



10 | The two-culture problem: ecological restoration and the integration of knowledge

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Ecological restoration provides an arena in which values regarding what matters in the environment are contested among practitioners from a variety of disciplinary traditions. Whereas Andrew Light (Reading 9) examines four debates within the essentially non-scientific tradition of environmental ethics, Eric Higgs takes a broader perspective in re-examining a single divide: that between science and non-science. He suggests that the divide remains as relevant in contemporary times as when C. P. Snow first expressed the division in terms of 'two cultures' in the early 1950s. As a complement to the science of 'restoration ecology', the wider more non-science notion of 'ecological restoration' prompts a sense of responsibility as being a conversation (between science and non-science) rather than a 'debate' and chimes well with the idea of responsibility as a *creative* force.

Introduction

The terms 'ecological restoration' and 'restoration ecology' are frequently interchanged. Most of the students I teach, for example, think initially that these terms are synonyms, and certainly widespread conflation of the terms in the literature would support such a view. Restoration ecology, as I argue, is the suite of scientific practices that constitute an emergent subdiscipline of ecology and comprises what we consider typical of a contemporary natural science: hypotheses, conjectures, testing, experiments, field observations, publications, and debate. Ecological restoration is the ensemble of practices that constitute the entire field of restoration, including restoration ecology as well as the participating human and natural sciences, politics, technologies, economic factors, and cultural dimensions. [...]

This paper is motivated by the concern that the broader practice of restoration may become narrowed over the next decade as a result of zealous attention to scientific and technological considerations as well as our intrigue with larger and larger projects. Scientific and technological acumen is necessary for successful restoration, but insufficient. Durable



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restoration projects enjoy support by local communities, effective policies, appropriate legislation, long-term financing, and a host of intangible factors that contribute to turning what might be a transitory initiative into something that, like the Curtis and Greene Prairies at the University of Wisconsin-Madison Arboretum, which are arguably the earliest comprehensive ecological restoration projects in North America (Mills 1995), will leave positive legacies for future generations. Such success will require vigilance and care to ensure that the authority of science and our fascination with technology do not produce austere and ultimately fragile restorations in the future.

My concern originates in the observation that it remains difficult to construct the intellectual and practical bridges that link the divide between the natural and human sciences (and humanities). Within colleges and universities there exists a schism that is perpetuated in research and teaching. Those who study restoration ecology have difficulty finding or incorporating broader perspectives in their studies. Likewise, those who take interest in restoration from a social perspective find it challenging to cross the gulf to the natural sciences (there are many fewer of these students). Some research and training programs are interdisciplinary by intent or leave room for flexible study, but interdisciplinarity has not sufficiently inoculated most academic institutions effectively to create integrated learning opportunities for aspiring restorationists. For the most part those who pursue restoration are formally trained in ecology, natural resource management, or any one of the allied natural sciences. Lest my arguments are construed as antagonistic to natural science, this is definitely not the case: what I propose instead is a more ambitious integration of learning and research in restoration that combines insights from both the natural and human sciences. The challenge lies in creating opportunities that emphasize integration within institutions that are largely inimical to such change and a larger culture that abets the split between science and culture.

The problem of separation is scarcely new. It is no easier now to have commerce between science and culture than it was almost 50 years ago when Sir Charles Percy Snow coined his controversial 'two cultures' hypothesis. Snow, a man of letters, inflamed controversy over the place of science in mid-century England and gave rise to the convenient notion of separate cultures guiding natural and human sciences (or science and humanities). The debate proved a complicated one. Snow argued that scientific literacy was appallingly low and that most so-called educated people operated in woeful ignorance of basic scientific concepts. No doubt he was right at some level, although his critics have taken him to

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task for his motivations. Judging by contemporary standards of scientific and mathematical literacy, for example test scores from high schools in North America, the problem persists. Care is needed, however, in separating out issues of scientific literacy from scientific authority, the former in shorter supply than the latter. The point made here is that the authority and structure of science constrain a broader notion of restoration.

In this essay I use Snow's term of convenience, two cultures, to illustrate a worrisome separation in restoration, one that threatens to undermine a broader participatory approach. I begin with the story of a restoration project that depends on science and culture for success and then move on to propose two reasons why the separation of science and culture is apparent: (1) the increasingly technological constitution of restoration; and (2) the authority of science. The conclusion is a plea for redoubling our efforts to provide restoration education that integrates across the natural and human sciences and humanities, and in so doing extends the interdisciplinary ambitions that are widespread if only partially effective in most contemporary universities. Ecological restoration could be an ideal locus for a liberal education (Jordan 2003). These arguments are applicable to estuarine restoration as much as any other type of restoration. My intention is to make a general case, although estuarine restoration, especially within urban and urbanizing regions, typically demands such an integrated approach.

Discovery Island

In July 2000 the first harvest in more than a century of Blue camas (*Camassia quamash*) bulbs took place on Discovery Island (near Victoria, British Columbia, Canada) by a team of ethnobotanists and Lekwungen indigenous peoples. Camas bulbs are a rich source of carbohydrates that were used historically as a major food source and trade good by the Coast Salish-speaking indigenous peoples in the region around the Strait of Juan de Fuca, southern Vancouver Island, and the archipelago of islands between the very southwestern part of Canada and the northwest of the United States, as well as farther afield in the interior plateau of what is now the province of British Columbia (Canada) and the state of Washington (U.S.A.). Camas grows in meadows and savannas (associated locally with the regionally threatened Garry oak [*Quercus garryana*] ecosystem), both ecosystem types that have undergone extensive alteration and loss in this region over the past century.

The camas harvest of 2000 was culturally and ecologically significant. The Lekwungen people (or Songhees First Nation) occupied for roughly 4,000 years lands in what is now the City of Victoria. With British

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colonization of southern Vancouver Island in the 1840s, a series of purchases and agreements resulted in the loss of use of almost all traditional lands. Two forced relocations away from what would now be considered prime real estate in Victoria have provided a smaller urban reservation of less than 100 ha. Disease, especially smallpox in the late nineteenth century, reduced the community from several thousand to a low point around 1900 of just 100 individuals. Despite deprivations, the community rebounded to over 400 by the year 2000. It is difficult to imagine the scale of cultural loss and dislocation experienced by the Lekwungen people.

Cheryl Bryce, a member of the Lekwungen Nation, approached ethnobotanists Nancy Turner and Brenda Beckwith (School of Environmental Studies, University of Victoria, Canada) to advise on the traditional harvest and cooking of camas. A site on Discovery Island, a small island less than 2 km off the coast of Victoria, with extant camas meadow was selected for the initial harvest (part of Discovery Island is owned by the Lekwungen). In traditional times successful harvesting of camas depended on elaborate management, including selective harvesting of camas bulbs, weeding (especially Death camas [*Zigadenus venenosus*]), and annual prescribed burning. After a century of inattention, bulb production was low, weedy native and exotic plants had invaded the meadow, and the absence of fire had allowed a thick thatch to form on the meadow. Despite this, sufficient bulbs were harvested on this initial occasion to create a ceremonial harvest and pit cook (a traditional cooking method in which foods are placed in a small pit and heated using hot rocks).

This marked the beginning of revitalization through a cultural keystone species (Garibaldi and Turner 2004): camas. Seeds were harvested and replanted on nearby sites, weeding programs instituted, and prescribed fire re-introduced. Whether or not camas becomes a dietary mainstay for the Lekwungen in the future is less significant than the symbolic importance of the harvest. Keeping camas populations healthy depends on ecological restoration, which combines common contemporary techniques for maintaining a specific community of native plants with recognition of cultural objectives. It is a vital part of the project that camas harvesting respects the ecological fragility and significance of ecosystems. The historical continuity with the harvesting sites is what anchors the restoration project; it would be an utterly different prospect to contemplate a commercial, technological harvest of camas, although this, too, might become part of a Lekwungen cultural and economic revitalization.

Indigenous peoples worldwide are searching for ways of respecting tradition and living with modernity, and adaptations are required that

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may seem strange to those of us who live already within modern industrial economies. Inuit hunters in Nunavut (Canada), for example, use snowmobiles and geographic position systems in their hunts and at the same time maintain significant features of traditional hunting culture; the balance is sometimes difficult and always changing (Aporla 2003). Simplified monolithic models of indigenous engagement with ecosystems – original ecologists or despoilers – are incapable of capturing either contemporary realities faced by devastated peoples or the diversity of cultural practices and viewpoints. Ecological restoration in the case of the Lekwungen is also – and equally – cultural restoration. A crucial factor in the success of this project was that ethnobotanists trained to straddle botany and anthropology were principal advisors. This serves as an exemplar for the argument that successful restoration depends on ecological insights as well as cultural knowledge and support.

The technological constitution of restoration

In earlier work I suggested that we are approaching a fork in the road of restoration (Higgs 2003). Along one fork is the bumpy, experimental, community-engaged practice of restoration that has typified the growth of the field so far. Another path has opened, along which we find restoration megaprojects and increasingly well-refined, technically adept projects. We should not choose one or the other, but need to recognize that the well-paved road threatens to divert traffic from traditional approaches to restoration and to change fundamentally what counts as good restoration.

We live in a technological society, one thoroughly saturated with artifacts and processes aimed at convenience and efficiency. Some have described a basic pattern underlying technological society in which things that matter to us – music, art, celebration, knowledge – are increasingly rendered as commodities for consumption (Borgmann 1984; Higgs et al. 2000). What is worrisome is that we lose touch with the condition of authenticity with which we cherish traditional experience: contrast, for example, the live performance of music, especially music produced by oneself and friends, with recorded music. The latter is a reflection, more or less pale, of the direct experience.

The same pattern holds for ecosystems and restoration. Ecosystems can be rendered as commodities under the conditions of mitigation banking, real estate, and a propensity to fix problems that emanate from misuse. It is one thing to restore the damage wrought by heedless action as an act of historical reconciliation and quite another to despoil an ecosystem with the knowledge that there is a technology of reparation.

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There is a risk we are increasingly influenced by the latter worldview, and this turns back to earlier concerns voiced by critics of restoration in the 1980s. Restoration itself can also become a commodity, and this is precisely glimpsed in the popularity of corporate restoration projects in which restoration becomes a symbol of environmental commitment. And, as restoration becomes more popular, it will be subject to the same constraints of efficiency that motivate other technological practices. At one level it is difficult to complain about efficiency because presumably it yields more restoration. The salient question is: What kind of restoration is being procured?

If ecological restoration is about the restoration of ecosystems and the human communities that sustain and are sustained by these ecosystems, then we should worry about the broader implications of ever more efficient technological restoration. What we want instead is the road less traveled, the one along which we find participatory restoration that manifests the best of science and culture. The challenge is in maintaining the meandering route in a society largely given over to a straight-line technological approach to life.

The authority of science

Several years ago Soule and Lease (1995) kicked off a furious debate about the meaning of nature with their book *Reinventing Nature? Responses to Postmodern Deconstruction*. They were unsettled by claims from social scientists and humanists that nature is entirely a cultural construct and that ecosystems will lose significance in an advanced technological society. The ensemble of essays in that volume, written by philosophers, literary critics, historians, and ecologists, painted not a simple negative view of postmodernism and the tendency to see nature as a cultural projection, but rather a complicated, ambiguous portrayal of how nature is represented. All contributors opposed a radical postmodernism in which nature is purely an artifact of human consciousness, but quite a few admitted that a complete understanding of nature depends on an interchange between so-called objective observations via science and the subjective knowledge that comes from memory, social position, and personal experience. Hence, along a line between nature-as-objective-fact and nature-as-cultural-construction the truth lies somewhere in the middle.

I think Soule and Lease were keen on exposing the frailties of postmodernism and championing the authority of science. In doing so, however, they threatened to submerge knowledge that falls outside of conventional science: personal testimony based on experience, for example, and crea-

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tive knowledge derived from art, music, and poetry. Restorationists should take note, because they have until now thrived upon the mix of science and practical knowledge. Moreover, every time an ecosystem is restored, a particular view of nature is expressed. Restorationists are central players in defining and redefining how nature is defined and interpreted.

One risks making a too obvious claim by suggesting that restoration is practiced by people who hold particular values about what counts as an appropriate ecosystem, and this in turn is conditioned by our contemporary and changing views of nature and wilderness. Soule and Lease were concerned that these cultural values were being taken too seriously and at the expense of ecological verities. The concern, then, is that restoration would become a practice given over to human motivations alone and would result in what some have termed designer ecosystems (Palmer et al. 2004). A related objection is that any model of ecological restoration that embodies cultural awareness misses the significance of true wilderness: areas that have little or no sustained human involvement. Examples abound of wilderness restoration, but such projects are based to some extent on an acknowledgment of human engagement with the landscape. Moreover, the idea of wilderness has been impaled in a number of important ways, not the least by acknowledgment of a systemic underrepresentation of long-standing if subtle human practices (Cronon 1995; Higgs 2003). This being the case, there is danger in suggesting that either ecology or culture should trump one another. Both deserve attention. Although it is fair to suggest that cultural values, especially those of indigenous people, have been underplayed, it would be dangerous to swing to a kind of restoration that would submerge the ecological significance of a place.

Successful restoration depends on science and local knowledge (or traditional ecological knowledge as it is sometimes known, or experience; the knowledge of testimony and pattern). The ability to conduct controlled experiments and understand nutrient cycling is complemented by practical knowledge such as the history of planting on a particular site, organizing volunteers to water seedlings, with whom to speak in smoothing regulatory tangles, and where the best local supplies are obtained. Although both forms of knowledge are important, typically only scientists are considered experts. [...]

[A]n overreliance on science can deform the work of restorationists, first by pushing other forms of knowledge to the sidelines. Landscape architects, for example, who are trained to think in several different ways, often alternate between scientific or technical knowledge that accounts for why some plantings work better than others and aesthetic judgment

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that indicates why one planting will appear better than another. Science also tends to reify nature, which is to take an abstraction and make it seem real. This brings us back to the beginning of this section and to debates over the objectivity with which we regard nature. In taking too strong a view of nature – which after all is an abstract notion if for no other reason than it is expressed through language – more weight than appropriate is often given to our particular view of things instead of understanding this view as historically and culturally conditioned. Humility is difficult to achieve when the challenge of restoration is reduced to putting the right pieces into place. We do see the world through our social filters, for example, in the way we have tended to systematically exclude people from our understanding of ecological history. Cultural contingency matters for restorationists because we need to understand that people make sense of a place in different ways. In the end, science matters, but as one of many rather than the only form of knowledge that makes up the practice of ecological restoration. Relying on science alone or as the highest form of knowledge steers us away from a broader view of restoration toward an exclusive focus on restoration ecology. When science is vaulted to primary position and combined with the ethos of a technological society, as described in the previous section, the basics are in place for the ascendance of restoration ecology over ecological restoration.

Two cultures

The title of this paper hints at resolution of the two-culture problem, one in which the separated estates of science and culture are joined or rejoined. The two-culture formulation compelled me to dig into the debates around a lecture given by Lord C. P. Snow in 1959 at Cambridge (Snow 1993). Snow, a novelist and influential mid-century public man in England, spoke and later published his account of a growing gulf between humanistic and scientific thinking. He argued that the rise of scientific thinking had not been adequately assessed and understood by those in an academy still profoundly shaped by humanistic traditions. If there is such a thing as cultural literacy, then Snow argued that scientific literacy counted, too. Snow was not so much inventing the idea of a gulf between humanistic and scientific thinking but giving popular expression to it. Snow ignited a storm of controversy that raged on both sides of the Atlantic in the early 1960s, and his phrase, two cultures, became an emblem for the gulf separating scientific from other forms of knowledge. [...]

What Snow misses, as pointed out by Kimball, is the recognition that

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what science needs is a moral center, and this center is and will always be extrinsic to the practice of science.

By moral center I mean the orientation that forms over time in a society by which conventions of appropriate practice are brought to common and widely agreeable understanding. The moral center changes over time to represent new conventions, and as Aldo Leopold famously observed, expands to include a wider range of moral responsibility (Leopold 1949). It anchors our understanding of what is right and wrong at any given time, although arbitrating issues at the outer reaches of social convention is fraught with difficulty in a civil society. This is felt acutely in pluralistic societies that are working with multiple cultural perspectives on what matters most and what values are central to a good life. The existence of a moral center allows for recognition, respect, and incorporation of different points of view.

Scientific knowledge and practice are crucial ingredients in the mixture that constitutes a moral center, but by no means either the defining or deterministic character of it. This is a main clue for understanding the gulf separating the two cultures. In a society that gives privilege to scientific and technological knowledge, the moral center upon which science and technology must ultimately be based is obscured. The kinds of knowledge that most effectively open up the moral center to understanding – primarily humanistic knowledge but also the human sciences – are pushed to the sidelines. Thus, at a time when we most need moral direction we have the fewest available resources with which to work.

This creates a sharp problem for ascertaining the best conduct for restoring ecosystems and what the proper ends for restoration ought to be, especially knowing that our values toward those ecosystems will shift over time as they have been doing throughout history. The solution will not come from regression analyses or replicated studies, but the deep, searching, intelligent, humble inquiries into the human past and prospect, to the varieties of human experience, value and creativity, and of course to the many ways we have both loved and despoiled nature. To confront the moral challenges of science requires that we respect those things unknowable through scientific inquiry and that we avoid replacing moral inquiry with unreconstructed rationalism and a relentless consumptive mood.

I witness this daily at my university and know that it is widespread in other institutions of higher learning. The humanities and arts are pushed aside or slowly starved by the ‘can do,’ moneyed practicality of contemporary science. We have forgotten mostly that what allows us to be good citizens and excellent restorationists is our capacity for judgment,

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wisdom, and good conduct. Although scientific training is vital, it will never be more than a necessary condition to good restoration. [...]

My antidote to the two-culture problem is to ensure that those who train to be restorationists understand the moral center of their work, which is anchored to a compassionate understanding of place. Restoration education must reflect the traditions of interdisciplinarity inside ecological restoration, secure these for the future, and thereby serve as a beacon of integrative practice. No restoration program should be sanctioned without courses that include environmental philosophy, economics, sociology, and so on. A well-rounded student, a concept that flies to a certain extent in the face of modern training, will in the end be exactly what restoration practice needs. Not everyone will be equally competent and rounded. Much like the grand tradition of liberal arts education, restoration education must draw from all corners of learning. This is the surest way of honoring the broad promise of *ecological restoration*.

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