

SERN News

Wildlife in Restoration | Volume 34 Issue 3

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A LETTER FROM THE EXECUTIVE DIRECTOR



Bethanie Walder
Executive Director
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Dear SER Members,

In the conservation advocacy arena, there's a saying that all wins are temporary and all losses are permanent. That saying has been especially present on my mind recently, starting with decisions in the United States around the proposed Pebble Mine in Bristol Bay and drilling in Alaska's Arctic National Wildlife Refuge and continuing with the unfolding ecological disaster in Mauritius as oil spreads into internationally recognized coral reefs and mangroves critical for local livelihoods. To add insult to injury, headlines also recently stated that the Greenland ice sheets appear to have passed the point of no return in terms of melting as a result of climate change, and multiple reports argued that the Amazon is near or has also already passed its tipping point even before the current Brazilian administration accelerated forest clearing. These potential ecological collapses, along with losses or disasters like those in Bristol Bay and Mauritius, deeply impact human and wildlife communities and threaten biodiversity on our planet.

While it is always frustrating that wins seem temporary and losses permanent, restoration tries to upend that concept and provide hope and opportunity even where ecological damage has occurred. However, though we have never known more about how to effectively implement restoration projects, restoration should never be used as a justification for ecological degradation. Even with the best plans and intentions in place, restoration cannot return ecosystems like Bristol Bay or Mauritius to the largely pristine states they previously existed in. Restoration can mitigate ecological impacts, but it cannot erase them.

Maybe because restoration is not always successful at reversing degradation, efforts to safeguard wildlife and biodiversity have historically focused more on conservation and preservation than restoration. As we can see in these cases from around the world though, degradation is likely to come to even the most pristine places through climate change, fragmentation, extraction, and disasters – thus wildlife need us to use every tool in our toolkit to mitigate and reverse these effects. Wildlife play central roles in ecosystem function that we are only beginning to understand, with both their presence and absence having ripple effects through the natural world. Their presence and absence also have profound effects on human communities, especially indigenous communities where local wildlife are important both as a source of food and as cultural symbols. Many ecological restoration projects focus on plants, habitat, and engineering, often assuming that as long as you restore the land or water, the wildlife will return. In reality, however, wildlife issues permeate the field of restoration: projects designed to benefit a specific species; projects designed with the hope or assumption that wildlife will use a site once restoration is complete; projects that return a missing species as a key component of a successful restoration; and of course, rewilding projects.

The August issue of *SERNews* focuses on this link between restoration and wildlife (we'll focus on rewilding in a future issue since that is a big topic in and of itself). This issue features four thematic articles, starting with an overview that takes a deep dive into some of the reasons why

restoration projects can fail to benefit wildlife (even when designed to do so) and how practitioners can avoid creating ecological traps. The second article looks at the reintroduction of a keystone species – giant tortoises – in the Galapagos Islands as part of an islands-wide restoration effort and how the endemic species on the island responded. The final two articles offer case studies of wildlife-focused community forest restoration projects. The first looks at the interconnected role of conservation, restoration, and community support to benefit grizzly bears in the northwestern United States. The final article explores a project in the Great Green Wall of the Sahel Desert and how one community focused their restoration efforts on bringing back extirpated wildlife species.

From the mounting human, ecological, and economic costs of the COVID-19 pandemic, to the overturning of temporary ecological wins, to potentially permanent ecological losses – current events and news can leave us demoralized, stressed, and highly discouraged about both the present and the future. Ecological restoration still provides hope and opportunity to mitigate those permanent losses, as long as it is not used to justify the degradation in the first place. With ecological restoration we can help return wildlife to places where they had disappeared, maintain and rebuild connectivity in a changing landscape, and support viable wildlife populations where they still persist. With ecological restoration we can also reduce the impacts of climate change; we can re-make whole, functional, dynamic, self-sustaining ecosystems again, even where they had previously ceased to exist. Though it is not and will not be a panacea, ecological restoration is a critically important tool for improving conditions for nature, for wildlife, and for people.



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WILDLIFE IN RESTORATION

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COVER

Juvenile Española Island tortoises being released on Santa Anna as part of the Giant Tortoise Restoration Initiative (photo GTRI).

MEMBERS in ACTION

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USING ANIMAL BEHAVIOR TO GUIDE HABITAT RESTORATION

Robin Hale^{1,2}, Ralph McNally², Daniel T Blumstein³, and Stephen E Swearer²

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Much of the world's biodiversity is threatened by human impacts to ecosystems. The World Wildlife Fund's "Living Planet Report" highlights that between 1970 and 2012 vertebrate populations have declined by 38, 81 and 36% respectively in terrestrial, freshwater and marine ecosystems (WWF 2016). Given that habitat loss and degradation are some of the main threats to biodiversity, the need to restore habitats is well-established, as highlighted by the recent announcement of the United Nations Decade on Ecosystem Restoration.

While restoration is urgently needed to preserve biodiversity, intended outcomes for wildlife in these projects, such as increasing abundance or re-establishing populations, often do not eventuate. There are several reasons restoration can fail wildlife, some of which are well understood, like the failure of plants to establish, and others that have historically received less attention. Restoration is often undertaken based on the assumption that if we alter

structural habitat (e.g. replant vegetation, add structures to streams or into the ocean), then animals will colonize restored sites and be able to survive and reproduce, eventually creating self-sustaining populations. However, what happens if our fundamental assumptions about what constitutes suitable habitat for animals are incorrect? This is a potentially crucial reason why restoration can fail, but one that is not often considered.

Animals are continually making decisions about where to live, where to feed, and with which other animals to interact. By improving our knowledge of these decisions, particularly how and why animals make them, we can improve the chances that habitat restoration has the intended positive outcomes for biodiversity. In a recent paper (Hale et al. 2020), we highlighted two fundamental ways that unexpected behaviours of animals can cause intended restoration to fail, and how behavioural ecology can be incorporated into the planning and monitoring of restoration projects.



Willow flycatchers. Photo: Stock photo.

The first way animal behaviour impacts restoration relates to habitat selection (Hale and Swearer 2017). Many animals assess the potential suitability of a habitat based on environmental cues, which could come from the local environment (e.g. vegetation type, soil moisture), or from other animals (e.g. many marine fish are attracted to the smell of other fish; Coppock et al. 2013). When one of these cues is missing, animals may not colonize restored sites, even if habitat conditions are otherwise improved. For example, willow flycatchers (*Empidonax traillii*) may fail to recolonize



California ground squirrel and Western burrowing owl. Photos: Stock photo.

restored sites regardless of habitat suitability if these sites lack other calling flycatchers (Schofield et al. 2018). However, many restoration projects often assume that animals will colonize restored sites without considering the habitat-selection behaviour of animals (Hale et al. 2019).

The second way relates to whether habitat suitability in restored sites is simply driven by the presence of ecological resources (e.g. food and shelter), or whether there are more complex interactions that also need to be considered. We often understand the basic requirements for species and can ensure they are provided during restoration (Vesk et al. 2008a); however, complex behavioural interactions with other species can also be important drivers of habitat suitability. Like canaries acting as early-warning systems in coal mines, some species act as sentinels to warn others of the presence of predators. Birds like killdeer (*Charadrius vociferous*) have loud, distinct alarm calls that incidentally let other species of birds know that predators such as foxes are nearby. “Ecosystem engineers” are animals that can create, maintain, or destroy habitat for other species. Beavers (*Castor fiber* and *Castor canadensis*) have become an iconic example of an ecosystem engineer, but many other species have important impacts on habitat creation or maintenance; for example, the burrowing of California ground squirrels (*Otospermophilus beecheyi*) creates burrowes and maintains open vegetation habitat used by Western burrowing owls (*Athene cunicularia*; McCullough Hennessy et al. 2016). As

these examples demonstrate, target animals that colonize restored sites may not be able to survive or reproduce if these kinds of components of habitat suitability are not present.

The phenomenon of “ecological traps” is a stark illustration of why we need to understand animal behaviour to improve restoration outcomes. We would expect animals to prefer habitats that provide the things they need to survive and reproduce. However, when the environment changes, some animals may make incorrect behavioural decisions, preferring lower quality habitats (a trap). Perhaps the most compelling example of an ecological trap is aquatic insects that mistakenly lay their eggs on artificial surfaces like roads rather than in water; the eggs subsequently cannot hatch and therefore die. These species have evolved to use polarized light as a reliable cue to locate water, but roads (along with other structures like smooth dark buildings) can reflect light in ways that make them even more attractive than water. Similarly, some marine turtles that use moonlight to navigate to the ocean after hatching are attracted inland by streetlights along the shoreline. Restoration can also cause traps: butterflies may breed in restored wetlands that subsequently flood, killing their offspring, while nearby wetlands do not flood (Severns 2011); trees and shrubs planted in savannah habitats might attract predatory birds, causing declines in lizard populations that are eaten by predators (Hawlena et al. 2010). If restoration inadvertently creates ecological traps, then it could mean animals are



Photo credit: Stock photo

further threatened despite our best intentions.

How can we better incorporate knowledge of animal behaviour into restoration programs? The first step is to better understand these behaviours. For instance, which cues and senses do animals use to select habitats? Similarly, we need to understand all the factors that determine whether a habitat is suitable for animals – both in essential requirements such as shelter and food, but also for more complex behavioural interactions. In some cases, we may be able to source this information from published literature or through expert knowledge (including Traditional Ecological and Local Ecological Knowledge), whereas in other cases targeted research will be required. Once armed with this knowledge, we can use it to implement more fit-for-purpose restoration actions, or to better understand why some restoration actions fail. We may be able to modify habitats in cases of restoration failure, such as using song playbacks to attract birds to breed at restored sites (McCullough Hennessy et al. 2016). Our paper (Hale et al. 2020)

outlines ways we can collect behavioural knowledge to guide the planning of restoration projects or to apply to help mitigate restoration failure. We also highlight situations when behavioural information is likely to be most important, and some of the practical considerations for its application in restoration.

Logistical constraints are important in almost all restoration projects, so several factors need to be considered when deciding to incorporate behavioural knowledge. First, it is likely to be most cost-effective to use behavioural knowledge to help plan restoration projects (e.g. making sure our actions immediately or eventually provide the things animals need; Vesik et al. 2008b). Some solutions to restoration failure, such as song playbacks, may be inexpensive. In comparison others may be labour- or resource-intensive or more complex, such as restoring habitats for both sentinels or ecosystem engineers and other interacting species. Second, collecting behavioural information at a wide variety of restoration sites in any system is likely to be logistically challenging; it may be better to include intensive research sites within a broad network of monitoring locations, with these sites used to collect information about animal behaviour, or to trial behaviour-informed solutions. We can also draw on precedents from the wider field of “conservation behaviour” (Blumstein and Fernandez-Juricic 2010) that shows using behaviour in applied situations is feasible. As examples, in situ predator training can improve the success of translocations to areas with predators (Ross et al. 2019) and knowledge of grizzly bear (*Ursus arctos*) learning is being used to developed warning systems in Canada to reduce train collisions (St. Clair et al. 2019).

Habitat restoration is urgently needed but often fails to have the intended benefits for animals. An improved understanding of the behaviour of target animals is an important component to improving these outcomes, and ultimately to ensure restoration helps to limit and reverse the impacts of habitat loss and degradation on biodiversity.

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RETURN OF THE GIANT TORTOISES VIA A REPLACEMENT SPECIES TO SANTA FE, GALAPAGOS

Washington Tapia, Galapagos Conservancy, and James P. Gibbs, New York College of Environmental Science and Forestry

Santa Fe Island (2,413 ha) is one of the oldest islands in the Galapagos Archipelago, uninhabited, and home to a suite of endemic species (Fig. 1). Starting in the 1700s, the terrestrial ecosystem on Santa Fe began to change in response to the loss of the important keystone herbivore – the Santa Fe giant tortoise, driven to extinction through overexploitation by seafarers in the 1700s and 1800s – and the subsequent invasion of exotic feral goats, first recorded in 1905 (although likely introduced well before then). The goats appear to have caused severe soil erosion and substantial changes in the structure of the vegetation, although all endemic and native plant species persisted. In the 1960s and 1970s, 3,008 goats were removed from the island, resulting in their eradication and allowing vegetation on the island to begin recovering.

However, full recovery of the terrestrial ecosystem of Santa Fe Island requires the restoration of the missing mega-herbivore – the giant tortoise – and the ecosystem services it once provided. In their search for food, water, mates, and nesting sites, tortoises trample vegetation and create permanent trails, which generate heterogeneity in plant communities. Through digging to create resting and nesting sites, tortoises can expose large areas of bare soil, which affects plant regeneration rates and community dynamics. The combination of tortoise herbivory and movement results in the

dispersal of seeds and the transportation of nutrients within and among ecosystems. Santa Fe Island’s plant community ranges from open, desert-like scrub to denser dry season deciduous steppe woodlands. The characteristic and visually impressive Santa Fe Island landscape is unlike that found elsewhere in the Archipelago, with its conspicuous dominance of a vast “forest” of the Galapagos prickly pear (*Opuntia echios*

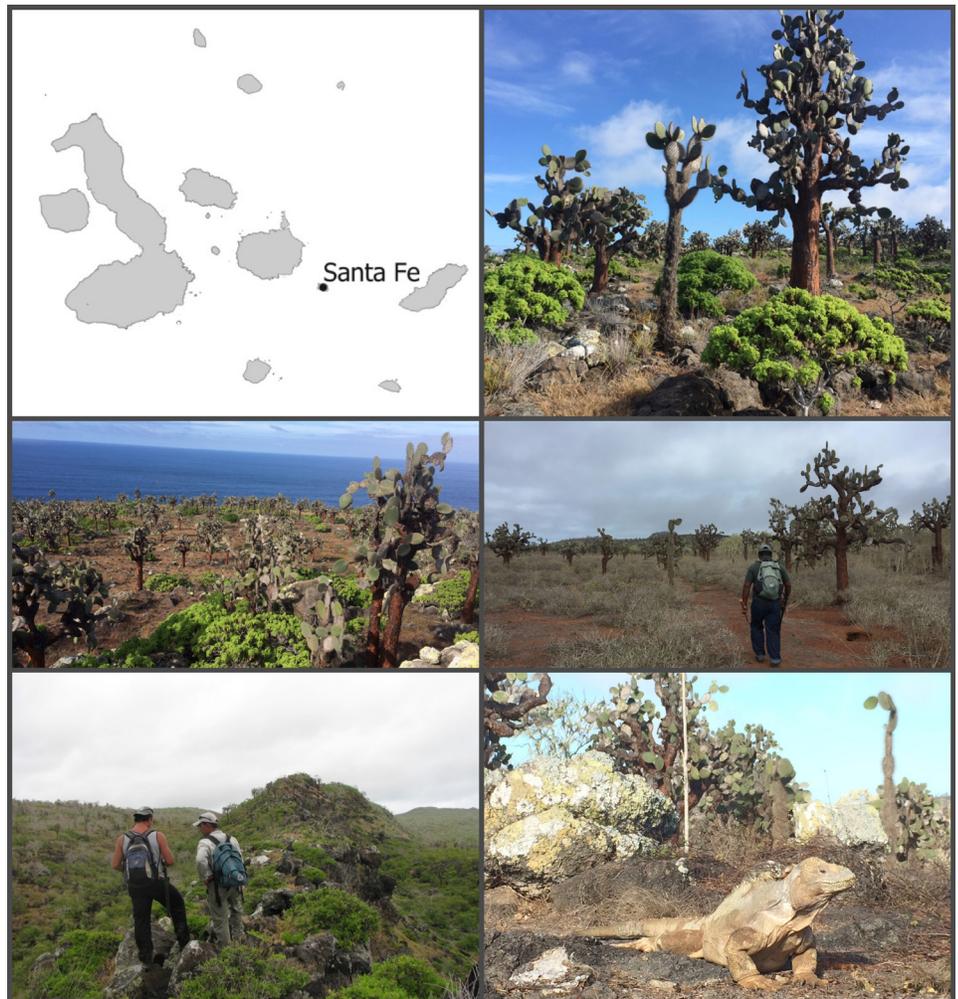


Figure 1: Santa Fe Island: Island location within archipelago (top left) along with several examples of the visually impressive Santa Fe Island landscape, which is not found elsewhere in the Archipelago, with the conspicuous dominance of *Opuntia echios* “forest,” a highly distinct feature of the island. Photos: GTRI.

var. *barringtonensis*), significant not only due to its endemic sub-species status but also due to its extraordinary physical size (adults are often > 5 m tall) and abundance, estimated at 245,090 individuals on this small island (Fig. 1). Noteworthy endemic fauna include the pallid land iguana (*Conolophus pallidus*, Fig. 1), Santa Fe leaf-toed gecko (*Phyllodactylus barringtonensis*), and Santa Fe rice rat (*Aegialomys galapagoensis bauri*).

The Giant Tortoise Restoration Initiative (GTRI) is a collaborative project implemented by Galapagos Conservancy and the Galapagos National Park Directorate focused on restoring tortoise populations across the Galapagos. In 2015, GTRI began releasing translocated Española tortoises (*Chelonoidis hoodensis*) as an ecological replacement on Santa Fe Island following guidelines developed by the IUCN to direct conservation-oriented translocations in an ecologically sound manner. The overall goal has been to establish a self-sustaining population of at least 1,680 giant tortoises on the island, or just under one tortoise (0.7) per hectare, the minimum density at which tortoises are estimated to begin to “engineer” plant communities.

The tortoise liberation program has been undertaken in concert with an intensive monitoring program to track the project’s outcomes. One component of the monitoring focuses on the demographic consequences for the tortoises. Some 551 captive juvenile Española tortoises between five to 11 years old have been translocated in cohorts biannually (2015, 2017, 2019), and a cohort of 34 mostly sub-adult tortoises captured on Española Island in 2019 was translocated to Santa Fe Island in January 2020 (Fig. 2). The juvenile tortoises demonstrate a somatic growth rate comparable to that observed on their native island as well as an extraordinarily high and stable annual survival rate of 94.5% (only a few have been killed by Galapagos hawks), resulting in a minimum of 503 of the 585 released tortoises still alive at the end of the five-year-long population establishment phase. Most tortoises remain concentrated near the release area but are gradually dispersing and currently occupying at least 11.5% (285 ha) of the island (Fig. 2). A demographic model integrating all the vital rates estimated (e.g. survival and reproduction) predicts rapid population growth ($\lambda = 1.07$) and high probability of population persistence through 2100, with primary program objectives reached within the next three



Figure 2: Releases of a total of 551 juvenile Española Island tortoises to Santa Fe Island from the Tortoise Breeding Center on Santa Cruz Island (hand-carried, top left) and 34 sub-adults translocated from Española Island, delivered by helicopter in December 2019 (top right and lower left), and area of island occupied by tortoises after 5 years (lower right, green indicating predicted suitable habitat for tortoises on the island). Photos: GTRI.

decades if current vital rates and habitat conditions for tortoises prevail in the warmer, wetter climate predicted for Galapagos under most climate change scenarios. An abundance of friable soils on the island should be sufficient for tortoise nesting once the juvenile tortoises reach maturity, but until successful nesting is registered the outcome of this program remains tentative.

The other component of the monitoring program focuses on ecosystem responses to tortoise reintroduction, and suggests that populations of cactus and land iguanas have increased over the last decade coincident with the arrival of giant tortoises, a trend that likely reflects ongoing ecosystem recovery in response to goat eradication over 40 years ago. Experimentally excluding herbivores from some areas and not others via fencing has revealed that iguanas and tortoises reduce herbaceous plant cover, and iguanas but not tortoises reduce both *Opuntia* and woody plant recruitment regeneration, at least near adult cactus trees where the exclosures were established (elsewhere cactus abundance has increased). No response is evident (as yet) of other vertebrate animals to introduction of tortoises to the island (Fig. 3). The reintroduction of the mega-herbivores is still in its early phases and the tortoise population and the tortoises themselves are still small, meaning that any substantial “ecosystem engineering” has yet to manifest as a result of this conservation action.

Aside from regular monitoring of the tortoises, their habitat, and the key components of the island’s ecosystem, little further conservation intervention to establish the tortoise population is expected (Fig. 3). If unacceptable reductions in habitat components or population levels of key endemic species occur, the tortoises can be removed from the island; unlike most vertebrate animals, giant tortoises are unable



Figure 3. Example of monitoring systems in place to measure future impacts of tortoises on the Santa Fe Island ecosystem. Photos: GTRI.

to hide themselves in refuges, burrows, or cavities and so can be found and removed if necessary.

Completion of this first stage of a successful conservation intervention serves as a “proof of concept” for introduction of tortoises as “ecological replacements” to other islands in Galapagos, including those contemplated for Pinta and Floreana Islands, both much larger islands than Santa Fe, and for other island ecosystems around the world where giant tortoises once played a role as ecosystem engineers.

Further details of this and other, on-going tortoise population restoration programs to facilitate ecosystem recovery in Galapagos can be found in Gibbs JP, Cayot LJ, and Tapia W (2020) Galapagos Giant Tortoises. 1st Edition, Academic Press (available Nov. 2020).



CONNECTING THE WILD: CONSERVATION, RESTORATION, AND COMMUNITY IN A KEY GRIZZLY BEAR CORRIDOR

Kali Becher, Vital Ground Foundation

As an ever-growing human footprint fragments wildlife populations, habitat connectivity is increasingly important to wildlife conservation. At the same time, climate change is shrinking habitats, shifting the distribution of food sources both temporally and spatially and forcing wildlife to adapt, either by changing their range or traveling farther to find food.

These dual threats carry significant impacts for wide-ranging species such as the grizzly bear (*Ursus arctos horribilis*). Historically, grizzlies ranged over large areas of diverse habitat in western North America, from plains to mountains, accessing a variety of food sources depending on the time of year. Due to the patterns of development in the western United States, core grizzly bear habitat remains only in the large, intact habitat blocks located in mountainous tracts of public land. These areas of intact habitat are separated by river valleys that are predominantly filled with privately-owned lands. As a result, habitat connectivity between core areas can only be achieved through connecting blocks of mountainous public land with habitat-rich private lands protected from dense development in the foothills and valleys.

Across the region, however, these low-elevation lands have been significantly altered by residential and commercial development concentrated along lakes and rivers, with forests cleared for agriculture and industrial activities. As a result, the landscape has become fractured by highways, railroads, and subdivisions, severely limiting the permeability of the

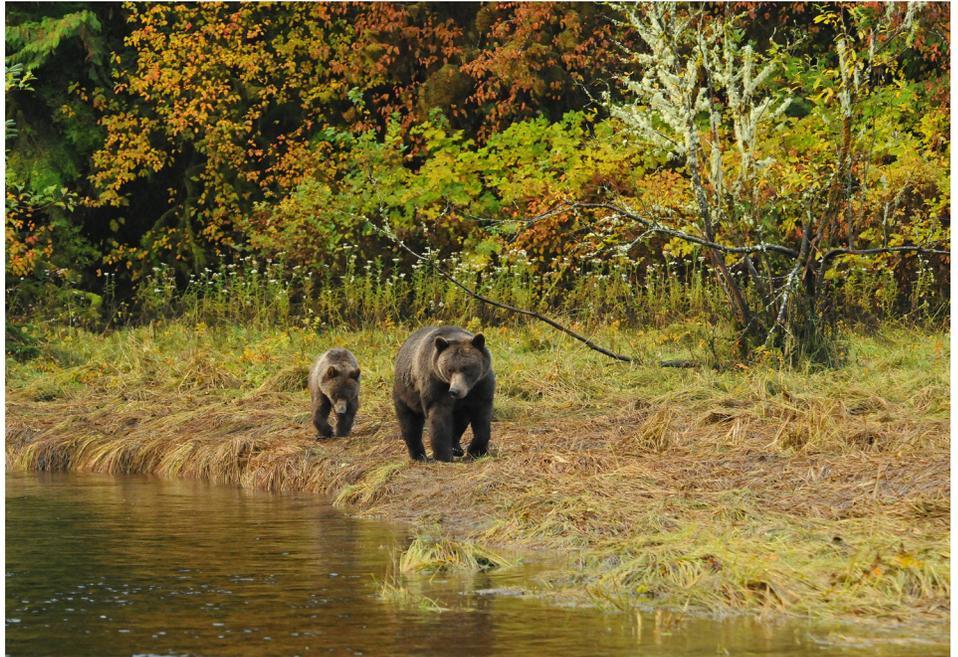


Photo credit: Robert Scriba

land for wildlife movement. For many animals, their movement through valleys is difficult due to the lack of forage and cover, and dangerous obstacles such as interstate highways and railroads, making it likely they will avoid the journey altogether. In addition, for grizzly bears that do venture outside of more secure habitat, they can get in to trouble as they discover novel food sources, such as backyard chickens, garbage, and fruit trees. Bears can become used to these low-effort, high-reward foods and start seeking them out instead of natural food sources and can also gradually lose their fear of people. While some of these bears can be relocated by wildlife managers, others are euthanized due to the danger they pose to the communities where they have taken up residence. These human-related conflicts, whether from being hit by a car or getting into residential attractants, make developed valleys high-mortality areas for grizzly bears. The future of wildlife connectivity for species like the grizzly bear, therefore, involves not only private land

conservation, but also ecological restoration and community cooperation.

FRAGMENTATION AND ISOLATION

Achieving a permanently-connected landscape that ensures the long-term survival of grizzlies and the many native species that share their range is the vision of the [Vital Ground Foundation](#). As a land trust, we protect private lands using conservation easements or through directly acquiring and managing land important for grizzly bear habitat conservation. Grizzly bears are an icon of North America due to their ecological and cultural importance, yet the species currently occupies just two percent of its historic range south of Canada. Since being listed as a threatened species in the U.S. under the Endangered Species Act in 1975, the grizzly's population has increased significantly in the Northern Rockies, but their distribution is still limited to isolated recovery areas, with nearly all of the U.S. "Lower 48" states' remaining grizzlies living in the ecosystems in and around Glacier and Yellowstone National Parks.

Roughly a hundred of miles west of Glacier National Park, a genetically-isolated group of grizzlies persists in the Cabinet-Yaak Ecosystem in Montana's far northwestern corner and Idaho's northern Panhandle. Within this recovery area are two sub-populations - one in the Purcell Mountains and one farther south in the Cabinet Mountains. Recent population estimates number each group at just 25 animals, well under the population recovery goal of 100 animals. Separating them is the steep-walled Kootenai River valley that contains a railroad, a highway, and a large river in addition to residential, commercial, and industrial development. The isolated

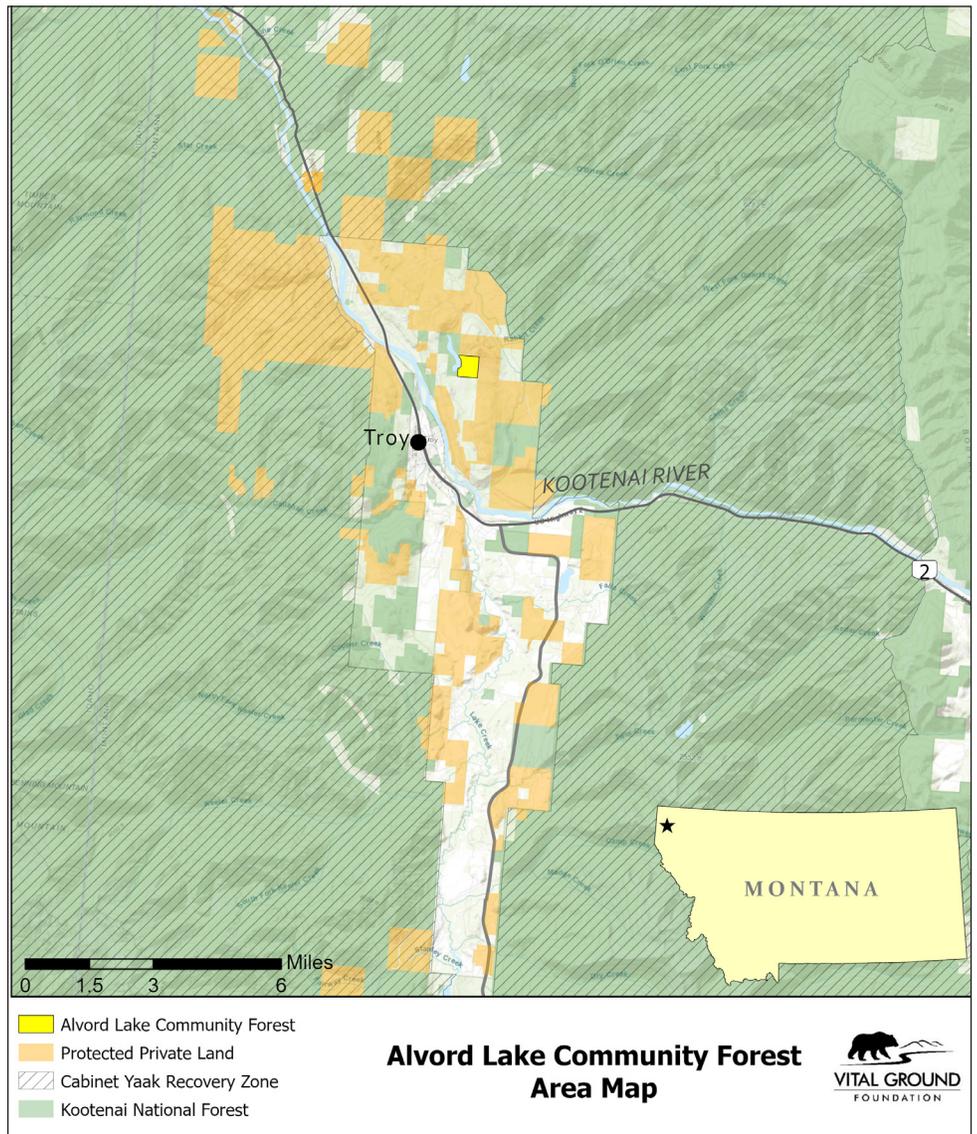


Figure 1: Location of the Cabinet-Yaak Ecosystem (star icon on inset) and the Alvord Lake Community Forest.

grizzly populations' genetic health, and therefore long-term survival, depends on their ability to exchange genes with bears from elsewhere, requiring movement between the two mountain ranges and beyond.

Vital Ground and a variety of community partners have been working to piece back together a protected habitat corridor between these two mountain ranges. We focus our work on locations that have the highest potential for providing secure habitat and movement between the mountainous forestlands of the Purcell and Cabinet ranges.

ALVORD LAKE: A STUDY IN COMMUNITY CORRIDOR CONSERVATION

The Alvord Lake Community Forest located outside the town of Troy, Montana, in the foothills of the Purcell range, is an ambitious community conservation and restoration project. In this ecologically diverse area, the Alvord Lake property provides a great example of how grizzly bears act as an umbrella species, with conservation-related decisions focused on grizzly bears directly and indirectly benefiting many other species. In addition to providing grizzly bear habitat, the property also hosts amphibian species of concern including western toad (*Anaxyrus boreas*), Northern alligator lizard (*Elgaria coerulea*), western skink (*Plestiodon skiltonianus*), and twelve bird species of concern, including the common loon (*Gavia immer*). There are only 65-75 nesting pairs of common loon in western Montana, and common loons have been successfully nesting and producing chicks at Alvord Lake since the mid-1980s. Other mammals that occur on the property include wolves (*Canis lupus*), black bears (*Ursus americanus*), mountain lions (*Puma concolor*), whitetail and mule deer (*Odocoileus hemionus* and *O. virginianus*), elk (*Cervus canadensis*), moose (*Alces americanus*), and bobcat (*Lynx rufus*). The area also lies within the likely habitat range for Montana State Species of Concern fisher (*Pekania pennanti*) and wolverine (*Gulo gulo luscus*), the latter of which has been proposed as a threatened species under the US Endangered Species Act.

This collaborative conservation project provides a case study of the convergence of issues surrounding wildlife connectivity: private land conservation, land use changes, habitat restoration, and community values. Starting in the 1950s, the property was logged many times while under ownership of an industrial-scale timber company who sold the property in 2002 to a real estate developer with plans for a subdivision. By this point, the 142-acre property was surrounded by a network of private land protected with conservation easements and public land, and was a popular recreation spot for the local community. The community knew this proposed subdivision would fragment important wildlife habitat and cut off public access; fortunately, a neighbor was able to purchase the property in order to prevent



Area around Troy, Montana (top) and Alvord Lake Community Forest (center; Photos: Kali Becher); community access to lake (Photo: Adrienne Ingram).

the development, although this was not intended as a long-term solution.

After nearly 12 years, the owners could no longer keep the property, but this time a new opportunity arose. A coalition of local groups partnered with Vital Ground to create a vision and establish goals for a community forest and apply for funding from the U.S. Forest Service's Community Forest program. This funding, along with contributions from local, regional, and national donors allowed Vital Ground to purchase the property in 2015. The Alvord Lake Community Forest was created, securing hiking, hunting and fishing access around the lake, conserving a piece of land with both local and regional importance for wildlife, and maintaining the property as a working, sustainably-managed forest. While Vital Ground owns the land, all management occurs in coordination with a local stakeholder group made up of federal and state agencies, tribal representatives, local conservation groups, community members, and representatives from the local chapter of the Society of American Foresters.

It was clear from the beginning of the project that previous land uses harshly impacted the property. Logging had left its mark, both through roads and skid trails, and had altered species composition and structure. While the old roads had mostly been abandoned and naturally revegetated (potentially with some seeding by the logging company), the primary logging roads had become dominated by noxious weeds that had started creeping up skid trails into the forest. Additionally, the majority of the forest itself was within an early to mid-successional age class, with a very dense understory and a sparse overstory of the unmerchantable trees left from previous logging. The species composition had also been altered by logging and sustained fire-suppression, so that the forest was trending toward shade-tolerant, climax species such as grand fir (*Abies grandis*) and Douglas fir (*Pseudotsuga menziesii*) that are very susceptible to root diseases and insects, and less resilient to disturbance. In many areas, this forest structure also resulted in fewer shrubs and forbs, reducing the amount of available forage for wildlife and grizzlies, and decreasing overall diversity.

RESTORATION AND EDUCATION

The goals of the community forest are to restore and maintain forest health; maintain and improve fish habitat, water quality, and wildlife resources and habitat; and maintain traditional public uses and educational opportunities. The stakeholder group knew the most pressing need at the community forest was improving forest health, which would have the benefits of improving wildlife habitat and providing educational opportunities. To support these restoration goals, Vital Ground secured a multi-year grant from the U.S. Forest Service's Landscape Scale Restoration program, administered by the Montana Department of Natural Resources and Conservation.

Over the past three years, we have implemented multiple forest thinning projects covering 70 acres, with 30 more acres slated for treatment this year. Project treatments needed to balance goals of improving forest health and ensuring high-quality wildlife habitat through cover and food resources. These projects have reduced understory density in order to increase vigor and resilience of the remaining trees, creating openings for increased shrubs and forbs, and reducing the risk of high-intensity wildfire. We have also maintained patches of dense understory for wildlife cover. Finally, we have substantially reduced the cover of noxious weeds through hand-pulling, biocontrols, and targeted herbicide use, seeding in their place native species that will provide better forage for wildlife. All the work has been done by local contractors and can be easily accessed for tours to help educate the community on the benefits of forest restoration.

The next phase of restoration will focus on shifting the forest's species composition by planting species that are more resilient to the site's conditions, less vulnerable to root disease, and adaptable to a fire-maintained ecosystem. We also hope to see more shrub growth in response to forest thinning, which will improve both wildlife forage and cover. We will plant beneficial species if there is little natural recruitment, ultimately resulting in a more resilient forest with increased complexity and species diversity, providing higher quality wildlife habitat. Collaborative community restoration projects also provide opportunities to engage the local community

in monitoring and on-site restoration. At Alvord Lake, volunteers conduct bird surveys throughout the forest, and many school groups use the area for environmental education trips. During the forest thinning projects we also reserved a number of control plots, providing an opportunity to engage with citizen science and school groups in project monitoring.

While we may not completely understand how grizzly bears select their routes through developed foothills and valleys, we do know that areas with less development and ample, diverse wildlife cover and forage provide more secure and usable corridors. When these habitat linkages exist, grizzly bears are less likely to stray into more developed areas where they can stumble upon attractants such as garbage, fruit trees, and backyard chickens, incidents that often repeat and result in the bear's relocation or death by wildlife managers. Protecting and restoring corridors prevents conflicts and improves the grizzly and other species' chances of durable survival. In remnant populations like the Cabinet-Yaak's, any human-related mortality has a large impact on the species' recovery. Projects like the Alvord Lake Community Forest keep bears in the woods and out of trouble, conserving and restoring vital connections for grizzlies and the many other species that need healthy habitat and the ability to move across the landscape.



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LARGE-SCALE LAND RESTORATION FOR WILDLIFE CONSERVATION IN NORTHERN SENEGAL: THE CASE OF THE GREAT GREEN WALL

Moctar Sacande and Nora Berrahmouni, UN Food and Agriculture Organization (FAO)

NATURAL CAPITAL AT RISK: THE SAHEL, NORTHERN SENEGAL

Africa's forests, grasslands, and wildlife are its most significant resources, supporting the economy, food security, and livelihoods of over 60% of its population, especially the rural poor. These precious resources are even more important in the vast drylands of the Sahel region – a semi-arid transition zone between the Sahara and the savanna – where these resources are largely unprotected and degraded. The devastating effects of climate change, deforestation, desertification, and overexploitation of natural resources has simultaneously put the Sahel's biodiversity and the livelihoods and food security of its people at risk. In the face of such unprecedented challenges, increasing plant diversity is crucial to restore degraded land, protect wildlife, and allow sustainable production in agro-sylvo-pastoral systems.

The vast Sahelian agro-sylvo-pastoral zone of Northern Senegal, called the Ferlo, extends over 13,200 km² from Saint Louis in the west to Bakel in the east. The conditions are arid, characterized by a short rainy season from June to September (200-500 mm average annual rainfall) and dusty winds (the harmattan) during the dry season, making this area prone to droughts and desertification. The vegetation is savanna dominated by arid and semi-arid trees and shrubs such as African myrrh (*Commiphora africana*), *Combretum glutinosum*, Karaya gum tree (*Sterculia setigera*), and white acacia (*Faidherbia albida*). On



Participants in a community nursery producing native tree seedlings. Photo credit: FAO/AAD Senegal.

sandy soils, the vegetation includes thorny woody species such as thorny acacia (*Acacia nilotica*), desert date (*Balanites aegyptiaca*), and Indian jujube (*Zizyphus mauritiana*). This mosaic-like vegetation includes a tapestry of high-quality species for grazing such as *Aristida mutabilis*, *Eragrostis tremula*, *Schoenefeldia gracilis*, *Zornia glochidiata*, sandburr (*Cenchrus biflorus*), bluestem (*Andropogon gayanus*), and *Aristida longiflora*. However, this vegetation is under increasing pressure from frequent bush fires and overgrazing, leading to changes in plant composition to species that are indicators of poor soil, including giant milkweed (*Calotropis procera*), *Leptadenia hastata*, and *L. pyrotechnica*. Historically, the Ferlo was known to have a rich variety of wildlife – much of which has all but disappeared in these areas – including species such as the red-fronted gazelle (*Eudorcas rufifrons*), ostrich, small carnivores, armadillo, terrestrial turtles, hyena, African golden wolf (*Canis anthus*), fennec

fox (*Vulpes zerda*), wild cats, bustards, cattle egret (*Bubulcus ibis*), and desert and Nile varanids (*Varanus griseus* and *V. niloticus*).

THE GREAT GREEN WALL: A COMBINATION OF NATURE-BASED SOLUTIONS

To combat desertification, prevent further degradation, and build back the lost plant and wildlife biodiversity in the Ferlo, the Government of Senegal joined efforts with other countries in initiating one of Africa and the world's most ambitious green infrastructure projects: the Great Green Wall for the Sahara and the Sahel, endorsed by the African Union in 2007.

In 2008, field activities started in Senegal with a 20,000 ha reforestation project in the Louga region. Other areas were fenced to reduce pressure from grazing and promote natural regeneration. FAO focused its contributions in Senegal on supporting the National Agency for the Great Green Wall through its Action Against Desertification program (AAD), which aims to boost large-scale land restoration, strengthen sustainable land management, and improve communities' livelihoods. The AAD covers 10 GGW countries and is supported financially by the European Union - Organisation of African, Caribbean and Pacific States, and Turkey.

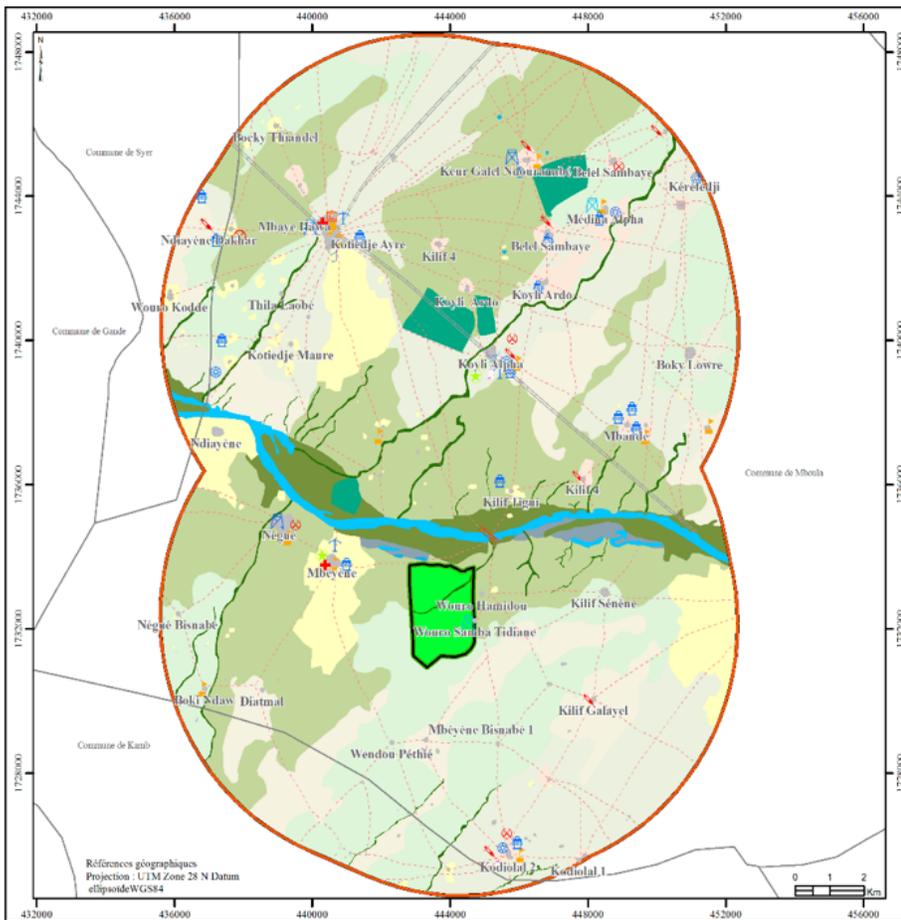
LARGE-SCALE RESTORATION APPROACH IN THE GREAT GREET WALL – BIODIVERSITY HAND IN HAND WITH COMMUNITY DEVELOPMENT

FAO's restoration approach for the Great Green Wall includes a combination of plant science and restoration practices using a large number of species including trees, shrubs, and grasses that match the restoration needs of the communities and improve biodiversity conservation.

FAO's restoration model assesses how restoration benefits the resilience and livelihoods of communities across the entire value chain: from the planting of seed to end-products and ecosystem services, including biodiversity conservation, carbon sequestration, and ecotourism (Berrahmouni et al,

2015, Sacande et al, 2020a). The practices used in the restoration model include:

- i. **Promoting natural regeneration** through community protection, management, and enrichment of forest woodlands, croplands, and grasslands.
- ii. **Investing in large-scale land preparation and planting** where degradation is so severe that natural vegetation will not regenerate on its own. Mechanized ploughs (e.g. the Delfino Plough that mimics the traditional manual half-moons) are often used to prepare larger areas of land, ranging from 50 to 200 hectares per village. The communities select the native woody and grass species to be planted. On any given site, the diversity of planted species amounts to a minimum of 10 species per hectare, combining grasses, trees, and shrubs to maximize ecological functions and build better resilience on the ground.
- iii. **Fighting sand encroachment** by establishing and protecting native woody and grassy vegetation adapted to sandy and arid environments.
- iv. **Mobilizing high-quality seeds and planting materials** of well-adapted native woody and herbaceous fodder species (for livestock and wildlife) to build ecological and social resilience. Over 200 plant species have been identified as useful species to rural communities across GGW countries through household surveys; 50 of these species are being planted in the AAD countries (Sacande et al., 2016; 2020a).
- v. **Developing comprehensive value chains**, ecosystem services, and livelihood options that benefit local communities and enable the flourishing of green economies. New enterprises have developed, including ecotourism in community wildlife nature reserves and the production of non-timber forest products such as restoration seeds, fodder, gums and resins, honey, and balanites oil.
- vi. **Building simple, cost effective, robust, participatory monitoring systems** to support biophysical and socio-economic baseline assessments, identify interventions, track progress, inform stakeholders and investors, and support lessons learnt and adaptive management.



Koyli Alpha's Community nature reserve (in green). FAO/AAD Senegal.

RESTORING AND MANAGING THE COMMUNITY-BASED NATURE RESERVE OF KOYLI ALPHA

Community-based nature reserves are important conservation strategies for people and wildlife as part of the GGW program. In Senegal, community-based reserves are included in the environmental protection law under the Forestry Code as a “natural site of local interest for conservation, created by the Commune outside the classified forest estate and within its administrative limits.” FAO’s AAD program responded to an early request from Koyli Alpha’s communities and local administration to start working on a community-based nature reserve in 2017, with a primary goal to reintroduce wildlife to the area. With the best advice of wildlife experts and agreements of all surrounding villages, an appropriate site was selected to implement the Koyli Alpha reserve located at the edge of the Senegal River.

In partnership with the National Agency of GGW (2013), the local administration, and the local communities, a 1,000 hectares area was fenced to delineate the boundaries of the reserve. The fencing and restoration plan focused encouraging natural regeneration, enrichment plantings where needed to improve vegetation cover, and increasing available forage species for the re-introduction of wildlife.

SUCCESSFUL REINTRODUCTION OF WILDLIFE SPECIES

Historically abundant, wildlife around Koyli Alpha became rare over the 20th century due to habitat encroachment by development, habitat degradation, and hunting. The village was keen to reintroduce wildlife species and better conserve and protect them through fencing and restoration focused on habitat

quality after learning from past inappropriate practices.

The wildlife reintroduction process started with tortoises (*Centrochelys sulcata*) taken from the village de tortues (a turtle sanctuary; Bambilor in Dakar) shortly after fencing was completed on the reserve. After three years of land preparation and planting with herbaceous and woody species, the reserve was ready for the re-introduction of oryx and gazelle. The species were translocated from the nearby enclosure of Katane within the Reserve of North Ferlo, home to 120 oryx (*Oryx dammah*), 27 dorcas gazelles (*Gazella dorcas*), and dama gazelles (*Nanger dama*). An initial group of oryx (four females and two males) were translocated into the Koyli Alpha reserve in May 2020 under the technical and scientific supervision of wildlife experts and veterinarians. In the coming months other ungulate species including Dorcas gazelles will be reintroduced as well.

Members from the village community, local administration, national parks, and tourism office

are participating in a management committee for the reserve set up under GGW supervision and have already produced and adopted a management plan. Additionally, Koily Alpha has been established as a protected area with sustainable use of natural resources under IUCN Category VI with the main objectives of: conserving biodiversity and restoration of local wildlife; supporting environmental services (source for fodder, wood energy, reserve of wildlife for ecotourism); and sustainably managing natural resources. There is also potential to develop ecotourism, and the village aspires to benefit from such opportunities that may arise by linking the tourism routes between the cities of Dakar and Saint Louis.

OUTCOMES OF THE RESTORATION AND CAPACITY DEVELOPMENT EFFORTS

Using FAO's Collect Earth tools, AAD estimates that 2,120,606 hectares of land in the Ferlo (corresponding to 48% of the Louga and Saint Louis regions) is in need of restoration. From 2016-2020, AAD has helped communities in this region successfully plant 6,733 hectares of degraded agro-sylvo-pastoral lands, using a combination of assisted natural regeneration and enrichment planting with native woody and fodder species for both livestock and wildlife (e.g. *Alysicarpus ovalifolius*, *Aristida funiculata*, *Indigofera aspera*, *Zornia glochidiata*). Community mobilization is the key ingredient for the restoration process to succeed.

As part of this process, AAD equips communities with training on seeding, planting, restoration, site maintenance, and management; communities are directly involved in the selection of the site to restore, seed collection, and planting and management of the restored areas. The species selection process is also carried out based on the community's needs and priorities, and in consideration of ecological adaptability.

In five years, the AAD program has brought nearly 60,000 hectares of degraded agro-sylvo-pastoral lands under restoration in the GGW countries, planting 25 million native tree species that are commonly used by rural communities. A total of 100 tons of forest seeds of 110 woody and herbaceous fodder species were collected and planted in ten GGW countries, bringing huge positive economic and ecological returns. These comprehensive and integrated operations require multilayer collaboration between a wide range of actors and contributors lending their support.

CONCLUDING REMARKS: THE WAY FORWARD

Building on successes achieved so far combining restoration, wildlife conservation, and sustainable development efforts, the Great Green Wall in Senegal has become a living example showcasing the possibility of achieving opportunities created through the implementation of the Great Green Wall across



Re-introduced oryx and sulcata tortoise in Koyli Alpha's Community Nature Reserve. Photo credit: FAO/AAD Senegal.

Africa. The success of the initiative in achieving large-scale restoration was due to the community-centred and cross-sectoral approach used, and the multi-disciplinary scientific and technical support provided by FAO and research and technical experts. There is still a long way to go to achieve land restoration and conservation objectives, but the planted seeds of restoration and wildlife reintroduction success will bear long term fruits if the team and partners continue to work together, bridging biodiversity resilience with development needs, contributing to the achievements of the multiple UN Sustainable Development Goals (15, 13, 2 and 1). The UN Decade on Ecosystem Restoration will bring renewed restoration commitments, incentivizing governments, partners, and communities to continue working together to build step-by step this green wall of opportunities for biodiversity, food security, resilience, and sustainable development.

See AAD pages at: www.fao.org/in-action/action-against-desertification/en/

See antelopes release at: www.youtube.com/watch?time_continue=8&v=66W2cleBjks&feature=emb_logo

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Mechanised ploughing for large scale restoration in the Great Green Wall. Photo: FAO/AAD Burkina Faso

FEATURED RESOURCES

UPDATES FROM THE RESTORATION RESOURCE CENTER, *RESTORATION ECOLOGY*, AND THE WEBINAR LIBRARY

Restoration Resource Center

22

SER's [Restoration Resource Center](https://ser-rrc.org) (RRC) is an online platform for exchanging knowledge and experience through ecological restoration projects, publications, and other resources from around the world. The RRC can be accessed through the SER website, or directly at: <https://ser-rrc.org>. Practitioners and researchers are encouraged to submit their projects!

Restoration Ecology Editor-in-Chief Picks

23

This quarter's Editors' Picks features three articles from the August 2020 issue of *Restoration Ecology* focused on strategies to support the UN Decade, spatially patterned restoration methods, and monitoring quarry restoration

Webinar Library

24

Enjoyed the theme of this issue? If you'd like to learn more about wildlife and restoration, check out these selected webinars from the SER library



RESTORATION RESOURCE CENTER

FEATURED RESOURCES

ECOLOGICAL IMPACTS OF THE EURASIAN REINTRODUCTION PROGRAMME

Simone Milne, Royal Botanic Garden Edinburgh

Beavers (*Castor fiber*) were reintroduced to Scotland in 2009 in the first formal reintroduction of a mammal to the UK motivated by the species' positive influence on biodiversity. However, the resulting habitat changes led to some localized adverse ecological impacts and unexpected socio-economic impacts.

In this presentation from SER2019, Scott Milne explores the process, challenges, and impacts of the reintroduction process with a specific focus on ecological restoration and re-establishing ecosystem health.



Photo: Stock photo

EFFECTS OF PRESCRIBED FIRE ON WILDLIFE AND WILDLIFE HABITAT IN SELECTED ECOSYSTEMS IN NORTH AMERICA

The Wildlife Society

Prescribed fire is widely used as a management tool and affects ecosystem structure in a variety of ways. As a result, fire can impact wildlife in positive, negative or neutral ways, as well as over short or long term time periods. This report uses a regional approach to explore historical and current use of prescribed fire in target ecosystems, the effects of fire on wildlife in those regions, and potential challenges of using fire in each system.



Photo: Stock photo



RESTORATION ECOLOGY EDITOR-IN-CHIEF PICKS AUGUST 2020

A WORLD OF POSSIBILITIES: SIX RESTORATION STRATEGIES TO SUPPORT THE UNITED NATION'S DECADE ON ECOSYSTEM RESTORATION

James Aronson, Neva Goodwin, Laura Orlando, Cristina Eisenberg, and Adam T. Cross

The UN Decade on Ecosystem Restoration relies on three pathways to action: generating a global community, fostering political support, and building technical capacity. The authors offer six strategies selected to create a framework for governments, nongovernmental organizations, and other organizations to take action.

To increase the effectiveness of restoration during the UN Decade, the authors propose the following: (1) incorporate holistic actions; (2) include traditional ecological knowledge; (3) collaborate with allied movements and organizations; (4) advance and apply soil microbiome science and technology; (5) provide training and capacity-building opportunities; and (6) study and show the relationships between ecosystem health and human health.

THE USE OF SPATIALLY PATTERNED METHODS FOR VEGETATION RESTORATION AND MANAGEMENT ACROSS SYSTEMS

Marianne Evju, Dagmar Hadegn, Magni Kyrkjeide, and Berit Köhler

The scale and severity of environmental degradation has led to multiple international targets for restoration, yet conventional restoration methods are often prohibitively expensive at large scales and have mixed success rates. Spatially patterned restoration – planting or seeding in clusters throughout a target area – is a novel restoration approach that can minimize costs and potentially increase effectiveness.

The authors used a literature review to determine if different methods are being used regionally, which restoration goals the methods address, and if there is a body of knowledge being generated. They found that the three most commonly used methods differed in the ecosystems where they are most commonly used, and the methods resulted in different ecological outcomes. While two of the methods showed the development of a body of knowledge, additional economic analysis and theoretical knowledge is needed.

BEYOND THE GREEN: ASSESSING QUARRY RESTORATION SUCCESS THROUGH PLANT AND BEETLE COMMUNITIES

Teresa Mexia, Cristina Antunes, Alice Nunes, António Mira, Ana I. Correia, Artur Serrano, Otilia Correia

Although understanding the response of multiple taxa to restoration provides the clearest information about the success of a project, comprehensive biodiversity assessments are rarely possible. Instead, specific taxa that are indicative of a site's structure and function can be used as a proxy.

In this paper, the authors used abundance, diversity, and community composition of plants and beetles to assess revegetation in a limestone quarry. Over 19 years, the composition of both beetle and plant communities in restored sites improved but did not meet the composition in reference sites. The use of an invasive species in the revegetation of the restored quarry could be driving the differences by impacting the structure and function of both plant and beetle communities.



WEBINAR LIBRARY IN CASE YOU MISSED IT...

SER hosts a webinar series to provide an opportunity to engage with restoration experts from across academia and the applied field; we also partner with our Chapters to bring additional regional perspectives. We are continuously adding new recordings to our [Webinar Library](#) and access to recordings is a member benefit. This month we are featuring presentations related to working with and understanding wildlife in restoration.



Environmental DNA - A Cool New Science That Will Benefit Your Restoration

Josh Running, Jake Rikey, Mary Murdoch



Overcoming Pollinator Habitat Restoration Challenges

Aaron Feggestad



Where Road Ecology and Ecological Restoration Converge

Marcel Huijser



Bringing the Salmon Home: Protecting Tribal Trust Resources on the Klamath

Craig Tucker and Michael Belchik



Biotic Interactions in the Tropics: Challenges for Restoration and Conservation

Mar Sobral, Robert Bagchi, Christopher Kaiser-Bunbury, Anand Osuri

SOCIETY NEWS

UPDATES ON MEMBERSHIP, POLICY & PRACTICE, THEMATIC SECTIONS, AND MORE

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NEWS FROM SER

MEMBERSHIP NEWS

Laura Capponi, SER Membership Director

A big thank you to the 100+ SER members who participated in the beta test of our new member community forum in August. We'll be formally launching this tool for networking, learning, and engagement in early September!

BUILDING A DIVERSE AND INCLUSIVE NETWORK FOR ECOLOGICAL RESTORATION PROFESSIONALS

The Society for Ecological Restoration is continuing to work towards our commitment to improve diversity and equity both within the Society and within the field of ecological restoration. We are writing with both an update and an invitation, as we continue this important work.

At its June meeting the SER Board approved a new "Membership for All" Initiative expanding eligibility of our income-qualified pricing. The new "equity" membership categories for individuals and organizations replaces our former category for citizens of lower income countries. The Membership for All program also includes a new one-time, no-fee Open Doors

Membership for individuals who are unable to pay dues, but who want to be involved in SER. These new membership options became available on the SER website as of Friday, July 24.

The Board also approved a motion to immediately strengthen the diversity, equity, and inclusion language in the 2011 Code of Ethics. In addition, the Board formed an ad hoc committee that will conduct a more formal review of the 2011 Code of Ethics (including the newly adopted language), while also developing plans for increasing equity within both the field of ecological restoration and the Society. The committee will make recommendations both for how to engage the full membership in this process and for an initial scope of work for a standing committee once this immediate work is complete. SER is forming the ad hoc committee now and expects it to begin its work in September 2020.

For information about member benefits, log on to ser.org with your username and password and visit the new Members' Center at <https://www.ser.org/page/membersonly>.

WELCOME NEW BUSINESS MEMBERS

All Business Members are listed in the [Restoration Directory](#) on SER's Restoration Resource Center. The directory provides a resource to identify and locate environmental restoration leaders in private and public industries.



Dendra Systems provides intelligence and automation services to restore natural ecosystems. Global scale ecosystem degradation is one of the world's greatest challenges. At Dendra Systems, we are enabling global scale management and restoration of natural ecosystems through automation and ecosystem intelligence.



Ecosystem Investment Partners is a unique firm that delivers high quality ecological restoration and conservation projects across the U.S. We acquire, restore and permanently protect priority conservation properties, and sell the credits we generate to customers who must offset their unavoidable environmental impacts.



COMINGS AND GOINGS



Welcome to our new Certification Coordinator, Chris Lenhart! In addition to his work with SER, Chris is a Research Assistant Professor with the Department of Bioproducts and Biosystems Engineering at the University of Minnesota. His work focuses on treatment wetlands, stream restoration and water quality management, particularly in agricultural areas. Additionally, Chris has experience planning and implementing restoration projects with The Nature Conservancy (TNC) as well as with several consulting companies, including EOR, Inc. and Kestrel Design Group. One of the really great things about Chris' resume is that he works as both a practitioner and a researcher, bringing opportunities to help bridge that ever-present divide between the two core communities of SER membership. Finally, Chris has been involved with the Midwest-Great Lakes Chapter of SER for over a decade and co-authored *Ecological Restoration in the Midwest: Past, Present and Future* in 2018.

We're sad to say goodbye to our SER intern and two of the field technicians from the Native Seed and Grassland Restoration Community Conservation Program. All three brought great ideas and energy to their work with SER. Best of luck on your next endeavours!



SARAH WEBER
SER Intern
Programs & Outreach



PAYTON FELLER
Junior Field Technician
Native Seed and Grassland
Restoration Community
Conservation Program



KADEN ASHDOWN
Junior Field Technician
Native Seed and Grassland
Restoration Community
Conservation Program



POLICY, SCIENCE & PRACTICE UPDATE

Bethanie Walder, SER Executive Director, and George Gann, SER International Policy Lead

POLICY: INTERNATIONAL MEETINGS, CONSULTATIONS, AND LEGAL ACTIONS



In July, SER became a formal partner of the UN Decade on Ecosystem Restoration. We are excited to help launch the strategy for the Decade on September 15 – look for more information in coming weeks. As part of the development of the Decade, Jim Hallet (SER Board Chair), Kingsley Dixon (Vice Chair), and Cara Nelson (past Chair) are sitting on the Best Practices Task Force. SER’s Program Manager, Alexis Gibson, will be participating in the Monitoring Task Force.

George Gann, SER’s International Policy Lead, has been working with IUCN’s [Rewilding Thematic Group](#) on an article focused on rewilding principles. SER’s involvement in this process has been critically important in distinguishing rewilding from restoration, and the article has been submitted for peer-review. Cara Nelson is also a co-author and member of this committee.

SER submitted comments to the UN Convention on Biological Diversity’s open review process for the post-2020 Global Biodiversity Framework. Our comments focused on elevating the role of restoration in the post-2020 agenda and promoting a stronger connection between the restoration objectives from the Aichi Targets and the new Global Biodiversity Framework that will follow. SER also pointed out the importance of ensuring that biodiversity’s inherent value is recognized as strongly as the value that biodiversity provides to humans and ecosystem services.

SER-Europe has been continuing to participate in the consultations related to the developing European Union Biodiversity Strategy, which has the potential to radically increase investment

and implementation of ecological restoration in countries of the European Union.

In June, SER joined the Society for Wetland Scientists and 12 other professional societies in filing two separate Amicus Briefs to oppose the US government’s efforts to reduce protections for wetlands and streams through changes to the Waters of the United States regulations. SER has been supporting SWS in their work on this effort over the last three years. These “friend of the court” briefs allowed our team’s lawyers to provide additional arguments to oppose the proposed rollbacks.

POLICY: SCIENCE AND POLICY COMMITTEE



The Science and Policy Committee is thrilled to welcome four new members: Karma Bouazza, Bruce Clarkson, Stephanie Mansourian, and Luiz Moraes. The SPC is finishing the development of its workplan after finalizing a 2020-2030 strategic plan earlier this year.

POLICY AND PRACTICE: INTERNATIONAL STANDARDS



As of the end of May, the [International Principles and Standards for the Practice of Ecological Restoration](#) have been downloaded more than 8,000 times from the *Restoration Ecology* website, making it the 10th most downloaded article from the journal. It also continues to be cited in new peer-reviewed scientific literature. We are always looking for more examples of how the Standards are being used, so please keep us informed of your efforts to implement the Standards in your work. In July,

Bethanie Walder, SER Executive Director, gave an [introduction to the Standards](#) at the US Interagency Ecological Restoration Quality Committee Monthly webinar series.

In addition to the Chinese translation we released with the Standards in September 2019, the French translation will be available in early September – thank you to our volunteer translators Alice Dubuisson, Julien Lassauque, and Stephen Riviere for making this possible! We continue to work with translators around the globe on Spanish, Portuguese, Ukrainian, Mongolian, Catalan, and German versions; if you are a native speaker and would like to translate the document into another language, please contact alexis@ser.org.

The first companion document to the Standards, the International Principles and Standards for Native Seed in Ecological Restoration, will be available as a special, open access issue in *Restoration Ecology* on August 26. Developed by the International Network for Seed-based Restoration (INSR), a thematic section of SER, the Seed Standards provide a framework to enable the development of country-specific native seed standards including ethical collecting procedures for wild seed while encouraging the development of native seed farming as a strong driver of rural and regional job creation and investment. Congratulations to INSR for their work putting together this important resource! Check out their [September 2nd webinar](#) for more information on how you can use the Seed Standards in your practice.

We continue to partner with Curtin University (Australia) and the Southern University of Science and Technology (SUSTech, China) to develop the first sector-based companion document to the Standards focused on mining.

SCIENCE: RESTORATION ECOLOGY - ARID LANDS



The first issue of the [Restoration Ecology-Arid Lands](#) thematic series was released in late June. The six papers in the first issue and a collection of 25 innovative articles

focused on restoration in arid ecosystems are freely available through mid-September.

SCIENCE AND PRACTICE: WEBINARS



Are you one of the 4,537 people who attended one of our live webinars this year? Or maybe one of the 4,780 who has watched the webinars on demand? While we are no longer hosting weekly

Wednesday Webinars (as we did during the height of the global COVID19 shelter-in-place orders), we are now offering two webinars a month – these are generally scheduled for the second and fourth Tuesday of every month – so we still have [9 webinars](#) on tap for this year! We recently finalized the schedule for the remainder of 2020 with topics ranging from thornforest to river restoration, stakeholder engagement and the role of indigenous communities in restoration. You can find the complete schedule [here](#). As a reminder, all live webinars are free to members and nonmembers alike. In addition, on demand viewing is available to SER members in the [SER webinar library](#).

PRACTICE: TRAININGS



SER is partnering with the US National Park Service to deliver a virtual training on ecological restoration of grassland ecosystems in protected areas. The training will be based on the International

Standards. Trainers will address issues specific to US mid-Atlantic grassland restoration, seed sourcing, and other topics, while also implementing a virtual field tour and restoration plan development workshop. SER will also partner with the NPS to deliver a similar training in 2021, likely focused on a different ecosystem.

In late August, SER won a new contract to provide introductory and advanced arid land training courses for the US Bureau of Land Management. We are thrilled to be working on this new project and will provide a longer update in the next issue of *SERNews*.

PRACTICE: CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER (CERP) PROGRAM



In 2020, our total number of certified practitioners increased to 480. Many of the new CERPITS were from two international colleges, Cornwall College in England and Niagara College in Canada.

There are more ways than ever to [keep up with your education as a CERP](#). There were many Continuing Education courses, workshops, and seminars submitted for credit over the last few months.

The final [CERP application window](#) of 2020 opened on August 17th and will close on October 16th. During this time period we will be promoting applications, answering questions from applicants and otherwise supporting those who wish to apply for certification. As part of our new process, applications can be submitted at any time of the year, but applications received after October 16th will be reviewed in the first cycle of 2021.

Big advance thanks to Paul Davis (CERP) for volunteering to update the SER/CERP e-learning course to be consistent with the Second Edition of the Standards. Though the updated course won't be ready before this application window closes, it should be ready shortly thereafter and will be available as an online course for CERP/CERPIT applicants, and as an on-demand webinar style presentation to anyone who is interested. We look forward to having that available sometime in November.

We want your input! SER is gauging the interest of members in a pooled general liability insurance program. Please take a few minutes to let us know if you would be interested and provide feedback on what that program might look like. Responses don't commit your company to any future participation. You can find the survey [here](#).

SER IS
settings global standards for ecological restoration

AMPLIFYING
opportunities to connect & learn from the community

YOUR VOICE
in advancing international restoration policy

SER SOCIETY FOR ECOLOGICAL RESTORATION



PROGRAM UPDATE: NATIVE SEED AND GRASSLAND RESTORATION COMMUNITY CONSERVATION

Cristina Eisenberg, Program Director



Field season closing ceremony. Photo: Kaden Ashdown.

In late 2019, SER entered into a 5-year partnership with the US Bureau of Land Management (BLM) to implement the Native Seed and Grassland Restoration Community Conservation Program. The program focuses on the role of Traditional Ecological Knowledge (TEK) in restoration and is being conducted in partnership with the Fort Belknap Indian Community (FBIC), working closely with Tribal Preservation Officer (THPO) Michael Black Wolf, tribal elder Donovan Archambault, and FBIC Science Lead Dennis Longknife, Jr. Wendy Velman, BLM Montana/Dakota State Office Botanist, and the FBIC Tribal Council provide strong support. We are happy to report that we have completed a successful first field season led by Program Director and Principal Investigator Dr. Cristina Eisenberg (Oregon State University), who is an Indigenous woman.

Three fulltime summer field technicians – Monroe Fox, Kaden Ashdown, and Payton Feller – worked closely with Dr. Eisenberg (with Monroe’s engagement supported by the Blood Tribe Lands Department). In partnership with FBIC, we trained 8 Community Conservation Fellows, selected by the Tribal Historic

Preservation Office (THPO), in TEK, native plant identification, seed collection in compliance with the BLM Seeds of Success program, and general restoration principles from the SER Standards. Many elders supported the project, led ceremonies, and shared their knowledge to improve the outcomes for the fellows and program overall. The Community Conservation Fellows did an outstanding job and learned the methods and protocols rapidly.

We are also partnering with the THPO to collect and protect historical knowledge from within their community of elders.

Daniel Werk is interviewing elders to better understand the role of important native plants from both a cultural perspective and for use in restoration. This part of the project is managed and implemented by the THPO. In addition, we hired Donovan Archambault on contract to develop a TEK restoration guide for the tribes. The THPO/FBIC will determine which information will remain exclusively within the tribal community and which information (if any) can be shared publicly. We are thrilled to be working with FBIC and BLM on this important and innovative project and look forward to planning for another successful field season next year, in keeping with FBIC COVID-19 safety protocols.

Besides restoring the land, the objective of this program is to support and restore wellbeing to an Indigenous community by providing education and job opportunities and by obtaining program resources such as housing and food directly from the FBIC. As an example, Dr. Eisenberg has selected two of the Conservation Fellows to work as field technicians on this program in 2021. Dr. Eisenberg will work with BLM and SER to obtain fellowships during the academic year to further support their development as restoration ecologists within a TEK framework.



EMERGING PROFESSIONALS AND STUDENT HIGHLIGHT

Magda Garbowski, 2018 - 2020 Student Director

Although the Society for Ecological Restoration is now over 30 years old, some of the most earnest, productive, and inspirational champions of the science and practice of ecological restoration are newcomers to the field. In this section we highlight the amazing work and outreach being done by seven students and early-career professionals from around the world. We also provide a list of social media handles for numerous student associations for you to follow!

SER aims to connect newcomers to the field with established professionals through networking opportunities, webinars, and social media. If you'd like to become more involved with this group, please reach out to SER about joining the Students and Emerging Professionals Committee.



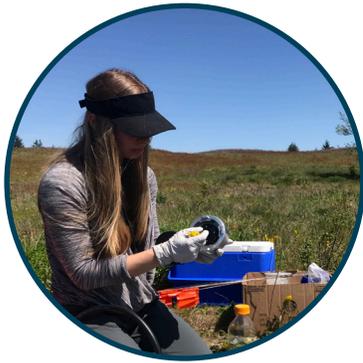
TRAVIS SOWARDS

Brigham Young University
USA

Travis Sowards is the incoming SER Student Representative! He first became interested and excited about restoration ecology after taking a course with Dr. Pete Fulé at Northern Arizona University and learning about the novel approaches and technologies that could be used to restore damaged ecosystems. Prior to beginning graduate study in conservation at Brigham Young University, Travis worked for the US Forest Service in Hawaii on projects related to invasive species removal and preservation of culturally and ecologically sensitive fishponds. His current work focuses on seed technologies aimed at increasing the likelihood of germination, emergence, and establishment of plants in restored dryland systems. Travis has been a

member of SER since 2018 and has been actively involved in the SER Southwest and Great Basin chapters. The network has allowed him to share his enthusiasm for restoration with like-minded scientists and practitioners.

Looking forward, Travis thinks the UN's Decade on Ecosystem Restoration provides a fantastic opportunity to focus on restoring our damaged and degraded ecosystems across the globe. However, he believes restoration researchers and practitioners will need to work together and provide quality feedback to ensure restoration projects are implemented responsibly and effectively. Additionally, he says that validating and incorporating indigenous, cultural, and historical knowledge will be vital to ensure no aspect of ecosystem services are overlooked or lost. He understands that effective restoration does not happen overnight but is excited about the diverse groups of people coming together to restore ecosystems, shape the future, and maintain lands for future generations. He admits that it is a tough job but feels privileged to work with many others who have similar visions for the future.



VICTORIA FOX

University of Washington
USA

Victoria Fox has been involved with SER and restoration in her community for the last six years. She began as a volunteer, interned at the SER-University of Washington (UW) Native Plant Nursery, set up her own restoration site and is now president of SER-UW. Initially drawn to plants through gardening, she quickly became intrigued by native species being used at restoration sites in her region. Through her involvement with SER she has been able to gain hands-on restoration experience and to contribute to the chapter as an officer. She says, “If I hadn’t become involved with the SER-UW, I may have decided on an entirely different career path such as forestry or biology.”

She currently works in prairie restoration but has experience in lowland forest ecosystems and urban pollinator pathways. Working in both the field and lab at UW, Victoria is trying to assess the role of endophytes (i.e. fungi or bacteria living in plants) in native prairie plants with her research. Specifically, she wants to know what types of bacteria help keep prairies healthy and if root connections are key pathways to movement of these beneficial bacteria from plant to plant.

Victoria believes that connecting with communities that are not already engaged with ecological restoration is the biggest challenge facing ecological restoration in the coming decade. For her “ecological restoration itself embodies hope for the future.” She draws hope from the countless volunteers that come together and dedicate their time and effort to restore their local environments.

Mlu Nsikani became interested in ecological restoration by accident. After finishing his BSc., he was eager to continue working with birds as he had for an honors project, but he mistakenly contacted a professor of invasion ecology who informed him of a lab looking for students to work on ecological restoration projects. “What’s that?” Mlu asked. After finding out what exactly restoration is, he has never looked back. He still loves birds but “loves them more when they are on a restored site.”

Currently, Mlu is working on several projects: one focused on scaling-up restoration to real world applications, another aimed at assessing the effectiveness of invasive management techniques in ecological restoration, and a third looking at the use of high-tech equipment (e.g. helicopters and drones) to manage invasive plants on mountains. He is actively involved with SER in his region and was involved with organizing the SER2019 World Conference in Cape Town. Mlu recently joined the SER Program Committee and is serving on the Conference subcommittee.

Mlu believes that scaling up restoration is a key challenge the community will have to address in the near future. He’s hopeful about the increasing recognition of the importance and need for ecological restoration by countries and international organizations, such as the United Nations Decade on Ecosystem Restoration.



MLU NSIKANI

Stellenbosch University
South Africa



JORGE SANCHEZ BALIBREA

Asociación de Naturalistas del Sureste
Spain

Jorge Sanchez Balibrea became involved with ecological restoration as a sixteen-year-old volunteer in a forest nursery of an NGO while looking for an alternative to military service.

In his current role at [Asociación de Naturalistas del Sureste](#), in Murcia, Spain, he has worked in a variety of ecosystems ranging from semi-arid shrub lands, forests, and dunes, to riparian areas and farming landscapes. A key goal of his work is to make NGOs important actors in driving ecological restoration by promoting partnerships between companies, public authorities, researchers, and society. In addition, he strives to disseminate information about ecological restoration to the public, primarily youth.

Jorge thinks that ecological restoration is one of the most important tools that we have to fight against global changes, to recover biodiversity, and to promote sustainable farming and soil management. Looking into the future, Jorge hopes for an increase in funding for ecological restoration from public and private entities. He also hopes for increased engagement from volunteers as well as public and private entities to ensure successful implementation of restoration.

FOLLOW SER STUDENT GROUPS

Brigham Young University

FB: @SER.BYU

Twitter: @SER_BYU

Colorado State University

FB: @CsuEcologicalRestoration

Twitter: @csu_ser

Northern Arizona University

FB: @SERNAU

Ohio State University

FB Group: Society for Ecological Restoration at OSU

Instagram: @osu.ser

Simon Fraser University | British Columbia Institute of Technology

FB: @SERBCIT

Twitter: @ser_bcit

Instagram: @er_student_association

Texas A&M

FB: @SERTAMU

Trent University

FB: @sertrentuniversity

Instagram: @ser.trentuniversity

University of Arizona

Instagram: @uofa_restore

University of Guelph

FB Group: Society for Ecological Restoration

University of Guelph

University of Montana

FB: @uofmser

University of Waterloo

FB: @serwaterloo

Instagram: @seruwaterloo

University of Wisconsin

FB: @uwsp.ser

University of Washington

FB: @UWSER

Instagram: @sernursery



NATASHI A. L. PILON

University of Campinas
Brazil

Natashi A.L. Pilon first became involved in ecological restoration through an internship during her undergraduate studies. She assisted graduate students with lab and field projects focused on adaptive management and ecosystem restoration. She hasn't stopped working in ecological restoration since! Natashi became involved with SER through her attendance at the 6th World Conference on Ecological Restoration in Manchester, UK. This conference allowed her to expand her professional network and opened the door for possible collaborations. She also actively reads the society's journal, *Restoration Ecology*, and the Restore Newsletter to improve her research and stay up to date on the science and practice of restoration.

Natashi is a PhD student at the University of Campinas | UNICAMP Institute of Biology (IB). Her research is focused on elucidating the ways in which tropical grass ecosystems assemble to improve the restoration process and ensure resilient ecosystems. Specifically, her research focuses on restoration techniques and components underlying resilience of cerrado (savannah) vegetation to disturbance.

Natashi thinks that the greatest challenge for ecological restoration will be the unpredictability of changing climate conditions and the intensity of disturbances, and also the unpredictability of government interest and resources for ecological restoration. To convince society of the need for restoration and scale up restoration efforts to the global scale, she believes we need to engage the public in the process. She thinks the best recipe for future action is conservation and restoration, allied with practices of sustainable production and consumption.

Meera Chandran is a founding member of [Forest First Samithi](#) (FFS), an NGO that works on restoration of land degraded by alien invasive species through conservation of indigenous tree species of the Western Ghats mountains in Kodagu and Wayanad. Forest First's work includes partnering with communities to address degraded forest land, protect sacred groves, increase planting diversity in coffee estates, and enhance riparian buffers. They have restored over 100 acres of land and have conserved over 150 tree species of Western Ghats including rare, endangered and threatened floral species.

For three years, Forest First has been running a restoration program to support community livelihoods. In addition to her conservation and restoration experience, Meera has years of global consulting experience from her time at a top IT company.



MEERA CHANDRAN

Forest First Samithi
India



DANILO IGNACIO DE URZEDO

University of Sydney
Australia via Brazil

Danilo Ignacio de Urzedo has been involved with SER since 2015 when the 7th world conference was held in Brazil. Being part of SER has allowed him to gain knowledge from conferences, SER newsletters, and webinars that cover diverse dimensions of ecological restoration. He has recently joined the board of the International Network for Seed Based Restoration and looks forward to developing strategies for advancing knowledge, policies, techniques, and community participation to promote native seed supply.

Although Danilo grew up among industry and concrete, he became interested in plants by cultivating a small garden in a limited area in his parents home near Sao Paulo. While the prospect of University was distant, fortuitously, a government plan in the mid 2000's allowed Danilo to complete a bachelor's degree in forest engineering at the University in Sao Paulo, with an internship in restoration in the Amazon. Since then, he has completed a masters and worked

for Instituto Socioambiental and Xingu Seed Network implementing grassroots actions for native seed supply and ecosystem restoration within indigenous and rural communities. He is currently pursuing a PhD at University of Sydney, Australia largely focused on how restoration can provide ecosystem services and climate solutions along with promoting local livelihood improvements in tropical regions. Danilo studies the role of markets, government, community networks, indigenous peoples, and women in shaping frameworks and place-specific outcomes.

Looking into the future, Danilo thinks the restoration community faces challenges in overcoming the shortages of diverse native plant materials for restoration projects. He does, however, find hope in the fact that ecological restoration can be an effective mechanism for environmental justice in tropical regions by creating jobs, income, and livelihood improvements for local communities, indigenous people, youth, and women's groups.

SER SECTIONS

SER volunteer thematic sections are organized around a theme and provide SER members with the opportunity to engage on a specific topic related to restoration. *Membership in SER sections is free with all active SER memberships.*



International Network for Seed-Based Restoration (INSR)

www.ser-insr.org
[@InfoINSR](https://twitter.com/InfoINSR)

Fosters an understanding and advancement of seed ecology, conservation, and seed-based restoration of degraded ecosystems.



Large-Scale Ecosystem Restoration

www.ser-lers.org

Strives to understand innovative solutions for the restoration of large-scale ecosystems through the integration of ecological and socio-economic aspects.



FEATURED SECTION - INSR UPDATE

Nancy Shaw, INSR Chair Elect

INSR ANNUAL MEETING

INSR will hold the 2020 Membership Meeting on Tuesday, September 8, 2020 at 5 PM Central Daylight Time (GMT-5).

This meeting will be a great opportunity for all members and friends of the Section to come together. The Board will provide updates about the past year's activities and discuss next year's plan. We will also be asking for INSR member input on what can be improved or changed via an interactive conversation about how to move forward to improve practice and communication in seed-based restoration. We kindly request that you [register for the event](#).

Here are some new resources focused on seed-based restoration:

AN OVERVIEW AND DISCUSSION OF FINDINGS OF THE 2020 AUSTRALIAN NATIVE SEED SECTOR REPORT

In this webinar, Dr. Paul Gibson-Roy provides a brief background Australia's seed and restoration sectors, discusses results of the national native seed sector survey findings and implications, and presents report recommendations. The survey provided an important snapshot of the status of the Australian native seed sector, and its structure and capacity to meet current and future seed demand for ecological restoration. The [webinar recording](#) available to SER members.

2020 NORTH AMERICAN FOREST AND CONSERVATION NURSERY TECHNOLOGY WEBINAR SERIES

[Weekly webinars](#) from August 5 to September 23, 2020 feature diverse topics from seeds to nursery production to outplanting. This webinar series is free but requires registration. It is offered by the Intertribal Nursery Council, Western Forestry Conservation Nursery Association, Joint Southern and Northeastern Forest and Conservation Nursery

Associations, Intermountain Container Seedling Growers' Association, and the Forest Nursery Association of British Columbia.

SEED ECOLOGY AND RESTORATION PRACTICE TO RE-ESTABLISH FYNBOS VEGETATION AFTER ALIEN PLANT INVASION

Invasive alien plants negatively impact natural ecosystems through a long term decrease in biodiversity and altered ecosystem functioning. Alien plant removal may mitigate some of these impacts, but in many cases this intervention alone does not facilitate effective restoration of an ecosystem. In a critically endangered vegetation type within the mega-diverse fynbos biome in the Cape Region of South Africa, passive and active interventions were compared in terms of restoration success following removal of invasive *Acacia saligna*, since this ecosystem is a good example of where clearing alone has often failed to facilitate recovery of the native ecosystem. Read [more](#).

Check the [INSR website](#) for seed-based restoration news, resources, events and opportunities!





EVENTS & OPPORTUNITIES

For more events, including those that have been pre-approved for continuing education credits under SER's CERP program, check out our SER [community calendar](#).

Failing Forward and Lessons Learned

August 27, 2020 – Webinar

During this webinar we will talk with two practitioners whose projects didn't go as planned and learn more about the critical insights they learned over more than a decade of watching their projects unfold. Register [here](#).

INSR Annual Meeting

September 8, 2020 – Online Meeting

Join the INSR Board to hear updates on activities from the last year, plans for the coming year, and provide input through an interactive conversation. [Register here](#).

International Seed Standards Launch and Panel Discussion

September 2, 2020 – Webinar

This webinar will serve as a launch event for the newly released International Native Seed Standards. Join the authors and other experts to learn and discuss what the Seed Standards mean for you and how they can be used. Register [here](#).

Generation Restoration – SER Student Associations

September 10, 2020 – Webinar

This webinar will focus on two of SER's 19 student associations - UNED Costa Rica Student Network for Ecological Restoration and SER-Brigham Young University (United States). Wilmar Ovaes (UNED Student Network) and Travis Sowards (SER-BYU) will talk about how they started their student associations, the projects and activities the groups have worked on, and where they see the groups going in the future. Register [here](#).

Positioning Scientists as Relevant and Respectful Partners in Restoration

September 24, 2020 – Webinar

To ensure that contributors from scientific research are relevant and respectful toward other partners, we need to be mindful of how the authority of science is wielded. This webinar with Lizzie King (U. Georgia) will use case studies to explore the ways scientists can cultivate skills for valuing multiple perspectives and strengthening the relevance of their contributions. Register [here](#).

Developing Long-Term Viable Stream Restoration

October 8, 2020 – Webinar

In this webinar, Mark Briggs will introduce the audience to the *Renewing Our Rivers* restoration guidebook, and present case studies and lessons gained from stream restoration experiences in Australia, Mexico, and the United States. Register [here](#).

Invader Impacts on Soil Ecosystems – What Every Restoration Practitioner Should Know

October 22, 2020 – Webinar

Ylva Leckberg (MPG Ranch) will use several invaders from the U.S. Intermountain West as case studies to explore how invasion alters soil microbial communities and nutrient cycles, and what the consequences of these shifts might be for restoration. Register [here](#).

Events and Opportunities continued on the next page.



EVENTS & OPPORTUNITIES (CONT.)

Contributions of Indigenous Peoples and Local Communities to Ecological Restoration

November 12, 2020 – Webinar

Dr. Pamela McElwee will present on the crucial role Indigenous Peoples and local communities play in environmental management. The presentation will also provide examples of how Indigenous and Local Knowledge can be incorporated in the planning, execution, and monitoring of restoration activities. Register [here](#).

SER Australasia 2021 Conference: Restoration Through Traditional Knowledge

May 10-13, 2021 - Darwin, Australia

The call for sessions, workshops, and abstracts is currently open. This conference will showcase the role traditional knowledge plays in the restoration of ecosystems, while providing the foundation, tools, and latest research to make the most of your restoration project. View more information [here](#).

SER2021: Reclaim, Restore, Rewild

June 19-24, 2021 – Quebec City, Quebec

Call for symposia, workshops, and training proposals now open!

Join us for SER's 9th World Conference on Ecological Restoration in Quebec City. SER2021 will be a joint conference with the Canadian Land Reclamation Association and Université Laval. The event will bring together our global community to discuss a diverse range of land management approaches, including reclamation, restoration, and rewilding. View more information [here](#).

SER Europe 2021: A Green New Deal for Europe's Nature

August 31-September 4, 2021 - Alicante, Spain

Calls for sessions, workshops, and abstracts will open later this year. View more information [here](#).



SER2021
Reclaim, Restore, Rewild
SER, CLRA, RE3 Conference
June 19 - 24, 2021

Visit www.ser2021.org for more information



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KEEP IN TOUCH



Know someone interested in ecological restoration? Share this issue of SERNews with them.

For information on how to become an SER member, drop us a note at membership@ser.org or visit our website: www.ser.org/membership.