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Moral-Material Ontologies of Nature Conservation: Exploring the Discord between Ecological Restoration and Novel Ecosystems

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Recent years have witnessed growing concern on how we should conduct conservation activities in a world of human-altered biophysical conditions. The ‘novel ecosystems’ perspective has emerged as a way to meet this challenge. However, its focus on accepting ‘new natures’ as the ‘new normal’ has drawn much criticism from those wedded to conventional forms of conservation such as ‘ecological restoration’. This paper: (1) provides a much needed review of this dispute; (2) formulates and deploys an original analytical framework that draws on Thomas Kuhn’s ‘theoretical history’ of science and Charles Taylor’s moral philosophy to extricate the entangled moral and material ontologies of nature that conflate facts with values in the world-building activities of disputants; and (3) identifies and examines the processes underlying these world-building activities. The paper closes by offering an initial suggestion on how to explore options for resolving this highly contentious debate.

Introduction

The ‘Anthropocene’ was coined at the turn of the millennium to describe a new geological epoch where human activities have generated global impacts equalling or surpassing natural processes (Crutzen, 2002, Crutzen and Stoermer, 2000). As a concept, it delineates a period ‘pregnant with risks as well as generative opportunities’ (Johnson et al., 2014, 440) by confronting humanity with a reality that ‘graphically transgresses the ontological distinction that supposedly exists between humans and those globe-girdling environmental systems that have remained relatively stable for the last 12000 years’ (Castree, 2014c, 450). A prominent effect of this reflective concern has been to intensified anxiety that ‘we have destroyed something worth preserving’ (Robbins and Moore, 2013, 8). In few places has this been felt more strongly than in nature conservation, which ‘encourages societies to reflect upon and regulate their relationship with the non-human world’ (Jepson and Ladle, 2010, 2). Here, concern centres on how we should conduct conservation activities in a world of human altered biophysical conditions where environments characterised by species invasions and altered climates render questionable traditional conservation methods devised under the more

stationary assumptions of twentieth century ecological science (Bridgewater and Yung, 2013). Hence, by rethinking the conventional understanding of nature as removed from society, this reflective stance ‘challenges the modern science-politics settlement, where natural science speaks for a stable, objective Nature’ (Lorimer, 2012, 593).

To reconceive nature in this way involves more than just a moral concern with past human impacts on the planet. Rather, it informs the materiality of our future influence on the environment, as how ‘nature’ is conceived informs the direction of conservation law, policy and our physical engagement with the non-human world (Baskin, 2015, Whitehead, 2014). Such a rethinking of nature’s ontology thereby presents a considerable challenge for traditional forms of conservation practice such as habitat protectionism and ecological restoration (Throop, 2000, Jordan et al., 1990) that principally emphasise preserving the species composition of ‘healthy’ ecosystems or restoring ‘degraded’ ecosystems to a ‘natural state’ of acceptable historic variability (Cabin, 2011, Tongway and Ludwig, 2011, Comín, 2010). The primary conundrum supplied by this reflective position for these approaches arises because the orientation of such nature conservation activities is towards historic ecosystems configurations in an age where the geological, climatic and ecological envelope facilitating such historical conditions has been superseded (Corlett, 2015).

A number of new nature conservation concepts have emerged in recent years that seek to respond to this challenge of conserving nature in a world of changing biophysical conditions by advocating new directions for conservation theory and practice. Some such as ‘rewilding’ promote a ‘backward-looking’ (Keulartz, in-press) eco-centric approach to conservation focused on re-creating the ecological conditions of the deep past (Taylor, 2013, Bauer et al.,

2009, Brown et al., 2011, Navarro and Pereira, 2012), albeit sometimes challenged as artificial (Deliege, in-press) and often promoted with an inherent aesthetic preference (Prior and Brady, in-press). Others, such as the now established ecosystems services concept have emerged as a reconsideration of where value may lie in humanity's interactions with the non-human world (Lennon and Scott, 2014, Daily, 1997, Potschin and Haines-Young, 2011). However, these perspectives do not necessarily question the fundamental premise of traditional conservation approaches, namely that recreating historic ecosystem configurations should be allocated primacy in conservation activities. In contrast, the *novel ecosystems* concept advances a 'forward-looking' (Keulartz, in-press) perspective that challenges the hegemonic priority afforded historic species composition and ecological processes in nature conservation. Consequently, the novel ecosystems concept has become a focus of contentious debate at the frontier of nature conservation theory. Those endorsing this concept imagine such novel ecosystems as constituting 'non-historical species configurations that arise due to anthropogenic environmental change, land conversion, species invasion or a combination of the three. They result as a consequence of human activity but do not depend on human intervention for their maintenance' (Hallet et al, 2013, 17). Hence, novel ecosystems are conceived as a self-directed evolutionary response of nature to human influence. From this perspective, it is the autogenic attributes and novel interactions of 'new natures' (Higgs, 2013, 293) which are prioritised rather than the fidelity of a particular species assemblage with an historic environmental configuration.

The essential difference between traditional approaches and the novel ecosystems concept thereby centre on what is valued in conservation theory, and hence what should be retained and enhanced in formulating nature conservation activity. However, advocates of these contending perspectives have most commonly deployed arguments justifying their views by

referencing the empiricist logic of natural science in propounding the reality ‘of’ nature rather than according due attention to how the constitution of such a reality is founded on morally informed interpretations of value ‘in’ nature. In particular, the discord between those advocating ecological restoration and novel ecosystems has become increasingly polarised as ethical debates on the morality of conservation activities are confused with the science of nature’s materiality, such that the values informing how facts are conceived are elided in the presentation of an ‘objective reality’ independent of human interpretation. Therefore, exploring the dispute between these divergent positions may throw light on how different scientific and normative perspectives can become conflated and help shape understanding of both the empirical realities of nature and what amounts to ‘good’ conservation practice.

As such, this paper unpacks this ‘blackbox’ of conflated moral-material claims at the frontier of nature conservation debates by extricating the tangle of values and facts in such debates. In doing so, it complements but does not duplicate the analytical approaches adopted by others who have advanced our understanding of how such entanglements shape perceptions of reality (Anderson and Wylie, 2009, Latour, 2005, Hinchliffe et al., 2005, Soper, 2000, Jasanoff, 2012, Castree and MacMillan, 2001, Daston and Vidal, 2010, Keulartz, 2012, Yusoff, 2013). Specifically, the paper draws upon and then amalgamates Thomas Kuhn’s philosophy of science and the moral philosophy of Charles Taylor to devise an original analytical framework that helps disentangle the knot of confusing contentions at the heart of this dispute. While the basic premises of Kuhn’s philosophy is familiar to most, this paper argues that much of this is misunderstood and that a more nuanced reading of his work yields benefit when investigating how the ‘facts’ about reality are produced. In contrast to Kuhn’s popular recognition, the details of Taylor’s philosophy are little known beyond the academic study of political and ethical theory. However, this paper demonstrates that Taylor’s

interpretive approach to the moral constitution of character offers analytical insight into how inter-subjective perspectives forge communally associated and morally infused identities that help shape perceptions on what amounts to legitimate knowledge claims.

The paper draws on an ‘archive’ (Foucault, 1972) generated by collating 89 academic papers and 10 books that were identified as pertinent to the debate. These sources were identified via Google Scholar using the search terms: ‘novel ecosystems’; ‘ecosystems thresholds’; ‘ecological restoration’; ‘restoration ecology’; ‘environmental restoration’; ‘anthropocene’; and ‘new nature(s)’. This search was undertaken between December and March 2015. Given the comparatively recent emergence of the novel ecosystems concept and the relatively short, yet contentious history of debate surrounding the concept, all but two academic papers deemed pertinent were published in the period 2009-2015. The majority of the papers are drawn from scientific journals, with the most prominent journals being: *Trends in Ecology & Evolution*; *Restoration Ecology*; and *Conservation Biology*. The papers were thematically grouped and examined for repeated themes. The review of the papers was conducted three times to ensure that all arguments made were identified and noted. The books were similarly ordered and reviewed. The author completed both the search and the review process. The scrutiny of this archive thereby facilitated a comprehensive knowledge of the debate between those advocating for the recognition of novel ecosystems and those working in ecological restoration that contest the validity of the concept. Given that this debate is located on the frontiers of nature conservation theory, it is likely that the opinions advanced in this archive may seek to push the boundaries of understanding and advocacy such that the stern positions adopted and polemics issued may not necessarily reflect the complexity of stances taken in practice (Hinchliffe, 2008, Gross, 2003). However, this paper demonstrates that careful analysis of how interpretations of ‘nature’ are conceived and advanced at the frontline of

nature conservation theory facilitates insight into the processes through which material and moral ontologies are formulated, conflated and subsequently presented as objective realities. Hence, in addition to presenting an original analytical framework, the paper also supplies a comprehensive overview of an important environmental values debate that has not yet been systematically examined. Accordingly, the remainder of this paper first outlines the philosophical perspectives of Kuhn and Taylor before demonstrating the clarity obtained by carefully relating their sensitivities. The paper then presents an original analytical framework that is subsequently deployed to extricate and clarify the tightly interlaced moral and material ontologies of nature that underpin contending arguments advanced by proponents of ecological restoration and novel ecosystems. The paper closes by offering an initial suggestion on how to give better representation to role played by ‘values’ in such debates.

Approaching Fact-Value Entanglements

From a conventional perspective, scientific knowledge is conceived to evolve in a linear cumulative fashion and is objectively produced from a neutral standpoint. Thomas Kuhn challenged this understanding in his seminal work, *The Structure of Scientific Revolutions* (Kuhn, 1962), by advancing a ‘theoretical history’ (Bird, 2000, viii) which proposed that scientific knowledge emerges in a non-linear fashion and is grounded in the broad-based consensus of a community of learned interpreters rather than necessarily corresponding with an objective reality. Kuhn’s most frequently quoted concept is that of a ‘paradigm’. However, reference to this is often made without adequate attention to the nuances of Kuhn’s conception of what a paradigm entails (Sharrock and Read, 2002). Much of this stems from a failure to appreciate that a paradigm has two inherently related dimensions for Kuhn. For him, ‘One sense of ‘paradigm’ is global, embracing all the shared commitments of a scientific

group; the other isolates a particularly important sort of commitment and is thus a subset of the first' (Kuhn, 1996, 113). Thus, a paradigm in the first sense is conceived 'sociologically' (Bird, 2000, 68) by encompassing 'the entire constellation of beliefs, values, techniques and so on shared by members of a given community' (Kuhn, 1970, 175). Kuhn would rename this concept a 'disciplinary matrix' in subsequent editions of *The Structure of Scientific Revolutions* (Kuhn, 1996, Kuhn, 1970) to prevent confusion with the second and narrower sense in which he used the term, a sense which he felt was 'the most novel and least understood aspect of the book' (Kuhn, 1996, 187). Here, a paradigm refers to what Kuhn terms 'exemplars' (Kuhn, 1996, 23). These comprise the 'set of recurrent and quasi-standard illustrations of various theories in their conceptual, observational and instrumental applications. These are the community's paradigms, revealed in textbooks, lectures and laboratory exercises' (Kuhn, 1996, 43). Such exemplars supply the 'acceptable examples of actual scientific practice – examples which include law, theory, application, and instrumentation together – provide [sic] models from which spring coherent traditions of scientific research' (Kuhn, 1996, 10). Hoyningen-Huene (1993) identifies three functions that such exemplars serve, these are: 'puzzle identification'; 'research assessment'; and the 'lexicon of empirical concepts'. In the case of 'puzzle identification', exemplars steer attention towards problems perceived as worth solving and thereby specify the direction of research. With regards to 'research assessment', exemplars supply the criteria by which knowledge claims are evaluated. Finally, the 'lexicon of empirical concepts' refers to the suite of terms given meaningful definition by exemplars and employed by those adhering to the 'constellation of beliefs, values, techniques and so on shared by members of a given community' (disciplinary matrix). Bird identifies a further function of exemplars. He suggests that exemplars 'enable scientists to see the world in such a way that solutions to those puzzles become apparent' (Bird, 2000, 69). Therefore, exemplars operate dialogically

and in mutual support with the beliefs and activities of scientists (disciplinary matrix), by steering effort and furnishing the criteria of assessment through which facts are produced, knowledge circulated and scientific activity justified. Hence, taking both senses of the term together, a 'paradigm' is a world-building worldview.

In 'normal' scientific activity, Kuhn contends that anomalies persisting in a paradigmatic explanation are understood as puzzles yet to be solved and are perceived as capable of resolution by the paradigmatic worldview. However, a 'crisis' occurs when a sufficient number of anomalies accumulate so that a sense of professional insecurity is provoked. Such anxiety prompts doubt concerning the procedures and theoretical explanations anchoring the paradigmatic perspective on reality. 'Hitherto a failure to solve a puzzle reflected negatively on the scientific capacity of the scientist who had tackled it. During a crisis the blame shifts from the scientist to the paradigm' (Bird, 2000, 43). At this juncture, new models of understanding (exemplars and disciplinary matrices) emerge to contend the dominance of the paradigm in crisis. Should one of these new models gain paradigmatic dominance, Kuhn's titular 'scientific revolution' can be said to have occurred. New paradigms that challenge the existing scientific worldview generally build upon but nevertheless transform the meanings given to concepts in the previously dominant paradigm (Kuhn, 1996, 147). In this sense, the 'lexicon of empirical concepts' is transformed concurrent with the emergence of new relationships that are grounded by way of new exemplars. Such new relationships generate 'incommensurability' between contending paradigms as different principles are supplied for evaluating the legitimacy of knowledge claims. Thus, an impasse develops as adherents to the contending paradigms reference their own presuppositions to defend theories and results produced in according with the premises of their paradigm, such that, 'a logically convincing proof can be given only to someone who concedes the premises to begin with' (Sharrock and

Read, 2002, 48). The idea that theories deriving from subsequent paradigms are incommensurable is one of the most intensely debated aspects of Kuhn's account. Much of the controversy centres on the assumption that incommensurability equates to non-comparability as a new paradigm overthrows the old (Newton-Smith, 2002, Shapere, 1984). However, Kuhn adopts a more sophisticated view in which comparability is always attempted. What ultimately matters is a choice grounded in schooling, disposition and the charisma of a paradigm's advocates. Hence, in periods where contending paradigmatic perspectives supply alternative options rather than a singular explanation, Kuhn's theory of scientific revolutions suggests that personal and interpersonal choice rooted in non-scientific criteria rather than the persuasive force of objective evidence may be a significant factor in determining which paradigmatic worldview to support. Given its normative motivation, this may be especially pertinent to the science of conservation biology that provides the scientific underpinning of nature conservation activity, the latter of which is 'a collection of social values and agendas that seek both to protect species and natural areas, and more generally, to govern our relationship with the natural world' (Jepson and Ladle, 2010, 17). Accordingly, to fully appreciate the complex entanglements of fact and value in nature conservation debates, it is necessary to attend to how normative positions inform the resonance of particular scientific paradigms in such debates. The Canadian moral philosopher Charles Taylor offers guidance in this respect.

While Kuhn seeks to clarify the ways by which the scientific realities of 'fact' come into being, Taylor's attention is directed to how the moral realities of 'values' are produced. With this focus on the constitution of moral positions, 'Taylor's claim is not that the self – the person, identity – is prior to morality, but rather that it is constituted in and through the taking of moral stances' (Calhoun, 1991, 233). Taylor suggests that such moral stances exist in

‘frameworks’ of qualitative contrast of good and bad, noble and base, worth and waste etc that supply ‘the background for our moral judgements, intuitions and reactions’ (Morello, 2007, 622). These frameworks are instantiated in social practices as the subject interacts with shared understandings of moral acceptability. As noted by Taylor, ‘If understanding makes the practice possible, it is also true that it is the practice that largely carries the understanding’ (Taylor, 2004, 25). In this sense, Taylor connects the framework of the subject with the intersubjectively held moral horizon of a community of interpreters in a manner similar to how Kuhn associates the world-building worldview of the individual with the disciplinary matrix in which they are positioned. Indeed, at a societal level and analogous to the ‘theoretical history’ advanced by Kuhn in the philosophy of science (Bird, 2000, viii), Taylor undertakes a ‘theoretical history’ in the social and political philosophy of society that leads him to develop the concept of ‘social imaginaries’. He uses this concept to explain how common understandings make possible acceptable collective practices by providing them with a sense of legitimacy. Taylor’s work thereby supplies an analysis of social conduct that bears similarities with the concept of ‘paradigms’ proposed by Kuhn in that it advances a socially attentive explanation of why agents hold certain beliefs which inform what they do and how they do it. Hence, social imaginaries are ‘the invisible meta-structures of societies, the behavioural assumptions of vast groups of affiliated peoples’ (Neill, 2008, 576). These assumptions enable people to coalesce and operate together by establishing shared expectations of how different forms of social interaction is morally justified. In this way, they help shape the frameworks that positively orientate us in ‘moral space’ (Taylor, 1989, 25) ‘by offering implicit limits to choice and thereby making action possible...[such that]...we know who we are only by knowing where we stand’ (Calhoun, 1991, 234). Taylor specifies that ‘implicit in this understanding of the norms is the ability to recognize ideal cases’ (Taylor, 2004, 24). Such ‘ideal cases’ serve a similar function to the ‘exemplars’

proposed by Kuhn in that they both embody and facilitate reasoning on the norms against which the moral legitimacy of different activities are assessed in much the same way as exemplars supply the scientific criteria against which the factual legitimacy of knowledge claims are evaluated.

It is thereby possible to draw associations between Kuhn's theoretical history of scientific paradigms and Taylor's theoretical history of social imaginaries in constructing an analytical approach to uncover and examine the entanglement of fact and value perspectives in nature conservation debates. This approach begins by examining attempts to stipulate the core scientific and moral positions in exemplars and ideal cases. As this investigation seeks to determine the essence of scientific and moral standpoints, it is here termed a process of *essencing*. The analytical approach then turns to scrutinising the processes of *extrapolating* the standards of scientific and moral evaluation from exemplars and ideal cases to influence the forms of legitimate activity undertaken when *engaging* with the social and material world. This analytical approach is summarised on Table 1. Although divided into a tripartite structure for the purposes of analysis and presentation, it is important to acknowledge that the processes of *essencing*, *extrapolating* and *engaging* do not necessarily proceed sequentially. Rather, each process may be mutually influential and dynamically co-constitutive, with for example the process of *engaging* with fact production impacting on the provision of ideal cases in *essencing*. Such interactions engender understandings of the material ontology of a seemingly objective world concurrent with shaping understandings of the moral ontology governing righteous activity within this world. This process is illustrated in Figure A. The framework is next employed to facilitate an extrication of the fact-value entanglements in debates between ecological restoration and novel ecosystems perspectives.

<Table 1 in here>

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Fact-Value Entanglements in Nature Conservation

Essencing

Much activity in ecological restoration directly references a document produced by the Society for Ecological Restoration (SER) entitled the ‘International Primer on Ecological Restoration’ (2004), commonly referred to as ‘The Primer’. As noted by Shackelford et al (2013, 297), this document ‘represents an important foundation in the field, providing definitions and guidelines for the science and implementation of ecological restoration.’ The Primer was produced to supply practitioners and academics interested in ecological restoration with an exposition of the principles defining restoration at an international scale (Nellemann and Corcoran, 2010). The document thereby serves as an ‘exemplar’ for the scientific practice of ecological restoration by conceptually describing ‘how ecological restoration projects can be planned, conducted, monitored, and evaluated’ (Winterhalder et al., 2004, 4). Both SER, and The Primer that it produced, emerged as the products of concerted efforts by those involved in ecological restoration to articulate their particular perspective on how restoration activity ought to be conducted. These efforts were set against a backdrop of conservation activity most prevalently conceived as constituting preservation-orientated work focused on the protection of threatened fauna (Baldwin et al., 1993). It was in this context that charismatic conservationists such as William Jordan (DePaul University), John Stanley and John Rieger (private consultants) sought to position ecological restoration as an acceptable professional conservation approach distinct from traditional forms of habitat

preservation. Schooled mainly in the biology of floral succession rather than zoology, these figures focused attention on the ability of ecosystems to regenerate once restored to their pre-disturbance condition (Jordan and Lubick, 2011). As such, those involved in creating and positioning SER sought to legitimise a new nature conservation approach centred on restoring ecosystems for the benefit of floral and faunal interactions. Accordingly, the production of *The Primer* represents an effort at *essencing* by seeking ‘to summarize and provide an overview of the field, to present the first comprehensive definitions of the science, to provide guidelines for practitioners, and/or to outline the “ideal” goal of ecological restoration’ (Shackelford et al., 2013, 297). This ‘ideal’ goal is expressed by the definition of ecological restoration supplied by *The Primer* as ‘the process of assisting the recovery of an ecosystem that has been damaged, degraded, or destroyed’ (SER, 2004, 3). Such damage, degradation and destruction is generally perceived ‘as the direct or indirect result of human activities’ (SER, 2004, 1). Ecological restoration thus seeks to reverse the corrupting influence of humanity on nature by returning sites to their pre-interference state. In this sense, the activity of ecological restoration, and the science of restoration ecology underpinning it, are rooted in a moral framework that conceives as a righteous undertaking the task of repairing anthropogenic harm to nature. This positioning within a morally infused social imaginary is grounded through a number of ‘ideal cases’ produced by SER and placed on its website as a series of ‘Restoration Project Showcases’ (www.ser.org), and via a book series by Island Press, as well as a the journal ‘Ecological Management & Restoration’, and the ‘Ecological Restoration Journal’. This literature thereby furnishes inherently entwined exemplars of good scientific conduct and ideal cases of morally virtuous activity.

As a younger worldview than the science of restoration ecology and the activity of ecological restoration, the novel ecosystems perspective has a more limited range of scientific

‘exemplars’. Nevertheless, a growing number of journal papers promote this viewpoint through furnishing case study examples of novel ecosystem dynamics (Collier, 2012, Belnap et al., 2012, Strayer, 2010) and endorsing discussions on the scientific merits of this ecological perspective (Kowarik, 2011, Van Mechelen et al., 2015, Trueman et al., 2014). Analogous to the emergence of ecological restoration, those advancing the novel ecosystems perspective do so against a backdrop of dominant alternate approaches to nature conservation that are, at least from a theoretical perspective, broadly hostile to the assertions made by the promoters of the novel ecosystems approach. It is in this context that proponents of the novel ecosystems viewpoint have sought scientific legitimacy and associated normative acceptability for the concept from their peers. Assisting such endeavours has been the advocacy activity of charismatic figures in the ecological sciences such as Erle Ellis (University of Maryland, USA) and Richard Hobbs (University of Western Australia), as well those in other fields, such as the prominent pragmatist philosopher Andrew Light (George Mason University, USA). Such advocates have sought to align the novel ecosystems concept with their established ‘forward-looking’ positions (Keulartz, in-press) on designing conservation responses to changing biophysical conditions and issues of social-ecological adaptation. As renowned academics and public speakers in their respective fields, the support of such figures has facilitated communicating the concept to a potentially receptive audience via journal papers, books and conference presentations. A touchstone for adherents of this paradigmatic perspective is an anthology of contributions by scientists, philosophers and journalists collated and published in a book titled ‘Novel Ecosystems: Intervening in the New Ecological Order’ (Hobbs et al., 2013c). By furnishing a coherent conceptual description of novel ecosystems, case study examples, methodologies for assessment and management frameworks, this book supplies an ‘exemplar’ for an emerging worldview of what nature conservation should entail, how this can be practiced and why. Hence, the book

and its accompanying website (www.wiley.com/go/hobbs/ecosystems), represent efforts at *essencing* by endeavouring to supply a ‘picture of the current state of play regarding how we might understand, manage and interact with novel ecosystems’ (Hobbs et al., 2013a, 8). In doing so, both the book and a variety of publications advocating the novel ecosystems concept (Marris, 2013, Mascaro et al., 2011) provide a number of ‘ideal cases’ that interweave the paradigmatic ‘facts’ concerning the existence of novel ecosystems with the ‘value’ of planning for their conservation. Ultimately, this is contrasted with the views of those who advance an approach to nature conservation grounded in perspectives advanced by the ecological restoration paradigm such that those advocating the novel ecosystems perspective contend that the ‘reality’ of an altered biophysical world transformed by anthropogenic change wherein new forms of ecological interactions have emerged, justifies the view that autogenic ecosystem dynamics in this new and irreversible environmental context are ‘valuable’ (Thompson and Bendik-Keymer, 2012). However, this runs counter to those promoting a restoration approach wherein the ‘reality’ of ‘ecological wreckage from human enterprise’ (Clewell and Aronson, 2013, 113) is seen to underpin the redemptive ‘value’ of restoration activity (Smith, 2014). Such entanglements subsequently determine different perspectives on the ‘moral facts’ of good and bad nature conservation practices as inter-subjective values become conflated with what are perceived as objective truths in the dialogue between *essencing* and *extrapolating*.

Extrapolating

Given its morally informed emphasis on seeking to repair the damage and destruction inflicted on nature by human activity, it is unsurprising that,

What makes ecological restoration distinctive is that we rely insofar as possible on past expressions of the preimpairment [sic] ecosystem as our reference or starting point and salvage whatever legacies from the past that we can in order to ensure a fully functional, dynamic, and sustainable ecosystem in the future. (Clewell and Aronson, 2013, 5)

Thus, a fundamental objective in ecological restoration is to establish ‘historical fidelity’ (Sarkar, 2011) with an identified ecosystem configuration prior to its damage by human activity. What is crucial therefore is that the internal functional attributes sustaining such an ecosystem ‘be performed by the same kinds of components, or entities that did so in the past’ (Garson, 2014, 98). This focus on replicating past species composition steers the scientific methodologies that supply the criteria of assessment against which the legitimacy of knowledge claims are subsequently evaluated. Central to this *extrapolating* process is the formulation of a ‘reference model’ that ‘informs the development of restoration project plans and also serves as a benchmark’ (Clewell and Aronson, 2013, 12). It is in this sense that ‘The restored ecosystem contains a characteristic assemblage of species that occur in the reference ecosystem’ (SER, 2004, 3), such that ‘the restored ecosystem is eventually expected to emulate the attributes of the reference, and project goals and strategies are developed in light of that expectation’ (SER, 2004, 5). With this *extrapolating* process, ‘puzzle identification’ (Hoyningen-Huene, 1993) thus centres on how to accurately identify and replicate the attributes of historical ecosystems.

In contrast to prioritising historical fidelity, those advancing a novel ecosystems perspective maintain that,

While historical ecosystems may provide critical information for understanding the forces that shaped a particular ecosystem, their appropriateness as a reference model in our changing world is receding.

(Harris et al., 2013, 193)

Proponents of this paradigm contend that irreversible changes in the climatic and biophysical environment, including species invasions and species extinctions, render attempts to replicate the species composition of past ecosystems scientifically unfeasible and managerially inappropriate. As noted by Davis et al. (2011, 154),

Most human and natural communities now consist both of long-term residents and new arrivals, and ecosystems are emerging that never existed before. It is impractical to try to restore ecosystems to some 'rightful' historical state.

In advancing a new 'lexicon of empirical concepts' (Hoyningen-Huene, 1993), supporters of the novel ecosystems perspective maintain that many ecosystems have crossed an irreversible 'threshold' (Suding and Hobbs, 2009). In such instances, a permanent shift is thought to have occurred from 'hybrid' ecosystems comprising historic and new species compositions to 'novel' ecosystems consisting of new species assemblages (Hobbs et al., 2009). From this perspective, historic ecosystems composition is thought to be rendered irretrievable, prompting new perceptions on what can be legitimately termed 'nature' and 'natural'. Here, moral norms and the criteria governing the assessment of valid knowledge claims become entangled as exponents of this view proclaim that 'Accepting new natures means that we need to reinvent or at least rethink goals and how these are anchored' (Hobbs et al., 2013a, 60). Undertaking this reappraisal of nature conservation activity involves confronting the

difficult moral and scientific issues concerning how novel ecosystems are to be categorised (Yung et al, 2013, 248).

It is somewhat expected that those promoting historical fidelity in nature conservation would find this perspective untenable. Indeed, advocates of ecological restoration have challenged this viewpoint by reference to numerous scientific studies refuting the proclaiming unfeasibility of successful ecosystems restoration (Cabin, 2011, Tongway and Ludwig, 2011, Clewell and Aronson, 2013), with some going so far as to contend that ‘No proof of ecological thresholds that would prevent restoration has ever been demonstrated’ (Murcia et al., 2014, 552). In this turbulent atmosphere of contesting norms and assessment criteria, the conflation of moral and scientific legitimacy within the rival perspectives intensifies as the debate moves from theory to practice during the process of *engaging*.

Engaging

The natural world order advanced by those supporting the novel ecosystems perspective involves a significant element of innovative ‘puzzle identification’ (Hoyningen-Huene, 1993) and ‘solution specification’ (Bird, 2000) as proponents of this paradigm seek to foster fresh approaches to nature conservation that respect the newly valued new natures of the Anthropocene. For advocates of this view, a concern with ensuring historical fidelity in ecological restoration becomes increasingly fruitless as such practices are perceived as ‘likely to create an ecological zoo that will ultimately disappear as environments continue to change at unprecedented rates’ (Standish et al., 2013, 298). In this context, recourse to historical ecosystems is ‘no longer practical...[as] we leave behind traditional goals that underpin conservation and restoration, notably connection to historically rooted ideals’ (Hobbs et al.,

2013d, 59). Accordingly, supporters of this perspective suggest that new more ‘realistic and optimistic conservation actions’ (Hallett et al., 2013, 25) are required that focus on maintaining and enhancing ecosystems services rather than ensuring a particular species composition (Collier, 2014, Sack, 2013, Standish et al., 2013). Released from mooring to historical referents, promoters of this conservation strategy predict that ‘novelty will lose visible context to people, at which point we will simply be living in a new normal of rapidly changing ecosystems’ (Marris et al., 2013, 348).

However, for those of an opposing persuasion,

This is the antithesis of ecological restoration. If novel ecosystems substitute for historical referencing, and are proposed as their own autoreferences [sic], then ecological restoration is relegated to an exercise in ecological engineering. (Clewell and Aronson, 2013, 246)

In countering the assertions of those advancing the novel ecosystems perspective, the adherents of more traditional forms of ecological restoration ‘argue for a precautionary principle’, where ‘rather than embracing invasion-driven ‘novel ecosystems’ as a ‘new normal’, we should seek to reestablish [sic]...the historical trajectory of ecosystems, before they were deflected by human activity’ (Murcia et al., 2014, 549). Accordingly, a key matter of disagreement regarding the legitimacy of conservation activity between these contending paradigms are the contrasting perspectives on the management of non-native species (Tassin and Kull, 2015). For adherents to traditional practices, ‘since ecological restoration of natural ecosystems attempts to recover as much historical authenticity as can be reasonably accommodated, the reduction or elimination of exotic species at restoration project sites is highly desirable’ (SER, 2004, 9). Conversely, those advancing the novel ecosystems

perspective endorse a more ostensibly pragmatic approach by asserting that ‘the presence of non-native species in ecosystems is unavoidable and so it is critical that managers distinguish between those non-native species that are likely to foreclose options for management and those that are not’ (Standish et al., 2013, 297). Others of this persuasion go further by claiming that ‘invaders do not represent a major extinction threat to most species in most environments...In fact, the introduction of non-native species has almost always increased the number of species in a region’ (Davis, et al., 2011, 153).

What these opposing views attests to is that the processes of *essencing*, *extrapolating* and *engaging* increasingly interweave factual claims with value assumptions as the perspectives advanced by the two paradigms spiral deeper into polarity concurrent with an intensification of the dialogue between theory and practice. By employing an analytical approach informed by the ‘theoretical histories’ of Kuhn and Taylor it is possible to disentangle the conflation of value assumptions and factual claims, and explore the processes by which moral and material ontologies are produced. The fruit of this unravelling is summarised in Table 2. This process of extrication is next used as a platform upon which to extend the analysis into an examination of how the entwining of paradigmatic scientific worldviews with morally infused social imaginaries generate the conflated moral-material ontologies of nature conservation.

<Table 2 in here>

Moral-Material Ontologies in Nature Conservation

Taylor proposes that an inherent property of human agency is the possession of moral ‘frameworks’ that positively orientate us in a ‘space of questions’ (Taylor, 1989, 29) regarding good and bad, right and wrong. In doing so, such frameworks inform thought and action. Specifically, by configuring qualitative contrasts of good and bad, these frameworks foster ‘a moral concern’ (Taylor, 1977) about what is the right thing to do, why it is so and how it should be done. Indeed, ‘for Taylor, to say that the self necessarily has a moral dimension is in the first place to say that it cannot be but orientated to the good’ (Smith, 2002, 88). Importantly, although what one perceives as good and bad may appear self-evident, such qualitative contrasts are forged through ‘webs of interlocution’ as one engages with others (Abbey, 2002, 69). Such ‘webs’ thereby organise the inherently intersubjective constitution of moral reality. Taylor’s understanding thus focuses ‘not simply on community as an additional value alongside others, but on the ways in which membership in a community provides the basis for strong moral evaluations’ (Calhoun, 2000, 7). In the context of those nature conservation debates discussed above, the seemingly obvious ‘rightness’ of a particular scientific paradigm, and consequently, what it is good to do, may thereby be understood as fostered inter-subjectively by interlacing the social imaginary and disciplinary matrix to which one is aligned. This braiding of moral and material ontologies is manifested in how advocates of the contending restoration and novel ecosystems perspectives expound their reasoning and justify their actions. For example, some advocates of the ecological restoration approach have suggested that,

If an ecosystem is impaired, its historic trajectory is interrupted. Ecological restoration allows an ecosystem to resume its historic trajectory. This is similar to a physician assisting in the healing process, so that patients can resume their lives. (Clewell and Aronson, 2013, 4)

Deploying the analogy of a physician in this manner implies the unquestionable righteousness of the restoration perspective in ‘the healing process’, simultaneous to suggesting that the knowledge claims upon which ecological restoration is grounded is as valid as that of medical science. However, equipped with the conceptual tools supplied by Kuhn and Taylor, a closer reading of this analogy reveals how it conflates values and facts in insinuating an apparent moral-material ontology that conceals the potentially contestable premises upon which it is founded. Specifically, employing terms such as ‘impaired’ within a medical analogy allude to an objectively inevitable ecological trajectory which has been ‘interrupted’, and for which it is therefore good to seek to help ‘resume’. From this standpoint, much of the current enthusiasm about novel ecosystems would rapidly subside,

...if the principle of historical continuity were more widely appreciated and adopted. This perspective would reveal that many so-called novel ecosystems are really impaired ecosystems that can be recovered by ecological restoration...(Clewell and Aronson, 2013, 245)

In this sense, many advocates of the restoration paradigm seek to deny the legitimacy of knowledge claims made by the proponents of novel ecosystems through suggesting that they are misinterpreting the facts of a situation. However, such arguments elide mention of how the ontological position on the materiality of what counts as ‘natural’ within the restoration paradigm is profoundly woven through with a moral ontology concerning what constitutes ‘value’ in nature, and consequently, what ‘good’ nature conservation entails. Therefore, central to the concerns expressed by advocates of the restoration paradigm that novel ecosystems thinking ‘lowers the bar’ (Murcia, 2014, 551), is that the challenge presented by this perspective undermines the hegemony of ‘historical fidelity’ as a guiding concept in nature conservation legislation and practice (Burgess, 2004). Such ‘breaking with the old ways’ (Aronson et al., 2014, 647) thereby risks subverting the paradigmatic dominance of

their moral-material ontology in nature conservation. Thus, ecological restoration should be ‘understood not only as a technical task but as a deeply embedded social and political process’ (Baker et al., 2013, 518). ‘Social’ in that its premises are inter-subjectively formulated by a community of morally aligned scientists, and ‘political’ in that its advocates seek influence by advancing a particular viewpoint that disqualifies the standpoint of others in a quest for institutionalised privilege in the activities of nature conservation (Forsyth, 2003).

Whereas the proponents of the restoration paradigm have most prevalently sought to accent the objectivity of the material ontology they advance in seeking moral influence in conservation debates, advocates of the novel ecosystems paradigm often openly attend to the moral ontology they promote in an attempt to dissolve the hegemony of ‘historical fidelity’ and thereby create the conceptual space to advance their material ontology of nature. They do this by endeavouring to expose the assumptions of ‘value’ upon which the restoration paradigm rests. For example, Davis and Slobodkin (2004, 2) criticise the restoration paradigm in asserting that,

By continuing to try to frame its goals and objectives in a scientific context, the field, paradoxically, may actually undermine its credibility. Whatever the desirable features of a proposed restored environment are deemed to be, this decision lies in the social, not scientific, realm.

This focus on the moral ontology concerning the value ‘of’ nature facilitates a converse approach to embedding the ‘technical task’ of ecosystems management with the ‘social and political processes’ (Baker et al., 2013, 518) of knowledge constitution and advocacy by questioning the legitimacy of valuing historical species composition over contemporary

autogenic processes. Hence, for supporters of this paradigm, it is these processes that constitute the principal material ontology of nature with the particularities of the species assemblages they give rise to forming an interesting, but secondary concern. This perspective thereby prompts an alternative moral-material ontology for nature conservation in which the autogenic processes of nature are allocated primacy and not the specifics of species composition (Standish et al., 2013). In this way, ‘lands currently described by ecologists as ‘degraded’ or, less formally, as ‘trash’ (Marris et al., 2013, 246) are reinterpreted from a different moral-material ontological position, where an alternative suite of questions arise concerning how to convince others of the value of novel ecosystems and thereby facilitate their perpetuation. Consequently, for many adherents of this paradigm, the objective of ecological restoration to employ ‘historic conditions...[as] the ideal starting point for a restoration design’ (SER, 2004, 1), represents a direct affront to the value of respecting the ‘natural’ processes of currently self-directed ecosystems. Ultimately therefore, these fundamentally opposing perspectives on how value ‘in’ nature is conceived and consequently how the value ‘of’ nature is understood have generated a stalemate in this debate as the moral-material ontologies of either side remain locked in polarised positions that talk past each other rather than to each other (Hobbs, 2013).

Conclusion

This paper disentangles and clarifies some of the interwoven moral and material ontologies contending for prominence at the frontiers of nature conservation theory. While recognising that values and facts are often conflated is not wholly original (Hinchliffe et al., 2005, Latour, 2005), what this paper contributes is the presentation and deployment of an original analytical framework that elucidates how the process of conflation operates in generating apparently

objective physical realities concurrent with the production of moral realities. At first this may appear to parallel earlier ethical debates surrounding traditional forms of nature conservation and the emergence of ecological restoration (Baldwin et al., 1993, Elliot, 1997, Katz, 1993). However, this paper shows that the debates between those promoting ecological restoration and novel ecosystems differs in that the role of ‘objective’ science is given greater emphasis than previous debates. Furthermore, the stress placed on appeals to objective science coincides with a minimisation of concern for ‘values’. Indeed, although earlier conservation debates often explicitly stressed the value-dimension regarding ‘what’ is done, ‘how’ and ‘why’, contemporary debates have a greater tendency to issue knowledge claims by explicit reference to science at the expense of moral deliberation.

Highlighting such questions resonates with Taylor’s endeavour to philosophically explore and explain the constitution of modern identities (Taylor, 2004). The function of this philosophising is to furnish an ‘orientation for action, a historical understanding of current identity as an empowering basis for moving forward’ (Calhoun, 1991, 238). Taylor’s approach is to force an articulation of the frameworks that form the background for thinking and doing. As such, he seeks that we confront the ways by which we organise our understandings, prejudices and motivations. This involves ‘disclosing the pretensions of neutrality by highlighting the place of good in our moral outlook and life’ (Morello, 2007, 627). Thus, articulating a framework entails making sense of our responses by revealing what is assumed in our judgements. Taylor’s belief is that when one appreciates more profoundly the background of one’s values and commitments, a deeper self-knowledge is reached and the potential of greater respect for the position of others is yielded (Taylor, 1989). This is because articulating frameworks amplifies awareness of the complexity of values and the diversity of perspectives which people hold dear. As a consequence of this

mutually enhanced consciousness, Taylor believes that articulating frameworks ‘increases the chances of rational debate about values...[as] understanding the underpinnings of moral responses in a fuller and clearer way makes it easier to debate their merits’ (Abbey, 2002, 42). It is in this context that articulating frameworks offer the prospect of moving beyond countering claims of scientific veracity through a form of self-critique whereby openly and jointly revealing how our moral-material ontologies convey tacit values challenges us to honestly explore the suppositions upon which they are founded. This form of reflection may thereby help counter the tendency to advance post-social ontologies of nature that emphasise the modelling of eco-‘system’ interactions in ways that leave unacknowledged the role of values in guiding the attributes of the environment selected as worthy of attention (Löwbrand et al., 2015). Such reflection may also help reveal how the interlacing of moral and material ontologies that characterise this conservation debate are rooted in a modern western ‘naturalistic’ epistemology that partitions the human cultural world from that of non-humans. As noted by Descola (2013), such a binary perspective reflects power differentials in the production of material-moral ontologies of ‘nature’ that conventionally ignore the experiences and meanings of the world operative in non-western societies, many of which exist in closer contact with, and awareness of the non-human elements of their environments

Thus, the key to moving forwards may be to counter pretensions that concepts of nature and the activities they beget are purely scientifically motivated and value-free. Articulating frameworks facilitates this and may enable a person or community of interpreters to ‘constructively operate at multiple points along the science-advocacy spectrum, as long as there is clear awareness and communication about the roles being played’ (Chapin and Fernandez, 2013, 2). This would help offset the potential for the polarisation of contending moral-material ontologies by revealing the ‘normative science’ grounding knowledge claims

whereby ‘facts are interpreted through the filter of an assumption that implies an inherent policy preference’ (Lackey, 2001, 439). It is in this sense that articulating the frameworks constituting the moral-material ontologies of nature may represent the next great challenge for nature conservation in the Anthropocene.

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Table 1		
Analytical Approach		
Philosophical Focus →	Kuhn’s ‘theoretical history’ in the philosophy of science	Taylor’s ‘theoretical history’ in the philosophy of society
World-Building Concept →	Scientific Paradigm	Social Imaginary
Dimension of Theory ↓		
<i>Essencing</i>	Exemplars	Ideal Cases
<i>Extrapolating</i>	Criteria of Assessment	Norms
<i>Engaging</i>	Scientifically Legitimate Activity	Morally Legitimate Activity

Table 2			
Applied Analytical Approach			
Philosophical Focus →	Kuhn’s ‘theoretical history’ in the philosophy of science	Taylor’s ‘theoretical history’ in the philosophy of society	
World-Building Concept →	Scientific Paradigm	Social Imaginary	
Dimension of Theory ↓			
<i>Essencing</i>		Exemplars	Ideal Cases
	<i>ER</i>	<i>‘The Primer’ & SER website</i>	<i>Examples of ‘virtuous work’ in recovering species configurations</i>
	<i>NE</i>	<i>Novel ecosystem book</i>	<i>Examples of ‘virtuous work’ in acknowledging novel ecosystems</i>
<i>Extrapolating</i>		Criteria of Assessment	Norms
	<i>ER</i>	<i>Reference model</i>	<i>Restoration, replication, reversal</i>
	<i>NE</i>	<i>Thresholds</i>	<i>Acceptance, pragmatism</i>
<i>Engaging</i>		Scientifically Legitimate Activity	Morally Legitimate Activity
	<i>ER</i>	<i>Restore historical fidelity</i>	<i>Eradicate non-native species</i>
	<i>NE</i>	<i>Enhance ecosystems services</i>	<i>Accept non-native species</i>
Ontologies →	Material Ontology	Moral Ontology	
<i>ER = ecological restoration; NE = novel ecosystems</i>			

Figure A

World-building through the processes of *Essencing*, *Extrapolating* and *Engaging*

