

USDA Forest Service

## **CVal:**

### **Carbon Credit Benefit and Cost Analysis for Managed Forests**

Developed by:

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### **Climate Change Continuing Education Spring Webinar Series**

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# How Climate Change & Variability May Affect Forests

- **Productivity may change**
  - Longer growing season (+)
  - Increasing atmospheric CO<sub>2</sub> (+ / -)
  - Air pollution (-)
- **Damage from weather events**
  - Freeze/thaw events (-)
  - Droughts, ice storms, etc. (-)
  - Wildfire (-)
- **Forest pests and wildlife**
  - Altered insect and disease incidence (-)
  - Shifts in bird and other species populations
- **Species composition is changing**

USDA Forest Service

# USDA Forest Service



Marketable

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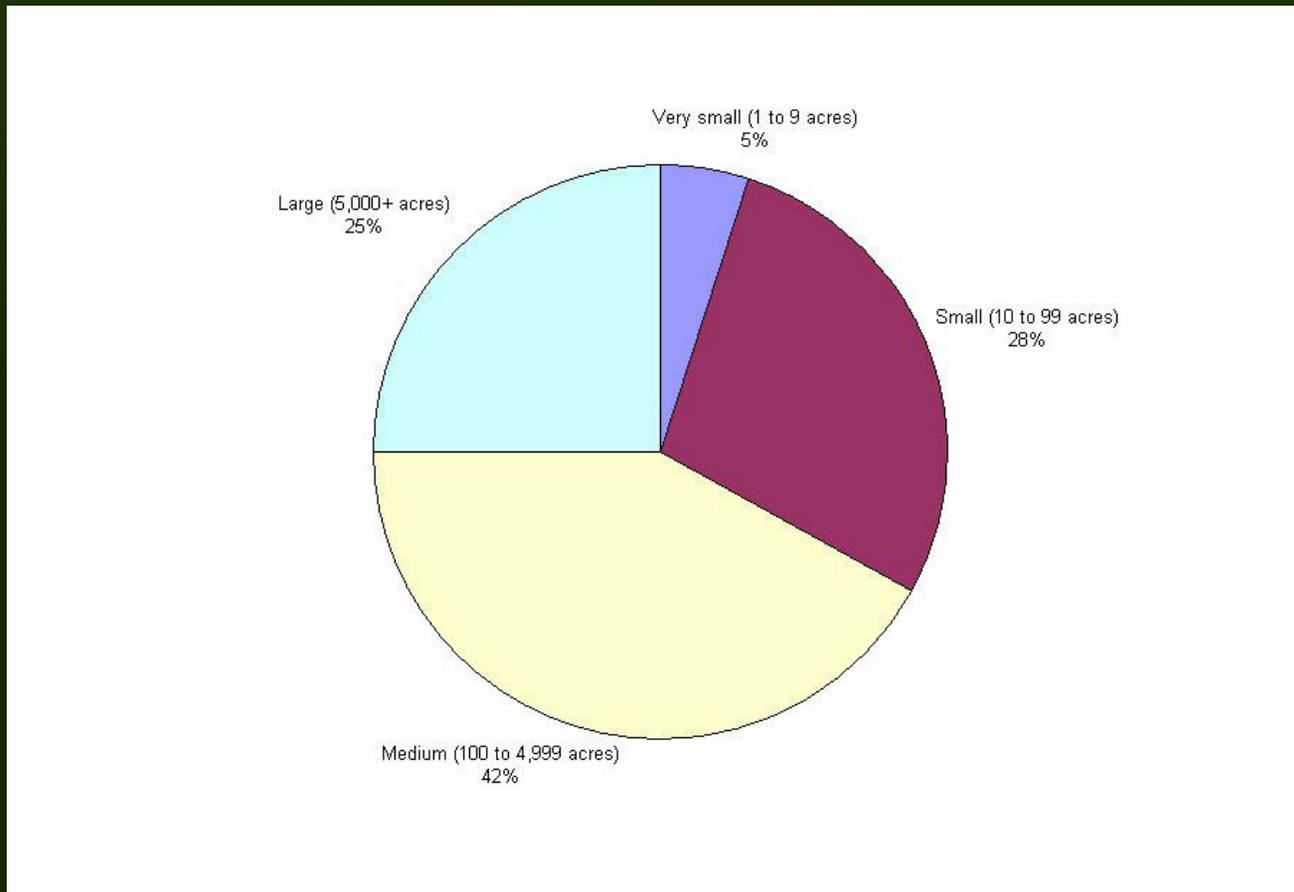
Non-Marketable

Priceless

# US Forest Ownership



# US Forest Ownership by Parcel Size



# Is there was an alternative to this...?

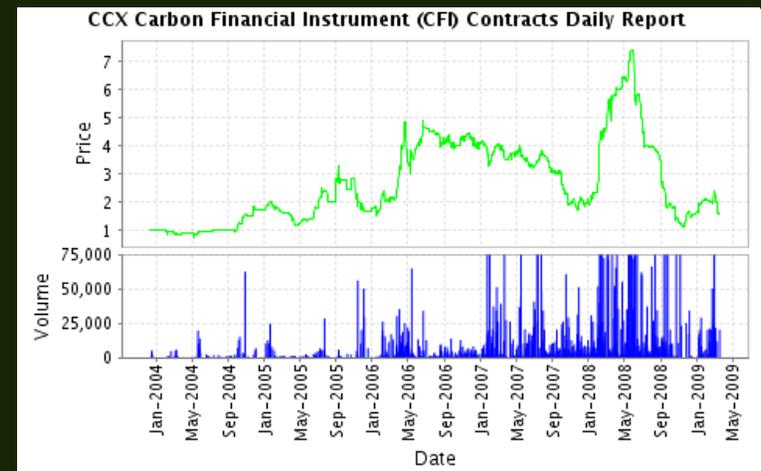
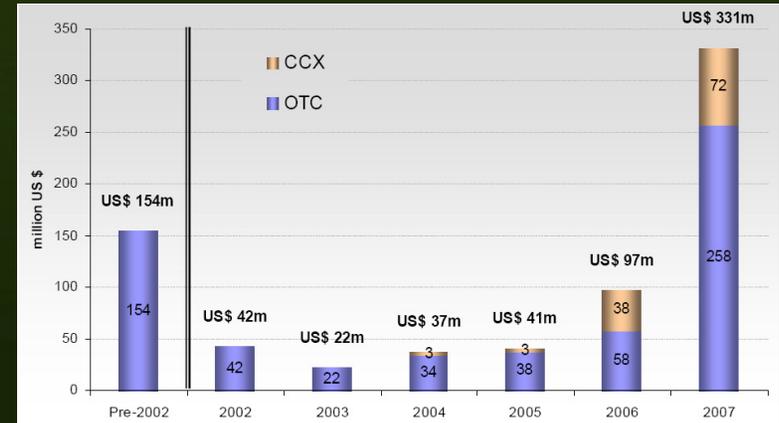


# CVaI: A Tool to Accurately Value Carbon Sequestration Contracts

Transaction Volumes and Values, 2006 and 2007<sup>1</sup>

Markets	Volume (MtCO <sub>2</sub> e)		Value (US\$million)	
	2006	2007	2006	2007
Voluntary OTC Market	14.3	42.1	58.5	258.4
CCX	10.3	22.9	38.3	72.4
<b>Total Voluntary Markets</b>	<b>24.6</b>	<b>65.0</b>	<b>96.7</b>	<b>330.8</b>
EU ETS	1,104	2,061	24,436	50,097
Primary CDM	537	551	5,804	7,426
Secondary CDM	25	240	445	5,451
Joint Implementation	16	41	141	499
New South Wales	20	25	225	224
<b>Total Regulated Markets</b>	<b>1,642</b>	<b>2,918</b>	<b>31,051</b>	<b>63,697</b>
<b>Total Global Market</b>	<b>1,667</b>	<b>2,983</b>	<b>31,148</b>	<b>64,028</b>

Source: Ecosystem Marketplace, New Carbon Finance, World Bank



Source: Forging a Frontier: State of the Voluntary Carbon Market 2008 by Ecosystem Marketplace. And Chicago Climate Exchange CFI Daily Reports, compiled from Dec 03 – Mar 09.

## CVal: Benefits

- Non-proprietary carbon valuation tool that can be used to easily evaluate the net present value (NPV) of a potential managed forest carbon contract
- Designed for use with CCX XFO contracts, but can easily be calibrated for use with other protocols
- Powerful, flexible, easy to use
  - User is able to toggle a comprehensive list of variables to perform sensitivity analyses, calculate year-by-year returns, project NPV, IRR, and MIRR, and break-even analyses

## CVal: Features

- Versions with or without built-in macros
- Auto-calculation of NPV, IRR, MIRR, and ending balance on a per-acre or per-project basis
- Cash flow table
- Built-in sensitivity analysis
- Integrated graphics demonstrating cash flow, sensitivity analysis, and rates of return
- Built-in warnings and error messages
- Extensive annotations

## CVal: Hot off the Presses

- Available at:  
[http://www.fpl.fs.fed.us/documnts/fplgtr/fpl\\_gtr180.html](http://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr180.html)
- Can download spreadsheet with or without macros, and the accompanying General Technical Report (GTR)

# CVal vs. Back-of-the-envelope

Microsoft Excel - CVal 1.01 macros.xls

File Edit View Insert Format Tools Data Window Help

Share As Application... WebEx Settings

R22

1 **CVal: Carbon Credit Benefit and Cost Analysis for Managed Forests** Version: 1.01 macros

2 Developed by E.M. (Ted) Bilek, USDA Forest Service, Forest Products Laboratory, email: tbilek@fs.fed.us, telephone: (608) 231-9507 NOTE: User-entered variables and assumptions are in blue.

3 In collaboration with Peter Becker, Eastern Ozarks Forestry Council, and Tim McAbee, LandMark Systems

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5 Tract name: **Peavey Pines**

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7 **Summary financial information for Peavey Pines as of year 6**

8 **Total net benefit at 5.0%: \$ 504**

9 **Internal rate of return: 16.6%**

10 **Modified internal rate of return\*: 13.2%**

11 \*MIRR at a finance rate of 5.0% and a reinvestment rate of 5.0%.

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13 **NOTE: Pre-contract sequestered CO2e IS NOT included in the benefits.**

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15 **Benefits and costs discounted at the hurdle rate of 5.0%**

	Total		Annualized over 3 years	
	Per acre	Per tract	Per acre	Per tract
Benefits valued as of year 6	\$ 14.16	\$ 3,540	\$ 5.20	\$ 1,300
Costs valued as of year 6	(12.14)	(3,036)	(4.46)	(1,115)
<b>Net benefit valued as of year 6</b>	<b>\$ 2.02</b>	<b>\$ 504</b>	<b>\$ 0.74</b>	<b>\$ 185</b>
<b>Net benefit valued as of year 9</b>	<b>\$ 2.33</b>	<b>\$ 583</b>	<b>\$ 0.74</b>	<b>\$ 185</b>

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NOTE: Per acre and per tract annualized net benefits valued at year 6 and year 9 are

1. CASH FLOW INPUTS

Tract size: 250 acres

Year 1 carbon sequestration rate: 1.50 tonnes CO<sub>2</sub>e/acre/yr

Sequestration rate is... Constant

Carbon reserve pool factor: 20%

Initial carbon price: \$ 3.50 per tonne CO<sub>2</sub>e

Carbon price is... Constant

Aggregator's fee: 10%

Verification fee: \$ 0.25 per tonne CO<sub>2</sub>e

Annual re-certification cost: \$ - per tract

Trading fee: \$ 0.20 per tonne CO<sub>2</sub>e

Other annual costs: \$ - per acre

Up-front costs sensitivity factor: 0%

Annual costs sensitivity factor: 0%

End-of-project costs sensitivity factor: 0%

Initial inventory cost: \$ 1.0

Management plan cost: \$ 1.0

Certification cost: \$

Other up-front costs: \$

Contract year (year that up-front costs occur):

Ending inventory cost: \$ 2

Other end-of-project costs: \$

Hurdle rate: 5

Finance rate: 5

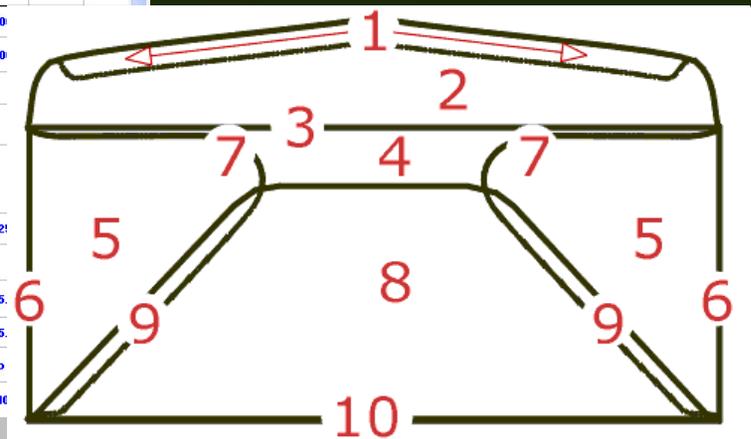
Count pre-contract carbon?: No

End-of-project year: 2010

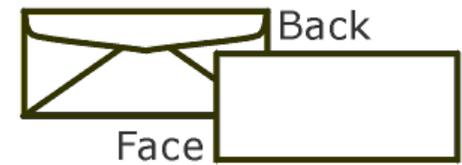
Total up-front costs: \$ 2.0

Total end-of-project costs: \$ 2

WARNINGS FOR THE INPUT TABLE (below):



- 1 Seal Adhesive
- 2 Top Flap
- 3 Top Fold
- 4 Throat
- 5 Side Flap
- 6 Side Fold
- 7 Shoulder
- 8 Bottom Flap
- 9 Seam Overlap
- 10 Bottom Fold



## CVal: General Findings

- **Critical:**
  - **Tract size**
  - **Whether pre-inventory carbon can be counted**
  - **Price of carbon**
  - **Sequestration rate**
  - **Hurdle & finance rates**
- **Important:**
  - **Start-up costs**
  - **Annual costs**

# A Quick Refresher

- **NPV** net present value; the current value of a series of cash flows
- **IRR** internal rate of return; indicator of the efficiency of a project, or yield on investment
- **MIRR** modified internal rate of return; assumes all positive cash flows are reinvested (at the weighted average cost of capital)
- **FINANCE RATE** cost of borrowing money
- **HURDLE RATE** aka minimum acceptable rate of return (MARR); the minimum return an individual or company is willing to accept on a project, given risks involved and other alternatives