

Reclamation, Rehabilitation, Restoration and Remediation in Canada: A SEARCH FOR COMMON GROUND

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Background

THE CANADIAN LAND RECLAMATION ASSOCIATION (CLRA) just celebrated its 40th anniversary. The Association has come a long way. This milestone offers us a chance to reflect on land reclamation in Canada and debate on how it could grow over the next 40 years. We had a chance to do so in a special session at the national meeting of the CLRA in June. We debated the relationship between land reclamation and ecological restoration. We have agreed to continue the debate in print.

In the English language, the terms rehabilitation, restoration, remediation and reclamation all apply to our acts of improving degraded environments. We have used them increasingly over the past half century in our discussions, in science (Figure 1) and in regulation (Table 1). These terms have come to take on specific and sometimes divergent meanings.

In Canada, Alberta Environment has compiled a glossary of these terms (Powter, 2002; Box 1). Other regions in Canada use similar, but sometimes distinct definitions (e.g., Bowman & Barker 1998). In Canada, reclamation is the term used most frequently in a regulatory framework (Table 1). Unfortunately, the term reclamation also applies internationally to the filling or drainage of wetlands and coastal lands to convert them to intensive land uses, and in the United States, with the river basin-scale management of water in the American West. In Canada, the current meaning of the term does not involve drainage, filling or large-scale water management. Note that in French, the translation of reclamation

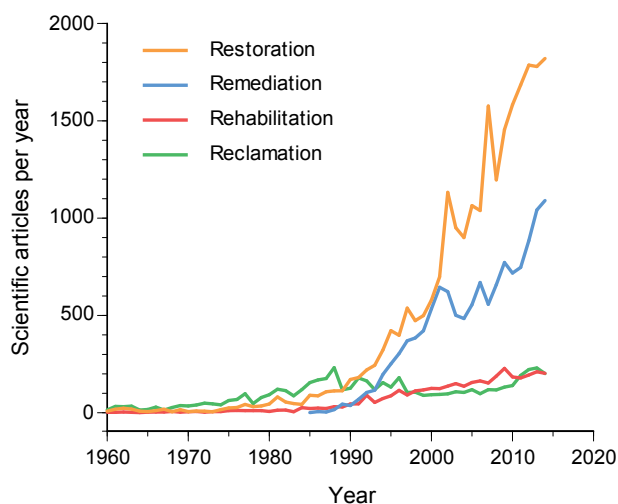


Figure 1: The frequency of the terms reclamation, rehabilitation, remediation and restoration in the scientific literature over the past half century, as determined from the BIOSIS citation index. The articles were restricted to those related to environmental science, ecology, conservation, pollution management, soil science and waste management.

Table 1. Survey of the principal legislative terms used in provincial acts across Canada related to the repair of damaged lands.

Legislated term	Province
Reclamation	BC, AB, SK, YK, NWT, NU, NB, NS
Rehabilitation	MN, ON, QC, NL
Restoration	NWT, QC

in the sense of the CLRA is ‘réhabilitation de sites dégradés’, so our Québec colleagues do not have as much confusion and can perhaps communicate more clearly than across English-speaking Canada.

We have to know what we mean when we talk to each other, deal with the regulations and communicate with the public. But more importantly, we have to know what we mean so we can then move beyond these terms and improve our science and practice across Canada and globally.

Groups have spent a great deal of effort to define these terms universally. One group is the Society for Ecological Restoration (SER) International (Box 2; SER International, 2004). They

BOX 1

Definitions from Alberta Environment (Powter, 2002)

Restoration: *The process of restoring site conditions as they were before the land disturbance.*

Ecological restoration: *The process of assisting recovery and management of ecological integrity.*

Rehabilitation: *Implies that the land will be returned to a form and productivity in conformity with a prior land use plan, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values.*

Reclamation: *The process of reconvertng disturbed land to its former or other productive uses.*

Remediation: *The removal, reduction, or neutralization of substances, wastes or hazardous material from a site so as to prevent or minimize any adverse effects on the environment now or in the future.*

BOX 2

Definitions from the Society for Ecological Restoration International (SER International, 2004)

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

Rehabilitation shares with restoration a fundamental focus on historical or pre-existing ecosystems as models or references, but the two activities differ in their goals and strategies. Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure. Nonetheless, restoration, as broadly conceived herein, probably encompasses a large majority of project work that has previously been identified as rehabilitation.

Reclamation, as commonly used in the context of mined lands in North America and the UK, has an even broader application than rehabilitation. The main objectives of reclamation include the stabilization of the terrain, assurance of public safety, aesthetic improvement, and usually a return of the land to what, within the regional context, is considered to be a useful purpose. Revegetation, which is normally a component of land reclamation, may entail the establishment of only one or few species. Reclamation projects that are more ecologically based can qualify as rehabilitation or even restoration.

represent a broad, culturally diverse group of practitioners and scientists across 70 countries. They brought together eleven global experts, including two Canadians, Eric Higgs from the University of Victoria and the late Keith Winterhalder from Laurentian University. They defined ecological restoration, reclamation and rehabilitation, but they did not define remediation. Interestingly, they define ecological restoration very broadly. More ecologically-based rehabilitation and reclamation qualifies as ecological restoration. Our presentations at the national meetings of the CLRA commonly deal with reclamation, rehabilitation and restoration, as defined by the SER International group. We also often cover remediation.

Given this background, we have each written positions on whether the SER International definitions are sound and generally useful to be applied across Canada. Some of us have also commented on which of these activities the CLRA, as a national organization, should work to promote and represent.



Line Rochefort: She is a professor at Laval University currently holding an NSERC industrial chair in peatland management. She has been a member of an international terminology working group for the International Peat Society (IPS) and the International Mire Conservation Group (IMCG).

Because of my past 20 years of working collaboratively on different ecological restoration projects at the international level, and having spent three years debating on definitions of reclamation/restoration

among 10 countries (UK, Germany, South Africa, Finland, Sweden, Russia, Ireland, USA, Canada and Australia), my view will reflect more of an international understanding use of terms, rather than how we use the terms in Canada and in our different provincial legislations. What I report here is some consensus, reached between the 10 countries listed above, aiming at defining better what reclamation/restoration could mean in the context of peatlands, peatlands being at the center of the management of both the IPS and the IMCG, having formed a working group.

This working group first stated that unmistakable and clear definitions of terms facilitate communication and decisions. In our world of peat and peatlands this is as true as in any other section of science, business or daily life. We all know that often communication problems arise out of confusion about or disagreement on connections between terms and concepts.

When we had our discussion at the international level, we had agreed on the following set of rules to help us find an agreeable definition.

1. Terms and definitions should follow common use of words outside our own specialised world as found in general

- English dictionaries;
- 2. terms and definitions should follow etymological logic;
- 3. terms and definitions should be consistent when used in composites; and
- 4. as far as possible we should adopt the term definition of expert groups, organisations and societies (e.g. restoration from SER International; wetlands from RAMSAR, greenhouse gases from IPCC, etc.).

With this in mind, we reached an agreement to use the term reclamation as defined by SER International (Box 2), and the following examples were given for the peatland context: (i) the reclamation of formerly drained blanket bog to prevent the formation of gully erosion and maintain red grouse hunting habitat; and (ii) the stabilisation of former peat fields of coastal peatlands in eastern Canada that have been contaminated with seawater with the aim to create good resting ground for migratory birds. In the same sense, the Swedish and Canadian co-authors of the book *Biology of Peatlands* (Rydin & Jeglum, 2006) define the term reclamation as the planned creation of another ecosystem that is different from the original.

Likewise for rehabilitation and restoration, the peatland management experts have adopted the definition from the SER International experts (Box 2). The restoration concept originates from Latin *restaurare*, meaning “repair, rebuild, renew”. This meaning has remained in modern English. In relation to ecosystems management, the International Union for Conservation of Nature (IUCN) has also adopted the definition provided by SER International.

We also added the recommendation to our peatland manager members (IPS and IMCG) that a key to restoration is making the goal clear. If the ultimate goal is not to restore the ecosystem that has been degraded, damaged or destroyed, the use of the term restoration should be avoided. This would apply for example when cutover peatlands are afforested or turned into fish ponds. Restoration does not equal any form of after use (including non-use) with a nature conservation tinge and we urge not to use the term in that



Figure 2. Heber Dam Penstock right-of-way following restoration treatment. Photograph taken on July 13, 2013. The arrow identifies a tree that can be seen in Figure 3 as well.



Figure 3. Heber Dam penstock right-of-way following 3 years of vegetation growth.

connotation. Best is to refer to the goals of the after-use measures, be they restoration of peatland habitat or creation of recreational fish ponds.

In our discussions, we also proposed to our members to use the term ‘responsible management’ instead of sustainable management, which proves to be more controversial. Responsible management balances economic, social and environmental considerations in such a way that reasonable

people now and in the future will not attribute blame. It may operate at any scale, from global and regional to local.

I want to conclude that in my field of expertise (peatland management), the terms as defined by SER International (Box 2) are the ones promoted in our publication. We definitively do not promote a definition that includes as a goal the restoration of site conditions back to what they were before the land distur-

bance (Box 1). Such a definition should be eliminated as a goal of land management as it is quite difficult to restore a habitat or an ecosystem as it was prior to disturbance.



David Polster: He is an independent consultant specializing in the restoration of drastically disturbed sites. He has been a member of the CLRA since 1977 and served as president three times.

I have worked in the fields of reclamation and restoration for over 35 years and I have come to the conclusion that since effective reclamation is in fact ecological restoration, it is actually ecological restoration that we are doing on our disturbed sites. The fact is

that the definition of ecological restoration does not require that the top be put back on the mountain or that the same ecosystems be re-established on the disturbed ground. Effective reclamation requires that the ecosystems be self-sustaining and that they provide the ecological goods and services that operated on the land (e.g., hydraulic integrity, wildlife habitat, etc.). By supporting ecological restoration, the CLRA will be promoting good reclama-

tion. The CLRA and SER have worked together on conferences in the past and it would be beneficial to both organizations to work together in the future. Many of the strategies that are used in ecological restoration can be very effective in the restoration of mines and other large disturbances. By working together the CLRA and SER can improve the practice of restoration across Canada.

Natural processes such as colonization, nutrient cycling and succession have been revegetating natural disturbances (landslides, volcanic eruptions, floods, fires, etc.) since the advent of terrestrial vegetation over 400 million years ago. These processes can be applied effectively to anthropogenic disturbances to provide a suitable vegetation cover. Figure 2 shows the penstock corridor at the former BC Hydro Heber Dam site. The dam and penstock were removed over the summer of 2012. The restoration design called for the disturbed areas to be made rough and loose (Polster, 2015) with woody debris scattered on the surface. By 2015 (Figure 3) the disturbed areas were supporting 5,392 Red Alder trees as well as 80 other species that established naturally.

Reclamation can make use of these natural processes to save money (none of the 5,400 alder trees/ha shown in Figure 3 were planted) and to re-establish the natural successional pathways that will ensure a self-sustaining vegetation cover. Natural systems can provide restored ecosystems that follow the natural recovery processes and therefore fit into the local ecosystems.

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Chris Powter: He is currently an environmental consultant in Edmonton. He worked for Alberta Environment for 29 years, mostly in land reclamation research, policy and legislation and then for three years as the head of the province’s Environmental Impact Assessment program. Chris then spent almost 5 years at the University of Alberta running an oil sands research program (the Oil Sands Research and Information Network) which focused on reclamation, among other themes.

reclamation, among other themes.

I have no problems with the SER International definitions in Box 2. I see the primary differences being less about science and more about exercising a values-based choice about desired outcome – do you want an ecologically-centred outcome (restoration or rehabilitation, and possibly reclamation) or a people-centred outcome (reclamation, and possibly rehabilitation)? I think we should steer clear of remediation in this discussion – it is a critical component of all of the choices, rather than an alternative.

As noted above, and in my panel presentation, professional practitioners have an obligation to use the words carefully, in particular because we work in highly regulated industries where words have very specific, legislated meanings. One of the impediments to a rational discussion of the issue is that provincial and territorial legislation uses all three terms (Table 1), and in some jurisdictions more than one term! In an ideal world we would use a single term across the country; alternatively, if we must have different terms, it would be good to at least have common definitions for each term used across the country. This is an idea the CLRA (and SER) could promote.

Given the diversity of legislation across the country I’m not sure the CLRA should try to promote one practice or another (or worse, exclude one or another). We all benefit from the perspectives brought by other specialists and each of us could probably cite one or more instances where we have adapted ideas from one of the term-specific practices to our own needs. What we should do is strongly encourage conference presenters and writers for Canadian Reclamation to be clear about what term they are using, what it means and why they are using it. This will help conference attendees and readers to better understand the context for the materials presented, and perhaps deflect questions about word choice and thus allow more focus on the science.

There seemed to be a consensus at the conference that the CLRA should explore improving our ties with the restoration

community. Suggestions for moving forward included: developing common definitions of terms and jointly hosting a conference with the SER. In this article we are exploring the SER International definitions but there are others, including regulatory definitions, so a prequel to the “common definitions” idea would be compiling a list of definitions in use in Canada now.

I think it would be interesting to have a special issue of Canadian Reclamation dedicated to short articles talking about the use and value of the different terms across the country and people’s perceptions and preferences around the terms. Similarly, it would be interesting to poll education institutions to see what their course titles in this area are – after all, future practitioners are probably going to adapt their own language to suit their needs.

So, can we move from an us versus them to a we position? While it is fun to enter into lively debates with other practitioners, especially really passionate ones, it is not a good idea for us to carry those debates out into the public arena. There is enough confusion about what we do and how successful we can be without adding language issues into the mix. We need a way to communicate planned outcomes and measures of success to our stakeholders and regulators, and then we need to steward to those outcomes and be able to report status, successes and failures back to stakeholders in the same terms we used to begin the process. Adopting common definitions is one tool to help achieve this. At the very least, being clear with stakeholders about the terms we are using, even if they differ with other jurisdictions, or even projects in the same jurisdiction, will help.



Daniel Campbell: He is an assistant professor in the School of the Environment at Laurentian University in Sudbury, Ontario. He conducts research in the rehabilitation of severely disturbed lands, and has worked extensively in wetlands and mining-related projects.

Remediation is a distinct activity, often practiced by members of the CLRA. Alberta Environment provides a clear definition. The definition of reclamation, rehabilitation and restoration has been the subject of more debate. Their difference lies in the end points that are targeted. If you are starting from a mine site and aim after closure toward a corn field, a housing project, a botanical garden or one of the other wonderful after uses compiled by Pearman (2009) in her 101 Things to Do with a Hole in the Ground, you

WE ALL BENEFIT FROM THE PERSPECTIVES BROUGHT BY OTHER SPECIALISTS AND EACH OF US COULD PROBABLY CITE ONE OR MORE INSTANCES WHERE WE HAVE ADAPTED IDEAS FROM ONE OF THE TERM-SPECIFIC PRACTICES TO OUR OWN NEEDS.

- Chris Powter

THE CLRA CAN TAKE A LEADERSHIP ROLE IN PROMOTING THE SCIENCE AND PRACTICE OF BOTH LAND RECLAMATION AND ECOLOGICAL RESTORATION IN CANADA.

- Daniel Campbell

are reclaiming derelict land and giving it value to human society. Reclamation, in part, is a good description of these activities. Members of the CLRA are sometimes involved in these practices.

If you start from this mine site and are aiming toward any natural ecosystem, I argue that you are practicing ecological restoration, as defined by SER International. You may be aiming for a broad target, such as a general successional sequence toward a forest, or a narrow target, such as a black spruce forest with an understory of blueberry, twinflower and feathermosses over a podzol-like soil. The former is much easier to achieve than the latter, but in both cases, you are 'assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed'. I like this definition because it is general and describes the gradient of our activities, from reclamation, in part, to rehabilitation and restoration. It also is not far from the definition of ecological restoration in Alberta. Much of what our members do in the CLRA could therefore be called ecological restoration, as broadly defined by SER International.

Some practitioners want to define restoration narrowly as a return of the ecosystem to what it was before the disturbance. This target is next to impossible, given the nature of many disturbances, the long-term trajectories of ecosystems and the current state of global change. So let's abandon this notion. Instead, make sure that we state clearly what the desired ecosystem targets are.

The broad field of ecological restoration is growing rapidly, as shown by the rapid rise of the term 'restoration' in the scientific literature, especially as compared to 'reclamation' (Figure 1). We now have the knowledge and experience to aim toward narrower targets, able to provide complex ecosystem services. Many jurisdictions are also demanding higher standards, using native species and aiming toward regional representative vegetation or effective ecosystem services.

I believe that a role of the CLRA is to build knowledge and practice toward these higher standards. I believe that we should move to grow stronger ties with the SER and similar groups. The CLRA can take a leadership role in promoting the science and practice of both land reclamation and ecological restoration in Canada.

Concluding Remarks

Our session at the CLRA meeting this past June was animated, with much banter, controversy and disagreement. Here we see that we share much common ground, despite our differences in geography, regulatory contexts and industrial alliances. We all agree that good definitions allow us to work and communicate more effectively. They also allow for our field to grow. We all agree with the definitions by SER International. Several of us point out that much, but not all, of what we do in the CLRA falls under this broad definition of ecological restoration. Several of us also point out that goals or desired end points are the key, and when in doubt, simply state these goals clearly.

Another important conclusion is that the professional lines between reclamation and restoration practitioners are blurred or do not even exist. We must get beyond an 'us versus them' position towards a 'we' position and work together for our common field to grow. Some of us advocate for closer links between the CLRA and SER. As a first step, the CLRA should provide its definition prominently visible on its web site, with examples. 🌱

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