Introduction

Ecosystem services are the benefits derived by humans from ecosystems. Ecosystems are dynamic complexes of plant, animal (including humans), and microorganism communities and the non-living environment (including soil, water, air) that interact as a functional unit. While the concept of ecosystem services has existed for decades, a consensus view of the concept was solidified by the 2005 Millennium Ecosystem Assessment report. The report classified ecosystem services into four major groups: provisioning, regulating, cultural, and supporting.

Provisioning ecosystem services include products that humans obtain from ecosystems including food, water, fuel, fiber, and genetic resources. Regulating services include the benefits of climate regulation, disease regulation, water regulation and purification, control of erosion, pollination, and the maintenance of air quality. Cultural services refer to non-material benefits obtained by humans from ecosystems including cultural diversity and heritage, recreation and ecotourism, aesthetic values, and spiritual and religious values. Finally, supporting services are the services provided by ecosystems that support all other ecosystem services. Examples of supporting services include soil formation, nutrient cycling, primary production (mostly the energy captured by photosynthetic organisms, like grasses), and atmospheric oxygen production (Millennium Ecosystem Assessment, 2005).

Public and private rangelands in the Western United States, and the ranchers that manage those rangelands, provide ecosystem services within all four groups outlined above. Ranchers most obviously contribute to provisioning services through the production of beef and forage resources that can be used by cattle and wildlife species. However, ranchers may also engage in practices that enhance or conserve other ecosystem services such as wildlife habitat (Figure 1), water quality, biodiversity, soil, recreational opportunities, and the preservation of open spaces. As such, it is critical to understand the current practices of ranchers, their views of ecosystem services, and how they manage public lands to enhance these services. To that end, an exploratory survey was conducted with the objective to document how public
land ranchers (ranchers who currently hold Bureau of Land Management (BLM) and/or United States Forest Service (USFS) grazing permits) value and manage for ecosystem services.

Methods
We used a mailed survey questionnaire to gather information from ranchers located in the Colorado Plateau (Arizona, New Mexico, Utah), Central Rocky Mountains (Colorado, Idaho, Wyoming), Desert Southwest (Arizona, New Mexico, Nevada, Texas), and the Great Basin (Idaho, Nevada, Utah) regions. A national list of BLM and USFS grazing permittees was obtained and the sample was drawn based on zip code information. We followed standard mail survey methods as outlined by Dillman et al. (2009) and the survey protocol was approved by the University of Wyoming Institutional Review Board for Human Subjects prior to execution. We had a 25 percent response rate with 645 ranchers participating.

Results
Ranchers were asked to rank a variety of ecosystem services both in terms of importance and value to their operation. Overall, they ranked livestock operations first in importance for their operations, as might be expected, followed by the maintenance of open space, clean water production, providing hunting and fishing access, maintaining biodiversity, providing aesthetically pleasing landscapes, providing recreational activities, sequestering carbon, and producing biomass.

The ranking order of the value that ranchers placed on the different ecosystem services was different as compared to the importance ranking order. The ranchers ranked livestock operations as the most important in terms of value followed by clean water, open space, aesthetics, biodiversity, hunting and fishing, biomass, recreation, and carbon sequestration. While there were minor differences in the ordering, ranchers across the four regions generally followed the same pattern of ranking.

Ranchers were generally active in controlling invasive plant species in all regions, though the Desert Southwest had the lowest percentage with about 55% of the ranchers in that region responding in the affirmative that invasive plants were both present and being controlled in some manner. The most commonly used practice to deal with invasive plants was targeted grazing except in the Great Basin where establishing desirable vegetation was used on the most acreage. Targeted grazing is the application of ruminant livestock, such as beef cattle, sheep, or goats, at a determined time, duration, and intensity to accomplish specific vegetation or landscape goals, such as reducing invasive plant species.

Ranchers were generally managing rangelands to enhance wildlife habitat. While the species targeted for wildlife habitat management varied across the four regions, as would be expected due to the geographic distribution of wildlife.

Figure 2. Percentage of respondents who either did not allow access or did not charge for recreational access by region and recreational activity (n=645)
species, at least 10% of respondents within each region were managing for the following four species: mule or whitetail deer, elk, turkey, and pronghorn. The degree to which other species including sage-grouse, goose, and quail were managed varied by region.

There was a relatively high participation rate across all regions for various riparian area treatments with stock water development and exclusion fencing leading the way over riparian pastures and woody or herbaceous plant establishment. Though the reasons for implementing these practices differed somewhat by region, they generally followed the same pattern with livestock exclusion being the most cited reason followed by improving water quality, improving livestock distribution, improving wildlife habitat, and improving fish habitat.

Recreation is a tangible cultural ecosystem service from which private landowners could capitalize. We found that the vast majority of ranchers across all regions either did not provide them, or, if they did, they did not charge for the services (Figure 2). Of those that did charge, the most common practices were either a flat fee or fee per user.

Finally, we asked questions about the ranch itself. Ranches tended to be larger in the Great Basin and smallest in the Desert Southwest in terms of livestock sales. The percent of household income derived from ranching ranged from 44% in the Desert Southwest to 57% in the Great Basin. Off-ranch income was the second most important household income source in all regions though it ranged from 16% in the Great Basin to 26% in the Desert Southwest. All ranches spent about 50% of their income on family living expenses followed by on-ranch investments.

We were also interested in the reasons why ranchers choose to ranch. As shown in Figure 3, in all regions the most important reasons were family traditions, culture, and values followed by passing on the ranch to future generations, raising the family on the ranch, and being good stewards of the land.

Why Ranchers Choose to Ranch

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The major implication from this study is that ranchers in all regions surveyed have untapped opportunities in providing ecosystem services to society and monetizing those services to supplement their incomes. There may be a variety of reasons why ranchers either do not allow access to their private lands or do not charge for such access if they do. Nevertheless, there appears to be a large untapped potential income source. That income may help in offsetting costs of providing the kinds and quality of ecosystem services that society demands. On the other hand, with profit being at the low end of why ranchers choose to be in ranching and lifestyle considerations ranking near the top, it may be that dealing with the public, even if profitable, does not fit in with why they are ranching.

In conclusion, it is apparent that ranchers in all regions are actively providing ecosystem services to society at large including wildlife habitat, open space, clean water, biodiversity, and hunting and fishing opportunities. These services are being provided in addition to the food (beef) that ranchers are generating on public and private lands in the Western United States; thus, ranchers are providing multiple societal benefits from each acre of land under their care.

References

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Photo courtesy of U.S. Fish and Wildlife Service, (Theo Stein and Katie Theule)

Ranchers moving cattle off of summer public grazing lands in Wyoming. Inset: Bighorn Sheep are one of the numerous wildlife species that co-exist with cattle that graze public lands.

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