

Challenges and Opportunities

The genius of the place is made up of the physical, biological, social, and historical forces which together give its uniqueness to each locality or region. All great cities have a genius of their own which transcends geographical location, commercial importance, and size. And so is it for each region of the world. Man always adds something to nature, and thereby transforms it, but his interventions are successful only to the extent that he respects the genius of the place.

René Dubos¹

René Jules Dubos (1901–82), the American microbiologist and conservationist who coined the phrase “think globally, act locally,” believed that people could enjoy, preserve, and enhance the value of an ecosystem if they thoroughly understood and respected the spirit or “genius” that made it what it is. As he noted in a 1970 lecture at the University of California School of Forestry and Conservation, this spirit embodies the complex interaction over time of physical, biological, and human forces.

In the Alberta context, “land capability” evolved as a practical expression of the “genius” envisioned by Dubos. Albertans recognized that we must make sure that the inherent values are not lost as human activities alter more and more of the landscape.

The 1970 date of Dubos’s talk is significant. As Henry Thiessen described in Chapter 3, the publication of Rachel Carson’s *Silent Spring* in 1962 marked the beginning of growing environmental awareness in Alberta as it did elsewhere in Canada, North America, and globally. The creation of Alberta Environment in 1971, and the enactment of the Land Surface Conservation and Reclamation Act in 1973, are examples of government recognizing and adapting

to the emerging environmental movement. By that time, a great deal had been learned here from the on-the-ground experiences of provincial and municipal inspectors and public lands officials since passage of Alberta’s pioneering Surface Reclamation Act in 1963.

In retrospect, the early 1970s marked a “tipping point” when environmental, social, and economic forces combined to push land conservation and reclamation in a new direction. The election of a new provincial government in 1971 opened the door for new approaches, although the groundwork had already been laid under the previous regime.

In October 2015, former premier Alison Redford said that the election of new governments in Alberta and Canada could signal another tipping point for environmental and energy policies.² If that proves to be the case, land conservation and reclamation policy changes will benefit from a half century of practical experience, an enormous body of knowledge gained, skilled and committed practitioners, a decade of debates leading to the still-unfolding Land Use Framework, and ongoing concerns about the impacts of energy in general and oil sands development in particular.



International student working on species for revegetation. *M. Anne Naeth*

In the course of researching this book, the authors and the experts on the steering committee and among our reviewers observed successes and failures. We identified both challenges and opportunities that await decision-makers and practitioners in the next half century of land conservation and reclamation in Alberta. This chapter outlines some of the salient findings.

A number of themes are repeated across the chapters:

- There is a considerable body of knowledge, experience, and expertise in conservation, reclamation, and certification for wellsites and plains coal mines. A lot of reclamation has been done in oil sands mines, mountain coal mines, pits, pipelines, borrow excavations, and roadways; but there is limited experience with certification of these sites. There is limited experience with conservation and reclamation, and almost no certification, for in situ oil sands, exploration operations, quarries, peat operations, railways, plants, transmission lines, and telecommunication systems.
- Cooperation between industry and regulators, and in later years other stakeholders, was at the core of the successful evolution of policy and practice. This cooperation included a sense of shared ownership of solutions, joint research to find answers, and open exchange of issues and knowledge. A shift away from the concept of shared ownership risks a loss of the trust and innovation that drove success.
- Frequent face-to-face interaction between regulators and industry—in meetings, field trips, and site inspections, and between regulators and the public in reclamation certificate inquiries and complaint response inspections—was invaluable in building trust and leveraging the knowledge that different parties brought to decision-making.
- Consistent and coordinated cross-ministry policy and regulatory decisions, clearly seen in the work of the Conservation and Utilization Committee and the Development and Reclamation Review Committee, benefits both industry and regulators.
- The adoption of pre-planning of disturbances in 1973 was a significant step forward. The plans were extensively reviewed and approved and the path was then set as to what would result. The implication of an approved plan was that the activity would be acceptable to society; that approval and certification would be assessed against that plan.
- The increased emphasis on conservation since 1983 has helped improve chances of reclamation success, reduce environmental footprint, and lower costs.
- A broad range of education and knowledge-sharing opportunities has provided Alberta with significant technical capacity to address conservation and reclamation challenges.
- There is a lack of publicly accessible information on the level of disturbance and reclamation for many sectors. The emphasis on mineable oil sands disturbance distorts public awareness of the impacts of other types of industrial activity. Industry, government, and the public would benefit from a better inventory of the amount of land disturbed, reclaimed, and certified. The data could help prioritize efforts to make industrial developments truly “sustainable” in the sense of returning disturbed lands as quickly as possible to subsequent productive use.
- The vast majority of reclamation certificates have been issued for wellsites, in large part because there is an economic driver to get the certificate—the termination of annual lease payments—that does not exist for other activities. If certification is considered to be a cornerstone of the regulatory system, then more needs to be done to drive operators to get certificates. Pipelines and road rights-of-way (other than the roadbed) are unique in that the disturbances are reclaimed immediately after construction but cannot currently be certified until after abandonment; if the goal of reclamation is to return lands to productive use then perhaps this post-construction reclamation work needs to be formally acknowledged.
- Different conservation and reclamation policies and requirements for sites on public land and sites on private land continue to exist and make it difficult for government to explain requirements to stakeholders and to companies that work across the province.
- Shifting the objective of reclamation from productivity to capability after 1983 was

pivotal in reclamation planning and practice. Yet, 32 years later we are no closer to having a common understanding about what this elusive capability objective means, how to make transparent decisions around alternative land uses, and how to assess success.

- Changes in policy and practice, however well intended, often lead to unintended consequences that then require additional policy responses. For example, an emphasis on plant cover as a criterion of success drove use of grass/legume mixes in forested land or crested wheatgrass in native prairie. Similarly, a preference for productive upland forest led in situ operators to leave elevated (upland) roads and well pads in wetlands.

Additional reclamation principles and practices that have served us well since the 1963 legislation include:

- context in planning and development—provincial policies, regional policies and plans, local community input, and input from those directly affected regarding land-use goals and priorities
- public and Aboriginal consultation
- regulator familiarity with operations and particular site conditions
- site-specific requirements, reflecting particular ecological and social conditions
- flexibility in how to reclaim, given the diversity of disturbance types spread out over a broad range of ecological conditions and land uses

A major challenge for the future is to learn from the past and build on existing knowledge and expertise. Significant progress has been made in advancing reclamation practices in Alberta. However, the development of measures to assess the success of these practices, combining science-based tools with environmental and social goals, has not kept pace. Challenges specific to the government and each of the sectors follow.

People: Society, Laws, and Regulations

The creation of the Department of Environment in 1971 with a mandate to coordinate policies, programs, services and administrative procedures in matters pertaining to the environment resulted in a unique government-industry-public planning approach to land conservation and reclamation matters. Inspectors from the Land Conservation and Reclamation Council worked directly with landowners, municipal inspectors, and industry representatives to address landowner complaints. The council's inspectors also held on-site inquiries to ensure that all factors were considered before reclamation certificates were issued for reclaimed land.

Changes in regulatory delivery of reclamation activities, such as audits for upstream oil and gas sites and codes of practice for pits, have reduced the historical interaction between government, industry, and landowners that was a key strength of the early regulatory system. At the same time, these changes streamlined the system with the intent of maintaining good conservation and reclamation. Enforcement handles problems that arise. The audit of a percentage of the sites that received reclamation certificates provides a check and balance on the process and the operators.

A reorganization of the Department of the Environment in 1998 resulted in a regionalization of most programs. The change provided more expertise to some regions such as the oil sands area around Fort McMurray, but it was less beneficial for some other regions and the central coordinating function. Improved reclamation criteria and codes of practice will continue to enhance environmental performance.

The Alberta Energy Regulator (AER) was established in 2013 and is authorized to make decisions on applications for energy development, monitoring for compliance assurance including conservation and reclamation requirements, decommissioning of developments, issuing reclamation certificates, and all other aspects of energy resource activities. The AER regulates oil and gas wells, pipelines, gas processing plants, oil sands mines, in situ oil sands schemes, bitumen upgraders on mine sites, coal mines, and coal processing plants. Alberta Environment and Parks continues to be responsible for conservation and reclamation of all non-energy specified land activities.

The major challenge will be to balance stakeholder and public input with the need to have effective, efficient, and timely processes that allow proponents and operators to develop their projects and to bring closure to their activities at the end of operations.

Ensuring consistency of policy and oversight approaches between energy and non-energy activities will take extra effort with the separation of these sectors.

Knowledge

Alberta's government, industries, specialist contractors, consultants, and academics have amassed an enormous body of knowledge about the province's landforms, soils, hydrology, and vegetation. Without this, the progress to date in land conservation and reclamation would not have been possible. Educational institutions have developed programs to train the next generation of scientists and practitioners.

Government, industry, and academia have been leaders in developing innovative practices such as three-lift salvage, winter soil salvage, using native vegetation, creating wildlife habitat, horizontal drilling for water crossings, and minimizing erosion on disturbed lands. There is continued effort to develop methods to minimize disturbance and accelerate reclamation. Particular focus areas include: developing wetlands, pit lakes, and connecting streams; reclaiming peatlands; assessing how to incorporate Aboriginal values and needs into reclamation; developing an understanding of the potential impacts of climate change on reclamation success; and, exploring use of remote sensing to assess reclamation success.

The challenges will be to continue building the knowledge base, ensure that information is accessible to all who need it, and support the institutions that disseminate it. At the same time, there is a need to make historical information more accessible (old knowledge to complement new knowledge), and to extend the timeframe for research and monitoring work to get a better understanding of the long-term success of conservation and reclamation practices.

Coal

The coal industry has adapted to the changes in expectations and regulations. As research brought new practices to the reclamation business, government and industry have incorporated these into the approved plans. This cycle has happened numerous times. Over the decades, as standards changed, an immense, almost overwhelming, body of information has been compiled on each parcel of land disturbed: for example, timing of activities, specific practices,

soil quality conditions, water tables, crop yields, and wildlife use. By 2010, some 31,000 hectares had been disturbed by coal mining. While large portions (about half) have been reclaimed, only 7 per cent have been certified. In 2014, some \$403 million were held in reclamation security for coal mines.

The reclamation certification process has stalled; industry has submitted applications, but they sit with the regulators. This is partly due to concerns over potential impacts and acceptance of liabilities. The complexity of the process, involving a variety of agencies and different legislation, is another factor. Corporate concern over loss of control of land or leases, either immediate or future, also plays a role.

With an increasing desire of government and some stakeholders to phase out coal-fired power plants, timely and cost-effective reclamation will become increasingly important. The key reclamation challenge today and looking forward is defining success and putting an effective, timely process in place to keep coal reclamation current with mining and to define the end of the reclamation process, especially for mountain mines. Practices and processes that have served well in the past—collaboration, research, practical site considerations, and the like—will help address this challenge.

Quarries

Limestone, sandstone, and shale are the major quarry operations in Alberta, together with ammonite and various decorative rock types. As non-energy activities, they are regulated by Alberta Environment and Parks under the Environmental Protection and Enhancement Act and the Conservation and Reclamation Regulation. Some of the public land dispositions date back over a century, and reclamation did not become a focus until the late 1970s. Like coal mines, quarries are found in plains, foothills, and mountain regions of Alberta, as well as in the boreal forest.

The industry practices and regulation of quarries evolved more or less in parallel with those for coal, including features such as end-pit lakes and the creation of wildlife habitat. One innovative approach, rock sculpting, shows promise as a way to create desirable landscapes in the reclamation of mountain quarries. A project in the Athabasca region proposes to establish more natural wetland complexes instead of a traditional end-pit lake.

The high visibility of quarries in areas like the Bow Corridor will continue to pressure government and industry to demonstrate what reclamation success

looks like. The long lifespan of many quarries means that eventual reclamation and certification are likely to occur in much different environmental, social, and economic circumstances than when they were planned and approved. If development of Alberta's mineral resources expands with an increasing emphasis on economic diversification, there will be a steep learning curve for Alberta to address issues such as acid mine drainage, metal contamination, and potentially radioactivity. The challenge will be adapting to those changes in a way that is environmentally desirable and acceptable to all concerned parties.

Oil Sands

Oil sands development creates extensive disturbed areas that remain active for many years before reclamation can start. The processing of the oil sands results in large storage facilities for produced sand and wet tailings, creating a



Reclaimed fen. Syncrude Canada Ltd.

huge reclamation challenge that will take decades and cost billions of dollars to complete. Eventually, reclamation will also apply to the extraction and upgrading plants and their stockpile areas for sulphur and coke.

The government has now required the reduction of wet tailings and provision of target dates to close the existing ponds. A number of oil sands operators are actively pursuing new wet tailings treatment technology, with significant progress achieved and information shared among the operators. The use of processes that generate “solid” tailings will greatly advance the oil sands sector, potentially changing the pace of reclamation as well as the mix of reclamation options.

As of year-end 2013, mining operations in the Fort McMurray area had affected almost 90,000 hectares. Of this total, 8,000 hectares are in some stage of reclamation. As of 2015, 104 hectares have been certified, an indication that, similar to coal mining, there are challenges in the pace of the reclamation certification process. One major factor influencing the timing of reclamation certification is the requirement for oil sands operators to re-create a landform and reconstructed soil that will support boreal landscapes—a mosaic of uplands, wetlands, lakes, and streams. Once the reclamation is complete, oil sands operators must evaluate reclamation success against the approval conditions and, eventually, oil sands-specific reclamation criteria. The time required to prove success through monitoring can be quite long.

As of June 30, 2013, the province held more than \$1 billion in reclamation security. The actual cost of reclamation could be in the order of at least \$10 to \$15 billion, all of which will eventually be fully secured under the province's Mine Financial Security Program.

In terms of capital investment, the oil sands collectively represent the largest energy project on the planet—but also the largest reclamation effort. Given the long lifespans of oil sands mines and plants, the biggest challenge facing the industry is the ever-changing goalposts for success. This is further complicated by rapidly changing tailings technologies, proximity to Aboriginal communities, and intense, and often harsh, criticism and scrutiny by people outside Alberta.

Wellsites

Prior to 1947, about 2,000 oil and gas wells had been drilled in Alberta. By October 2015, the government had licensed a cumulative total of 492,562 wells. This number included 55,000 mostly long horizontal wells for in situ bitumen production; horizontal drilling allows a number of wells to be drilled from one well pad, reducing the disturbance area. The Alberta Energy Regulator listed about 275,000 wells as “operational” in 2015.³

More than 170,000 wells have been abandoned. Of these, 66,000 have received reclamation certificates, and about 37,000 were “exempt” from certification requirements because they were abandoned on private land prior to 1963, on public land prior to 1978, or on federal land. There are also approximately 46,000 defunct licences (re-entered or cancelled). The operators remain liable for the remaining 68,000 abandoned, uncertified wellsites and the 275,000 operational sites. Energy price shocks contribute to the inventory of orphan wells (without a financially responsible operator); the AER listed 272 wells in this category in October 2015 and the Orphan Well Association is expecting many more to come.

Reclamation of in situ facilities poses several unique challenges in comparison to conventional oil and gas and oil sands mining. In situ results in a high density of relatively small scale (in comparison to mining) disturbances concentrated in an area, which severely fragments a forest. Disturbances range widely in intensity, spatial and temporal scale, and the many different forest types and ecosystems; and there are considerable chances that a reclaimed facility will be re-disturbed. Furthermore, construction of in situ facilities occurs on a variety of forest types and ecosystems, which can have variable levels of resiliency.

The AER also lists a cumulative total of almost 31,000 oil and gas “facilities” licensed in Alberta. These range from gas compressors and oil batteries to large sulphur-recovery gas processing plants. Of the 2,700 abandoned facilities, only 39 have received reclamation certificates, and another 87 are exempt.

The future reclamation challenges for depleted conventional and in situ production facilities are significant. The number of abandoned wells will likely increase due to low or fluctuating oil and gas prices. The number of orphan wells is a concern. Since there are no deadlines for reclaiming abandoned wells, the number of non-certified sites will likely increase. The auditing process to confirm appropriate reclamation has now been the norm

for more than a decade on private land—almost two decades on public lands—but it may not necessarily reflect the needs and expectations of landowners and the public.

Pipelines

Two-thirds of Alberta’s 415,000 kilometres of provincially regulated energy pipelines were built since 1990. More than half carry natural gas. About 35,000 kilometres are listed as “discontinued” and 37,000 kilometres as “abandoned.” Most are regulated by the Alberta Energy Regulator (AER); the Alberta Utilities Commission (AUC) regulates local distribution pipelines. The National Energy Board regulates an additional 30,700 kilometres of pipeline in Alberta, including interprovincial and international pipelines and the major natural gas transmission system. In 1963, when Alberta enacted the Surface Reclamation Act, there were 7,725 kilometres of oil pipelines and 16,825 kilometres of gas pipelines in the province.

The focus on conservation and reclamation continues for pipelines crossing the many different types of landscapes in Alberta. Public interest and concerns about the types of liquid products carried in proposed pipeline projects and the location of the pipeline rights-of-way are also at an all-time high.

Pipeline construction and operation activities—including right-of-way reclamation and erosion control, inspection, repair, decommissioning, and abandonment—normally span many decades. Once the company stops using the pipeline, it can apply to the Alberta Energy Regulator for abandonment. After extensive study and data collection, the company may then apply for a reclamation certificate, although there are conflicting views on the number of certificates actually issued to date.

Pipelines are unique in that the primary reclamation occurs before operation and abandonment. As a result, the focus of the pipeline industry over the last 50 years has been on conservation and reclamation during construction and quickly fixing and reclaiming problems during operation. Final abandonment and reclamation certification are now getting more attention from industry and regulators.

With pipelines as large as 54 inches (1,350 millimetres) being currently proposed in Alberta, one of the questions facing government and industry is the ultimate fate of the pipe—should it be removed? Pressure for removal of all sizes of pipe is increasing as Alberta’s urban and rural residential areas expand.

Industry and governments face significant challenges with future abandonment and reclamation certifica-

tion of many thousands of kilometres of pipelines. A cooperative approach will be required with the input of the public, landowners, industry, and governments to achieve practical approaches and solutions. Given that pipelines are reclaimed after construction and will have formed part of the operating landscape for decades, an additional challenge may be justifying the rationale for requiring what is essentially an expensive paper exercise to obtain a reclamation certificate when the pipe is left in the ground.

Roadways

There are more than 226,000 kilometres of public roads in the province, of which almost 165,000 kilometres are gravel, treated, or earthen. There are no approvals under the Environmental Protection and Enhancement Act (EPEA) for the construction or reclamation of roadways. However, operators require a reclamation certificate following roadway abandonment. Most urban roads are not covered by reclamation requirements.⁴ For most provincial roadways, Alberta Transportation is the operator that is required under EPEA and the Conservation and Reclamation Regulation to conserve and reclaim. The department in turn directs its contractors to perform conservation and reclamation. The majority of the reclamation processes involved do not differ substantially from those required for mines, quarries, oil and gas installations, and other disturbances. Practices have evolved to reduce erosion, enhance revegetation, and improve reclamation of borrow excavations.

For many Albertans, roadway rights-of-way may be the only exposure they get to the success (or failure) of reclamation work. For this reason it is critical we put our best foot forward and continuously look for innovative ways to showcase reclamation outcomes. The challenge for Alberta Transportation and other road builders and operators is to maintain high standards and continue innovations such as the creation of wetlands on borrow excavations.

Pits

There are about 650 pits on public land. On private land there are about 884 pits that are 5 hectares or larger and between 1,500 to 2,000 pits on private land that are less than 5 hectares.

Gravel deposits often underlie valuable land slated for

commercial and industrial development, leading to land-use conflicts. Pit development raises public concerns about quality of life (noise, dust, nuisance) and the environment (especially groundwater). Some municipalities have viewed pits as an “incompatible land use” in some areas within their boundaries. Regional approaches and coordination between rural municipalities will be critical in the future to ensure consistency in the regulation of smaller municipal pits and the larger commercial operations.

Regulatory oversight of the industry has shifted from education and assistance to authorizations and compliance over the last 50 years. While some operators are very knowledgeable and capable and have the financial and technical resources to operate very large pits, there are many smaller operators working on pits that do not receive the same level of regulatory scrutiny. These operations can expand to the point that they meet the trigger for regulatory authorization (5 hectares on private land). In some cases the upfront conservation work that would enable successful reclamation may not have been done; thus both industry and the regulators are playing catch-up to arrive at an acceptable outcome. Finally, there remain significant differences in how pits are regulated on private and public lands—in terms of requirements, process, and financial security.

Reclamation of pits on high-quality agricultural lands to equivalent agricultural capability is a significant challenge. Another major challenge is developing a set of practical reclamation criteria applicable to the broad range of pit sizes and depths that will result in a very diverse set of social and ecological outcomes. Reclamation of pre-legislation abandoned pits through an orphan-fund approach would provide environmental and social benefits and could be a significant public relations gain for the industry.

Conclusion

The seeds of reclamation success have been planted and nurtured for 52 years. By identifying the principles and practices that have led to success, and weeding out those that have not borne fruit, conservation and reclamation will continue to support sustainable development of Alberta's non-renewable resources. Notwithstanding the significant advancements in knowledge and practice that we have made so far, Alberta's biggest advantage is, and will continue to be, our practitioners. The value of their commitment to excellence and willingness to work cooperatively to achieve a common goal cannot be overestimated.