More than planting trees: career opportunities in ecological restoration

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It was the end of two months of fieldwork under intense heat and constant attacks from mosquitoes. Our crew was responsible for setting up a monitoring protocol to measure the recovery of wildlife in restored habitat associated with 200 km of linear disturbances in a remote boreal forest. We gathered at the campsite and waited for the helicopter that would take us back to civilization. To celebrate the end of the field season, we decided to take a group photo. Just as the whole team had taken the pose, a huge wolf came out of nowhere and grabbed my lunch bag. The wolf disappeared into the forest as quickly as it appeared and the lunch bag was never seen again. – *NM*

Although encountering a thieving wolf is a rare occurrence, a career in ecological restoration can be very exciting, and can provide you with a sense of accomplishment and a feeling that you are making a difference in the world. The United Nations and the World Resources Institute estimate there are 2 billion hectares of land suitable for rehabilitation through landscape restoration (World Resources Institute 2014). Such an abundance of degraded land offers many opportunities to develop your career path. A recent study conducted in the US concluded the domestic ecological restoration sector generates $9.5 billion in economic output annually and directly employs 126,000 workers, most of whom are not researchers – which means the restoration sector employs more people than either the coal mining, logging, or steel production industries (BenDor *et al.* 2015).

Ecological restoration is becoming an increasingly important tool to help repair the ecological integrity of degraded forests, wetlands, rangelands, mine-impacted sites, and other critical habitats. Restoration initiatives are often driven by the cumulative effects of anthropogenic disturbances such as mining, logging, urban development, and other intensive land uses, but also by natural disturbances such as fires, insect outbreaks, winds, floods, invasive species, and droughts. Considering the multiple factors at play in degraded ecosystems, the restorationist is the Swiss Army knife of ecologists. Rather than applying your expertise in one specific area, what often matters the most is the capacity to connect transdisciplinary science to solutions adapted to regional priorities and various ecosystems. Capacity building is the next big skill you must have, as you will design restoration practices by bringing together multiple stakeholders, including industries, municipalities, Indigenous communities, government agencies, and non-governmental organizations (NGOs). However, these groups rarely have the same needs, interests, or vision. Engagement should start early to evaluate trade-offs between conservation actions, landscape development, and socioeconomic values. Coordination with people and organizations involved with a project can help build the support needed to get that project moving and ensure the resilience of the restored area. In addition, partnerships with stakeholders can also add useful resources, ranging from money and technical expertise to volunteer help with implementation and monitoring. Furthermore, as a practitioner, you will manage restoration projects in accordance with regulatory guidelines (eg Endangered Species Act, Clean Water Act, mining site abandonment and reclamation) and your expertise could be used to advance restoration policies (Baker and Eckerberg 2013).

As an outdoor enthusiast, you will spend long hours in the field visiting degraded ecosystems or meeting with local clients. You will take samples (water, soil, air, and vegetation) to assess site conditions and set up protocols to monitor ecosystems resiliency (Figure 1). Having an appetite for technology is definitely an added value, as you might install tracking cameras to monitor wildlife recovery. You may also get the chance to learn how to navigate a drone to take aerial pictures or videos, which could be applied to estimate the closure of the canopy cover or the ecological limits of a wetland. In the office, be ready to juggle multiple tasks. Communicating in a professional manner on the phone and in meetings is critical when engaging and negotiating with stakeholders. Possessing excellent computer skills and the ability to analyze data is helpful for preparing computer models using spatial mapping and statistical analyses. Effective written communication skills will allow you to compose reports with relative ease for diverse audiences. Skills in project management to coordinate budgets, schedules, and human resources will ensure that the project is delivered on time and with the desired results. Teamwork is also a key competency in order to implement and facilitate the multiples stages of restoration planning (ie setting benchmarks and endpoints, cost–benefit analyses, risk assessment, monitoring, defining criteria of success and failure).

In an era of rapid land conversion boosted by human pressures and climate change, the discipline of restoration is evolving to assist the development of multifunctional landscapes. The restorationist is well positioned to be a key player in designing

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Figure 1. Katalijn MacAfee testing restoration techniques (mounding) of linear disturbances in northern Alberta's oil sands region.

multifunctional landscapes that simultaneously support ecological functions, human well-being, ecosystem services, and climate-change mitigation, while also fulfilling cultural, aesthetic, and recreational needs (O'Farrell and Anderson 2010).

If you want to succeed in this new market, you need to build connections and seize opportunities to collaborate with private companies. Why? Because much of the practice of restoration is conducted in collaboration with businesses and associated personnel (eg seed producers, environmental consultants, extractive industries, landscape engineers, laboratory experts in biochemistry or microbiology; Mohr and Metcalf 2018). These firms work with governmental agencies, NGOs, and other stakeholders, and seek support to achieve the multiple goals of restoration. Internships and positions are often available for students, and will allow you to gain in-depth experience in the industry. The opportunities go well beyond tree planting. Ecosystem valuation, carbon sequestration accounting, landscape planning, erosion control, mitigation and conservation banking, flood control, social and cultural surveys, water-quality assessment – you name it, there is probably a restoration group that does it! But keep in mind that restoration requires more than just technical science and data expertise. The "real world" challenge is to be able to build durable bridges between different disciplines and break silos between the research community and the industrial sectors. In this collaborative endeavor, an orchestrator is needed (that could be you) to actively develop clear, achievable, and measurable goals.

In most cases, the minimum education requirement is a bachelor's degree in forestry, biology, conservation, wildlife, or natural resources management. A combination of in-depth experience in the private resources extraction sector and environmental sciences is also valued for implementing projects with industrial partners. To cope with the changing needs and priorities of the discipline, certifications and courses are also available. For example, both the Society for Ecological Restoration (SER; www.ser.org/page/Certification) and the Ecological Society of America (ESA; www.esa.org/certification) offer various certifications, and the US Department of Agriculture provides peer learning sessions through the Collaborative Forest Landscape Restoration Program to encourage science-based ecosystem restoration of priority forest landscapes (https://www.fs.fed.us/restoration/CFLRP/training.shtml). You could also boost your career at the international level by joining a community of practice such as The Global Partnership on Forest and Landscape Restoration (www.forestlandscaperestoration.org) or Wetlands International (www.wetlands.org).

If you dream of doing your part for the planet, and do not mind getting your hands dirty, then this job is for you. Personally, what we like most about this job is the opportunity to eliminate barriers between the research community and the business sector, and to work together to improve ecosystem health. A career in ecological restoration offers a unique opportunity to bring multiple stakeholders together and collectively achieve a common goal. This is the challenge but it is what makes this job so stimulating, fulfilling, and worthwhile.

Supporting Information

References may be found in the online version of this article at http://onlinelibrary.wiley.com/doi/10.1002/fee.2083/suppinfo

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