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COLORADO FOURTEENERS: ESTIMATING A PRICE ON THE “PRICELESS” A PRIMER ON WHEN AND HOW TO APPLY ECONOMICS TO THE ENVIRONMENT

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Introduction

To many, the mountains are a symbol of Colorado’s beauty and natural wonder. Their majestic presence dominates our skyline, and the mountains can serve as a solitary retreat from the hassles every day life. The mountains also serve as an end destination for numerous recreation opportunities. The Colorado Mountains are home to a collection of peaks whose summits rise above 14,000 feet, otherwise known as “Fourteeners”. Fourteeners attract visitors from near and far who enjoy hiking, “family time”, photography and wildlife viewing. Famous Fourteeners like Pikes Peak in Colorado Springs and the Maroon Bells in Aspen are prime examples of Fourteeners that serve a multitude of recreational interests. However, to many, these 54 Fourteeners also serve as a focal point to fulfill a lifelong dream of summiting a high peak—or the entire list of Fourteeners.

In recent years, heightened Fourteener visitor use and recreation have resulted in considerable ecological impacts, such as trail widening, soil erosion, and land disturbances. Although visitor use on public lands is somewhat difficult to measure (English et al, 2002), estimates place Fourteener use at approximately 10,000-20,000 at popular Fourteeners along the Front Range (Frazier, 2006), and at least 500,000 visitors each year for the entire state ((Kedrowski (2006); Rappaport (2007)). Furthermore, the fragile alpine areas

are not easily restored ((Kedrowski (2006); The USDA Forest Service (2006); (Evans, 2007)), making a balance between human use and natural area management difficult to achieve. Because visitor use is now at a level where the environment may suffer irreparable damage, policy managers often describe the quandary as mountains that are being “loved to death” (USDA Forest Service, 2006).

While Fourteeners clearly provide a “priceless” experience, many of the problems with visitor use are “economic” in nature. The purpose of this paper is to present the importance of estimating values in natural and environmental amenities, even when the experience seems priceless. Using the case of the Colorado Fourteeners, we use economic tools to explain why damage is occurring on the public lands, and we outline three economic principles that can be used to assess the value of environmental goods and natural areas, or order to improve their management.

Why Estimate a Price on the Environment?

Because nature provides a retreat from the commercial world, estimating a price on environmental goods at first seems contradictory. However, the fact of the matter is that nothing is free of cost. Hiking trails, parking lots, and campgrounds all require money for maintenance. Even open space and land that is set aside for public use frequently requires a lease, or

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outright purchase. Although public tax dollars are used to acquire and maintain recreational resources, the fact of the matter is that public land budgets compete with other programs (like education, military spending, and social programs). One key way in which to leverage a program is to show policy makers the value that the program provides to society. Showing benefits is more easily done with programs where benefits can be easily quantified (e.g. fewer victims of crime, higher graduation rates). In contrast, showing the value of the environment is more of a challenge, particularly since visitor use is challenging to document. Simply put, finding the value of an environmental amenity helps draw attention to the environment, which may yield more funding support. Furthermore, showing the economic value of a natural area can help protect that environmental resource from development.

Outdoor recreation also provides a clear economic benefit to rural communities, where recreationists spend a great deal of money enjoying their outdoor activities. Thus, we can look at recreation expenditures as a valuable resource for rural resident income and community services. The flip side of this is, “What would happen to the rural community if the environmental resource were destroyed or developed?” In other words, the community loses both the beauty of the natural resource and income from the very resource that attracts visitors to the area.

Economics Can Explain Sources of Environmental Damage

One classic economic explanation for Fourteener ecological damage is that most Fourteeners are entirely publicly owned and do not require access fees at the main trail heads. As a result of the free access, people will continue to use the mountain until their personal costs (which include time and expenditures) exceed the enjoyment that they receive from the experience. Thus they will climb the Fourteener regardless of the environmental and congestion cost their activities impose. Because it is difficult to exclude people from using a public good, it can be over-used. In the case of Colorado’s Fourteeners, at low use levels, there may be minimal human impact to the ecosystem. However, as anyone who has climbed the Long’s Peak “Keyhole” on a summer day will attest, there is congestion at high levels of use. This can yield danger to other hikers and climbers, as well as sustained environmental damage and an unpleasant recreation experience.

Thus, one question is how to manage a valuable public resource like the Colorado Fourteeners. Economists

consider “public goods” to be an example of a “market failure”. This means that the “price” of the Fourteener (free at most places) doesn’t reflect the high values climbers have for the resource. Crafting the appropriate solution for managing the Fourteeners is tricky. Some good economic issues to consider are:

- How “fair” is it to restrict access to a public good like the Fourteeners, when the incremental costs of another visitor at “low use” times is almost zero?
- How much environmental damage or environmental “cost” balances the benefits enjoyed by Fourteener recreationists before trail access is restricted?
- How can we encourage recreationists to select recreation times that will minimize the environmental impact of their recreation activity (e.g. weekday use vs. weekend use)?
- How do we ensure that policy managers allocate appropriate funding to manage valuable natural resources like the Fourteeners?

How to Assess the Value of a Natural Resource

Measuring the economic value of a resource is tricky. There are two approaches to measuring the value of an environmental or natural resource: “*contributions to the local economy*”, and “*user benefits*”.

Contributions to the Local Economy

This category consists of two elements: visitor expenditures and local income generated (also known as “value added”).

Visitor expenditures include things like food, gas, lodging, and other costs. Most recreation studies prefer to calculate expenditures made for that particular trip. Often times the researcher will distinguish whether the expenditures were made close to the recreation site (20-30 mile radius) or in a larger geographical space. It is generally accepted that the further people live from the attraction, that the more money people will spend on the activity.

Local income generated, or “value added” is a bit more complex, but it is an important measure of economic contribution to a state and local economy. Let’s say you buy an energy bar at a local convenience store before you head out on the trail. You have essentially added value to the economy in several different sectors. Your purchase has helped pay for the convenience store clerk’s wages. This is a gain to the local economy. The transport of the food to the convenience store, the production of the energy bar and the growing

of the raw ingredients used to make the sports bar are contributions to the state economy where the energy bar is produced. To work backwards, there is “value added” to the economy in every step of the production of the energy bar. When the wheat is grown and sold to the baker, the value of the raw materials has increased, because they are now “consumables”. When the energy bar is cooked and sold wholesale there is more value, because the convenience store has given money to the baker. Then when you buy the retail product there is even more value, because you have essentially paid the wholesaler for availability. In other words, almost every purchase that is made is part of a “domino effect” and this domino effect can still have a very valuable impact on local and state economies. Further the wages paid at each step in the production process will get spent elsewhere in the state economy. There are economic models that measure the multiplier effect and value added to the economy at both the county and the state level. The values also contribute to national data.

User Benefits

Although natural experiences may seem “priceless”, there is no doubt that they provide value to the participant. Natural resource and environmental economists specialize in estimating dollar values on items and experiences that seem to defy a price. The first reaction for some people is that this is morally “wrong” at some level and that it presents a conflict in value with the natural world. Do natural wonders really need a price tag? The answer is that in order to call attention to something that really is important to the public—like the Colorado Fourteeners—it really is helpful when the economic value is known to the management agencies and the elected officials. Here are some examples of how “non-market” values can be useful:

- *Budget Allocation:* Agencies like the USDA Forest Service have limited funds to devote to many important natural areas. Providing the dollar value of a natural amenity makes a pitch that the area is deserving of funding and management attention, particularly if the public places a higher value on the resource than what is expected.
- *Grant Writing:* Many non-governmental organizations and non-profit groups supplement the efforts of government groups; however, the competition for funding is intense. Providing a dollar value for a natural resource helps grantors better understand the value of the project. It also makes it easier for the non-profits to justify their

budgets and to make a pitch for the worthiness of the cause.

- *Compensation:* When natural areas are destroyed due to either natural causes (e.g. Hurricane Katrina) or by man (e.g. oil spills), quantifying the “non-market” value helps us to understand the magnitude of the impact. It can also provide guidelines for assessing environmental damage liabilities.
- *Estimating the Trade-Offs with Other Uses:* Many Fourteeners and natural environments contain valuable timber or minerals. Thus, there is pressure to develop these commodities at the expense of the natural environment. Knowing the non-market value of the environment helps decision makers to balance the trade-offs between commodity production and the environment.

The most common way in which we assess the use value of market and “non-market value” for an item is using a measured called “*consumer surplus*”. Without getting too technical, consumer surplus is essentially the difference between the maximum you would have paid and what you actually did pay. For example, say you went to buy a pair of high quality hiking socks and you were ready to pay \$15, but instead, you only had to pay \$10 because they were on sale. Your consumer surplus is \$5, because you were willing to pay the \$15, but you didn’t have to. This extra \$5 in your pocket is your consumer surplus. Here are a few more details about consumer surplus:

- Individuals often have different consumer surpluses. Using this same example, let’s say that your sister also went to the store, but she was only willing to pay \$12 for a pair of socks. She now has a consumer surplus of \$2.
- There can be “zero” consumer surplus. Let’s say your brother went to the store with you, but he was only willing to pay \$10 for a pair of socks. If the price was \$10 and he wouldn’t pay a penny more, then he has a consumer surplus of \$0. He still got the socks, though. Someone who was only willing to pay \$8 wouldn’t even buy the socks.
- We can sum all of the consumer surpluses to determine a “societal” consumer surplus. In this case, the consumer surplus for you, your sister, and your brother is $\$5 + \$2 + \$0 = \7 .

This same reasoning applies to the decision of whether or not to visit a Fourteener. Economists use a simulated market survey design combined with statistical

analysis to estimate the consumer surplus for natural resources. While the techniques may not be “perfect”, the process of determining a consumer surplus clearly provides insight into the value of the natural resource.

Summary

In summary, the Colorado Fourteeners are a symbol of Colorado’s beauty and wealth of recreation opportunities. While the mountains may provide “priceless” experiences, understanding the value of the mountains can help ensure that the beauty and abundance of recreation opportunities continue for years into the future. For more detailed information about results from our economic study on Colorado Fourteeners, please reference *The Economics of Colorado Fourteeners: Research Summary (07-19)* or *Quick Fact Sheet on the Economics of Colorado Fourteeners (07-20)*: <http://dare.agsci.colostate.edu/csuagecon/extension/pubstools.htm>

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Environmental Economics, Econ 4545. University of Colorado, Spring 2001. Instructor: Vijaya Sharma, Ph.D. Brief Notes of My Lectures.

Trade-off between Market Goods and Environmental Quality. Production possibility frontier of two goods: market goods and environmental quality (draw a PPF). The more the production of market goods, the lower the environmental quality, given a state of technical know-how. Values placed by a society on environmental quality and on market goods (the social indifference curve, derived from social welfare function) determine the choice of the society where to locate on... Nature provides raw materials and energy to the economy. Economy uses the resources to produce goods that are then consumed. Can economic growth be compatible with looking after the environment? Economics can illustrate the external costs of growth and suggest solutions. If the willingness is there. We need to put a monetary value on the cost of pollution / environmental damage and make sure that is reflected in the price people pay (e.g. tax on negative externalities). This will mean the cost of burning fossil fuels will increase reducing demand. The biggest problem is making sure that we actually include all environmental costs in the price of goods and services we use. How fast is the economy growing? Is it speeding up or slowing down? How does the trade deficit affect economic growth? What's happening to the pattern of spending on goods and services in the economy? When considering the production process for the entire economy, the value of intermediate products—that is, goods and services that are used as inputs in the production process (and will not contribute to future production) is excluded, so that the measure of output is an unduplicated total. For example, consider a simple economy with one product, bread, which is produced in three stages: 1. Wheat is grown, harvested, and sold for \$1 by a farmer (for simplification, it is assumed the wheat is produced using no intermediate products) Then draw a diagram to show the effect on the price and quantity of minivans.

- People decide to have more children.
- A strike by steelworkers raises steel prices.
- Engineers develop new automated machinery for the production of minivans.
- The price of sports utility vehicles rises.
- A stock market crash lowers people's wealth.

Answer: a. People decide to have more children. - Demand, Increase (shift right). P.