Appendix--Alternative Ways to Estimate the Value of a Conservation Easement

The table below summarizes alternative ways to estimate the per-acre value of a conservation easement, as discussed in the text, based on the expected net returns illustrated in figure 4.

R_{at} expected annual net returns to agricultural use ($100 per acre every year)
R_{ut} expected annual net returns to urban use ($50 per acre in the first year, then $150 per acre every year thereafter)
i discount rate (5 percent per year, every year)
T duration of the easement (infinite)
V_{B0} today's per-acre value of the land before restrictions are imposed (determined below)
V_{A0} today's per-acre value of the land after restrictions are imposed ($2,000 per acre)
V_{e0} today's per-acre easement value; $= V_{B0} - V_{A0}$ (determined below)
t^* optimal time to convert from agricultural to developed use (determined below)

Method 1 compares the two uses assuming that expected returns remain constant at current levels.
Method 2 compares the two uses recognizing that expected urban returns change after the first year.
Method 3 considers the best sequence of uses, if conversion were to take place at the optimal time.
Method 4 considers the option of waiting for more information on adjacent development plans.

	V_{B0}	V_{A0}	V_{e0}	t^*
1	$\max\{R_{a0}, R_{u0}\}/i$ $= \max\{100, 50\}/0.05$ $= \$2,000$	R_{a0}/i $= 100/0.05$ $= \$2,000$	$2,000 - <u>$2,000</u> = $0	never
2	$\max\{\sum_{t=1}^{\infty} R_{at}/(1+i)^t, \sum_{t=1}^{\infty} R_{ut}/(1+i)^t\}$ $= \max\{\sum_{t=1}^{\infty} 100/1.05^t, 50/1.05 + \sum_{t=2}^{\infty} 150/1.05^t\}$ $= \max\{2000, 48 + 2857\}$ $= \$2,905$	$\sum_{t=1}^{\infty} R_{at}/(1+i)^t$ $= \sum_{t=1}^{\infty} 100/1.05^t$ $= 100/0.05$ $= \$2,000$	$2,905 - <u>$2,000</u> = $905	1st year
3	$\sum_{t=1}^{\infty} \max\{R_{at}, R_{ut}\}/(1+i)^t$ $= \max\{R_{a1}, R_{u1}\}/1.05 + \sum_{t=2}^{\infty} \max\{R_{a1}, R_{ut}\}/1.05^t$ $= \max\{100, 50\}/1.05 + \sum_{t=2}^{\infty} \max\{100, 150\}/1.05^t$ $= \$95 + \$2,857$ $= \$2,952$	$\sum_{t=1}^{\infty} R_{at}/(1+i)^t$ $= \sum_{t=1}^{\infty} 100/1.05^t$ $= 100/0.05$ $= \$2,000$	$2,952 - <u>$2,000</u> = $952	2nd year
4	$R_{a1}/(1+r) + 0.5(\sum_{t=2}^{\infty} \max\{R_{at}, R^H_{ut}\}/(1+i)^t)$ $+ 0.5(\sum_{t=2}^{\infty} \max\{R_{at}, R^L_{ut}\}/(1+i)^t)$ $= 100/1.05 + 0.5(\sum_{t=2}^{\infty} \max\{100, 250\}/1.05^t)$ $+ 0.5(\sum_{t=2}^{\infty} \max\{100, 50\}/1.05^t)$ $= \$95 + \$2,381 + \$952$ $= \$3,429$	$\sum_{t=1}^{\infty} R_{at}/(1+i)^t$ $= \sum_{t=1}^{\infty} 100/1.05^t$ $= 100/0.05$ $= \$2,000$	$3,429 - <u>$2,000</u> = $1,429	2nd year or never