

The Value of Farm and Forest Preservation to Residents of Preston, Connecticut

Robert J. Johnston, Ph.D.
Tammy Warner Campson
University of Connecticut

Joshua M. Duke, Ph.D.
University of Delaware

May 3, 2007

This research was funded by the National Research Initiative of the Cooperative State Research, Education, and Extension Service, USDA, Grant 2003-35400-13875. Opinions belong solely to the authors and do not imply endorsement by the funding agencies. Any remaining errors are those of the authors.



Executive Summary

This report describes results of the **2005 Preston Land Preservation Survey**.

This survey was a carefully designed choice experiment which assessed the amount that Preston residents would be willing to pay in taxes and associated fees to preserve farm or forest land in their town. Survey results quantify the value that Preston residents have for different types of farm and forest preservation. Results indicate that the value of farm and forest preservation can be substantial, and can vary widely depending on the kind of land under consideration, the method used to prevent development, and the risk of future development on unpreserved parcels. When considering additional preservation in the range of 40-250 acres, the average value per acre of preserved farm or forest in Preston, to Preston residents, is **\$405** per year, or **\$6,754** in total capitalized value.¹ This value reflects the benefits that Preston residents derive from the preservation of undeveloped land in their town. It does **not** include additional values that residents of all other Connecticut cities and towns hold for the preservation of farm and forest in Preston, which average \$6,595 per year, or \$109,914 in total capitalized value. These additional values are described in another report. Benefits of farmland preservation are composed mainly of residents' non-market values for amenities such as recreational access, scenic vistas, and community character. These values are **not** captured in prices paid for farm and forest land in market transactions, nor are they reflected in the market values of farm products. As a result, markets underestimate the true value of farm and forest to Preston residents.

¹ Total present value over all future time periods.

The Character of Preston

The Southern Connecticut town of Preston comprises about 31 square miles of fields, farms, and forests. Only 9.3 percent of the town's land is developed. Residents and visitors value the scenic beauty and recreational opportunities afforded by local farms and natural areas. The public expresses these values in numerous ways, including support for land preservation ballot initiatives and a community-level commitment to preserving farms, forests, and open space. The public's willingness to pay for land preservation derives from the non-market *amenity benefits* provided by rural lands. These benefits are direct, positive influences on people's quality of life, and are not often reflected in market values of land. Over time, market forces—which reflect market values only—likely lead to too much development and too little preservation of farm, forest, and open space. In the last 17 years, the amount of developed land in Preston has increased by 18.5 percent.² The challenge for policy makers is to find a way to quantify the true value of farm, forest and open space preservation to local residents, and to incorporate these values into land use and preservation decisions. This report presents results from a study which uses economic valuation techniques to estimate these values.

Measuring Preservation Values in Preston

In 2006, Connecticut voters passed 86 percent of local bond initiatives for farm, forest and open space preservation. These votes reflect state residents' willingness to accept tax increases in return for land preservation, or *willingness to pay* for the preservation of open space in rural communities like Preston. However, these votes do not reveal exactly what types of preservation people value, and the magnitude of associated values. Building on the voting model, however, economists have developed methods for measuring willingness to pay for environmental amenities (such as those provided by farm and forest land) by replicating a voting

² http://clear.uconn.edu/projects/landscape/statewide_landcover.htm.

situation in carefully designed surveys. This method is called the *choice experiment*. Choice experiments let researchers quantify the benefits that people receive from preservation of particular types of farm, forest and open space. The results of these studies reveal the value of rural land preservation to Preston residents.

In 2005, researchers from the University of Connecticut and the University of Delaware mailed a self-administered choice experiment survey to 750 randomly-selected Preston residents. The *Preston Land Preservation Survey* presented respondents with a chance to vote yes or no over many different community-level land preservation options with varying tax costs to their households. Statistical analysis of thousands of votes over hundreds of different preservation choices enabled researchers to derive estimates of the average willingness to pay to preserve different types of farm and forest land. These estimates reflect additional taxes and fees that Preston residents would be willing to pay in order to obtain specific types of farm and forest preservation in their town. Of the 708 surveys that were deliverable, 40.8% of the surveys were returned, generating a sample of 289 responses, representing a broad cross-section of town residents.

What is the Value of Farm and Forest Preservation?

Survey responses reveal willingness to pay per household, per acre, per year for the type of open space specified in the survey questions. Aggregating (or adding up) responses over Preston households provides an estimate of the total annual value per acre, among Preston residents³. Annual values can be capitalized over time by discounting the future cash flows at an

³ This analysis aggregates over 40.8% of Preston households (2,946 total), the same proportion of households as those who responded to the survey questionnaire. This is a very conservative assumption, in that it assumes that the 59% of survey recipients who did *not* respond chose not to respond because they had zero willingness to pay for land preservation.

appropriate rate (in this case, 6 percent).⁴ Based on these methods, **the average value that Preston residents place on preserving each additional acre of farm or forest is \$405 per year, or \$6,754 in total capitalized value⁵.** Preservation values differ depending on land attributes and the type of preservation. The highest preservation values obtained in this survey were in excess of \$15,000 per acre in capitalized value. Higher values were associated with land at a high risk of development and land that offers public access. Lower values were associated with land that offers no public access and land that has a lower risk of development.

Figures 1 and 2 show a sample of different preservation options and their associated values⁶. Columns show both the capitalized value to Preston residents, as well as the values held by all other Connecticut residents for farmland preservation in Preston. Note that these statewide values almost universally exceed values held by Preston residents. This is solely a function of the small permanent population of Preston. Even though Preston residents are willing to pay **more per household** for farmland preservation in Preston, compared to Connecticut residents who do not live in Preston, there are **many more non-Preston residents in the State**. Hence, when per household values are multiplied by the number of households, the aggregate willingness to pay of non-Preston households actually exceeds that of Preston households—even when considering preservation that only occurs in Preston.

Definitions of the row and column headings are as follows:

⁴ This is the same method that would be used to assess the market value of a business or a working farm that provided a flow of revenues every year. The (present) value of a business is the sum of all the expected cash flows generated by that business – in essence, a purchaser is paying now for the opportunity to obtain income in the future. But people will not pay a whole dollar today for the opportunity to obtain a dollar in the future. Future cash flows are worth less than present cash flows, reflecting the time value of money. As a result, future cash flows must be *discounted* in order to make them comparable to cash flows today. A discount rate of 6 percent means that a dollar to be received next year is worth 94.3 cents today, a dollar to be received two years from now is worth 88.9 cents, and a dollar to be received 20 years in the future is worth only 31 cents today. Adding up all the (discounted) future cash flows over time is called *capitalizing* an investment.

⁵ The reported averages consider land that is at a high risk of being developed within the next 10 years. Land at a low risk of development had a substantially lower average value.

⁶ It is important to note that these values are applicable only to the next **40 to 250** acres being preserved, and should not be used to evaluate all of the remaining open space in the town. This is because of diminishing marginal utility – as additional farm land is preserved, people’s willingness to pay will diminish.

- ***Outright purchase*** means purchase and preservation of farm and forest by government or nonprofit groups (land trusts).
- ***Preservation contract*** (also called *conservation easements* or *purchase of development rights*) means that interested landowners are paid a fee in return for placing a legal contract on their land that prevents all future development.
- ***High risk*** means land that is likely to be developed within the next 10 years if it is not preserved.
- ***Walking*** means that the preserved parcel would offer public access for walking and biking.
- ***Hunting*** means that the preserved parcels would offer public access for hunting.

By cross-referencing preservation methods and types of land in figures 1 and 2, one can locate specific preservation values. For example, *crop land*, preserved via a *conservation easement administered by the state*, providing *walking access*, and at a *high risk of development*, has a capitalized value of **\$13,155** per acre. *Forest land*, preserved via *outright purchase by the state*, providing *no access*, and at a *high risk of development*, has a capitalized value of **\$5,373** per acre.

It should be noted that the local values reported here can be considered the willingness to pay of local residents for preservation that occurs *in their community*. This value reflects the benefits, or local value, that Preston residents derive from the preservation of undeveloped land in their town. It does **not** include additional values that residents of other Connecticut cities and towns hold for the preservation of farm and forest in Preston. These values are reflected in the “statewide values” columns. In most cases the local values can with a few adjustments be added

to statewide values for land preservation to obtain total preservation values. Statewide values are described in greater detail in another report by the same authors.⁷

⁷ Johnston, R.J., T.W. Campson and J.M. Duke. 2007. The Value of Farm and Forest Preservation in Connecticut. Technical Report, Department of Agricultural and Resource Economics, University of Connecticut.

Figure 1. Per Acre Preservation Value for Food/Dairy Farms and Idle Farmland

		Food or Dairy Farm		Idle Farmland	
Level of access		Local value	State-wide value	Local value	State-wide value
Outright Purchase by a Land Trust	Walking	\$14,514	\$257,598	\$12,488	\$286,012
	Hunting	\$7,645	\$234,519	\$5,618	\$262,934
	None	\$4,265	\$150,735	\$2,238	\$179,149
Outright Purchase by the State	Walking	\$13,474	\$123,242	\$11,447	\$151,656
	Hunting	\$6,604	\$100,164	\$4,578	\$128,578
	None	\$3,224	\$16,380	\$1,197	\$44,794
Preservation Contract (Land trust)	Walking	\$12,747	\$187,426	\$10,721	\$215,840
	Hunting	\$5,878	\$164,348	\$3,851	\$192,762
	None	\$2,498	\$80,563	\$471	\$108,978
Preservation Contract (State)	Walking	\$13,155	\$136,805	\$11,128	\$165,219
	Hunting	\$6,286	\$113,727	\$4,259	\$142,141
	None	\$2,905	\$29,942	\$879	\$58,356

Figure 2. Per Acre Preservation Value for Nursery Farms and Forest

		Forest		Nursery Land	
Level of access		Local value	State-wide value	Local value	State-wide value
Outright Purchase by a Land Trust	Walking	\$15,623	\$304,573	\$11,300	\$221,225
	Hunting	\$8,753	\$281,495	\$4,431	\$198,147
	None	\$5,373	\$197,710	\$1,051	\$114,362
Outright Purchase by the State	Walking	\$14,582	\$170,218	\$10,260	\$86,869
	Hunting	\$7,712	\$147,139	\$3,390	\$63,791
	None	\$4,332	\$63,355	\$10	negligible
Preservation Contract (Land trust)	Walking	\$13,856	\$234,401	\$9,533	\$151,053
	Hunting	\$6,986	\$211,323	\$2,664	\$127,975
	None	\$3,606	\$127,539	negligible	\$44,191
Preservation Contract (State)	Walking	\$14,263	\$183,780	\$9,941	\$100,432
	Hunting	\$7,394	\$160,702	\$3,072	\$77,354
	None	\$4,014	\$76,918	negligible	negligible

The Benefits and Costs of Preservation: An Illustration

How can the dollar amounts in Figures 1 and 2 be used to assess the benefits and costs of open space preservation in Preston? Consider the example of recent preservation initiatives in another Connecticut town. Recently, the town of Simsbury (via the Simsbury Land Trust) purchased the development rights on four of the remaining working farms in the town. The price paid for the development rights averaged \$16,000 per acre. Referring to the attributes in Figure 1, these are best characterized as *food or dairy farms*, at a *high risk* of development, preserved via a *preservation contract* administered by a land trust, and providing *no access*. If these farms had been located in Preston, the local willingness to pay to preserve these farms would have been **\$2,498** per acre (see figure 1). This does not include additional values that residents elsewhere in the state would also hold for the same preservation activity – in this case, **\$153,598** per acre. So, a cost of \$16,000 per acre would not be justified if all of the cost were to be paid by Preston residents (who would only be willing to pay **\$2,498** per acre). However, the cost would be easily justified if the costs were spread statewide—for example via a statewide bond. In this case the total willingness to pay would be **\$156,096** per acre (this is equal to **\$2,498 + \$153,598**).

Another acquisition in Simsbury, of forested land at a high risk of development, is currently underway at a price of \$32,763 per acre. At the August 15, 2006 Board of Finance meeting, the Chairman of Simsbury's Finance Board expressed concern about the discrepancy between the per-acre purchase price of the two different types of land – working farm land at a for \$16,000 per acre vs. forested land for \$32,000 per acre.⁸ Referring to Figure 2, the community-wide willingness to pay in Preston for similar *forested land*, at a *high risk* of development, preserved via a *preservation contract* administered by a land trust, and providing *walking access* would be **\$13,856** per acre—substantially higher than the willingness to pay for

⁸ Minutes of Town of Simsbury, Board of Finance meeting, August 15, 2006.

preserving the previously described farm land⁹. These results show the significant differences in benefits and values associated with different types of open space preservation.

These results also point to the difference between the **market prices** negotiated in these types of land transactions and the **willingness to pay values** reported here. It is important to keep in mind that willingness to pay reflects the public's values for the benefits that they receive from open space. Benefits from open space derive from such things as recreational uses, scenic vistas, community character, or appreciation of the fact that farm and forest can be passed on to future generations. **These benefits are not generally reflected in real estate prices.** These non-market values are also in addition to any values related to the marketed value of farm products.

Do These Results Make Sense?

Yes, these results make sense, and are consistent with values found repeatedly in other areas of the country. Although these values—average (local) willingness to pay of almost \$7,000 per acre for open space *over and above* the state-wide values of over \$100,000 per acre —are substantial in aggregate, they are based on reasonable and modest payments per household. For example, if 41% of households in Preston were willing to pay one dollar per acre, per year, that would add up to a capitalized value of \$11,056 per acre. These numbers are, however, based on survey responses, not actual binding votes. Do people answer the surveys the same way they would actually vote? Research shows that surveys such as this one can predict actual votes and willingness to pay very closely if the survey is properly designed.¹⁰ Moreover, results such as this are common nationwide, and particularly in the northeastern United States. Many other New

⁹ The state-level willingness to pay for this type of land was \$234,402 per acre, also substantially higher.

¹⁰ See Johnston, R.J. 2006. Is Hypothetical Bias Universal? Validating Contingent Valuation Responses Using a Binding Public Referendum. *Journal of Environmental Economics and Management* 52(1): 469-481.

England open space preservation analyses have shown large public values for the preservation of rural lands.

About the 2005 Preston Land Preservation Survey

This research was funded by the National Research Initiative of the Cooperative State Research, Education, and Extension Service, USDA, Grant 2003-35400-13875. The study was designed to help policymakers better understand the values that the public holds for the preservation of farm, forest, and open space. The principal investigators on this study were Robert J. Johnston, associate professor, Department of Agricultural and Resource Economics and associate director, Connecticut Sea Grant college program, both at the University of Connecticut; and Joshua M. Duke, associate professor, Departments of Food and Resource Economics and Economics, and the Legal Studies Program, University of Delaware. The experimental design was completed by Lidia Rejto and Diccon Bancroft at the University of Delaware STATLAB. Tammy Warner Campson is a graduate research assistant in the Department of Agricultural and Resource Economics at the University of Connecticut, and assisted in analyzing study results and writing this report. Further information on the study, data, and methods is available from Dr. Robert Johnston, University of Connecticut at Avery Point, 1080 Shennecossett Rd., Groton, CT 06340-6048. (860) 405-9278, robert.johnston@uconn.edu.