

MEASURING THE ECONOMIC VALUE OF LAND CONSERVATION

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Table of Contents

Section 1: Measuring the Economic Value

of Land Conservation 1

Quality of Life as a Competitive Edge 2

Business and Talent Attraction..... 2

Compensation and Competition 3

Ecosystem Value 4

Real Estate/Property Tax Benefits 4

Section 2: Belvoir Ranch and the Big Hole Properties:

A Case Study 7

Introduction 7

Value of Active and Passive Recreation..... 8

Belvoir Ranch Replacement Value..... 10



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Measuring the Economic Value of Land Conservation



The Big Hole property southwest of the City of Cheyenne.

Land that is protected from development, either for recreational use, habitat conservation, or natural resource protection, has a tangible value that can be hard to quantify. One of the primary benefits of open space and conservation lands is increased quality of life. While the value of quality of life is not often quantified, such essential amenities have a direct link to economic development and community vitality that can be measured in other ways.

Additional value and benefits from open space come from the value of the services provided by intact and healthy ecosystems, and user benefits to those who participate in the active and passive recreation opportunities provided by open space. This section describes the economic and community development benefits of open space and provides examples from economic literature on the value of open space and associated user benefits.

✦ ***The primary benefits of open space and conservation lands include increased quality of life, economic value, and intact and healthy ecosystems.***



✦ **While the value of quality of life is not typically quantified, high quality of life correlates with positive economic growth.**

QUALITY OF LIFE AS A COMPETITIVE EDGE

Quality of life has a broad meaning in urban planning and economic development. It refers to the livability of an area as defined by numerous community characteristics and indicators such as public safety, quality of educational opportunities, entertainment and cultural amenities, as well as environmental quality and access to open space, parks, and recreation opportunities. While the value of quality of life it is not typically quantified, high quality of life correlates with positive economic growth.

- A USDA study focused on natural amenities such as a favorable climate, topographic variation, and water features showed that areas with a higher concentration of natural amenities achieved higher population growth rates from 1970 to 1996 than less scenic areas¹.
- Similarly, a 1998 report by the Federal Reserve Bank of Kansas City found that the most scenic rural areas experienced growth in non-farm self-employment (sole proprietors) of nearly 4 percent per year while the least scenic areas grew at half that rate².

BUSINESS AND TALENT ATTRACTION

Metropolitan areas in the U.S. are transitioning from heavy industry and manufacturing towards more knowledge-based or ‘people intensive’ industries. A local example of this transition is the locating of the National Center for Atmospheric Research (NCAR) supercomputing facility in Cheyenne’s North Range Business Park. This facility is creating interest in Cheyenne as a location for private sector technology and computing businesses. This facility therefore has the potential to create spin-off benefits in coming years from new technology companies locating in Cheyenne and generating additional high paying jobs.

Knowledge industries rely less on access to raw materials, heavy infrastructure, and energy supplies, and more on skilled labor. As a result, attracting a skilled and talented labor pool is key to economic development for knowledge-based industries. A city’s success in economic development is therefore tied to its ability to attract and retain highly educated professional employees and entrepreneurs.

¹ McGranahan, D.A. (1999). *Natural Amenities Drive Rural Population Change*. U.S. Department of Agriculture, Economic Research Service, Food and Rural Economics Division. Agricultural Economic Report No. 781. September.

² Henderson, J. and K. McDaniel. (1998). “Do Scenic Amenities Foster Economic Growth in Rural Areas?” *Regional Economic Digest, Federal Reserve Bank of Kansas City* First Quarter: 11-16.

'Knowledge workers' often have more flexibility than others in choosing where to live, and quality of life is often a major factor in their decisions. Economic development and company relocation studies continue to show that quality of life is an important factor for individuals in deciding where to live and work, and for companies in deciding to relocate or expand. Some studies have found that environmental quality has ranked very highly in location choices, often equal to, or above, housing, the cost of living, and good schools.

COMPENSATION AND COMPETITION

The transition to knowledge-based and people intensive "footloose" industries has important economic development ramifications. To some extent, employees of these firms are sometimes willing to take a smaller salary in places that offer higher amenities than in places with below average quality of life. Conversely, firms located in areas with a low quality of life find they need to pay more to attract talent.

- A 1991 study of 174 Colorado companies that chose to relocate to Colorado found that among businesses of 40 people or less, 26% stated open space and recreation opportunities as the primary reason for their relocation decision³.
- A 2003 study analyzed the effect between proximity to national parks, lakeshores, seashores, and recreation areas on the 90 largest metropolitan areas. Their results indicate that individuals are willing to take a 4.0 percent pay cut to work in an area with these amenities located 100 miles closer⁴.

As communities invest in and pursue economic development, they should consider investments in quality of life and quality of place (the built environment, parks, and open space) as a key component of a long-term community and economic sustainability strategy.

The City of Cheyenne's investments in revitalizing Downtown Cheyenne, and its investments in the Greater Cheyenne Greenway are all investments in the quality of place and quality of life. The City's investment in the Belvoir Ranch and Big Hole properties is an extension of these existing policies and strategies, and an investment in regional economic growth.

3 Crompton, J.L., Love, L.L., & More, T.A. (1997). Characteristics of companies that considered recreation/parks/open space to be important in (re)location decisions. *Journal of Park and Recreation Administration* 15(1), 37-58.

4 Schmidt, L. and P.N. Courant. (2006). Sometimes Close Is Good Enough: The Value of Nearby Environmental Amenities. *Journal of Regional Science*. (46)5, 931-951.



★ **As communities invest in and pursue economic development, they should consider investments in quality of life and quality of place (the built environment, parks, and open space) as a key component of a long-term community and economic sustainability strategy.**



- ✦ **A 2001 study of 16,747 single family homes in Portland, Oregon found that homes within 1,500 feet of a natural park supported a 16% premium in value⁹.**
- ✦ **In 2005-2006, the Wyoming Legislature created the “Wildlife and Natural Resource Trust,” with funding of approximately \$40 million to support projects that enhance habitat and natural resource values across the state.**

ECOSYSTEM VALUE

Measuring the value of natural systems is a relatively new branch of economics pioneered in the last ten years by both economists and ecologists. The field aims to quantify public benefits that are not typically recognized or valued in market transactions. A 1997 study in the journal *Nature* estimated the value of benefits associated with the world’s ecosystems at \$33 trillion annually⁵. Services to the public from ecosystems include gas regulation, climate regulation (i.e., oxygen, carbon dioxide, nitrogen dioxide), water regulation, water supply, stormwater management, erosion control, soil formation, waste treatment, and pollination, amongst others. Additional examples of the economic value of natural systems are provided below:

- Research has identified a \$1 to \$100 ratio of investment to benefit on the preservation of intact ecosystems⁶.
- Tree canopy benefits in Ft. Collins, CO have an estimated one-time storm water management value of \$10,100,000 and annual benefits attributable to air pollution removal and storm water management of \$1,500,000 annually⁷.
- Over 100,000 different animal species — including bats, bees, flies, moths, beetles, birds, and butterflies — provide free pollination services. One third of human food comes from plants pollinated by wild pollinators. The value of pollination services from wild pollinators in the U.S. alone is estimated at \$4 to \$6 billion per year.⁸
- A 1997 Cornell University study estimated the economic and environmental benefits of biodiversity in the U.S. alone at \$319 billion. The Cornell study counted natural services of a diverse biota, including organic waste disposal, soil formation, biological nitrogen fixation, genetic resources to increase food crop and livestock yields, biological pest control, plant pollination, pharmaceuticals, and sequestration of carbon dioxide that would otherwise contribute to global warming.⁹

Valuing the benefits of ecosystem services is, however, a very new field and relies on a host of macroeconomic assumptions to derive numeric estimates. Because of this, the estimates summarized above should be interpreted as broad ranges of potential benefits.

⁵ Costanza, Robert (1997). The value of the world’s ecosystem services and natural capital. *Nature*. 387, 253-259.

⁶ (2002, Aug. 13). Investing In Environment Pays Off At 100-1, Say Researchers. Retrieved February 26, 2008, from ScienceDaily Web site: <http://www.sciencedaily.com/releases/2002/08/020812070301.htm>

⁷ American Forests. (2001). Regional Ecosystem Analysis for Metropolitan Denver and Cities of The Northern Front Range, Colorado [Brochure]. Washington, D.C.

⁸ Ecological Society of America (2000). What are Ecosystem Services Worth?

⁹ Pimental, David, et. al. (1997) Economic and Environmental Benefits of Biodiversity. *BioScience*. 47, 747-757.

REAL ESTATE/PROPERTY TAX BENEFITS

It has been well established that proximity to open lands and conservation areas enhances property values¹⁰. The “proximate principal” describes the correlation between higher property values and proximity to open lands, natural areas, and parks.

- A 2001 study of 16,747 single family homes in Portland, Oregon found that homes within 1,500 feet of a natural park supported a 16% premium in value¹¹.
- Conversion of one acre of developable pasture land in Maryland to conservation land increased the average value of the adjacent neighborhood residential properties by \$3,307¹².
- A 2001 study in Lawrence, KS demonstrated a 9% premium for houses adjacent to undeveloped prairie land¹³.

Although less research has been conducted on community-wide benefits as a result of open space purchases, the following studies found a positive correlation.

- A 1996 analysis of Boulder, CO open space purchases found that the 15,000 acres purchased between 1981 and 1995 led to an overall increase of 3.75% in the City’s real estate values. Importantly, the study controlled for changes in employment, rents, the housing stock, as well as vacancies and mortgage rates¹⁴ to isolate the effect of increased open space.
- A 1971 study of 15 parkland acquisitions in Pennsylvania Townships by Pennsylvania State Parks compared changes in property values to Townships without parkland. The study reported that Townships with newly acquired parkland experienced a 6% increase in land value in the five years after acquisition¹⁵.

10 Resources for the Future. (2005). *The Value of Open Space: Evidence from Studies of Nonmarket Benefits* [Brochure]. Washington, D.C.: Virginia McConnell and Margaret Walls.

11 Lutzenhiser, M., and N. Noelwahr. (2001). The effect of open spaces on a home’s sale price. *Contemporary Economic Policy* 19(3): 291-298.

12 Irwin, E.G. (2002). The Effects of Open Space on Residential Property Values. *Land Economics* 78(3): 698-704.

13 Earnhard, Dietrich (2001). Combining Revealed and State Preference Methods to Value Environmental Amenities at Residential Locations. *Land Economics* (1):12-30.

14 Riddel, Mary (2001). A Dynamic Approach to Estimating Hedonic Prices for Environmental Goods: An Application to Open Space Purchase. *Land Economics* 77(4):494-512.

15 Epp, Donald J (1971). The effect of public land acquisition for outdoor recreation on the real estate tax base. *Journal of Leisure Research* 3(1), 17-27.

✦ **A 1993 study measuring the for ranchland preservation in Western Colorado found that protecting ranchlands was worth between \$111 and \$186 (in 2006 dollars) per household.**



✦ **In areas where development pressure is high, open lands have a higher value to people.**



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Belvoir Ranch and the Big Hole Properties: A Case Study

INTRODUCTION

Belvoir Ranch was purchased by the City of Cheyenne in 2003 as a cooperative effort between the City of Cheyenne's Board of Public Utilities and the City Public Works Landfill Fund. The City paid \$5.9 million for over 17,000 deeded acres along with rights to 3,400 acres of land leased from the State of Wyoming. Stewardship partners include the Laramie County Conservation District and the National Resource Conservation Service.

The adjacent Big Hole property consists of 1,000 acres of rim pasture and 800 acres of spectacular canyon scenery at the Wyoming/Colorado border. It is part of the regional area identified as the Laramie Foothills/ Mountain to Plains Project which is sponsored by Larimer County, the City of Fort Collins, The Nature Conservancy, and the Legacy Land Trust. This effort will protect 55,400 acres between Fort Collins and Cheyenne, creating a mountain to plains conservation zone of approximately 140,000 acres. This land was acquired in 2005 for \$525,000 from the Nature Conservancy as part of a multi-state open space initiative. The Nature Conservancy holds a conservation easement on the property, which is one of the first created in the State of Wyoming under new 2005 legislation.



Aerial view of Lone Tree Creek a valuable ecological resource on Belvoir Ranch.



VALUE OF ACTIVE AND PASSIVE RECREATION

Using research conducted by the U.S. National Forest Service (USFS), the value of the potential recreation activities at Belvoir Ranch is estimated in **Table 1**. This survey attempts to quantify economic benefits of various recreational activities, based on average participation rates for each activity, the approximate times per year a user participates, and the perceived dollar value for each day of participation¹.

Participation rates for various outdoor activities in the Forest Service survey, which represent national averages, were multiplied by Cheyenne's population over the age of 18 (42,423 in 2007) and the average number of times people participate in each activity to calculate total user days. As shown, Cheyenne's population is estimated to generate 10,000 user days of mountain biking, 20,500 user days of camping, and so on.



The value of ranchland protection alone is estimated at \$3.3 million to Cheyenne residents per year, as shown². In addition, the value of recreational activities such as fishing is estimated at \$1.9 million, hiking at \$2 million, and wildlife viewing at \$3.4 million. Mountain biking has a high value per user day, although it has lower participation rates. Mountain biking is estimated to be worth \$800,000 per year to Cheyenne residents.

Total annual user benefits are estimated to be \$13.8 million for all of the activities shown. This compares favorably to the \$5.9 million the City paid for the 17,000 acre property. While preservation alone provides significant value, providing for additional recreational opportunities is expected to have additional economic benefits for the City and the region.



1 USDA, Forest Service. (October 2005). *Updated Outdoor Recreation Use Values on National Forests and Other Public Lands* (General Technical Report PNW-GTR-685). Pacific Northwest Research Station.

2 Rosenberger, Randall, and Walsh, Richard G. (1997). Nonmarket Value of Western Valley Ranchland Using Contingent Valuation. *Journal of Agricultural and Resource Economics*. 22 (2), 296-309.

TABLE I
Value of Active and Passive Recreation Activities to Cheyenne Residents

Ranch Activities	Participation	Anticipated Users ¹ (per year)	Average # of Times per year	User Days	Perceived Value per Day ²	Annual User Benefit
Mountain Biking	5%	2,121	4.8	10,171	\$78	\$800,000
Backpacking	7%	2,970	8.1	24,158	\$55	\$1,330,000
Camping	18%	7,636	2.7	20,503	\$39	\$810,000
Fishing	28%	11,878	3.2	38,249	\$50	\$1,910,000
Horseback Riding	6%	2,545	4.8	12,205	\$19	\$230,000
Hiking	18%	7,636	8.1	62,120	\$33	\$2,030,000
Wildlife Viewing	16%	6,788	11.3	76,701	\$45	\$3,440,000
Ranchland Protection ³	N/A	23,953	N/A	23,953	\$139	\$3,330,000
Total/Average	14%			268,059	\$52	\$13,880,000

Source: Plan Cheyenne; US Forest Service, Economic & Planning Systems

¹ National Participation Average multiplied by Cheyenne's < 18 Population of 42,423.

² Willingness to Pay in 2006 dollars

³ "Users" are the number of households in Cheyenne's metropolitan area.

★ **Total annual user benefits are estimated to be \$13.8 million for the activities shown. This compares favorably to the \$5.9 million the City paid for the 17,000 acre property.**

★ *The Belvoir Ranch/ Big Hole example illustrates the value that is preserved when strategic open lands are protected from development. The cost to replace such a resource at a later date would likely make its replacement infeasible.*

BELVOIR RANCH REPLACEMENT VALUE

The replacement value of open space or conservation lands can be estimated by examining the market value of land nearby that can be sold for private development. If Belvoir Ranch was developed, these land values provide a range of estimates for the cost to replace the open space provided by the Ranch. In the foothills west of Cheyenne raw land (without development approvals) suitable for residential development is valued between approximately \$900 and \$1,000 per acre, as shown in Table 2. Applied to the 17,000 acre Ranch, this indicates a replacement value of \$15.3 to \$17 million. Land that is taken from raw land with no development approvals to subdivided residential lots, typically 30 acres in size, is valued between \$1,800 and \$2,300 per acre. As subdivided residential land, the replacement value of Belvoir Ranch is estimated at \$30.6 to \$39.1 million.

Typically, large bulk land sales have a lower per acre price than the individual lot sales shown below. However, this example illustrates the value that is preserved when strategic open lands are protected from development. The cost to replace such a resource at a later date would likely make its replacement infeasible.

TABLE 2
Estimated Belvoir Ranch Replacement Value

Description	\$ per Acre		Belvoir Ranch Acres	Replacement Value	
	Low	High		Low	High
“Raw” land (unentitled, undeveloped)	\$900	\$1,000	17,000	\$15,300,000	\$17,000,000
Large Residential Lots (+/- 30 ac)	\$1,800	\$2,300	17,000	\$30,600,000	\$39,100,000
Belvoir Ranch Purchase Price			17,000	\$5,900,000	

Source: Economic & Planning Systems

It should be noted that these estimates are provided in 2008 dollars. As land prices often increase over time, applying a 3 percent inflation rate would mean that in 2025, the ranch property would be worth between \$25 and \$65 million.

Given its value as community legacy and the economic benefits that are expected to be derived, preserving its intrinsic resource values and making them available to Cheyenne residents and visitors, should be an asset to the quality of life in the region.



