): 397-419.

available, pre-existing, 'performative'[25] narrative formats. By demonstrating the ways in which particular modes of representation can challenge but also exert relations of violence (often at the same time), we also contribute to Kathryn Yusoff's call for environmental scholarship that engages with violence as a means of highlighting the risks inherent in the conceptualization of environmental relations, and the opportunities provided by potential alternative framings.[26]

We explore invasive narratives by tracking IAS in South Africa through the realms of science, law, policy and media. We begin with the presentation of IAS in South African scientific discourse, before following the 'alien' mussel *Mytilus galloprovincialis* on its travels up and down the intertidal zone of the South African west coast and eventually into notoriety as an 'uncontrollable alien invader.' We then examine how *M. galloprovincialis* has, along with a broad range of 'alien' fauna and flora, been enrolled into legislative frameworks designed to control species movement and interaction. We continue our journey in the media, where we unpack the 'AlienBusters' campaign, a public awareness project specifically designed to generate awareness of 'alien' plants and a media-friendly narrative around IAS legislation. Finally, we discuss the IAS narrative in terms of Nixon's concept of 'slow violence' and Stirling's 'fallacies of control.'[27]

Our primary aim is not to show that IAS is an inadequate and misleading term, a point that has been made by several others (albeit reaching different conclusions).[28] Instead, we want to focus on *why* and *how*, despite many and recognized shortcomings, the concept continues to be so prevalent, and what it suggests about our perception, interpretation and communication of complex environmental concerns and interactions more broadly.

Before we go any further, we want to make clear that we are not denying, in principle, the transformative effects of certain 'invasive' or 'introduced' species on particular ecological assemblages around the world, or that these effects may give cause for concern in specific circumstances.[29] Rather we are questioning the IAS narrative as a catch-all label and 'problem.'

---

[25] Larson, *Metaphors for Environmental Sustainability,* 163.

[26] Kathryn Yusoff, "Aesthetics of Loss: Biodiversity, Banal Violence and Biotic Subjects," *Transactions of the Institute of British Geographers* 37, no. 4 (2012): 578–592.

[27] Nixon, *Slow Violence*; Stirling, "Emancipating Transformations."

[28] David I. Theodoropoulos, *Invasion Biology. Critique of a Pseudoscience* (Blythe, California: Avvar Books, 2003); Warren, "Perspectives on the 'Alien' versus 'Native' Species Debate"; David M. Richardson *et al.*, "Biological Invasions—the Widening Debate: A Response to Charles Warren," *Progress in Human Geography* 32, no. 2 (2008): 295-298; Davis *et al.,* "Don't Judge Species by Their Origins"; Daniel Simberloff, *et al.*, "Non-Natives: 141 Scientists Object," *Nature* 475 (2011): 36; Jacques Tassin and Christian A. Kull, "Facing the Broader Dimensions of Biological Invasions," *Land Use Policy* 42 (2015): 165-169.

[29] See for example Brendan Larson, "An Alien Approach to Invasive Species: Objectivity and Society in Invasion Biology," *Biological Invasions* 9 (2007): 947-956.

Alien Species in South African Scientific Discourse

> The CIB [Centre for Invasion Biology] covers the full spectrum of research required to fully understand biological invasions.[30]

In South Africa, Dutch and British colonists initially embraced 'exotic' plant and animal species for their apparent economic and aesthetic qualities.[31] Scientific concern about the effects of 'invasive' and 'alien' plants upon 'indigenous' vegetation emerged at the end of the 19th century in the particular context of the Cape.[32] While this concern was sustained in the Cape throughout the 20th century, the perceived threat of 'invasive alien species' only began to extend beyond the Cape to South Africa as a whole—and from trees to a broad range of flora and fauna—from the 1980s onwards, in the context of an emerging globalized conception of IAS initiated by the Scientific Committee on Problems of the Environment (SCOPE).[33] 'Invasion biology' has since become a distinct discipline and has focused primarily on the perceived negative effects of 'invasive' species on 'native' flora and fauna, the biological characteristics of 'invasive' species, and the characteristics that make some ecological communities more or less resistant to 'invasion.'[34] British ecologist Charles Elton, author of the classic 1958 work *The Ecology of Invasions by Animals and Plants*, has subsequently become a touchstone figure in invasion biology[35]—an importance that Daniel Simberloff attributes to his vivid, powerful writing style and focus on the apparently negative impacts of rapid and uncontrolled increases of IAS on 'native' ecosystems.[36] While various scientific definitions differentiate 'alien' species (along a spatial axis) from 'invasive' (along a temporal axis) and 'invasive alien' (along both) — these definitions are openly contested and changing.[37] 'Invasive alien species' has gained

---

[30] Brian W. van Wilgen, Sarah J. Davies and David M. Richardson, "Invasion Science for Society: A Decade of Contributions from the Centre for Invasion Biology," *South African Journal of Science* 110, no. 7/8 (2014): 2.

[31] Brett M. Bennett, "Margaret Levyns and the Decline of Ecological Liberalism in the Southwest Cape, 1890 – 1975," *South African Historical Journal* 67, no. 1 (2015): 64–84.

[32] Lance Van Sittert, "Making the Cape Floral Kingdom: The Discovery and Defence of Indigenous Flora at the Cape ca. 1890 – 1939," *Landscape Research* 28, no.1 (2003): 113–129; Simon Pooley, "Pressed Flowers: Notions of Indigenous and Alien Vegetation in South Africa's Western Cape, c. 1902–1945," *Journal of Southern African Studies* 36, no. 3 (2010): 599 – 618. Both van Sittert and Pooley situate the emergence of 'alien' and 'invasive' concepts in the late 19th century within a nascent sense of a distinctly South African national identity.

[33] Brett M. Bennett, "Model Invasions and the Development of National Concerns over Invasive Introduced Trees: Insights from South African History," *Biological Invasions* 16 (2014): 499–512.

[34] Davis, *Invasion Biology*; Simberloff. *Invasive Species*.

[35] Charles S. Elton, *The Ecology of Invasion by Animals and Plants* (London: Methuen, 1958); Anthony Ricciardi and Hugh J. MacIsaac, "In Retrospect: The Book that Began Invasion Ecology," *Nature* 452, no. 34 (2008): 34.

[36] Daniel Simberloff, "Charles Elton: Neither Founder nor Siren, But Prophet," in *Fifty Years of Invasion Ecology: The Legacy of Charles Elton*, ed. David M. Richardson (Chichester: Wiley-Blackwell, 2011), 11–24.

[37] 'Alien' usually denotes a species that is not considered 'natural' in a particular place, while 'invasive' describes the movement of a species in time, i.e. whether it is spreading or not. E.g. there can be invasive native species, and non-invasive aliens. Pushing the limits of these categories exposes their

currency, particularly in South Africa, as a 'catch-all' term to draw attention to the supposed threat posed by particular species to a generalized biodiversity.[38]

Contemporary South African scientific literature has tended to portray IAS as an imminent and severe threat to rich endemic biodiversity, emphasizing South Africa's designation as a 'biodiversity hotspot' and the Cape in particular as one of six 'Floristic Kingdoms' around the world.[39] So far, research has focused on high profile plant 'invaders' (particularly several Australian *Acacia* species), considered immanent threats to vulnerable ecosystems as well as a range of 'ecosystem services' such as water provision.[40] The Centre for Invasion Biology (CIB) at Stellenbosch University is an inter-institutional centre for invasion biology research, and is the pre-eminent organization producing, supporting and coordinating scientific research on IAS in South Africa. The CIB is the primary conduit between scientific research and policy on IAS, and works closely with the South African National Biodiversity Institute (*SANBI*) (including the nascent Invasive Species Programme) and the Working for Water (WfW) programme to produce research that contributes to "effective policies and management solutions."[41] We therefore turn to a recent review of the CIB's work, written by several leading South African invasion biologists, to examine how the IAS narrative is presented.

The report, "Invasion Science for Society: A Decade of Contributions from the Centre for Invasion Biology," notes that the "growing problem" of alien species is "complex," and highlights a "broad research focus that embraces environmental, social and economic facets."[42] However, despite reference to the importance of history, sociology, economics and

---

inadequacies however, as 'invasive' is also a spatial description. James T. Carlton, "Bioinvasion Ecology: Assessing Invasion Impact and Scale," in *Invasive Aquatic Species of Europe. Distribution, Impacts, and Management*, ed. Errki Leppäkoski, Stephan Gollasch and Sergej Olenin (Dordrecht: Kluwer Academic Publishers, 2002), 7-19; Davis, *Invasion Biology*.

[38] For some early literature that enshrined IAS as threat, see David S. Wilcove *et al.*, "Quantifying Threats to Imperiled Species in the United States," *BioScience* 48, no. 8 (1998): 607-615; Richard N. Mack *et al.*, "Biotic Invasions: Causes, Epidemiology, Global Consequences and Control," *Issues in Ecology* 5 (2000): 1-20. Fifteen years later, IAS is routinely mentioned in scientific articles and popular literature as a primary threat to a generalized biodiversity, see for instance Richard Monastersky, "Biodiversity: Life—a status report," *Nature* 516, no. 7530 (2014): 158-161; IUCN, "Why is Biodiversity in Crisis?" accessed 24 March 2015, https://www.iucn.org/iyb/about/biodiversity_crisis.

[39] Norman Myers *et al.*, "Biodiversity Hotspots for Conservation Priorities," *Nature* 403 (2000): 853-858; Van Sittert, "Making the Cape Floral Kingdom."

[40] For example, see David M. Richardson and Robert L. Kluge, "Seed Banks of Invasive Australian *Acacia* Species in South Africa: Role in Invasiveness and Options for Management," *Perspectives in Plant Ecology, Evolutions and Systematics* 10 (2008): 161-177; R.D. Zenni, J.R.U. Wilson, J.J. Le Roux and D.M. Richardson, "Evaluating the Invasiveness of *Acacia paradoxa* in South Africa," *South African Journal of Botany* 75 (2009): 485-496; Brian W. van Wilgen *et al.,* "A Biome-Scale Assessment of the Impact of Invasive Alien Plants on Ecosystem Services in South Africa," *Journal of Environmental Management* 89 (2008): 336-349.

[41] Van Wilgen, Davies and Richardson, "Invasion Science for Society," 2; see also the website of the Centre for Invasion Biology (CIB), 'About Us,' accessed 24 March 2015, http://academic.sun.ac.za/cib/about.htm.

[42] Van Wilgen, Davies and Richardson, "Invasion Science for Society," 1.

management in understanding biodiversity change, the report makes clear that the role of the humanities and social sciences is limited to the development and implementation of the "solutions" mentioned above (rather than participating in research design, priority-setting, and so on). The top five "subject areas" listed on the CIB's website are ecology, biodiversity conservation, environmental science, plant science and zoology.[43] The peripheral role of historical and sociological perspectives in IAS research (a marginality common to other environmental concerns[44]) becomes evident in the report's shallow temporal anchoring of biodiversity change. The report presents South African ecosystems as diverse, unique and beneficial to humans, and more or less unchanging were it not for the threat posed by IAS, introduced 360 years ago by European colonists. The report does not identify any further historical reference points used by the CIB, implying that the 'native' ecologies it describes are both intrinsic and timeless—neglecting the much longer history of anthropogenic species distribution in particular,[45] and the intricate interdependencies of human-environment relationships through time in a wider sense.[46]

While IAS are considered 'complex,' then, this is a complexity that is parsable, imminently knowable, and ultimately controllable with the correct application of scientific technique. Moreover, the complexity of IAS, once "fully understood," can be readily translated into clear policy recommendations and management activities:

> The management of biological invasions is complex, demanding a robust and holistic understanding of the many and varied aspects of invasion and its various stages, and of appropriate management responses to those processes. The CIB has adopted a research framework to guide the allocation of resources and to ensure that all facets of this complex problem are addressed effectively … By engaging in a spread of activities across this framework, the CIB covers the full spectrum of research required to fully understand biological invasions and to explicitly link research outputs to the development of policy and the improvement of management.[47]

The idea of an objectively calculable 'effect' of a species on an ecosystem (as well as on societies, economies and cultures) across space and time is central to the narrative of the report, which identifies a long list of the potential negative effects of certain 'alien' and 'foreign' species. While acknowledging that "[m]any introduced species provide enormous benefits to the country's socio-economic development," the authors also state that "a small and growing proportion have a *net negative effect*" [our emphasis].[48] While more could be said about the

---

[43] Centre for Invasion Biology (CIB), 'Research,' accessed 24 March 2014, http://academic.sun.ac.za/cib/research.asp.

[44] Noel Castree *et al.*, "Changing the Intellectual Climate," *Nature Climate Change* 4, no. 9 (2014): 763-768.

[45] Tom Griffiths and Libby Robin, *Ecology and Empire: Environmental History of Settler Societies* (Edinburgh: Keele University Press, 1997); Warren, "Perspectives on the 'Alien' versus 'Native' Species Debate."

[46] Libby Robin and Will Steffen, "History for the Anthropocene," *History Compass* 5, no. 5 (2007): 1694-1719; Jane Carruthers *et al.,* "A Native at Home and Abroad: The History, Politics, Ethics and Aesthetics of *Acacia*," *Diversity and Distributions* 17, no. 5 (2011): 810-821.

[47] Van Wilgen, Davies and Richardson, "Invasion Science for Society," 2.

[48] Ibid., 1.

feasibility of calculating such a 'net effect,' it will suffice to note here that the unfulfilled promise of doing so—and a concurrent neglect of the multiple values by which such an effect might be evaluated —appears to underlie much of the CIB's work.

Having said this, invasion biology on the whole (including the CIB) is clearly developing more nuanced representations of 'IAS.' This is evident in the redefinition of the specific 'invasion biology' into a more holistic 'invasion science.'[49] Many invasion biologists have openly discussed the normative commitments and implications of their discipline, and many individual scientists know only too well the difficulties and uncertainties in generating knowledge about biodiversity.[50] Some ecologists have called for a shift away from conceptualizing biodiversity change in terms of battles between 'natives' and 'aliens,' towards more networked, relational and conditional interpretations (notably, however, not in the South African literature).[51] Nevertheless, as our analysis of the CIB report indicates, invasive environmental narratives can prove remarkably resistant to change. As we will discuss, the very terminology of IAS works as what ecologist Brendan Larson calls an "exemplary performative metaphor," inviting a narrative of identification, resistance and control.[52] This narrative appears even in scientific texts that ostensibly critique invasion biology for its 'lack of objectivity.' For instance Colautti and MacIsaac argue for "a neutral terminology to define 'invasive' species" because it would increase clarity and reduce uncertainty, so that scientists can "provide *clear, objective definitions* and models to managers and other officials charged with *protection of native biodiversity*" [our emphasis].[53]

Far from providing the promised "full understanding" of invasions, however, South African science has actually produced a fascinating picture of the uncertainty, dynamism and complexity of species interaction and biodiversity change. To help us understand how the assumption that a full understanding is possible is challenged by observation of 'alien' and 'native' species interaction, and how the IAS narrative of 'threat' and 'control' emerges from scientific discourse, we briefly present a case study of the 'Mediterranean' mussel *Mytilus galloprovincialis*, South Africa's most widespread marine 'alien invader.'

The Mediterranean Mussel *Mytilus galloprovincialis*

The Mediterranean mussel *Mytilus galloprovincialis* probably arrived on South African shorelines sometime around the late 1970s, but it is not known precisely how or when it became established.[54] Its presence initially went undetected because, apart from its orange

---

[49] Van Wilgen, Davies and Richardson, "Invasion Science for Society."

[50] Richardson *et al.,* "Biological Invasions—the Widening Debate: A Response to Charles Warren"; Slobodkin, "The Good, the Bad and the Reified"; Davis *et al.,* "Don't Judge Species by Their Origins."

[51] Robbins, "Comparing Invasive Networks: Cultural and Political Biographies of Invasive Species"; Davis *et al.,* "Don't Judge Species by Their Origins"; Erle C. Ellis, Erica C. Antill and Holger Kreft, "All Is Not Loss: Plant Biodiversity in the Anthropocene," *PLoS One* 7, no. 1 (2012): 1-9; Chris D. Thomas, "The Anthropocene Could Raise Biological Diversity," *Nature* 502 (2013): 7.

[52] Larson, *Metaphors for Environmental Sustainability,* 163.

[53] Colautti and MacIsaac, "A Neutral Terminology to Define 'Invasive' Species."

[54] C.L. Griffiths, P.A.R. Hockey, C. van Erkom Schurink and P.J. Le Roux, "Marine Invasive Aliens on South African Shores: Implications for Community Structure and Trophic Functioning," *South African Journal of Marine Sciences* 12, no. 1 (1992): 713-722; P.A.R. Hockey and C. van Erkom Schurink, "The

gonads, *M. galloprovincialis* closely resembles native mussels *Perna perna* and *Choromytilus meridionalis*. Indeed, it was only detected by chance in the early 1980s when a scientist saw an unfamiliar orange colour in his frying pan. This chance detection initiated substantial taxonomic work. W.S. Grant *et al.* described the specimen as a "cryptic species of *Mytilus*," and identified similarities with the *M. galloprovincialis* of the Mediterranean Sea, but argued that a larger heterozygosity in the South African specimen suggested it was not a recent dispersal: "Rather, the presence of *Mytilus* sp. in South Africa may represent a relict population of a wider geographic distribution of *M. galloprovincialis* resulting from Pleistocene cooling."[55] However, a year later, Grant and Cherry found no evidence of the 'cryptic' species in the shell middens of the indigenous inhabitants of the Cape, seeming to confirm the specimens as recently 'man-mediated' or 'introduced' *M. galloprovincialis* from the Mediterranean, presumably via long-distance shipping.[56]

From such cryptic obscurity, *M. galloprovincialis* has since become recognized as "the dominant mussel throughout the Cape west coast" in the intertidal zone.[57] Hockey and van Erkom Schurink labelled *M. galloprovincialis* as an "out of control and uncontrollable" alien invader, listing three incriminating, and 'inherent,' characteristics: "relative to indigenous mussel species, Mytilus exhibits several characteristics typical of an aggressive invasive species. Most important of these are its rapid growth rate at differing water temperatures, high fecundity and resistance to desiccation."[58] *M. galloprovincialis* is now considered the most abundant "invader" of South African marine ecosystems.[59] The mussel has become an important economic resource "as the entire mussel culture industry in South Africa is based on this alien species,"[60] but its success has attracted concern among scientists and conservationists.[61]

Much of the science into *M. galloprovincialis* since its labelling as an "out of control alien invader" has been justified according to the narrative structure that frames the CIB's mission statement—to 'know' and 'predict' in order to 'control' and potentially 'eradicate.'

Invasive Biology of the Mussel *Mytilus galloprovincialis* on the Southern African Coast," *Transactions of the Royal Society of South Africa* 48 (1992): 123-139.

[55] W.S. Grant, M.I. Cherry and A.T. Lombard, "A Cryptic Species of Mytilus (Mollusca: Bivalvia) on the West Coast of South Africa," *South African Journal of Marine Science* 2, no. 1 (1984): 149.

[56] W.S. Grant and M.I. Cherry, "Mytilus Galloprovincialis Lmk. in Southern Africa," *Journal of Experimental Marine Biology and Ecology* 90 (1985): 179-191; W.S. Grant, "South Africa's Mystery Mussel," *African Wildlife* 41 (1987): 175-179; Hockey and van Erkom Schurink, "The Invasive Biology of the Mussel *Mytilus galloprovincialis*."

[57] Griffiths, Hockey, van Erkom Schurink and Le Roux, "Marine Invasive Aliens on South African Shores," 713.

[58] Hockey and van Erkom Schurink, "The Invasive Biology of the Mussel *Mytilus galloprovincialis*," 136.

[59] I.J. De Moor and M.N. Bruton, *Atlas of Alien and Translocated Indigenous Aquatic Animals in Southern Africa. A Report of the Committee for Nature Conservation Research National Programme for Ecosystem Research,* South African Scientific Programmes Report No. 144 (Port Elizabeth, South Africa, 1988).

[60] C.L. Griffiths, T.B. Robinson, A. Mead, "The Status and Distribution of Marine Alien Species in South Africa," in *Biological Invasions in Marine Ecosystems: Ecological, Management, and Geographic Perspectives*, ed. G. Rilov and J.A. Crooks (Berlin: Springer, 2008), 400.

[61] CABI, "*Mytilus galloprovincialis*. Datasheet," accessed 24 March 2015, http://www.cabi.org/isc/datasheet/73756.

However, rather than producing definitive knowledge of *M. galloprovincialis*' 'net negative effect,' the scientific literature has produced a complicated picture that belies such clarity.[62] For example, the presence of *M. galloprovincialis* has "increased both the overall standing stock and vertical extent of mussel beds, with potential implications for the wider intertidal community: species that compete with *M. galloprovincialis* for primary space on rock surface may be displaced; those that find refuge in the mussel matrix may be advantaged; and those that feed upon mussels may experience enhanced food availability."[63] In particular, the African Black Oystercatcher *Haematopus moquini*, at one point Southern Africa's rarest ('native') seabird, appears to have benefited substantially from the spread of *M. galloprovincialis*.[64]

Alien Species in Law and Policy

> [The new Alien Invasive Species] regulations, coupled with the investments made through the Working for Water programme, have the potential to reverse the cancer of invasions in our country.[65]

The identification of IAS by scientists as an environmental problem exerting a negative impact 'upon' biodiversity has precipitated the worldwide development of legislation designed to control and ameliorate the 'threat.' In the United Nations Convention on Biological Diversity (CBD, 1992) signatory states committed to "prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species" (Article 8h). The CBD is translated into South African policy through the 1997 White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity, which describes South African IAS policy as "proactive, preventative and precautionary."[66] In practice, the regulation of IAS has taken the form of 'command-and-control' legislation that restricts the transferral and introduction of listed species, attempting to balance "the risks associated with introducing and releasing alien organisms with the potential social, economic and environmental benefits derived therefrom."[67] However, these legislative attempts to exert control over IAS, in South

---

[62] T.B. Robinson, G.M. Branch, C.L. Griffiths, A. Govender, P.A.R. Hockey, "Changes in South African Rocky Intertidal Invertebrate Community Structure Associated with the Invasion of the Mussel *Mytilus galloprovincialis*," *Marine Ecology Progress Series* 340 (2007): 163-171.

[63] Griffiths, Hockey, van Erkom Schurink and Le Roux, "Marine Invasive Aliens on South African Shores," 715.

[64] Hockey and van Erkom Schurink, "The Invasive Biology of the Mussel *Mytilus galloprovincialis*,"; T.B. Robinson, C.L. Griffiths, C.D. McQuaid and M Rius, "Marine Alien Species of South Africa— Status and Impacts," *African Journal of Marine Science* 27, no. 1 (2005): 297-306.

[65] South African Minister of Environmental Affairs, Edna Molewa, quoted in a press release describing the amended 2014 Alien Invasive Species Regulations. Department of Environmental Affairs (DEA), "Publication of the Amended Alien and Invasive Species Regulations," 4 August 2014, accessed 24 March 2015, https://www.environment.gov.za/mediarelease/alienandinvasivespeciesregulations.

[66] Department of Environmental Affairs and Tourism (DEAT), "White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity," Government Gazette no. 18163, 28 July 1997.

[67] DEAT, "White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity," 37.

Africa and elsewhere, have been complicated by the "confusingly broad array of factors" implicated in the perceived problem, including the range of human activities that are invoked in 'introduction,' 'control' and 'eradication' of IAS (including commercial, agricultural and cultural factors); the scientific uncertainty surrounding the identity, impact and potential future effects of IAS; and the limited ability to achieve enforcement and compliance with legislation.[68] South Africa's legal regime regulating IAS, while comparatively substantial compared to many CBD co-signatories, has been described as fragmented, piecemeal and confusing, emerging from many domains, and with substantial—potentially inevitable—inconsistencies.[69]

The law relating to IAS and biodiversity in South Africa primarily consists of the Conservation of Agricultural Resources Act (CARA) 1983 (amended in 2001), the National Environmental Management: Biodiversity Act (NEMBA) 2004 (amended in 2009 and 2013), and the recently notified Alien and Invasive Species Regulations (AISR) in 2014.[70] However, an array of legislative instruments contain reference to, relate to, or in some way affect IAS, including those that regulate water conservation, agricultural management, fire risk management, property rights and development planning.[71] Until the promulgation of the AISR in 2014, CARA provided the main legislation governing IAS in South Africa. Under CARA, a list of 198 "weeds" and "invader plants" was produced and divided into three categories that imposed a range of obligations on landowners who had listed plants on their property. Authorities could compel them to undertake 'control measures' against certain plants; however, as of 2006 there were no successful convictions under CARA.[72]

NEMBA, the primary legislation guiding environmental management, regulates IAS as a "threat to biodiversity." NEMBA initially followed a similar 'listing' strategy to CARA, but differentiated between 'alien' and 'invasive' species. As regards listed 'alien' species,[73] NEMBA

---

[68] T.R. Young, "National and Regional Legislation for Promotion and Support to the Prevention, Control, and Eradication of Invasive Species," The World Bank Environment Department, Biodiversity Series, 108 (2006): 1.

[69] A.R. Paterson, "Clearing a Path Towards Effective Alien Invasive Control: The Legal Conundrum," *Potchefstroom Electronic Law Journal* 9, no. 1 (2006): 151-207; In 2008, the Global Invasive Species Programme (GISP), a voluntary international programme consisting of several national and international conservation organizations, published a 'toolkit' for how to deal with 'IAS,' stating that "much more needs to be done to equip each country with a streamlined legal framework to tackle the problem [of invasive alien species] in a sustained and effective way," both indicating the difficulties of controlling IAS but also implying, similarly to the CIB report, that IAS are a 'problem' that can be 'dealt with' in unambiguous ways given sufficient resources and dedication. Clare Shine, *A Toolkit for Developing Legal and Institutional Frameworks for Invasive Alien Species*.

[70] Department of Agriculture, *Conservation of Agricultural Resources Act* (CARA), *1983,* Government Gazette no. 8673, 27 April 1983; Department of Environmental Affairs, *National Environmental Management: Biodiversity Act, 2004,* Government Gazette no. 26887, 8 October 2004; Department of Environmental Affairs, *National Environmental Management: Biodiversity Act, 2004. Alien and Invasive Species Regulations,* Government Gazette no. 37885, 1 August 2014.

[71] Paterson, "Clearing a Path Towards Effective Alien Invasive Control."

[72] Ibid.

[73] NEMBA (2004) defines 'alien species' as: "(a) a species that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution by natural means of migration or dispersal without human intervention" (Chapter 1, Paragraph 1).

adopted a "guilty until proven innocent" approach where permits were required to undertake any "restricted activities" with listed species and where certain activities were "strictly prohibited."[74] Acquiring a permit entailed assessment of "risks and benefits" of the proposed activity, including identification of the "invasive potential of … [the] species"—not an easy task considering the dynamic interactions that affect the role particular species may play in a landscape over time, and the sheer number of unknown 'aliens' extant in South African ecosystems. Listed 'invasive' species[75] were subject to much stricter levels of control. The issuance of the Alien and Invasive Species Regulations (AISR), making the provisions of NEMBA actionable, was due to occur in 2006. However, the proposed listing of particular culturally valued species and the difficulties of developing a set of workable regulations under the "guilty until proven innocent" approach produced a string of controversies.[76] The AISR was eventually released in August 2014 having adopted what the Department for Environmental Affairs has described as a more "pragmatic … innocent until proven guilty" approach for 'alien' species already residing in South Africa.[77] This means that species are not regulated by the AISR unless they are specifically designated as 'invasive' under categories 1a (species which must be "combatted and eradicated"), 1b ("controlled"), 2 ("require a permit to carry out restricted [activities]") or 3 (listed but "subject to exemptions"). While this approach appears to be a sensible move away from that initially proposed in NEMBA, where all 'alien' species were treated as if they were "illegal in themselves,"[78] the maintenance of a list-based command and

[74] "Restricted activities" as defined by NEMBA (2004) include "having in possession or exercising physical control over any specimen of an alien or listed invasive species," and "growing, breeding or in any other way propagating any specimen of an alien or listed invasive species, or causing it to multiply" (Chapter 1, Paragraph 1).

[75] NEMBA (2004) defines 'invasive species' as: "those whose establishment and spread outside of its natural distribution range—(a) threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species; and (b) may result in economic or environmental harm or harm to human health" (Chapter 1, Paragraph 1).

[76] One of the legal consultants charged with the task of creating a workable set of IAS regulations for the NEMBA "guilty until proven innocent" approach told the authors of this paper that the consultant group tried to convince the DEA to shift to an "innocent until proven guilty" approach from the outset of negotiations. The legal consultants argued that it would be impossible to create workable regulations for "guilty until proven innocent," given South Africa's research, capacity and resource constraints (and the uncertainties surrounding as yet undetected and unrecorded 'alien' species in South Africa). To make their case, the team took a small aloe from Cape Town to Johannesburg and explained to the DEA that, if the aloe was to be considered "guilty," they would have needed over 140 individual permits (each requiring a risk assessment) to get it there, as the aloe was an extra-limital species and there were circa 140 alien microbes attached.

[77] Department for Environmental Affairs (DEA), "The Regulation of Invasive Species: Clarification of the Regulation of Brown Trout and Rainbow Trout," 19 May 2014, accessed 24 March 2015, https://www.environment.gov.za/mediarelease/invasivespecies_regulation.

[78] Young, "National and Regional Legislation for Promotion and Support to the Prevention, Control, and Eradication of Invasive Species"; The DEA describe the AISR as "realistic, firm, pragmatic and mindful of invasions that have already occurred. The pragmatism extends to treating all alien species in our country as 'innocent until proven guilty'—they are not controlled in these regulations unless they are

control approach serves to reinforce the narrative of IAS as inherently 'bad' species sullying an otherwise temporally and spatially static South African nature. Indeed, the release of AISR was accompanied by tales of "unwanted and relentless gatecrasher[s] in our country"[79] and met with the headline, "Government gets tough on Invasive Aliens."[80]

The controversies and complications of the list approach illuminate the legislative (and scientific) difficulties of maintaining the IAS narrative in practice. Firstly, any such approach to IAS legislation inevitably covers a multitude of potential human interactions with the environment (including those relating to trade, agriculture, biodiversity conservation and so on). The introduction of new species to the landscape, or the continued existence of those already present, cannot be simply prohibited,[81] not least because of the desirability of many 'invasive aliens' for as diverse reasons as agricultural pest control or creating a cultural sense of place.[82] In South Africa these competing rationalities emerge in biodiversity legislation in the form of 'exceptions' to the rule of IAS as 'guilty.' For instance, while the mussel *M. Galloprovincialis* is listed under the AISR as a category 2 'invasive' requiring control, it enjoys exceptions relating to commercial activity.[83]

Secondly, the list approach is challenged by the dynamic co-evolution of ecological behaviour and human interpretation of species designated IAS through space and time, in relation to changing ecological and cultural contexts. Some species that are considered merely 'alien' can become 'invasive' after residing unnoticed in a landscape at low levels for many decades, while other species may be considered 'invasive' in certain places at certain times before retreating to a minor niche in an ecosystem. For instance, *M. Galloprovincialis* spread dramatically across Saldanha Bay, on the Cape West Coast, before its population crashed and 'native' mussels returned.[84] Further complicating issues, 'native' species can also be considered

---

listed as invasives." DEA, "The Regulation of Invasive Species: Clarification of the Regulation of Brown Trout and Rainbow Trout."

[79] Department of Environmental Affairs (DEA), "Publication of the Amended Alien and Invasive Species Regulations."

[80] Andrew Purnell, "Government gets tough on Invasive Aliens," *NCC Environmental Services Blog,* accessed 24 March 2015, http://www.ncc-group.co.za/blog/2015/03/government-gets-tough-invasive-aliens.

[81] Young, "National and Regional Legislation for Promotion and Support to the Prevention, Control, and Eradication of Invasive Species."

[82] Carruthers *et al.*, "A Native at Home and Abroad: The History, Politics, Ethics and Aesthetics of *Acacia*"; Jeanine M. Pfeiffer and Robert A. Voeks, "Biological Invasions and Biocultural Diversity: Linking Ecological and Cultural Systems," *Environmental Conservation* 35, no. 4 (2008): 281-293.

[83] Minister for Environmental Affairs, Edna Molewa, was quoted in the press release accompanying the AISR as saying that 'Category 2' species were the "most difficult." They "have value, such as plantation trees and fish-farming species, and yet can invade with very negative consequences outside of where they are being utilized. The Department has taken an approach that seeks to optimize the economic benefits of these species, whilst minimizing the damage that they cause." Department of Environmental Affairs (DEA), "Publication of the Amended Alien and Invasive Species Regulations."

[84] G.M. Branch, N.C. Steffani, "Can We Predict the Effects of Alien Species? A Case-History of the Invasion of South Africa by *Mytilus galloprovincialis* (Lamarck)," *Journal of Experimental Marine Biology and Ecology* 300 (2004): 189-215.

'invasive' in certain conditions.[85] This dynamism poses legislative challenges, as lists require frequent re-designations and revisions as experience and knowledge change in the context of evolving scientific, economic, ecological and cultural values.[86] Indeed, one South African scientist observed that the AISR lists were out-dated on publication.[87] These revisions can also prompt fierce controversy. The AISR's proposed listing of brown and rainbow trout as 'invasive' species provoked claims from fly-fisher groups that the government was intent on "destroying the trout industry."[88]

While lists can obviously be useful and even necessary for organizing information, they can also limit approaches and understandings by conveying simplified versions of knowledge and steering discussions in terms of the particular categories that inform them. Consequent attempts to nuance the IAS concept by dividing it into various subcategories and list entries thus has the opposite effect, reinforcing rather than addressing the underlying assumptions of the concept—that species have an objective, definitive character and function that can be measured and described solely through natural scientific methods. As lists are often easier to communicate than complex and dynamic texts that recognize contradictions and change, the result is often increased simplification as species categorizations become entrenched in the lists as they travel from scientific papers to law and policy, and to popular media and civic action.[89]

A third crucial challenge has been the limited ability of the South African Government to develop and enforce the IAS regulatory framework. A lack of human and financial resources has been compounded by an implicit recognition that enforcing compliance on individual landowners is rather inequitable, given the sheer preponderance of species designated IAS

---

[85] Avril L. de la Cretaz and Matthew J. Kelty, "Establishment and Control of Hay-Scented Fern: A Native Invasive Species," *Biological Invasions* 1 (1999): 223-236.

[86] M.A. McGeoch, D. Spear, E.J. Kleynhans and E. Marais, "Uncertainty in Invasive Alien Species Listing," *Ecological Applications* 22, no. 3 (2012): 959-971.

[87] KZN Conservancies Association Blog, "NEMBA Alien and Invasive Species Regulations," accessed 24 March 2015, https://kzncablog.wordpress.com/2013/07/30/nemba-alien-and-invasive-species-regulations/.

[88] Department for Environmental Affairs, "The Regulation of Invasive Species: Clarification of the Regulation of Brown Trout and Rainbow Trout"; For a further discussion about the controversies of trout in South Africa, see also Duncan Brown, *Are Trout South African? Stories of Fish, People and Places* (Johannesburg: Picador Africa, 2013); Melanie Gosling, "Homicidal Habits of Trout in Focus," *Cape Times*, 7 July 2014, accessed 24 March 2015, http://www.iol.co.za/capetimes/homicidal-habits-of-trout-in-focus-1.1715276#.VQMVWmYqofo; J. Shelton, M. Samways and J. Day, "Predatory Impact of Non-Native Rainbow Trout on Endemic Fish Populations in Headwater Streams in the Cape Floristic," *Biological Invasions* 17 (2014): 365-379.

[89] See for instance, the 'blacklist' of IAS drawn up by the European Union or the IUCN's list of world's "one hundred worst" invasive alien species. Claire Marshall, "EU Blacklist to Stop Spread of Alien Species," *BBC News Online*, 16 April 2014, accessed 25 March 2015, http://www.bbc.com/news/science-environment-27039714; S. Lowe, M. Browne, S. Boudjelas and M. De Poorter, *100 of the World's Worst Invasive Alien Species. A Selection from the Global Invasive Species Database,* published by the Invasive Species Specialist Group (ISSG), Species Survival Commission (SSC) of the World Conservation Union (IUCN).

across the country (including on vast tracts of state-owned land).[90] As of 2006 there were no prosecutions under the IAS provisions in CARA and NEMBA, and estimates suggest that populations of species designated IAS have actually increased in South Africa since the 1990s.[91] These destabilizations challenge the notion that 'control,' as promised by the CIB's proposed "full understanding" and the AISR, is possible or even desirable. In lieu of legislative capacity to provide such control, the burden of fulfilling South Africa's IAS policies has fallen largely upon government public works programmes like Working for Water (WfW) and campaigns such as Ukuvuka—Operation Firestop,[92] that have attempted to harness the scientific narrative of 'threat' and 'control' to generate job opportunities for the poor and incite mass public participation in a "perpetual war" against IAS.[93]

AlienBuster—Seek & Destroy! Alien Species in Public Campaigns and the Media

> It is time to reclaim our country! We need the public to join us in our fight to rid the planet of these deadly invaders![94]

The IAS narrative, inculcated within scientific discourse and enshrined in legislation, has increasingly come to dominate public engagement with South African nature. WfW, one of the government's flagship environmental programmes, is at the forefront of translating this narrative into public action and media awareness. WfW was established in 1995 under the leadership of then Minister for Water Affairs and Forestry, Kader Asmal (also a human rights lawyer and professor at the University of Cape Town), and at the time was jointly owned by the Department for Water Affairs and Forestry (DWAF), the Department for Environmental Affairs and Tourism (DEAT), and the Department of Agriculture (DoA). These department names have since changed and today WfW is a public agency responsible for controlling IAS infestations under the jurisdiction of the Department of Water Affairs (DWA).

WfW was designed by a group of natural resource managers and scientists to explicitly link large-scale conservation efforts in the post-Rio age with mass economic empowerment as South Africa emerged from apartheid.[95] The idea was that marginalized communities would be employed to remove troublesome 'alien' species —particularly acacia species such as *Acacia*

---

[90] The Alien and Invasive Species lists published by the South African Government in 2014 identify 559 alien species as invasive.

[91] van Wilgen *et al.,* "An Assessment of the Effectiveness of a Large, National-Scale, Invasive Alien Plant Control Strategy in South Africa."

[92] Ukuvuka—Operation Firestop was a public campaign designed to reduce fire risk in the Cape Peninsula by, among other activities, removing 'invasive alien' vegetation. Sandra Fowkes, "Lessons from Changes in Governance of Fire Management: The Ukuvuka Operation Firestop Campaign," in *Governance as a Trialogue: Government-Society-Science in Transition*, ed. Anthony R. Turton *et al.* (Berlin: Springer, 2007), 215-236.

[93] Robert Koenig, "Unleashing an Army to Repair Alien-Ravaged Ecosystems," *Science* 325 (2009): 562-563.

[94] *Saturday Star TGW Region Gauteng*, "War Declared on Aliens," 14 October 2000, 20.

[95] J.K. Turpie, C. Marai and J.N. Blignaut, "The Working for Water Programme: Evolution of a Payments for Ecosystem Services Mechanism that Addresses both Poverty and Ecosystem Service Delivery in South Africa," *Ecological Economics* 65, no. 4 (2008): 788-798.

mearnsii (Black Wattle) and *Acacia cyclops* (Rooikrans)—while concurrently gaining access to education and training opportunities.[96] This ability to "articulate the connections between economic development and ecological health" has established WfW as a global pioneer in bringing together concerns about biological diversity, social equity and economic empowerment.[97] WfW and DWAF (now DWA) have pursued an active communications strategy designed to raise public awareness of, and action against, the 'IAS threat.' As Sally-Ann Murray puts it, this strategy attempts to "reconfigure abstract legal-biological discourse into a more understandable popular form."[98] Having tracked the emergence of the legal-biological discourse by following the mussel *M. galloprovincialis*, we now turn to a terrestrial example—garden plants—to explore how WfW translated the IAS discourse into the public realm in the now notorious 'AlienBusters' initiative.[99]

The announcement of the 2001 CARA regulations concerning 'alien' plant species by the Department of Agriculture provided an ideal opportunity for WfW to raise awareness about IAS and the implications of the new legislation. The regulations identified 161 of the most dangerous 'aliens,' which were divided into three categories: category I—plants that must be removed and destroyed immediately, category II—plants that may be grown under controlled conditions only, and category III—plants that may no longer be planted.[100] DWAF, WfW and social marketing specialists the Bryan Slingers Partnership, inspired by the Australian 'Weedbuster Week,' devised a specifically South African public campaign—renamed 'AlienBusters'—utilizing strategies drawn from advertising and marketing.[101] Tim Low, an Australian biologist involved with 'Weedbuster Week,' advised WfW to "use words effectively … Use strong verbs (chokes, invades, marches, advances, entrenches, besieges), strong nouns (rogues, fence-jumpers, sleepers, villains) and occasional adjectives (mischievous, deplorable, abominable, scurrilous, baleful, truculent)."[102] The South African Government declared 8-15 October 2000 'AlienBuster Week.' The campaign was intended to explain how CARA impacted gardeners and landowners, encourage the replacing of 'alien' plants with 'native' ones, and recommend that gardeners withdraw patronage from any nurseries selling alien plants.[103] Appealing to a supposedly unified South African public, the campaign strategy

---

[96] Department of Water Affairs and Forestry (DWAF), *The Working for Water Programme: Annual Report 2002/3* (Pretoria: Department of Water Affairs and Forestry, 2004).

[97] United Nations Environment Programme (UNEP), *Working for Water: A South African Sustainability Case* (Nairobi: UNEP, 2007), accessed 24 March 2015, http://www.unep.org/training/programmes/Instructor%20Version/Part_3/readings/WfW_case.pdf.

[98] Murray, "Working for Water's 'AlienBusters.'"

[99] One of the authors of this article initially discussed the AlienBusters campaign, using the same primary sources as we use here, in a blog post for Organization Unbound. Tania Katzschner, "Stuck in an Old Story," accessed 24 March 2015, http://organizationunbound.org/expressive-change/stuck-in-an-old-story.

[100] Department of Water Affairs and Forestry (DWAF), "Working for Water Alien Buster Week Proposal," 2000.

[101] Murray, "Working for Water's 'AlienBusters.'"

[102] Tim Low, "Selling the Story," accessed 24 March 2015, https://www.dwaf.gov.za/wfw/Docs/Papers/SELLING%20THE%20STORY.doc.

[103] DWAF, "Working for Water Alien Buster Week Proposal."

cast IAS as an extra-terrestrial threat to national security, imploring citizens to "help stop them before they destroy earth. Become an AlienBuster! The Race to Save Planet Earth."[104]

The rationale behind the first South African AlienBusters campaign is outlined in the project proposal:

> Aliens are baddies whichever way you look at it. From Space Invaders to Mars Attacks, everyone loves to hate aliens. And with the huge popularity of scary-alien sci-fi films (from Men in Black to The X Files), the concept of AlienBuster Week will capture the imagination of the public in a big way.
>
> Another thing: The parallels between invading alien vegetation and invading alien UFOs are obvious. Both are space invaders. Both threaten life on our planet. In both instances the aliens are the enemy who must be destroyed to protect life on earth.
>
> So by latching onto the public fascination with (and fear of) "space aliens", we can make them see the real danger posed by alien vegetation. And we can have fun while we're doing it![105]

It is clear that the campaign's priority was to engage public fascination with and fear of the 'other' to mobilize particular types of pre-ordained action (e.g. eradication of 'alien' plants), rather than to promote, for instance, broader forms of ecological understanding or creative adaptation to environmental change. Indeed, the narrative invitation provided by the IAS metaphor prompted severe exaggeration in the campaign literature that arguably restricted rather than facilitated understanding of the changes in species populations, dynamics and distribution that characterize biodiversity. For instance, specific species designated IAS may change local and occasionally regional and global distribution and diversity of species, but certainly do not endanger "life on earth."[106] Likewise, further explanatory material provided by DWAF labelling IAS an "ecological disease" and describing the "[breath taking] extent and insidious nature of the evil" embodied by particular species (the Black Wattle is singled out), anthropomorphizes species and at the same time renders the human drivers behind their success (introduction of species, habitat destruction) invisible.[107]

Moreover, the easy narrative parallels between "alien" plants, "invasive aliens," and "space aliens" created metaphoric slippage throughout the campaign, with the terms often used interchangeably in ways that evoked equally problematic narratives—or in DWAF's terms, "recurring nightmares"—about human 'aliens.'[108] In a jointly signed mission letter to accompany the media launch of the campaign, the Ministers of DWAF, DoA and DEAT explain: "There are dangerous aliens among us … a total of 198 evil space invaders who are destroying our planet: depleting up to 10% of our precious water supply, killing large tracts of indigenous plants, endangering our animal species and causing millions of Rands' damage

---

[104] DWAF, "Working for Water Alien Buster Week Proposal," 7.

[105] Ibid., 3.

[106] Ellis, Antill and Kreft, "All Is Not Loss: Plant Biodiversity in the Anthropocene"; Thomas and Palmer, "Non-Native Plants Add to the British Flora without Negative Consequences for Native Diversity."

[107] Karoline Hanks, "A Legal Solution? The Conservation of Agricultural Resources Act explained," accessed 24 March 2015, https://www.dwaf.gov.za/wfw/Docs/Articles/CARA.doc.

[108] Hanks, "A Legal Solution?"; Murray, "Working for Water's 'AlienBusters,'" 138.

through fires and soil erosion."[109] The ministers' plea is described as passionate and they are quoted in the *Saturday Star* newspaper as saying: "It is time to reclaim our country! We need the public to join us in our fight to rid the planet of these deadly invaders!"[110] The campaign's enthusiasm for igniting public "fascination with (and fear of)" aliens, and "having fun while we're doing it," disregarded both the ecological complexities of IAS (reifying the idea of certain species as "inherently bad" and worthy of extermination) and the wider social resonance and implications of 'othering.'

One problem here is that forms of "alien unbelonging" enter South African imaginations in a far more visceral way than through association with Hollywood movies. As Sally-Ann Murray points out, the observation that "everybody loves to hate aliens" has become almost a national truism in a country negotiating the legacy of apartheid and contemporary waves of xenophobic violence against immigrants from other southern African states.[111] Indeed, a more current sci-fi film that arguably exerts a far greater pull on South African imaginations is Neill Blomkamp's *District 9* (2009), a film that inverts the traditional sci-fi tropes of, for instance, *Men in Black* and *The X-Files*, to reveal the often violent suppression of otherness in South Africa's own past, present and potential future.[112] While the intricate imaginary and material connections between non-human and human aliens in South Africa has been more fully unpacked elsewhere,[113] we raise the point here to suggest how successful—or 'invasive'—environmental narratives emerge from and interact with existing socio-cultural contexts.

A range of creative elements were produced for the campaign:

> A funky call-to action logo was developed to stand out from all the traditional nursery/gardening material. Bright, sci-fi-inspired colours were chosen instead of natural tones and comic-book typography reminiscent of Men in Black. The idea was in essence a 'cool logo' that would delight kids and amuse adults.

---

[109] *Saturday Star*, "War Declared on Aliens."

[110] Ibid.

[111] Murray, "Working for Water's 'AlienBusters,'" 140; for perspectives on xenophobia in contemporary South Africa, see Michael Neocosmos, *From 'Foreign Natives' to 'Native Foreigners.' Explaining Xenophobia in Post-Apartheid South Africa. Citizenship and Nationalism, Identity and Politics* (Dakar: Council for the Development of Social Science Research in Africa, 2006); Nahla Valji, "Creating the Nation: The Rise of Violent Xenophobia in the New South Africa," Unpublished Masters Thesis, York University, July 2003, accessed 24 March 2015, http://www.ritecodev.co.za/CSVR/creating-the-nation-the-rise-of-violent-xenophobia-in-the-new-south-africa/; Jason Hickel, ""Xenophobia" in South Africa: Order, Chaos, and the Moral Economy of Witchcraft," *Cultural Anthropology* 29, no. 1 (2014): 103-127.

[112] Michael Valdez Moses *et al.*, "*District 9*: A Roundtable," *Safundi: The Journal of South African and American Studies* 11, no. 1–2 (2010): 155-175.

[113] See Murray, "Working for Water's 'AlienBusters'"; Comaroff and Comaroff, "Naturing the Nation: Aliens, Apocalypse and the Postcolonial State"; Carruthers and Robin, "Taxonomic Imperialism in the Battles for Acacia: Identity and Science in South Africa and Australia"; Jane Carruthers *et al.*, "A Native at Home and Abroad: The History, Politics, Ethics and Aesthetics of *Acacia*"; Gilbert Caluya, "Fragments for a Postcolonial Critique of the Anthropocene," in *Rethinking Invasion Ecologies from the Environmental Humanities*, ed. Jodi Frawley and Iain McCalman (New York: Routledge, 2014), 35-44.

> A little alien directory was produced—a small guide that folds out to show the 15 most dangerous aliens that live among us, threatening our water, our animals, the very earth at our feet!
>
> First contact teaser packs were developed. The pack constituted of an official envelope from the Department of Alien Control (address Somewhere Secret, Planet Earth), containing a letter from the Department of Alien Control, a comic book giving relevant information and response mechanisms, official alien-spotting glasses and an alien directory.
>
> Alien Buster kits were also developed for the nurseries containing items such as caps, educational posters, alien bins, "thank you from an indigenous plant" seed packet giveaways, bumper stickers, comic books, kids' competition mobiles etc.[114]

The comic books were "the main message platform" in the campaign and the AlienBusters team was introduced in a Saturday newspaper supplement with the title 'Alien busters rise to the challenge':

> Bionic Bug the leader with her tentacles that suck the life out of invader plants; Mechanical Man armed with lots of strength and a chain saw at the end of one of his arms and Chemical Can with deadly spray guns on either side of his head and x ray vision. This powerful team have one thing in mind and that is to remove all alien plants so our own plants and animals can thrive.[115]

Murray notes that "the bond imagined for the 'AlienBusters' task team was an environmental concern able to transcend differences of race, gender and class, and thus able to heroicize readers in a courageous community of action."[116] However, as Lesley Green, Rob Nixon and others have made clear, this imagined bond is problematic in a South African context where environmental engagement does not transcend but rather pronounces ecological and social inequities.[117] Different communities and social constituencies have very different experiences of, and ideas about, what ecological engagement could and should be.[118] More problematic still is the suggestion that this bond be cultivated through a simplified, aggravated response based on polar conceptions of 'native' and 'alien,' encouraging and providing tools for ecological engagement in the form of violent eradication.[119] Perhaps appropriately for an initiative that enrolled narratives of political struggle and nation-building into stories of environmental engagement, AlienBusters was headed by then DWAF Minister Ronnie Kasrils, a

---

[114] DWAF "Working for Water Alien Buster Week Proposal," 5.

[115] *Saturday Argus Supplement*, "Alien Busters Rise to the Challenge," 21 October 2000.

[116] Murray, "Working for Water's 'AlienBusters,'" 133.

[117] Lesley Green, "Ecology, Race, and the Making of Environmental Publics: A Dialogue with *Silent Spring* in South Africa," *Resilience: A Journal of the Environmental Humanities* 1, no. 2 (2014); See also Rob Nixon's discussion of the South African game reserve in "Stranger in the Eco-Village: Race, Tourism, and Environmental Time," Chapter 6 in *Slow Violence*.

[118] As Nixon notes, "in its unevenly postapartheid mode, South Africa has to contend with the civilizational clout of powerful national and international ideologies of nature. These are potentially mutable ideologies, to be sure, but nonetheless etched into the nation's physical, psychic, and economic landscapes." Nixon, *Slow Violence,* 198.

[119] Murray, "Working for Water's 'AlienBusters,'" 147.

founding member of Umkhonto we Sizwe (the armed wing of the African National Congress). Launching the 'war on weeds,' Kasrils declared, "we need to sneak up on the aliens and suck the life out of them."[120] Discussing his role in the AlienBusters campaign, Kasrils declared, "old strugglers never die, they just go looking for a new struggle."[121] In the *Cape Times* report of the launch, photographs of the event are accompanied by the caption 'Armed and Dangerous' (the title of Kasril's autobiography) where Kasrils goes "off to war with trusted lieutenants cartoon characters Chemical Can, Bionic Bug and Mechanical Man."[122]

South African media has enthusiastically embraced this narrative (as Tim Low has observed, "alien invasions ... are very newsworthy"[123]), and contemporary reports about IAS tend to follow the same basic rhetorical lines as the AlienBusters campaign. The complexities of the 'IAS problem' (including the heterogeneous, and sometimes beneficial ecological, economic and social impacts of species designated IAS[124]) are rarely elaborated, and 'aliens' or 'invader plants' are seldom explained in the media in terms beyond their supposed 'inherent' characteristics.[125] Representative headlines include, "Attack on aliens applauded"[126] and "[Cape Town] battling invasion of deadly aliens."[127] A typical article begins with a concern for 'the health' of ecosystems, presents IAS as a health-threatening 'impact upon' the environment, and then proceeds to point out the negative effects of IAS on poor communities, human health and livelihoods, financial costs in relation to, for example, water scarcity, and the creation of job opportunities through eradication programmes.[128] A 2012 article in the *Mail & Guardian*

---

[120] B. Williams, "Ministers Start Vital Plant Fight," *Cape Times,* 12 October 2000.

[121] C. Venter, "Didn't we Get a Gold Even for That?" *Farmers Weekly*, 27 October 2000, 21.

[122] Williams, "Ministers Start Vital Plant Fight."

[123] Tim Low, "Selling the Story."

[124] Tassin and Kull, "Facing the Broader Dimensions of Biological Invasions."

[125] But see the critique of invasion biology published by Gloria Keverne, "The Nationalization of Nature," *The Witness*, 4 June 2014, http://www.witness.co.za/index.php?showcontent&global%5B_id%5D=120054; and the response by Brian W. van Wilgen and David M. Richardson, "Why Those Who Call us 'Ecofascists' are Wrong," *The Witness*, 16 June 2014, accessed 24 March 2015, http://www.invasives.org.za/resources/downloadable-resources/viewdownload/82-media-reports/597-the-witness-16-june-2014-why-those-who-call-us-ecofascists-are-wrong.html.

[126] Christina Scott, "Attack on Alien Applauded," *Mail & Guardian Online,* 14 June 2010, accessed 24 March 2015, http://mg.co.za/article/2010-06-14-attack-on-aliens-applauded.

[127] Henri du Plessis, "CT Battling Invasion of Deadly Aliens," *Independent Online*, 13 November 2014, accessed 24 March 2015, http://www.iol.co.za/scitech/science/environment/ct-battling-invasion-of-deadly-aliens-1.1779850#.VRVR4mR4ppY.

[128] See for instance *City Press*, "Aliens Shock Department," 27 July 2010, accessed 24 March 2015, http://www.citypress.co.za/news/aliens-shock-department-20100727/; *Sunday Times*, "Climate Change Boosts Invasive Alien Threat," 8 October 2010, accessed 24 March 2015, http://www.timeslive.co.za/business/2010/10/08/climate-change-boosts-invasive-alien-threat; Brian van Wilgen, "Experts in Battle Against Invasive Aliens," *Independent Online,* 6 June 2006, accessed 24 March 2015, http://www.iol.co.za/news/south-africa/experts-in-battle-against-invasive-aliens-1.280598?ot=inmsa.ArticlePrintPageLayout.ot; Adrienne Carlisle, "Bugs to Fight Water Weeds," *Sunday Times,* 11 January 2011, accessed 24 March 2015, http://www.timeslive.co.za/thetimes/2011/01/11/bugs-to-fight-water-weeds; *Mail & Guardian*, "Is SA

synthesizes all these concerns, warning of the "vast and growing impacts [of invasive alien species] on South African ecosystems, with direct financial costs and effects on human health and livelihoods."[129]

The 'good guys' in this war are the scientific and governmental organizations behind the control and suppression of the 'invasive aliens' (e.g. the CIB and WfW), portrayed as contributing a vital social good through provision of training and work opportunities to impoverished communities who, it is often claimed, would otherwise be negatively affected by 'invasions.' The assumed benefits obtained by the poor in return for participating in alien clearing schemes are rarely questioned, although WfW head Guy Preston, quoted in *The Guardian*, hints at the potential for dissenting views when he acknowledges, "The work is extremely tough, it's dangerous and the pay is not good. But we're keen to employ as many people as we can, to give them the dignity of work."[130] The word "dignity" stands in stark contrast with the title of the article—"Township poor risk life and limb in fight against plant invaders"—which acknowledges that eradicating these species involves low salaries and high risk for workers from communities that are already disproportionately vulnerable. The routine IAS narrative is remarkably persistent in media contexts, appearing in headlines even in the rare instances where the report itself discusses the complexity of the issues at stake. For instance, while Dave Richardson, director of the CIB, suggested at a 2012 event that more thought should be put into how to live with the 'novel ecosystems' created by IAS, the media report of the event ran with the headline "More work needed to curb spread of invasive species, says expert at award ceremony."[131]

What then, having traced IAS through science, law, public campaigns and the media, are the explanations for how and why this environmental narrative has thrived?

Invasive Narratives

> When we describe human activities within an ecosystem, we seem always to tell stories about them. Like all historians, we configure the events of the past into causal sequences—stories—that order and simplify those events to give them new meanings. We do so because narrative is the chief literary form that tries to find meaning in an overwhelmingly crowded and disordered chronological reality. When we choose a plot to order our

---

Losing Battle Against Invasive Alien Plants?" 31 October 2007, accessed 24 March 2015, http://mg.co.za/article/2007-10-31-is-sa-losing-battle-against-invasive-alien-plants.

[129] *Mail & Guardian*, "Stopping Invaders from Taking Over," 9 November 2012, accessed 24 March, http://mg.co.za/article/2012-11-09-stopping-invaders-from-taking-over; see also *Mail & Guardian*, "Future of Employment Glows Green," 1 November 2013, http://mg.co.za/article/2013-11-01-00-future-of-employment-glows-green.

[130] Rory Carroll, "Township Poor of South Africa risk Life and Limb in Fight against Plant Invaders," *The Guardian,* 1 November 2003, accessed 24 March 2015, http://www.theguardian.com/world/2003/nov/01/southafrica.rorycarroll.

[131] Engela Duvenage, "More work needed to curb spread of invasive species, says expert at award ceremony," *Stellenbosch University News*, 17 October 2012, accessed 24 March 2015, http://blogs.sun.ac.za/news/2012/10/17/more-work-needed-to-curb-spread-of-invasive-species-says-expert-at-award-ceremony/.

> environmental histories, we give them a unity that neither nature nor the past possesses so clearly. In so doing, we move beyond nature into the intensely human realm of value.[132]

This procedure, described by William Cronon, is not unique to environmental historians; telling stories (whether fictional, political, scientific) is a basic way in which we frame and make sense of our surroundings, individually and collectively (in this context, we use the words story or narrative in a broad sense, to denote any text or discourse that is in some way sense-making and interpretative). The story that has taken shape around so-called IAS is both powerful and persistent, and, evidently, travels easily between scientific, political, public and cultural domains. Such 'performative' narratives may sometimes be desirable for particular purposes, and can be instrumental for raising public and political awareness and initiating change. However, they may also be problematic. As Cronon intimates, narratives by their very nature highlight some elements of the world and exclude others. This power to frame reality can, conversely, hide their status as constructed narratives to begin with, and they may consequently shut down other potentially legitimate, emancipatory and equally feasible ways of framing and understanding a particular phenomenon.[133] We suggest that this is the case with the IAS story. In this section, we draw attention to some of the key features that make IAS such a powerful narrative, and identify why we think it is problematic.

The change processes described by the IAS narrative are significant not because they provide a representational challenge (in the sense of the processes of 'slow violence' described by Nixon), but rather because they are a narrative *invitation*, speaking to prevalent but also misleading and counterproductive ideas about the environment. The highly emotive rhetoric surrounding new or introduced species can be traced to the initial normative assumptions embedded in the history of the field of ecology concerning the inherent 'goodness' of 'balanced,' 'natural' ecosystems, and to popular discourses that implicitly reify these assumptions. As Dana Phillips notes, "ecology has come to be identified in the popular mind with such values as balance, harmony, unity, purity, health, and economy," to the extent that "many people regard these values, however utopian they may be, as all but indisputable and as all but synonymous with the very word 'ecology.'"[134] While these concepts have no real place in contemporary scientific descriptions of ecology, they play a key role in explaining the cogency of the IAS story, providing a utopian but widespread idea of a balanced, harmonious and thriving ecosystem against which certain species can be defined as disruptive, threatening and 'un-natural.' Because 'ecology' is so strongly associated with ideas of balance, which, as Libby Robin notes, "has such intrinsic appeal that it often goes unquestioned,"[135] as well as, more recently, ideas of 'ecosystem services,' potential change is immediately thought of in

---

[132] William Cronon, "A Place for Stories: Nature, History, and Narrative," *The Journal of American History* 78, no. 4 (1992): 1347-1376, 1349.

[133] Leach, Scoones and Stirling, *Dynamic Sustainabilities*.

[134] Dana Phillips, *The Truth of Ecology: Nature, Culture and Literature in America* (Oxford: Oxford University Press), 42.

[135] Libby Robin, "Resilience in the Anthropocene: A Biography," in *Rethinking Invasion Ecologies from the Environmental Humanities*, ed. Jodi Frawley and Iain McCalman (New York: Routledge, 2014), 45-63, 54.

terms of the opposite—disruption, fragmentation, contamination, illness and financial loss. Without the pre-existing story about 'natural' ecosystems as inherently 'good' and 'healthy,' there could not be such a powerful counter narrative of inherently 'bad' newcomers or 'invaders.'

In the past few decades ecologists have largely abandoned ideas about harmony, balance, and linearly progressing ecosystems in favour of concepts like complexity, disturbance, regime shifts and rapid change.[136] However, the framing rhetoric and concepts of 'invasion biology' (though not necessarily the actual work being carried out under that banner[137]) seem to have decoupled from this development and become self-sustaining narratives that continue to shape understandings, reactions, and strategies in polemical and reductionist ways. To begin with, the label 'invasion biology' in itself implies a clear distinction between invading species and invaded ecosystems, a line that in practice can be both debatable and difficult to draw in time as well as space. It suggests ideas of a timeless and static 'balance of nature' where 'invasive aliens' are somehow abnormal and appear as a disruption to the ordered progression of 'natural' evolution, presupposing a linear conception of ecological time as irreversibly advancing from one state to another.[138] Moreover, the idea of a distinct category of 'alien species' fails to differentiate between recently introduced plants or animals and ones with a long history in a particular place, and obscures the 'naturalness,' in historical and evolutionary terms, of changing species dynamics and distribution. While the 'aliens' are thus historically imprecise, as Caluya has noted, "the imagined 'natural' ecological system that is being protected is often historically specific."[139] In South Africa, Australia and other colonized territories, this desired 'natural' state tends to be equated with the moment of 'discovery' by Europeans (often neglecting the role of shifting indigenous practices in gradually forming what are seen as the 'pristine' landscapes of earlier times). However, this temporal specificity remains implicit, and thereby masks rather than opens up discussion of the different historical perspectives implied by the concept of 'invasive aliens.' The IAS narrative thus propounds a 'flat' perspective of history: rather than drawing attention to the complex, interwoven relationships between human and natural history, it envisions a simplified and threatened 'now' defined against a static and idealized 'then' that is only implicitly historically specific.

Secondly, the IAS story combines the notion of inherently 'good' versus 'bad' ecologies with ideas about nationhood, pairing 'good' with native and 'bad' with foreign, non-native and 'alien.' This nationalistic framework connects to a long history of enlisting 'nature' as part of

---

[136] Levin, "Ecosystems and the Biosphere as Complex Adaptive Systems"; Carl Folke *et al.,* "Regime Shifts, Resilience, and Biodiversity in Ecosystem Management," *Annual Review of Ecology, Evolution, and Systematics* 35 (2004): 557-581; Carl Folke, "Resilience: The Emergence of a Perspective for Social-Ecological Systems Analyses," *Global Environmental Change* 16, no. 3 (2006): 253-267.

[137] See for instance Richardson *et al.*, "Biological Invasions—the Widening Debate: A Response to Charles Warren."

[138] For instance, the idea that ecological succession proceeded to a single 'climax state.' Frederic E. Clements, "Nature and Structure of the Climax," *The Journal of Ecology* 24, no. 1 (1936): 252-284; S.T.A. Pickett, M.L. Cadenasso and S.J. Meiners, "Ever since Clements: From Succession to Vegetation Dynamics and Understanding to Intervention," *Applied Vegetation Science* 12, no. 1 (2009): 9-21.

[139] Caluya, "Fragments for a Postcolonial Critique of the Anthropocene," 36.

nation and empire-building processes,[140] which has found particularly strong expression in South Africa, where certain introduced and disruptive species have presented a common enemy for a fraught nation to unite against at various moments in history.[141] What is less recognized is that the very ideas of 'native' and 'alien' species may be a colonial heritage. Gilbert Caluya, drawing on the ecologist Mark Davis,[142] notes that "the terms 'native' and 'alien' were transposed from British common law to botany in the 1840s to distinguish 'true' British flora from others," which meant that "the language of British migration, a system for managing racial populations through the nation-state … [became] the primary language for imagining flora."[143] This legacy remains evident in the many popular names for IAS that contain national prefixes, such as the Spanish cane (*Arundo donax*), Japanese starfish (*Asterias amurensis*), Thailand catfish (*Clarias batrachus*), and Argentine ant (*Linepithema humile*), reinforcing the idea that species distributions are 'naturally' delimited by politically-derived national borders. Moreover, words such as 'alien,' 'homicidal' or 'cancer' are paired with military vocabulary such as 'battle,' 'invader,' 'eradicate,' 'perilous mission' and 'attack,' transposing the temporalities (hours, days, weeks) and emotions and strategies (malicious intent, direction, conquest) of warfare into description of ecological relations. Furthermore, the word 'alien' extends the idea of belonging to a planetary scale and suggests that 'alien species' may possess qualities that are categorically different from 'normal' species that belong on earth.

Thirdly, the IAS narrative engenders a sense of empowerment. IAS conjures up a specific chain of events and suggests a particular range of responses (e.g. defence, war), while it discourages or excludes others (e.g. acquiescence, accommodation). The two-dimensional image of native-beneficial and foreign-harmful produces a subsequent narrative where the desire to eradicate invasive species appears self-explanatory and unquestionable, as well as imminently possible and achievable. The term 'invasive' is, as Larson notes, "an exemplary performative metaphor because we have difficulty conceptualizing invaders without immediately wanting to do something about them."[144] As Guy Preston, head of WfW, explained to an interviewer, "it's important to take action. It's like a cancer: What would happen if you do nothing?"[145] These features help to make the 'threat' posed by 'invasive' species recognizable in time as well as space, and invite clear and tangible ways to respond by directly addressing our moral compasses (the central idea of the inherently good 'natural' ecosystem). Reducing a complex process to a stable set of identities produces a threat that can both be 'fully understood' by enough research and hacked away at by a willing public.

Fourthly, and finally, the IAS narrative is persistent and successful not least because, by proposing a comprehensible problem and an easily understandable solution, it responds to our

---

[140] See for example Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860* (Cambridge: Cambridge University Press, 1995).

[141] Lance van Sittert, "'The Seed Blows about in Every Breeze': Noxious Weed Eradication in the Cape Colony, 1860-1909," *Journal of Southern African Studies* 26, no. 4 (2000): 655-674; Comaroff and Comaroff, "Naturing the Nation"; Carruthers *et al.*, "A Native at Home and Abroad."

[142] Davis *et al.,* "Don't Judge Species by Their Origins," 153.

[143] Caluya, "Fragments for a Postcolonial Critique of the Anthropocene," 37.

[144] Larson, *Metaphors for Environmental Sustainability*, 163.

[145] Guy Preston quoted in Koenig, "Unleashing an Army to Repair Alien-Ravaged Ecosystems," 563.

urge to control environmental change. The reduction of complex processes to interactions between clearly defined entities enables the enrolment of species—such as the previously obscure and in many ways benign *M. galloprovincialis*—into a web of regulation, research and management. Capturing this sentiment, Mechanical Man (from WfW's AlienBusters comic) exclaims while reading CARA's three categories of 'alien'—"I'm glad CARA makes it all so clear!"[146] Following from this framing, a seemingly inevitable set of scientific questions present themselves, including: what characteristics enable the alien species to invade? How will the alien affect native species? How do we control the alien?[147] Underlying these questions about 'characteristics,' 'impacts' and 'implications for management' may be a fear of uncontrollability itself.[148]

Some invasion biologists have responded to critique of the IAS narrative by claiming that most scientists are "acutely aware of conflicts of interest" surrounding certain 'alien' species and that the "native/alien polarity [is] not a 'polarity' issue to invasion ecologists" but rather "regarded as points on a continuum."[149] While we recognize this as true, we also argue that this defence underestimates the subtle ways in which powerful framing narratives and concepts influence knowledge production and related action, regardless of caveats in specific scientific studies and situations. Lesley Head notes for example that while scientists increasingly attach contingencies to the concept of IAS, "management and legislative rhetoric around weeds are often framed in less flexible terms."[150] The result may be that "their uncritical use naturalizes antagonistic ways of relating to the natural world."[151] In a study of Australian trees in South Africa, Brett Bennett likewise suggests that "the currently popular anti-exotic rhetoric of many South Africans is at odds with the contribution of plantations and timber products to South Africa's economy and the more nuanced scientific findings about biological invasion held by the scientific community." Bennett further notes that "Just as many nineteenth-century colonists enthusiastically wanted to believe only the best things about

---

[146] Working for Water, "AlienBusters in the Race to Save Planet Earth, First Collectors' Edition," accessed 24 March 2015, http://www.dwaf.gov.za/wfw/Weedbuster/comic/weedbuster1.pdf.

[147] These stylized questions were derived from the questions posed in the scientific literature on the mussel *M. galloprovincialis,* but we think they are equally applicable to literature on IAS species more generally. Griffiths *et al.*, "Marine Invasive Aliens on South African Shores"; Sarah J. Bownes and Christopher D. McQuaid, "Will the Invasive Mussel *Mytilus galloprovincialis* Lamarck Replace the Indigenous *Perna Perna* L. on the South Coast of South Africa?" *Journal of Experimental Marine Biology and Ecology* 338 (2006): 140-151; Branch and Steffani, "Can We Predict the Effects of Alien Species?"; Hockey and van Erkom Schurink, "The Invasive Biology of the Mussel *Mytilus galloprovincialis* on the Southern African Coast."

[148] C.S. Holling and Gary K. Meffe, "Command and Control and the Pathology of Natural Resource Management," *Conservation Biology* 10, no. 2 (1996): 328-337; Ludwig, "The Era of Management is Over"; Stirling, "Emancipating Transformations."

[149] Richardson *et al.*, "Biological Invasions—the Widening Debate," 296.

[150] Lesley Head, "Living in a Weedy Future: Insights from the Garden," in *Rethinking Invasion Ecologies from the Environmental Humanities*, ed. Jodi Frawley and Iain McCalman (New York: Routledge, 2014), 88-99, 88.

[151] Brendan Larson, "Entangled Biological, Cultural and Linguistic Origins of the War on Invasive Species," in *Body, Language and Mind. Volume 2: Sociocultural Situatedness*, ed. R. Frank, R. Dirven, T. Ziemke, E. Bernárdez (New York: Mouton de Gruyter, 2008), 169-195, 169.

Australian trees, in a reversal of fortunes, many twenty-first-century South Africans want to believe only the worst."[152]

The Inverse of 'Slow Violence'

> Slowly unfolding environmental catastrophes present formidable representational obstacles that can hinder our efforts to mobilize and act decisively.[153]

Certain types of complex, systemic and dispersed environmental change (e.g. climate change) exert what Rob Nixon has termed 'slow violence' upon both human and non-human ecological communities. While violence is "customarily conceived as an event or action that is immediate in time, explosive and spectacular in space, and as erupting into instant sensational visibility," Nixon defines *slow* violence as "a violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all."[154] The complex processes of slow violence provide "formidable representational obstacles that can hinder our efforts to mobilize and act decisively," and defy attempts to produce explanatory and performative narratives.[155] The lack of such a narrative, Nixon contends, further exacerbates slow violence.

Other types of complex environmental change seem, at first sight, much easier to talk and write about than those Nixon describes. As we have explored in this paper, the sheer rapidity and visibility of particular kinds of biodiversity change can provide "arresting stories, images and symbols" that are readily embraced in news media, legislation, policy documents, research applications and popular imaginations.[156] This is not, as it may first seem, only a fortunate thing for drawing attention to negative impacts of biodiversity change, but is actually as much an indicator of our shortcomings when it comes to responding thoughtfully and systemically to environmental change as is our failure to react and respond to processes of slow violence. The translation of complex phenomena into fast, invasive narratives highlights, just as Nixon's analysis does, and as Daniel Kahneman has demonstrated through a long series of psychological experiments,[157] the ways in which we tend to substitute complexity and difficulty with more straightforward alternatives that better fit our existing ideas and imaginations, and that are easier to respond to in ways that feel meaningful. Simplistic and invasive narratives such as IAS thus represent the inverse of the neglected stories that precipitate slow violence: being fast, clear and catchy, they prevent more nuanced, disparate and varied means of conceiving of environmental change, and become dominant precisely because they leave more systemic and structural causes of environmental degradation

---

[152] Brett Bennett, "Naturalising Australian Trees in South Africa: Climate, Exotics and Experimentation," *Journal of Southern African Studies* 37, Issue 2 (2011): 265–280, 279.

[153] Nixon, *Slow Violence,* 2.

[154] Ibid., 2.

[155] Ibid., 2.

[156] Ibid., 2-3.

[157] Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011).

untouched.[158] In this way, invasive narratives may preclude diverse ways of knowing and engaging with changing ecologies, landscapes and environments.

To clarify, the difference between the rhetoric surrounding slow violence and that of IAS is not a simple dichotomy between a lack of narrative versus an exaggerated or hyperbolized one. Rather the issue concerns the implicit influence of narrative *form*, or genre, on concerns that are widely understood as defined and determined by scientific analysis alone. As Nixon details, slow environmental violence tends to be described in narrative forms that do not match or easily adapt to fast-paced, sensational-driven media and policy rhetoric that influence which issues are prioritized on social and political agendas. On the other hand, concerns about the effects of intentional and unintentional anthropogenic species redistribution, interpreted in terms of IAS, have been subsumed into a story drawing on the genre of science fiction, a genre associated in popular culture with more or less self-explanatory performative responses, easily adapted to and even amplified in those same rhetorical contexts. This may seem a literary distinction, but, as we wish to make clear in this paper, the issue and influence of genre can have substantial consequences for how a concern is understood, apprehended and addressed on practical levels.[159]

Stepping back to consider environmental narratives more generally, Naomi Oreskes has suggested that disparate traditions across academic disciplines may be partly responsible for producing different types of stories.[160] While Oreskes and her co-authors find that the disciplinary conventions of most climate scientists prompt them to "err on the side of least drama" in their conclusions,[161] Brendan Larson's encounters with conservation biologists and ecologists working with IAS suggest a greater willingness to adopt alarmist and evocative metaphors, perhaps in comparison erring on the side of most drama. This distinction can be thought of in terms of differing disciplinary genres, influencing how research results are received across and beyond academic boundaries.[162] In this sense, attention to how literary and aesthetic forms shape and influence environmental narratives can help unpack links between ecological science, environmental communication, social engagement, and cultural perceptions. "Clearly," as Nixon summarizes, "genre study remains a pertinent component of our inquiries into the complex interface between aesthetic forms and forms of socioenvironmental change."[163] These links between genre, aesthetics and sociopolitical environmental engagement are clearly abundant in the case of IAS.

While fast, clear, and catchy, basing species distinctions upon criteria of 'alien' and 'native'—even if understood as points on a continuum—encourages static temporal and spatial understandings of biodiversity. Ecosystems generally comprise complex compositions of

---

[158] Jonathan L. Clark, "Uncharismatic Invasives," *Environmental Humanities* 6 (2015): 29-52.

[159] For a discussion about the role of apprehension in this context, see Nixon, *Slow Violence*, 14.

[160] Oreskes and Conway, *Merchants of Doubt*; Naomi Oreskes, "The Scientist as Sentinel," *Limn* 3 (2013), accessed 24 March 2015, http://limn.it/the-scientist-as-sentinel/; Naomi Oreskes, "Playing Dumb on Climate Change," *The New York Times*, 3 January 2015, accessed 24 March 2015, http://www.nytimes.com/2015/01/04/opinion/sunday/playing-dumb-on-climate-change.html?_r=0.

[161] Keynyn Brysse, Naomi Oreskes, Jessica O'Reilley and Michael Oppenheimer, "Climate Change Prediction: Erring on the Side of Least Drama," *Global Environmental Change* 23, no. 1 (2013): 327-337.

[162] Larson, *Metaphors for Environmental Sustainability,* 161-193.

[163] Nixon, *Slow Violence*, 32.

species coming and going at different times from many different places.[164] Furthermore, positing qualitative differences between 'alien' organisms and the ecosystems in which they reside suppresses interpretations of biodiversity as a relational process—for example, obscuring the innumerable ways in which the 'alien' mussel *M. galloprovincialis* is already enrolled in complex webs of interdependence with 'native' South African biodiversity.

The IAS narrative is thus structured around out-dated modes of knowing nature, and has arguably become dominant at least in part because it leaves systemic and structural environmental injustice untouched. The equation of 'native' with 'good' and 'natural' ecologies means that successful new species are constructed as 'environmental threats.' By focusing on individual species, IAS suppresses attention to the processes—such as habitat destruction, economic policies, consumption patterns and so on—that drive rapid environmental degradation and change. Nevertheless, despite dwindling scientific relevance, equilibrium modes of understanding nature (often clothed in the language of complexity) remain attractive to some incumbent styles of governing, legislating and managing arguably because they perpetuate what Andrew Stirling calls "fallacies of control."[165] Stirling explains that elisions to 'control' constitute fallacies because they imply that forms of social action can be "as unqualified, exclusively and comprehensively determining as suggested by the everyday meaning of control"—when much evidence, not least from our IAS example, suggests otherwise.[166] For instance, while it is likely that there are more 'alien' species in South Africa today (engaging in innumerable and largely unknown ways with existing ecosystems) than before the creation of the legislative framework, WfW, and many other associated programmes and policies,[167] the IAS narrative continues to espouse the possibility of generating complete knowledge and controlling the 'threat' ("I'm glad CARA makes it all so clear"). For Stirling, then, claims to control are "better understood … more as instrumental fictions necessary for assertion of privilege, than as disinterested accounts of actuality."[168] Indeed, while there is no doubt that WfW has been truly empowering for some, and has likely increased species diversity in some areas, by "articulating the connections between ecological health and economic empowerment" in terms of the IAS narrative, WfW also serves to reinforce government fallacies of control rather than tackle systemic causes of gross social inequities and rapid environmental destruction.[169]

Finally and perhaps most insidiously the IAS narrative restricts, rather than expands, the options available to citizens, scientists, managers, and legislators to explore new and perhaps adversarial ways of knowing and engaging with emerging ecologies through pluralistic, endogenous and locally relevant processes. The portrayal of IAS as an absolute, non-negotiable ecological threat is one way of reducing the range of potential questions evoked by rapid biodiversity change to a dualistic choice of 'whether to be green or not,' where 'saving the

---

[164] E.g., Ellis, Antill and Kreft, "All Is Not Loss: Plant Biodiversity in the Anthropocene."

[165] Stirling, "Emancipating Transformations."

[166] Ibid., 17.

[167] van Wilgen *et al.,* "An Assessment of the Effectiveness of a Large, National-Scale, Invasive Alien Plant Control Strategy in South Africa."

[168] Stirling, "Emancipating Transformations," 17.

[169] UNEP, *Working for Water: A South African Sustainability Case*.

environment' is framed simply in terms of eradication and control rather than a complex and multifarious set of difficult ecological, political and philosophical questions subject to debate, discussion and disagreement.[170] In South Africa, this simplified narrative attempts to build a unified environmental public on the basis of what Sally-Ann Murray describes as the "violent eradication of forms of alien unbelonging."[171] However, as Aitken and colleagues make clear with the example of wattle in the state of Mpumulanga, there is no 'single public' that stands to benefit or lose from any particular 'alien' species, but rather a highly diverse range of actors interacting with species in different ways, from WfW eradication teams, to commercial foresters, to conservation managers, to poor rural communities seeking fuel and construction materials.[172] This diversity of knowing and engaging with 'alien' species in practice indicates possibilities for counter-narratives of 'alien' engagement to emerge. Indeed, the head of CIB recently called for more 'innovative thinking' about how to manage the 'novel ecosystems' created by, among other factors, "invasive organisms."[173]

We conclude by indicating two avenues that may serve to open up these plural and inevitably hybrid futures in the case of IAS. On the one hand, recent scientific studies —while largely maintaining the language of 'invasive,' 'alien' and 'native'—have begun to explore the complex effects of species movement on biodiversity, revealing a multiplicity of patterns at multiple scales. For example, Erle Ellis and colleagues suggest that vascular plant diversity has increased in regional landscapes, "mostly because species invasions tend to exceed native losses," while diversity has thinned at the global scale.[174] Meanwhile Chris Thomas and Georgina Palmer, in a study of British plant diversity, conclude that areas with increasing numbers of 'non-native' species also have increasing numbers of 'natives.'[175] Finally, Mark Davis and a group of fellow ecologists argue that the 'native' versus 'non-native' distinction is no longer useful as a 'guiding principle' of conservation and should be replaced with more "dynamic and pragmatic approaches … better suited to our fast-changing planet."[176] On the other hand, complexity perspectives in natural resource management have in recent years produced a range of approaches, including social learning,[177] adaptive co-management,[178] and

---

[170] To paraphrase Andrew Stirling's sentence in "Emancipating Transformations," 4.

[171] Murray, "Working for Water's 'AlienBusters.'"

[172] Michelle Aitken, Haripriya Rangan and Christian A. Kull, "Living with Alien Invasives. The Political Ecology of Wattle in the Eastern Highveld Mpumulanga, South Africa," *Études Océan indien* 42-43 (2009): 115-141.

[173] David M. Richardson quoted in Duvenage, "More work needed to curb spread of invasive species, says expert at award ceremony."

[174] Ellis, Antill and Kreft, "All Is Not Loss: Plant Biodiversity in the Anthropocene."

[175] Thomas and Palmer, "Non-Native Plants Add to the British Flora Without Negative Consequences for Native Diversity."

[176] Davis *et al.,* "Don't Judge Species by Their Origins," 153.

[177] Georgina Cundill, "Monitoring Social Learning Processes in Adaptive Comanagement: Three Case Studies from South Africa," *Ecology and Society* 15, no. 3 (2010): 28; Romina Rodela, "Social Learning and Natural Resource Management: The Emergence of Three Research Perspectives," *Ecology and Society* 16, no. 4 (2011): 30.

[178] Ryan Plummer *et al.*, "Adaptive Comanagement: A Systematic Review and Analysis," *Ecology and Society* 17, no. 3 (2012): 11; Marnie Graham and Henrik Ernstson, "Comanagement at the Fringes: Examining Stakeholder Perspectives at Macassar Dunes, Cape Town, South Africa—at the Intersection

revised understandings of environmental stewardship,[179] that attempt to place learning, plural perspectives and knowledges, and open-ended participation at the centre of management practice. The intersection of these and other avenues may provide fertile ground for the emergence of narratives that are cognizant of complexity and can open up for more diverse, caring and thoughtful forms of ecological engagement.

Susanna Lidström is a postdoctoral researcher at the Division of History of Science, Technology and Environment at the KTH Royal Institute of Technology in Stockholm. She is currently a guest researcher at Scripps Institution of Oceanography in La Jolla, California, where she studies literary non-fiction about oceans and environmental change.

Simon West is a PhD student in Natural Resource Management at the Stockholm Resilience Centre, Sweden. His research examines knowledge practices, performances, and politics in environmental conservation and management, primarily in South Africa and Australia.

Tania Katzschner is a senior lecturer in City and Regional Planning at the University of Cape Town (UCT). She has work experience in local government, the private sector, NGOs and conservation agencies, and is currently a PhD student in the Environmental Humanities programme at UCT researching, rethinking and restor(y)ing urban nature.

M. Isabel Pérez-Ramos is a doctoral candidate at the Division of History of Science, Technology and Environment, with the Environmental Humanities Laboratory, at KTH Royal Institute of Technology in Stockholm. She is also a member of the ecocriticism research group GIECO, funded by the Instituto Franklin (Alcalá de Henares, Spain). Her main academic interests are Chicano literature, the U.S. Southwest and environmental justice.

Hedley Twidle is a senior lecturer in the Department of English at the University of Cape Town, where he has been involved in the launch of a new interdisciplinary research initiative: Environmental Humanities South (http://www.envhumsouth.uct.ac.za). At the moment he is thinking about life-writing, the essay and narrative non-fiction in Africa. More of his work can be found at www.seapointcontact.wordpress.com

---

of High Biodiversity, Urban Poverty, and Inequality," *Ecology and Society* 17, no. 3 (2012): 34; Jason Evans, Ann C. Wilkie and Jeffrey Burkhardt, "Adaptive Management of Nonnative Species: Moving Beyond the 'Either-Or' Through Experimental Pluralism," *Journal of Agricultural and Environmental Ethics* 21 (2008): 521-539.

[179] Laura Ogden *et al.*, "Global Assemblages, Resilience, and Earth Stewardship in the Anthropocene," *Frontiers in Ecology and Environment* 11, no. 7 (2013): 341-347; F. Stuart Chapin III *et al.*, "Ecosystem Stewardship: Sustainability Strategies for a Rapidly Changing Planet," *Trends in Ecology and Evolution* 25, no. 4 (2010): 241-249.

ACKNOWLEDGEMENTS Many thanks to Lisen Schultz and three anonymous reviewers for helpful suggestions and comments on earlier versions of this article. Part of this research was made possible by funding from The Swedish Foundation for International Cooperation in Research and Higher Education (STINT). Simon West would like to acknowledge the financial support of Vetenskapsrådet (VR) and the Swedish Foundation for Strategic Environmental Research (Mistra).

Bibliography

Aitken, Michelle, Haripriya Rangan and Christian A. Kull. "Living With Alien Invasives. The Political Ecology of Wattle in the Eastern Highveld Mpumulanga, South Africa." *Études Océan indien* 42-43 (2009): 115-141.

Beck, Ulrich. *Risk Society: Towards a New Modernity*. London: Sage, 1992.

Beeson, Mark. "The Coming of Environmental Authoritarianism." *Environmental Politics* 19, no. 2 (2010): 276-294.

Bennett, Brett M. "Naturalising Australian Trees in South Africa: Climate, Exotics and Experimentation." *Journal of Southern African Studies* 37, no. 2 (2011): 265–280.

_____ . "Model Invasions and the Development of National Concerns over Invasive Introduced Trees: Insights from South African History." *Biological Invasions* 16 (2014): 499–512.

_____ . "Margaret Levyns and the Decline of Ecological Liberalism in the Southwest Cape, 1890 – 1975." *South African Historical Journal* 67, no. 1 (2015): 64–84.

Berkes, Fikret, Carl Folke and Johan Colding, eds. *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Cambridge: Cambridge University Press, 1998.

Berkes, Fikret, Johan Colding and Carl Folke, eds. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press, 2003.

Binns, J.A., P.M. Illgner and E.L. Nel. "Water Shortage, Deforestation and Development: South Africa's Working for Water Programme." *Land Degradation & Development* 12 (2001): 341-355.

Bownes, Sarah J. and Christpher D. McQuaid. "Will the Invasive Mussel *Mytilus galloprovincialis* Lamarck Replace the Indigenous Perna perna L. on the South Coast of South Africa?" *Journal of Experimental Marine Biology and Ecology* 338 (2006): 140-151.

Branch, George M. and C. Nina Steffani. "Can We Predict the Effects of Alien Species? A Case-History of the Invasion of South Africa by *Mytilus galloprovincialis* (Lamarck)." *Journal of Experimental Marine Biology and Ecology* 300 (2004): 189-215.

Brown, Duncan. *Are Trout South African? Stories of Fish, People and Places*. Johannesburg: Picador Africa, 2013.

Brysse, Keynyn, Naomi Oreskes, Jessica O'Reilley and Michael Oppenheimer. "Climate Change Prediction: Erring on the Side of Least Drama." *Global Environmental Change* 23, no. 1 (2013): 327-337.

CABI. "*Mytilus galloprovincialis*." Datasheet. 2011. Accessed 9 October 2014. http://www.cabi.org/isc/datasheet/73756.

Caluya, Gilbert. "Fragments for a Postcolonial Critique of the Anthropocene: Invasion Biology and Environmental Security." In *Rethinking Invasion Ecologies from the Environmental Humanities*, edited by Jodi Frawley and Iain McCalman, 35-44. New York: Routledge, 2014.

Carlisle, Adrienne. "Bugs to Fight Water Weeds." *Sunday Times* 11 January 2011. Accessed 24 March 2015. http://www.timeslive.co.za/thetimes/2011/01/11/bugs-to-fight-water-weeds.

Carlton, James T. (2002) "Bioinvasion Ecology: Assessing Invasion Impact and Scale." In *Invasive Aquatic Species of Europe. Distribution, Impacts and Management*, edited by Erkki Leppäkoski, Stephan Gollasch and Sergej Olenin, 7-19. Dordrecht: Kluwer Academic Publishers, 2002.

Carroll, Rory. "Township Poor of South Africa Risk Life and Limb in Fight Against Plant Invaders." *The Guardian* 1 November 2003. Accessed 24 March 2015. http://www.theguardian.com/world/2003/nov/01/southafrica.rorycarroll.

Carruthers, Jane, Libby Robin, Johan P. Hattingh, Christian A. Kull, Haripriya Rangan and Brian van Wilgen. "A Native at Home and Abroad: The History, Politics, Ethics and Aesthetics of *Acacia*." *Diversity and Distributions: A Journal of Conservation Biology* 17, no. 5 (2011): 810-821.

Chapin III, F. Stuart *et al*. "Ecosystem Stewardship: Sustainability Strategies for a Rapidly Changing Planet." *Trends in Ecology and Evolution* 25, no. 4 (2010): 241-249.

City Press. "Aliens Shock Department." 27 July 2010. Accessed 24 March 2015. http://www.citypress.co.za/news/aliens-shock-department-20100727/.

Sunday Times. "Climate Change Boosts Invasive Alien Threat." 8 October 2010. Accessed 24 March 2015. http://www.timeslive.co.za/business/2010/10/08/climate-change-boosts-invasive-alien-threat.

Clark, Jonathan L. "Uncharismatic Invasives." *Environmental Humanities* 6 (2015): 29-52.

Clements, Frederic E. "Nature and Structure of the Climax." *The Journal of Ecology* 24, no. 1 (1936): 252-284.

Colautti, Rob and Hugh MacIsaac. "A Neutral Terminology to Define 'Invasive' Species." *Diversity and Distribution: A Journal of Conservation Biology* 10, no. 2 (2004): 135-141.

Comaroff, Jean and John L. Comaroff. "Naturing the Nation: Aliens, Apocalypse and the Postcolonial State." *Journal of Southern African Studies* 27, no. 3 (2001): 627-651.

Cronon, William. "A Place for Stories: Nature, History, and Narrative." *The Journal of American History* 78, no. 4 (1992): 1347-1376.

Cundill, Georgina. "Monitoring Social Learning Processes in Adaptive Comanagement: Three Case Studies from South Africa." *Ecology and Society* 15, no. 3 (2010): 28.

Davis, Mark. *Invasion Biology*. Oxford: Oxford University Press, 2009.

Davis, Mark et al. "Don't Judge Species by Their Origins." *Nature* 474 (2011): 153-154.

de la Cretaz, Avril L. and Matthew J. Kelty. "Establishment and Control of Hay-Scented Fern: A Native Invasive Species." *Biological Invasions* 1 (1999): 223-236.

De Moor, Irene J. and Michael N. Bruton. *Atlas of Alien and Translocated Indigenous Aquatic Animals in Southern Africa. South African National Scientific Programmes Report* 144. Pretoria, South Africa, 1988.

Department of Agriculture (DA). Conservation of Agricultural Resources Act (CARA). Government Gazette no. 8673. 27 April 1983.

Department of Environmental Affairs and Tourism (DEAT). White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity. Government Gazette no. 18163. 28 July 1997.

Department of Environmental Affairs (DEA). "Publication of the Amended Alien and Invasive Species Regulations." 4 August 2014. Accessed 24 March 2015. https://www.environment.gov.za/mediarelease/alienandinvasivespeciesregulations.

Department of Environmental Affairs (DEA). National Environmental Management: Biodiversity Act. Government Gazette no. 26887. 8 October 2004.

Department of Environmental Affairs (DEA). National Environmental Management: Biodiversity Act, 2004. Alien and Invasive Species Regulations. Government Gazette no. 37885. 1 August 2014.

Department for Environmental Affairs (DEA). "The Regulation of Invasive Species: Clarification of the Regulation of Brown Trout and Rainbow Trout." 19 May 2014. Accessed 24 March 2015. https://www.environment.gov.za/mediarelease/invasivespecies_regulation.

Department of Water Affairs and Forestry (DWAF). Working for Water Alien Buster Week Proposal. 2000.

Department of Water Affairs and Forestry (DWAF). The Working for Water Programme: Annual Report 2002/3. Department of Water Affairs and Forestry, Pretoria, 2004.

Duit, Andreas and Victor Galaz. "Governance and Complexity—Emerging Issues for Governance Theory." *Governance: An International Journal of Policy, Administration, and Institutions* 21, no. 3, July (2008): 311-335.

du Plessis, Henri. "CT Battling Invasion of Deadly Aliens." *Independent Online* 13 November 2014. Accessed 24 March 2015. http://www.iol.co.za/scitech/science/environment/ct-battling-invasion-of-deadly-aliens-1.1779850#.VRVR4mR4ppY.

Duvenage, Engela. "More work needed to curb spread of invasive species, says expert at award ceremony." *Stellenbosch University News* 17 October 2012. Accessed 24 March 2015. http://blogs.sun.ac.za/news/2012/10/17/more-work-needed-to-curb-spread-of-invasive-species-says-expert-at-award-ceremony/.

Ellis, Erle C., Erica C. Antill and Holger Kreft. "All Is Not Loss: Plant Biodiversity in the Anthropocene." *PLoS ONE* 7, no. 1 (2012): e30535.

Elton, Charles. *The Ecology of Invasions by Animals and Plants*. London: Methuen, 1958.

Ernstson, Henrik and Sverker Sörlin. "Ecosystem Services as Technology of Globalization: On Articulating Values in Urban Nature." *Ecological Economics* 86 (2013), 274-284.

European Parliament (2014) "Parliament Backs EU-wide Plans to Stem the Spread of Invasive Alien Species." Press release 16 April 2014. Accessed 13 March 2015. http://www.europarl.europa.eu/news/en/news-room/content/20140411IPR43471/html/Parliament-backs-EU-wide-plans-to-stem-the-spread-of-invasive-alien-species.

Evans, Jason M., Ann C. Wilkie and Jeffrey Burkhardt. "Adaptive Management of Nonnative Species: Moving Beyond the 'Either-Or' Through Experimental Pluralism." *J. Agric. Environ. Ethics* 21 (2008): 521-539.

Folke, Carl et al. "Regime Shifts, Resilience, and Biodiversity in Ecosystem Management." *Annual Review of Ecology, Evolution, and Systematics* 35 (2004): 557-581

Folke, Carl. "Resilience: The Emergence of a Perspective for Social-Ecological Systems Analyses." *Global Environmental Change* 16, no. 3 (2006): 253-267.

Fowkes, Sandra. "Lessons from Changes in Governance of Fire Management: The Ukuvuka Operation Firestop Campaign." In *Governance as a Trialogue: Government-Society-Science in Transition*, edited by Anthony R. Turton *et al*., 215-236. Berlin: Springer, 2007.

Frawley, Jodi and Iain McCalman. "Invasion Ecologies: The Nature/Culture Challenge." In *Rethinking Invasion Ecologies from the Environmental Humanities*, edited by Jodi Frawley and Iain McCalman, 3-14. NewYork: Routledge, 2014.

Gosling, Melanie. "Homicidal Habits of Trout in Focus." *Cape Times* 7 July 2014. Accessed 13 March 2015. http://www.iol.co.za/capetimes/homicidal-habits-of-trout-in-focus-1.1715276#.VQMVWmYqofo.

Graham, Marnie and Henrik Ernstson. "Comanagement at the Fringes: Examining Stakeholder Perspectives at Macassar Dunes, Cape Town, South Africa—at the Intersection of High Biodiversity, Urban Poverty, and Inequality." *Ecology and Society* 17, no. 3 (2012): 34.

Grant, W. Stewart. "South Africa's Mystery Mussel." *African Wildlife* 41 (1987): 175-179.

Grant, W. Stewart and Michael I. Cherry. "*Mytilus galloprovincialis* Lmk. in Southern Africa." *Journal of Experimental Marine Biology and Ecology* 90 (1985): 179-191.

Grant, W. Stewart, Michael I. Cherry and T. Lombarda. "A Cryptic Species of Mytilus (Mollusca: Bivalvia) on the West Coast of South Africa." *South African Journal of Marine Science* 2 (1984): 149-162.

Green, Lesley. "Ecology, Race and the Making of Environmental Publics in South Africa: A Dialogue with *Silent Spring*." *Resilience* 1, no. 2 (2014).

Griffiths, C.L., P.A.R. Hockey, C. Van Erkom Schurink and P.J. Le Roux. "Marine Invasive Aliens on South African Shores: Implications for Community Structure and Trophic Functioning." *South African Journal of Marine Science* 12, no. 1 (1992): 713-722.

Griffiths, Charles L., Tamara B. Robinson and Angela Mead. "The Status and Distribution of Marine Alien Species in South Africa." In *Biological Invasions in Marine Ecosystems: Ecological, Management, and Geographic Perspectives*, edited by Gil Rilov and Jeffrey A. Crooks, 393-408. Berlin: Springer, 2008.

Griffiths, Tom and Libby Robin. *Ecology and Empire: Environmental History of Settler Societies*. Edinburgh: Keele University Press, 1997.

Grove, Richard. *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600-1860*. Cambridge: Cambridge University Press, 1995.

The Guardian. "Township Poor of South Africa Risk Life and Limb in Fight Against Plant Invaders." 31 October 2003. Accessed 20 March 2015. http://www.theguardian.com/world/2003/nov/01/southafrica.rorycarroll.

Hanks, Karoline. "A Legal Solution? The Conservation of Agricultural Resources Act explained." Accessed 24 March 2015. https://www.dwaf.gov.za/wfw/Docs/Articles/CARA.doc.

Head, Lesley. "Living in a Weedy Future: Insights from the Garden." In *Rethinking Invasion Ecologies from the Environmental Humanities*, edited by Jodi Frawley and Iain McCalman, 88-99. NewYork: Routledge, 2014.

Hickel, Jason. "'Xenophobia' in South Africa: Order, Chaos, and the Moral Economy of Witchcraft." *Cultural Anthropology* 29, no. 1 (2014): 103-27.

Hockey, P.A.R. and C. van Erkom Schurink. "The Invasive Biology of the Mussel *Mytilus galloprovincialis* on the Southern African Coast." *Transactions of the Royal Society of South Africa* 48 (1992): 123-139.

Holling, C.S. and Gary K. Meffe. "Command and Control and the Pathology of Natural Resource Management." *Conservation Biology* 10, no. 2 (1996): 328-337.

IUCN. "Why is Biodiversity in Crisis?" Accessed 24 March 2015. https://www.iucn.org/iyb/about/biodiversity_crisis/.

Katzschner, Tania. "Stuck in an Old Story." Accessed 24 March 2015. http://organizationunbound.org/expressive-change/stuck-in-an-old-story/.

Kahneman, Daniel. *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux, 2011.

Keverne, Gloria. "The Nationalization of Nature." *The Witness* 4 June 2014. http://www.witness.co.za/index.php?showcontent&global%5B_id%5D=120054.

Koenig, Robert. "Unleashing an Army to Repair Alien-Ravaged Ecosystems." *Science* 325 (2009): 562-563.

KZN Conservancies Association Blog. "NEMBA Alien and Invasive Species Regulations." Accessed 24 March 2015. https://kzncablog.wordpress.com/2013/07/30/nemba-alien-and-invasive-species-regulations/.

Leach, Melissa, Ian Scoones and Andy Stirling. *Dynamic Sustainabilities: Technology, Environment, Social Justice*. London: Earthscan, 2010.

Lakoff, George. "Why It Matters How We Frame the Environment." *Environmental Communication: A Journal of Nature and Culture* 4, no. 1 (2010): 70-81.

Larson, Brendan. "An Alien Approach to Invasive Species: Objectivity and Society in Invasion Biology." *Biological Invasions* 9 (2007): 947-956.

Larson, Brendan. "Entangled Biological, Cultural and Linguistic Origins of the War on Invasive Species." In *Body, Language and Mind. Volume 2: Sociocultural Situatedness*, edited by R. Frank, R. Dirven, T. Ziemke and E. Bernárdez, 169-195. New York: Mouton de Gruyter, 2008.

Larson, Brendan. *Metaphors for Environmental Sustainability: Redefining our Relationship with Nature*. New Haven: Yale University Press, 2011.

Levin, Simon A. "Ecosystems and the Biosphere as Complex Adaptive Systems." *Ecosystems* 1 (1998): 431-436.

Lowe, S., M. Browne, S. Boudjelas and M. De Poorter. *100 of the World's Worst Invasive Alien Species. A Selection from the Global Invasive Species Database.* The Invasive Species Specialist Group (ISSG), the Species Survival Commission (SSC) of the World Conservation Union (IUCN).

Ludwig, Donald. "The Era of Management Is Over." *Ecosystems* 4 (2001): 758-764.

Mack, Richard N. *et al.* "Biotic Invasions: Causes, Epidemiology, Global Consequences and Control." *Issues in Ecology* 5 (2000): 1-20.

Mail & Guardian. "Is SA Losing Battle Against Invasive Alien Plants?" 31 October 2007. Accessed 24 March 2015. http://mg.co.za/article/2007-10-31-is-sa-losing-battle-against-invasive-alien-plants.

Mail & Guardian. "Stopping Invaders from Taking Over." 9 November 2012. Accessed 10 March 2015. http://mg.co.za/article/2012-11-09-stopping-invaders-from-taking-over.

Mail & Guardian. "Future of Employment Glows Green." 1 November 2013. http://mg.co.za/article/2013-11-01-00-future-of-employment-glows-green.

Marshall, Claire. "EU Blacklist to Stop Spread of Alien Species." *BBC News Online*, 16 April 2014. Accessed 20 March 2015. http://www.bbc.com/news/science-environment-27039714.

McGeoch, M.A., D. Spear, E.J. Kleynhans and E. Marais. "Uncertainty in Invasive Alien Species Listing." *Ecological Applications* 22, no. 3 (2012): 959-971.

McKinney, Michael L. and Julie L. Lockwood, eds. *Biotic Homogenization*. New York: Kluwer Academic/Plenum Publishers, 2001.

Monastersky, Richard. "Biodiversity: Life—A Status Report." *Nature* 516, no. 7530 (2014): 158-161.

Moses, Michael Valdez *et al.* "*District 9*: A Roundtable." *Safundi: The Journal of South African and American Studies* 11, no. 1-2 (2010): 155-175.

Murray, Sally-Ann. "Working for Water's 'AlienBusters': Material and Metaphoric Campaigns Against 'Alien Invaders'." *Critical Arts: South-North Cultural and Media Studies* 19, no. 1-2 (2005): 127-149.

Myers, Norman *et al.* "Biodiversity Hotspots for Conservation Priorities." *Nature* 403 (2000): 853-858.

Neely, A. "'Blame it on the Weeds': Politics, Poverty, and Ecology in the New South Africa." *Journal of Southern African Studies* 36, no. 4 (2010): 869-887.

Neocosmos, Michael. *From 'Foreign Natives' to 'Native Foreigners.' Explaining Xenophobia in Post-apartheid South Africa. Citizenship and Nationalism, Identity and Politics.* Dakar: Council for the Development of Social Science Research in Africa, 2006.

Nixon, Rob. *Slow Violence and the Environmentalism of the Poor*. Cambridge, MA: Harvard University Press, 2011.

Ogden, Laura *et al.* "Global Assemblages, Resilience, and Earth Stewardship in the Anthropocene." *Frontiers in Ecology and Environment* 11, no. 7 (2013): 341-347.

Oreskes, Naomi. "The Scientist as Sentinel." *Limn* 3 (2013). Accessed 13 March 2015. http://limn.it/the-scientist-as-sentinel/.

_____ . "Playing Dumb on Climate Change." *The New York Times* 3 January 2015. Accessed 13 March 2015. http://www.nytimes.com/2015/01/04/opinion/sunday/playing-dumb-on-climate-change.html?_r=0.

Oreskes, Naomi and Erik Conway. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. New York: Bloomsbury Press, 2010.

Paterson, A.R. "Clearing a Path Towards Effective Alien Invasive Control: The Legal Conundrum." *Potchefstroom Electronic Law Journal* 9, no. 1 (2006): 151-207.

Pfeiffer, Jeanine and Robert Voeks. "Biological Invasions and Biocultural Diversity: Linking Ecological and Cultural Systems." *Environmental Conservation* 35, no. 4 (2008): 281-293.

Phillips, Dana. *The Truth of Ecology: Nature, Culture and Literature in America*. Oxford: Oxford University Press, 2003.

Pickett, S.T.A., M.L. Cadenasso and S.J. Meiners. "Ever Since Clements: From Succession to Vegetation Dynamics and Understanding to Intervention." *Applied Vegetation Science* 12, no. 1 (2009): 9-21.

Plummer, Ryan, *et al.* "Adaptive Comanagement: A Systematic Review and Analysis." *Ecology and Society* 17, no. 3 (2012): 11.

Pooley, Simon. "Pressed Flowers: Notions of Indigenous and Alien Vegetation in South Africa's Western Cape, c. 1902–1945." *Journal of Southern African Studies* 36, no. 3 (2010): 599–618.

Purnell, Andrew. "Government gets tough on Invasive Aliens." *NCC Environmental Services Blog*. Accessed 24 March 2015. http://www.ncc-group.co.za/blog/2015/03/government-gets-tough-invasive-aliens.

Pielke, Roger A. Jr. *The Honest Broker: Making Sense of Science in Policy and Politics*. Cambridge: Cambridge University Press, 2007.

Ricciardi, Anthony and Hugh J. MacIsaac. "In Retrospect: The Book That Began Invasion Ecology." *Nature* 452, no. 34 (2008): 34.

Richardson, David M. and Robert L. Kluge. "Seed Banks of Invasive Australian *Acacia* Species in South Africa: Role in Invasiveness and Options for Management." *Perspectives in Plant Ecology, Evolutions and Systematics* 10 (2008): 161-177.

Richardson, D.M., P. Pyšek, D. Simberloff, M. Rejmánek, A.D. Mader. "Biological Invasions—the Widening Debate: A Response to Charles Warren." *Progress in Human Geography* 32, no. 2 (2008): 295-298.

Richardson, David M. and Anthony Ricciardi. "Misleading Criticisms of Invasion Science: A Field Guide." *Diversity and Distributions* 19, no. 12 (2013): 1461-1467.

Robbins, Paul. "Comparing Invasive Networks: Cultural and Political Biographies of Invasive Species." *The Geographical Review* 94, no. 2 (2004): 139-156.

Robin, Libby. (2014) "Resilience in the Anthropocene: A Biography." In *Rethinking Invasion Ecologies from the Environmental Humanities*, edited by Jodi Frawley and Iain McCalman, 45-63. New York: Routledge, 2014.

Robin, Libby and Jane Carruthers. "National Identity and International Science: The Case of *Acacia*." *Historical Records of Australian Science* 23 (2012): 34-54.

Robin, Libby and Will Steffen. "History for the Anthropocene." *History Compass* 5, no. 5 (2007): 1694-1719.

Robinson, T.B., C.L. Griffiths, C.D. McQuaid and M Rius. "Marine Alien Species of South Africa—Status and Impacts." *African Journal of Marine Science* 27, no. 1 (2005): 297-306.

Robinson, T.B., G.M. Branch, C.L. Griffiths, A. Govender and P.A.R. Hockey. "Changes in South African Rocky Intertidal Invertebrate Community Structure Associated with the Invasion of the Mussel *Mytilus galloprovincialis*." *Marine Ecology Progress Series* 340 (2007): 163-171.

Rodela, Romina. "Social Learning and Natural Resource Management: The Emergence of Three Research Perspectives." *Ecology and Society* 16, no. 4 (2011): 30.

Rogers, K.H. *et al.* "Fostering Complexity Thinking in Action Research for Change in Social-Ecological Systems." *Ecology and Society* 18, no. 2 (2013): 31.

Sarewitz, Daniel. "How Science Makes Environmental Controversies Worse." *Environmental Science & Policy* 7, no. 5, October (2004): 385-403.

Saturday Argus Supplement. "Alien Busters Rise to the Challenge." 21 October 2000.

Saturday Star TGW Region Gauteng. "War Declared on Aliens." 14 October 2000, 20.

Scott, Christina. "Attack on Alien Applauded." *Mail & Guardian Online* 14 June 2010. Accessed 24 March 2015. http://mg.co.za/article/2010-06-14-attack-on-aliens-applauded.

Shelton, J., M. Samways and J. Day. "Predatory Impact of Non-Native Rainbow Trout on Endemic Fish Populations in Headwater Streams in the Cape Floristic." *Biological Invasions* 17 (2014): 365-379.

Shine, Clare. *A Toolkit for Developing Legal and Institutional Frameworks for Invasive Alien Species*. Nairobi, Global Invasive Species Programme, 2008.

Simberloff, Daniel and Betsy Von Holle. "Positive Interactions of Nonindigenous Species: Invasional Meltdown?" *Biological Invasions* 1 (1999): 21-32.

Simberloff, Daniel et al. "Non-Natives: 141 Scientists Object." *Nature* 475 (2011): 36.

Simberloff, Daniel. *Invasive Species: What Everyone Needs to Know*. Oxford: Oxford University Press, 2013.

Slobodkin, Lawrence B. "The Good, the Bad and the Reified." *Evolutionary Ecology Research* 3 (2001): 1-13.

Stirling, Andy. "Keep it Complex." *Nature* 468 (2010): 1029-1031.

Stirling, Andy. "Emancipating Transformations: From Controlling 'The Transition' to Culturing Plural Radical Progress." STEPS Centre Working Paper, 2014.

Tassin, Jacques and Christian A. Kull. "Facing the Broader Dimensions of Biological Invasions." *Land Use Policy* 42 (2015): 165-169.

Theodoropoulos, David I. *Invasion Biology: Critique of a Pseudoscience.* Blythe, California: Avvar Books, 2003.

Thomas, Chris D. "The Anthropocene Could Raise Biological Diversity." *Nature* 502 (2013): 7.

Thomas, Chris D. and G. Palmer. "Non-Native Plants Add to the British Flora without Negative Consequences for Native Diversity." *PNAS* 112, no. 14 (2015): 4387-4392.

Turpie J.K., C. Marai, J.N. Blignaut. "The Working for Water Programme: Evolution of a Payments for Ecosystem Services Mechanism that Addresses Both Poverty and Ecosystem Service Delivery in South Africa." *Ecological Economics* 65, no. 4 (2008): 788-798.

UNEP. *Working for Water: A South African Sustainability Case.* 2007. Accessed 10 March 2015. http://www.unep.org/training/programmes/Instructor%20Version/Part_3/readings/WfW_case.pdf.

United Nations (UN) Convention on Biological Diversity, 5 June 1992, Rio de Janeiro.

Valji, Nahla. "Creating the Nation: The Rise of Violent Xenophobia in the New South Africa." Unpublished Masters Thesis, York University, July 2003. Accessed 24 March 2015. http://www.ritecodev.co.za/CSVR/creating-the-nation-the-rise-of-violent-xenophobia-in-the-new-south-africa/.

van Sittert, Lance. "'The Seed Blows About in Every Breeze': Noxious Weed Eradication in the Cape Colony, 1860-1909." *Journal of Southern African Studies* 26, no. 4 (2000): 655-674.

_____ . "'Our Irrepressible Fellow-Colonist': The Biological Invasion of Prickly Pear (*Opuntia ficus-indica*) in the Eastern Cape c.1890-c.1910." *Journal of Historical Geography* 28, no. 3 (2002): 397-419.

_____ . "Making the Cape Floral Kingdom: The Discovery and Defence of Indigenous Flora at the Cape ca. 1890 – 1939." *Landscape Research* 28, no.1 (2003): 113–129.

van Wilgen Brian W. *et al.* "A Biome-Scale Assessment of the Impact of Invasive Alien Plants on Ecosystem Services in South Africa." *Journal of Environmental Management* 89 (2008): 336-349.

van Wilgen, Brian W., Sarah J. Davies and David M. Richardson. "Invasion Science for Society: A Decade of Contributions from the Centre for Invasion Biology." *South African Journal of Science* 110, no. 7/8 (2014): 1-12.

van Wilgen, B.W., G.G. Forsyth, D.C. Le Maitre, A. Wannenburgh, J.D.F. Kotze, E. van den Berg and L. Henderson. "An Assessment of the Effectiveness of a Large, National-Scale, Invasive Alien Plant Control Strategy in South Africa." *Biological Conservation* 148 (2012): 28-38.

van Wilgen, Brian W. and David M. Richardson. "Why Those Who Call us 'Ecofascists' are Wrong." *The Witness* 16 June 2014. Accessed 24 March 2015.

http://www.invasives.org.za/resources/downloadable-resources/viewdownload/82-media-reports/597-the-witness-16-june-2014-why-those-who-call-us-ecofascists-are-wrong.html.

van Wilgen, Brian W. "Experts in Battle Against Invasive Aliens." *Independent Online* 6 June 2006. Accessed 24 March 2015. http://www.iol.co.za/news/south-africa/experts-in-battle-against-invasive-aliens-1.280598?ot=inmsa.ArticlePrintPageLayout.ot.

Venter, C. "Didn't We Get a Gold Even for That?" *Farmers Weekly* 27 October 2000, 21.

Warren, Charles. "Perspectives on the 'Alien' versus 'Native' Species Debate: A Critique of Concepts, Language and Practice." *Progress in Human Geography* 31, no. 4 (2007): 427-446.

Wilcove, David S. *et al.* "Quantifying Threats to Imperiled Species in the United States." *BioScience* 48, no. 8 (1998): 607-615.

Williams, B. "Ministers Start Vital Plant Fight." *Cape Times* 12 October 2000.

Working for Water (WfW). "AlienBusters in the Race to Save Planet Earth, First Collectors' Edition." Accessed 24 March 2015. http://www.dwaf.gov.za/wfw/Weedbuster/comic/weedbuster1.pdf.

Young, T. R. "National and Regional Legislation for Promotion and Support to the Prevention, Control, and Eradication of Invasive Species." The World Bank Environment Department, Biodiversity Series, 2006, 108.

Yusoff, Kathryn. "Aesthetics of Loss: Biodiversity, Banal Violence and Biotic Subjects." *Transactions of the Institute of British Geographers* 37, issue 4 (2012): 578–592.

Zenni, R.D., J.R.U. Wilson, J.J. Le Roux and D.M. Richardson. "Evaluating the Invasiveness of *Acacia paradoxa* in South Africa." *South African Journal of Botany* 75 (2009): 485-496.