

# Ecosystem Services from the Wilderness

BY EVAN E. HJERPE

I feel at home, yet somewhat out of place. I am with a group of ecologists and students learning about fire ecology, deep in the Bob Marshall Wilderness below Glacier National Park in Montana. As a forest economist, I am comfortable with measuring trees and investigating the impacts of recent forest fires, but I feel a bit out my comfort zone in the tedium of recording plant taxonomies. Getting out of your comfort zone, however, is the only way to learn. And as I learn more about the ecological connections in the Northern Rockies and their dependence on fire, my brain files it all under a greater, hierarchical system of ecosystem services from the wilderness.

In economics jargon, ecosystem services are the myriad benefits that nature provides to humankind. As an economist, I see the world through an ecosystem services lens. My perspective accords with the worldview of most economists – that individuals and society look to maximize their well-being and happiness through whatever means possible. Where my perspective differs from many economists, however, is my focus on learning how nature, rather than money, contributes to societal welfare. Nature provides humans with almost everything, from provisioning services such as food, water, and shelter, to cultural services such as recreation and sacred inspiration. While we have become quite adept at adding our human capital and labor to the raw materials found in nature to produce novel technology and services, the fundamental building blocks of society are virtually limited to that which is produced by nature.

Likewise, nature provides numerous regulating services such as climate regulation and absorption of pollution, as well as many supporting services such as pollination, water purification, and nutrient cycling. These regulating and supporting ecosystem services are also critical for human survival and are easily degraded and disrupted by humans' industrious activities. All ecosystems, including the most artificial and human-influenced ones such as downtown urban centers, produce benefits to

humankind. However, the quality of ecosystem services provided by nature increases in the absence of human trampling. The production of high quality ecosystem services is perhaps one of the greatest contributions that wilderness areas offer to society.

During our expedition in the Bob Marshall Wilderness, we find

many provisioning ecosystem services in the form of clean drinking water and food supplements. We bring life to our bland dehydrated breakfasts and dinners with raspberries, thimbleberries, huckleberries, onions, mint, and native cutthroat trout. We also investigate 500-year-old ponderosa pine and western larch trees that show signs of bark peeling by native tribes hundreds of years ago. By peeling away bark patches, Native Americans were able to sustainably harvest cambium wood and sap from the same tree year after year. The trees were no worse for the wear and remained healthy (Figure 1).

Cultural ecosystem services include more abstract benefits to society such as recreational opportunities, spiritual development, and cognitive enrichment. One of the most important cultural ecosystem services provided by wilderness areas is scientific research. Being representative of more natural ecosystem processes, wilderness provides an excellent study control that can teach us many lessons to be applied in more managed, frontcountry lands. In Aldo Leopold's essay "Wilderness as a Land Laboratory," he notes the tremendous scientific value of wilderness and illustrates the need to retain wilderness specifically for its research merits. This "land laboratory" can produce scientific findings both



Evan Hjerpe. Photo by Jodi Lando.



**Figure 1 – Bark-peeled ponderosa pine. Photo by Evan Hjerpe.**

directly and indirectly relevant to the field of economics. While the physical sciences and ecology may produce the most direct benefits of wilderness research, economics is increasingly contributing to wilderness science. For example, ecological economic theories of optimal foraging efficiency of wildlife, biomimicry, and life-cycle analysis all draw conclusions directly from observing untamed nature. Indirectly, research from wilderness illustrates opportunities for efficiency gains in green infrastructure, agriculture, and mitigation of environmental impacts stemming from development. These findings help society save money and resources and help inform our attempts at sustainability.

Bob Marshall, the namesake of the wilderness area we are studying, also saw the unparalleled value of wilderness for scientific research. As co-founders of The Wilderness Society, Leopold and Marshall made the value of wilderness research explicitly clear. In The Wilderness Society's Articles of Incorporation, the first means listed for the purpose

of preserving American wilderness is scientific investigation. Both Leopold and Marshall were trained as foresters. And while they saw opportunities to use wilderness controls to inform more productive and efficient timber production, it was the non-market values of "undesirable" trees and wildlife present in wilderness

that they were fond of pointing out. Leopold and Marshall also valued what we left on the land even more than what we took from the land, and essentially began to define the unique bundles of ecosystem services provided by wilderness. This conservation economics ethic has grown and is a major rationale for preserving wilderness for future generations (Figure 2).

While it can be difficult to assign a dollar value to research, the benefits of wilderness research are far-reaching through space and time. Our research expedition into the Bob Marshall Wilderness was my first trip into this area, but it was the third year of data collection by the project leaders. And already, initial findings had been published and were being utilized by land managers and regional collaboratives to inform management strategies for the restoration of natural fire regimes in areas closer to communities where wildfires are more controlled.

Other cultural ecosystem services, such as recreational and



**Figure 2 – Measuring larch diameter. Photo by Evan Hjerpe.**

spiritual benefits, are perhaps most visibly on display in the Bob. As we move through the South Fork corridor, we experience the busyness of anglers, backpackers, and rafters. But as I move off trail, I am overwhelmed by the solitude. The howling of a pack of wolves and the discovery of their tracks coming to investigate our camp at night, leave us all with a feeling of ecological connectedness and increased spiritual respect for the wild. An ambling black bear, and the ubiquitous grizzly sign, remind us of a greater pecking order that can exist in wilderness. Osprey, bald eagles, red-tailed hawks, kestrels, and a prairie falcon pull our eyes skyward, while a pine marten and kaleidoscopic caddis fly casings give us reason to look downward. The dizzying array of native flora and fauna provides for myriad recreational and spiritual benefits, along with critical regulating and supporting ecosystem services.

But we are here to study the return of natural fire to a wilderness area that had seen fires suppressed for about 70 years. Recent fires had obvious, beneficial effects on a number of regulating and supporting ecosystem services, including nutrient cycling, scarification, and habitat creation. The team had plans to come back and focus on understory biodiversity and the relationship between wildfire and pollinators. Judging by the increased number of yellow jackets, bees, and flies in the burned areas, fires sure seemed to boost overall understory production and associated pollination.

As we move camp downriver to another burned study area, we witness the starring role of a fire ecology class – the birth of a wildfire itself. Floating into our second base camp, we see the telltale, billowing smoke plumes across the river. A lightning strike from

two days prior had been smoldering, and on this hot and windy afternoon it becomes a full-fledged wildfire – the Damnation Fire (Figure 3). For the next two days and nights, we are able to work and watch as this fire ebbs and flows up and down ridges into the next drainage. With the safety of a river between us and the wildfire, and a very fortunate prevailing wind taking the smoke away from us, we lay out bedrolls and tents under an eerie orange glow (Figure 4). Seeing 200-foot torching flames and mini-tornados of embers and heat provided a living “land laboratory” for students and teachers alike. The noise of the fire sounds like a freight train, and occasionally we hear huge snags tumbling downhill. This is an unforgettable educational opportunity that is unique to wilderness and not afforded in most places. There are no base camps of fire fighters, no helicopters dropping water and retardant on this fire. It is a wilderness fire, shaping the landscape as wildfires have done for millennia.

The economic value of wilderness ecosystem services can be difficult to quantify, as they are not typically traded in the market and have not been assigned a dollar value. But some of my market behavior, and the behavior of other wilderness visitors, represent partial values (or price) held for these services. For example, I had to purchase a plane ticket, lodging, vehicle transportation, and recreational equipment for my visit to the Bob Marshall Wilderness. I also had to incur the opportunity cost of lost personal work time despite helping with others’ work. The sum of these



Figure 3 – Damnation Fire. Photo by Evan Hjerpe.

travel costs represents a minimum dollar value that a wilderness visit is worth to me. Extrapolating the hundreds of dollars that it can cost to visit wilderness areas to the millions of annual wilderness visitors presents a societal baseline for the value of these ecosystem services. But, the enjoyment of spending time in the Bob Marshall Wilderness is worth more to me, and my well-being, than what was paid to experience it. This additional value, known as consumer surplus to economists, can be significantly greater than just the costs paid to visit the area.

The travel costs primarily represent the use values I get from experiencing wilderness ecosystem services firsthand. But, I also hold many nonuse values for wilderness ecosystem services, including services from wilderness areas that I might never visit – especially knowing that there are still places where nature is mostly intact and that wilderness might exist for future generations. The same is likely true for many U.S.





**Figure 4 – Damnation Fire at night. Photo by Evan Hjerpe.**

residents. Collectively, these existence, option, and bequest values held for wilderness ecosystem services can be very large, as the national pool of wilderness advocates is much greater than the annual number of visitors to just the Bob Marshall Wilderness.

Despite the nonmarket nature of many wilderness ecosystem services, they still result in numerous economic impacts such as employment opportunities, regional wages, and taxes. In the Bob Marshall Wilderness, numerous packers, guides, and outfitters are making a living by facilitating trips for people to enjoy the many recreational and spiritual benefits associated with such a grand and pristine landscape. Surrounding communities reap monetary returns by providing services to visitors. Likewise, wilderness and other protected lands have been shown to attract entrepreneurs, retirees, and other amenity migrants that bring outside income with them and spur greater economic impacts in regions adjacent to wilderness. Other wilderness ecosystem services such as carbon storage, pollination, and water filtration also have cascading economic

impacts in regions near and far. The avoided costs associated with such services as clean and abundant water production are counted in billions of dollars, yet unfortunately are not widely valued until drinking water has become too polluted.

The last couple days of our research trip in the Bob consist of floating and hiking equipment out of the South Fork of the Flathead River. Our group that had bonded during a week and a half in the wilderness is now splitting apart and going our separate ways – out of the feral woods and back into various work, school, and family routines. Leaving the Bob, I think of the upcoming winter and how life will continue largely untouched and unobserved in the wild. I take comfort in knowing that wilderness still exists, where wildfires can play their natural role in keeping a mosaic of forest and wildlife in all stages of life and decay. I am not worried about the extent of the Damnation Fire, because I know it is burning within mostly natural conditions in a patchwork of previous fire scars, fire-tolerant old growth, and freshly renewed understory. Nor am

I worried about the wildlife; rather, I am excited about the “land self-renewal” and the “health” of this ecosystem that produces the optimal mix and abundance of biodiversity. My journey back to the city accentuates just how little land is left in this natural condition, as there are too many pressures on our working forests for wood production, fire suppression, and the unstoppable wave of development. As I drive by cutover forests, dammed rivers, and irrigated fields, the significance and value of wilderness is only magnified.

Pondering the unique and numerous benefits afforded by the Bob Marshall Wilderness, I give thanks to the previous generations that had the foresight to understand that the economic value of wilderness is much greater and more complex than its immediate market value in board feet of timber. I hope that future generations, our grandkids, might also be able to reap the rewards of wilderness ecosystem services at a landscape level – not token parks or zoos where “wildlife” becomes an oxymoron. As naturally functioning landscapes become fewer and fewer in our industrial society, wilderness and its associated high quality ecosystem services is becoming a scarce commodity. The scarcer wilderness becomes, the greater its value becomes to society. The Bob, and its wilderness ecosystem services, has given me hope that we might be able to have both wild places and advanced economies, a concept that is uniquely American and will yield numerous known and unknown benefits, now and into the future.

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