
STEELE FARM: GREAT HILL ROAD. 4/08
AN: ECOLOGICAL ECONOMICS ANALYSIS.

WHY? Environmentalism has long argued that in order to protect the world's ecosystem we need to be able to assign a currency value to the life-support system it provides. Why? Because the world's ecosystem contributes massively to the *material* and spiritual welfare of mankind- as well as to the existence of all other life forms. One of the ways of recognizing this is to calculate how much we have and how much we are in the red, year on year, due largely to man made exploitation. In addition, such a valuation of the ecosystem services will illustrate their increasing 'scarcity', as they become more stressed- and predict their increasing value up to the point of infinity- without substitutes, wherever a reversal of patterns of depletion does not occur. The relative importance of the global ecosystem services value is stark when set aside global GNP: Costanza finds GNP to be (US)\$18 trillion per year (2007) compared to a range of (US)\$16 to \$54 trillion per year for ecosystem services [1]. These essential services are predominantly outside the market and belong to the 'common goods,' but we can calculate and show how a wealthy minority is squandering them.

The property at Steele Farm, though privately owned at present, is a concrete example of the alternative paths we can take to reach and respond to different valuations.

WHAT? We are going to measure and calculate the value of all the relevant ecological systems found at Steele Farm, using almost all of Costanza's 17 categories [2] where they perform in this predominantly (90%) forested piece of land. Waste treatment, climate regulation and food production are the most significant as well as plant/wildlife habitat and a small degree of water related services from wetland areas. By contrast, we also show two alternative measurements of marketable and sustainable services.

HOW? As well as adopting Costanza's methods we use a 'hybrid' of other methods (Hedonic, Contingent, Productivity, Replacement value), to highlight different non-market aspects, is used [3].

WHO? We have asked a knowledgeable group of Tamworth townspeople to help with the 'weighting' of ten conservation criteria for the area in which the farm cohabits, which are then fed into a formula for calculating its overall value.

WHEN? The most valuable time to do this is whenever a piece of land is possibly facing an economic loss or/and ecological depletion in one way or another- through 'development', extraction, or degradation of natural capital, and to actively oppose this with real alternatives.

ECOLOGICAL ECONOMICS: OMEF 501A-Green MBA Program

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‘PROJECT A’ PROPOSAL: MARKET VALUATION ALTERNATIVE.
1: Parcel of land: 110 ACRES in Tamworth, NH.
2: Site map attached.
3: Tax value calculations.
4: Real Estate value calculations.

1: DESCRIPTION OF THE PARCEL OF LAND. (See ‘Google’-Satellite image)

This is a family lot of approximately 100 acres; 114.8 acres if buildings and immediately contiguous land are included. It has a relatively flat topography, just beyond the foothills of the White Mountains.

Was formerly a tree farm and Apple orchard- has a large farmhouse and large barn.

It is predominantly a forested lot with a high mix of tree species, but mostly Pine.

The lot is in ‘current use’ status, with approved stewardship forester tax ‘rating.’

Great Hill Road begins in the center of Tamworth and this lot is about 1.3 miles from the town.

The town has a population of about 1,828 with 30-35% more in summer.

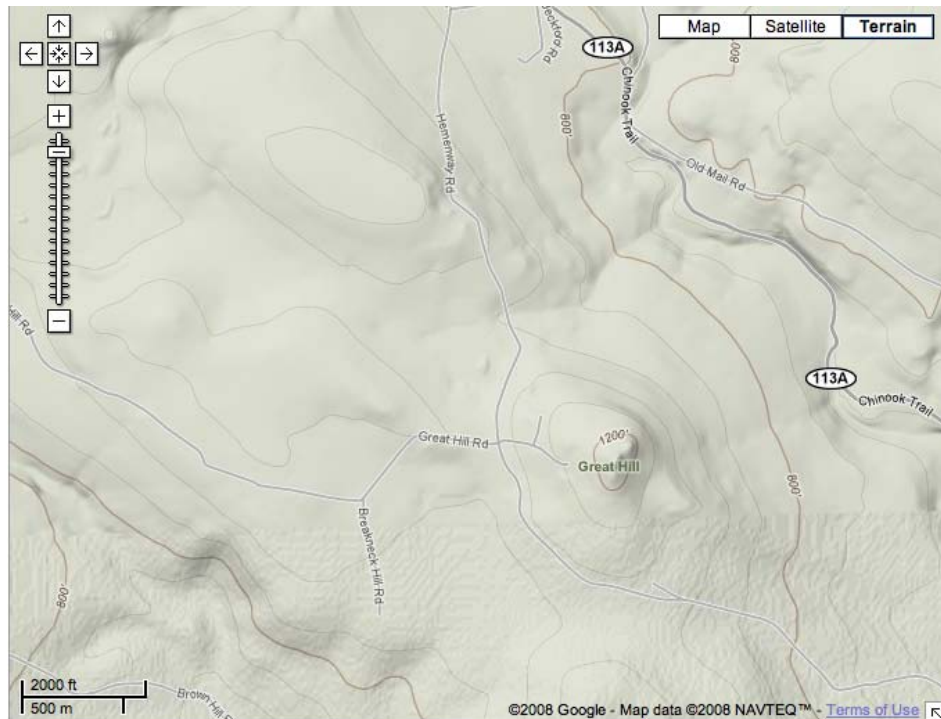
The next nearest house to the lot is 0.3 miles.

Hemingway State Forest Conservation land borders on the two main sides of the lot.

The many aesthetic aspects include a panorama of the White Mountain’s Mount Chocorua, as well as ‘Tall Pines’ Hemingway State Forest; and, provide extensive wildlife habitats for moose, black bear, deer, wild turkey, coyote, fisher-cat, raccoon, porcupine, beaver, otter, squirrel and chipmunk, salamander; and a large variety of rare (and common) birds and insects. Wetlands exist on a few acres and in the neighboring lot.

The property has substantial man-made, gravity-fed shallow water well, supplied from the mountain/foothills run-off.

2: SITE MAP



3: TAX VALUES.

As mentioned above the lot is assessed in 'current-use'- except for 4.8 acres immediately next to buildings. These dwellings are assessed at \$230,000 and the acres not in current-use are approx: \$36,000. Thus, the total value for tax being **\$266,000**

110 ACRES are forested, with a mix of tree species; Pine, Hardwood and others. Taking a median value for this from NH assessment ranges- at \$72 per acre- using the assessment for land under stewardship. Thus, the valuation for the forested section of the lot is approx \$7,920.

A few acres could loosely be termed wetlands and the slope of the land clearly assists in filtering water into the Swift River, in the center of Tamworth village as mentioned in the Forest Stewardship Plan

OVERALL CURRENT TAX VALUE= \$273,920.

4: REAL ESTATE.

The house and land has been 'assessed' recently, for 'fair market value', though this was not an appraisal.

The house itself together with the 13 acres that immediately surround it, are valued at approximately: **-\$409,000**

The value of the land not in current-use, assessed with the buildings is \$12,000 per acre.

The remaining forested 100 acres of land was valued at \$250,000- or \$2,500 per acre (assuming it remains in the 'current-use' category: - **\$250,000**

However, if the land were taken out of current-use and/or sub divided into 8 @12 acre lots, which is acceptable by statute, (for a penalty fee) then each of these lots are assessed at \$110,000. (\$100,000 after the fee approximately).

Statute requires a subdivision to have 200 feet of road frontage minimum- this lot has enough for 8 subdivisions. Thus, the above figure for the land could potentially be highly conservative, and could add another: - **\$800,000** to the value. This brings the current overall real estate value to a range of **\$659,000 - To\$1,459,000** approx.

ECOLOGICAL ECONOMICS.

An Alternative Method for Valuing a Piece of Land, for the Purpose of Conservation.

Conservation land has “public interest value” since it provides products and services such as wildlife habitat, climate regulation, waste cycling and water regulation, etc; as well as scenic views, recreation and cultural interests. Valuing the Steele Farm land has to factor all these ecological services and more.

But conservation lands per se are unique and so “there are few comparable sales or resale data to guide valuation”(Brown & Fausold[6]) whilst appraisals are based on the ‘best use’- defined typically as the most profitable economic use- clearly problematic for a space that produces ecological and public services that are valued **outside the market**.

Ultimately, such value reflects the benefit to all in the community that the land provides rather than mere economic transactions.

Brown and Fausold present a method for determining “**the conservation rating**” of a particular piece of land according to the conservation priorities of the particular community in which it is situated. These numerical rating’s are weighted, to highlight the relative public interest value of each feature. This is followed by finding “**the conservation value**”- where the above rating is converted to a dollar value by expressing it as a percentage of the average assessed value of land in the community- with clear allowance for the size of the property.

According to the method **the conservation value and, the market value are added**, to establish **the Replacement value**; thus incorporating both ecological and economic values. As noted in the introductory piece, such a valuation could be useful for ‘defending’ property from wholesale degradation and/or unscrupulous development, **especially if this offers a means- such as via a fee or taxation- of making the replacement value the actual value for consideration by all- including purchasers.**

APPLIED TO THE STEELE FARM FORESTLAND.

1. The Conservation Rating.

PART ONE:

The method for this leads by asking a representative group of people in the community, for their priorities: regarding both the forestland, and the wider community. These priorities are classified into criteria; which are scored from 0- 100 points; all the scores adding up to 100 points, resulting in a relative weighting of each criterion- as a percentage.

In Tamworth (the town in which the Steele Farm lot is situated) we selected ten conservation-minded people and presented the following list of criteria, and show the accumulated results alongside:

• Flood Control:	1
• Water Supply:	7
• Protection of Water Quality (from pollutants, sediment):	10
• Maintenance of Biological Diversity/ Wildlife Habitat:	24
• Buffer from Undesirable Land Uses	0
• Recreational Opportunity/ Hiking / Spiritual:	16
• Production of Natural Resources:	10
• Scenic Views:	28

• Historic/ Cultural Resources:	0
• Education:	4

PART TWO:	
Steele Farm's land was then rated, following the method, according to how well it met each of the above criteria on a: 0 – 3 scale, using the following guidelines with rating shown	
Flood Control:	
3 High Natural Valley Storage Capacities	
2 Medium Storage Capacities	4
1 Low Storage Capacity	
0 No Flood Control Benefit	
Water Supply:	
3 Existing Zone I or Capable of Producing Yield for Public Supply	4
2 Existing Zone II	
1 Existing Zone III	
0 No Potential as a Water Supply/ Ground source water recharge area.	
Protection of Water Quality/ Soil Erosion;	
3 Protects Class A Waters	
2 Protects Class B Waters	4
1 Protects Class C Waters	
0 Not Adjacent to Any Waterway	
Maintenance of Biological Diversity/ Wildlife Habitat:	
3 Site is listed in a State Natural Heritage Atlas as having National or Statewide Significance or provides a Corridor Linking other Open Lands	4
2 Site has local significance as a Habitat Area- Unique Features.	
1 Site is of common Distinction- no rare/ unique features.	
0 Site does not provide a significant Habitat Function.	
Buffer from Undesirable Uses:	
3 Site Buffers Public or Large Private Neighborhood – Sensitive Receptors from Adjacent Nuisance	
2 Site Buffers Small Private Neighborhood as above	
1 Site Buffers Non-Sensitive Receptors as above	
0 Site does not serve as a Buffering role	4
Recreational Opportunity/ Hiking/ Spiritual:	
3 Site is a Destination Point, Accessible to all, drawing people for Recreational Activity.	
2 Site Meets a Priority for Future Need Mentioned in the Open Space and Recreation Plan or in other Planning Documents	4
1 Site is not mentioned in any documents but is important.	
0 Not Applicable	
Production of Natural Resources:	
3 Site currently used for Timber and / or Firewood, Agri-products/ Community gardens	4
2 Site has Potential for above.	

1 Site provides a limited potential for above.

0 No Opportunity for above

Scenic Views:

3 Site Provides Distinctive Landscape Value... Wide and Unobstructed Views, Identified with Regional value 4

2 Site Recognized as providing above but with Obstructed Views.

1 Site provides interesting Landscape features that are not Readily Accessible.

0 Site does not provide any Scenic Qualities.

Historic Resources:

3 Features are listed on State or Federal Register of Historic Places

2 Features are listed on local Inventory of Significant, Cultural or Archeological Value 4

1 Features not listed in any Inventory.

0 Not Applicable

Education:

3 Site currently serves or is planning to serve as a destination for Organized Environmental Educational Programs 4

2 Site has Potential for above.

1 Site has Potential more as a supplement to other sites.

0 Not much Opportunity or Needs are met by other sites in Town.

PART THREE:

Finally, the site rating for each Criterion is then MULTIPLIED by the Community Weighting for that criterion to arrive at a weighted rating. The weighted ratings of each of the ten criteria are then summed to arrive at the total Conservation rating for the site.

The Conservation rating for Steele Farm's Land is: 273. To see what this means, read on.

2. The Conservation Value

To get to the conservation rating, in dollars, for Steele Farm's land, the average assessed value of land per acre in the town is calculated: this is equivalent to dividing the total assessed value of town land (alone), by the total number of assessed acres in the town. This is then multiplied, first: by the number of acres at Steele Farm and then multiplied again by the appropriate adjustment range, as set out by Brown and Fausold [7] according to the conservation score of 273.

The land at Steele Farm not surprisingly scores in the highest range of 250+ and therefore reaps the highest adjustment range of 26- 35%

Tamworth's assessed value of land per acre = \$12,500

Multiplied by 110 acres = \$1,262,500

Adjustment range of 26% = \$317,500 (approx) 'to':

Adjustment range of 35% = \$442,000 (approx)

3. The Market Value

The farm/ land was appraised recently (2007), on the 'best economic use' principle, which divided it up into several lots (see Market Valuation sheet).

Thus, based on eight lots, we have established an estimated land value of up to **\$800,000** (after 10% fee to town for taking land out of 'current-use'). As we noted there, this windfall 'once-off' profit could be reduced perhaps by 30-50% by costs associated with development (Brown and Fausold

suggest the higher level).
per acre

Using this figure, it represents a total = \$8,500

4. The Replacement Value

This final calculation is equal to the Conservation Value range added to the Estimated Market Value, and represents a plausible starting point for compensation negotiations by those affected, when land is converted to other uses.

Steele Farm's forestland Replacement Value = \$1,117,000 to \$1,242,000

Alternatively, using a median figure it represents = \$11,600 per acre.

PRO'S of this approach:

a) Involvement: of a cross section of the people in the town, in the assessment of the Ecological Service values and weighting.

b) Useful criteria listed and descriptions for the 0- 3 ratings of those criteria.

c) Assigning a combined dollar market value and dollar conservation value is both practical and factual- it 'speaks' to us.

CON'S of this approach:

a) It is not clear why the three "Value Adjustment" ratings are set at:

0 -10%; 11 -25%; and 26 -35%. Why not lower or higher ranges, so long as they reflect the relative Conservation ratings. Clearly, this is a weak link.

b) It is not clear whether the townspeople are responsible for Part Two of the Conservation Rating, which requires some specialized knowledge. In the interests of accuracy and science, it would be better if experts were involved, especially if litigation is possible.

c) Even with experts, critics will argue over the plausibility of putting a dollar value on such things as habitat areas, or recreational, or spiritual opportunities.

ECOLOGICAL ECONOMICS PROJECT 'A'
COSTANZA METHOD OF VALUATION:
APPLIED TO STEELE FARM

We will use the information from the Forest Stewardship Plan (see attached), which assesses the Biome area of the farm as predominantly Temperate/ boreal Forest.

Costanza's figures are adjusted as far as can be calculated to avoid double entries wherever services overlap.

Ecosystem Services (1994 US\$ per hectare, per year)

1 Gas Regulation: UNKNOWN VALUE

2 Climate Regulation: 88

3 Disturbance Regulation: unknown

4 Water Regulation: 0

5 Water Supply: unknown

6 Erosion Control: unknown

7 Soil Formation: 10

8 Nutrient Cycling: unknown

9 Waste Treatment: 87

10 Pollination: unknown

11 Biological control: 4

12 Habitat/refugia: unknown

13 Food Production: 50

14 Raw Materials: 25

15 Genetic Resources: unknown

16 Recreation: 36

17 Cultural: 2 Total = \$302 per hectare per year

Total for Steele Farm (110 acres) = **\$15,100 or \$1,510 per acre per year- (All figures are approximate)**

*Note the absence of figures for significant eco-services, which makes the resulting total highly conservative. For example we know how clear-cutting of forests in many areas causes land disturbance, affects water supply, erosion and habitat damage. This would apply if Steele Farm were clear-cut, to a certain extent- causing climate disturbance and the incurrence of increased water purification costs, amongst other things. This method cannot account for these at this time.

ECOLOGICAL ECONOMICS:
STEELE FARM VALUATION
USING THE: 'TO DEVELOP OR NOT TO DEVELOP' COST OF SERVICES
APPROACH (following an analysis by Sarah Friedman, 2000)[4]

I am adapting this approach to compare: (A) The economic and ecological services gains of a Sustainable Forest Stewardship Plan (to the inhabitants and the tax revenues); with: (B) The possible but uncertain economic gain/loss of revenues to the Town if 100 acres of Steele Farm were subdivided into 8 lots and developed, under two opposing scenarios. Assumptions and Conclusions follow.

A. TAX REVENUE IF UNDEVELOPED AND SUSTAINABLY MANAGED:	
ANNUAL LAND TAX (forested- current use):	\$168 @ 30 YEARS = \$5,040*
POTENTIAL TIMBER VALUE OVER 30 YEARS	
110 ACRES @ \$479 WITH 2 HARVESTS	
AT: YEAR 5, AND, 30.	@ 30 YEARS = \$106,000
COVER CROP VALUE:	
2 ACRES @ \$150	@ 30 YEARS = \$9,000
RECREATIONAL USE VALUE:	
200 VISITS @ \$5.00	@30 YEARS = \$30,000•
TOTAL ECONOMIC GAIN	OVER 30 YEARS = \$150,000

*All total are Current prices •Current prices; in addition, estimated visits specifically to the Steele Farm, its forests and vistas, encumbered with visits to the town and its amenities.

B. TAX REVENUE IF DEVELOPED:	
NUMBER OF LOTS = EIGHT.	
AVERAGE HOME VALUE \$200,000	
TOTAL ASSESSMENT OF HOUSING \$1,600,000	
TOTAL PROPERTY TAX PER YEAR = \$32,000. @ 30 Years = \$960,000	
<u>MINUS COSTS TO TOWN:</u>	

Scenario 1: Relatively many people, with multiple offspring	
With implied increase in cost to Town of municipal services:	
Including: water-quality, education, roads, police, fire, etc	
32 Residents, including 16 children	
Municipal/State = \$1600 per lot, per year = \$12,800.	@ 30 Years = \$384,000*
School = \$6,850 per Student p. year @ 16 = \$109,600	@ 30 Yrs = \$3,288,000
Under this scenario the Net Gain or (Loss) to Town, Annual = (\$90,400)	
<u>[Property taxes included]</u>	<u>@ 30 Yrs = (\$2,712,000)</u>

Scenario 2: Relatively few people with few children	
12 residents, including 2 children	
Municipal/ State = \$1000 per lot, per year = \$8,000.	@ 30 Years = \$240,000*
School = \$6,850 per student per year @ 3 = \$20,550.	@ 30 Years = \$615,550
Under this scenario the Net Gain or (Loss) to Town, Annual = \$3,450.	
<u>[Property taxes included]</u>	<u>@ 30 Years = \$104,500</u>

*All totals are at current prices, not adjusted for inflation over time

ASSUMPTIONS:

We are assuming that new homes will have the average value of existing homes, for the basis of property tax calculations. Another scenario might include homes of greater value. We also assume homes are occupied though 30-35% of Tamworth homes are 'second homes' or 'summer homes' with fewer subsequent costs to the town.

We are assuming all children will be educated in public schools and the school age/ costs distributed evenly.

CONCLUSIONS

The first assessment shows how there is no degradation to the ecosystem because its services are sustainable, INCLUDING a modest but noteworthy financial gain of \$150,000 to the income of the farm's owners and the town, through taxes.

The second assessment suggests there is a high probability of degradation to the ecosystem, as people move in.

AND, the economic costs RANGE from a more modest financial gain of \$104,500 to the town taxes, IF relatively few persons occupy the new homes- to a HUGE financial LOSS OF \$2,712,000- IF each home consists of an average of 4 persons.

To view the Costanza et al, 1997 article, [please click here](#).