



Carbon Credits:

An Opportunity for Forest Landowners

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Texas Forest Service

Texas Ag Forum
June 22, 2009





US Forest Carbon Markets / Registries

Currently, no national framework... YET!

- California Climate Action Registry
- *Chicago Climate Exchange (CCX)*
- DOE
- Georgia Carbon Sequestration Registry
- RGGI
- Over-the-Counter Transactions





What is a Carbon Credit?

- Computing CO₂ equivalents (CO₂e)
 - Carbon weight (C) = Tree Biomass dry weight/2
 - CO₂e = C*3.67
(based on molecular weights of C and O)
- 1 metric ton CO₂e is about 92% of 1 ton of green wood





Carbon Storage Rates

- U.S. Forests store 1 to 5 Mt CO₂e/ac/year
- East Texas forests ~ 3 Mt CO₂e/ac/year
- No till agriculture = 0.5 Mt CO₂e/ac/year





The Chicago Climate Exchange (CCX)

- North America's only active, voluntary and legally-binding GHG trading system
- Began GHG trading operations in 2003
- CCX membership system
 - CCX members make a voluntary, but legally binding commitment to meet annual GHG emission reduction targets of 6 percent by 2010
 - GHG trading among members
 - Large forest landowners can be a member
 - Small forest landowners can participate in providing offsets through an aggregator: An aggregator is a CCX-registered entity that pools smaller projects to allow them to be marketed on the exchange
 - Forestry is one of several types of CCX offset projects





Three CCX Offset Forestry Protocols

- Afforestation Protocol
- Sustainably Managed Forests Protocol
- Long Lived Wood Products Protocol





Afforestation

- Planted land that was not forested prior to January 1, 1990
- Trees may not be cut for 15 years
- Carbon credits are awarded based on annual increases in carbon stocks as determined by
 - CCX carbon accumulation tables
 - direct measurements
 - modeling





Sustainably Managed Forests

- Evidence of sustainable forest management
- Forests do not need to be afforested from non-forest lands
- Owners must make a 15-year commitment of sustainable management
- Owners must provide documentation of net increases in carbon storage
- A baseline of carbon storage must be established in order to measure or model annual net increases





Long Lived Wood Products

- Net carbon increases are determined by % carbon remaining in wood products in use and in landfills at the end of 100 years
- Timber sale contract must be explicit!
- Participants report harvest quantity and % softwood sawtimber, softwood pulpwood, hardwood sawtimber, and hardwood pulpwood from sustainably managed forests
- Using DOE guidelines, CCX developed factors that convert volume of wood harvested in each category to the quantity of carbon in use and in landfills at the end of 100 years





Calculating Carbon Credits

- Reference Tables
 - Based on geographic region, species, age class
- Direct Measurement / Modeling
 - Establish carbon baseline (carbon stocks on 12/31)
 - Forest inventory must be conducted
 - Results input into approved G&Y model
 - Model predicts net annual change (**growth**) in carbon
- Conversion Factors
 - Based on DOE technical guidelines





Carbon Accumulation Tables

<u>Region</u>	<u>Species</u>	1 through 5	6 through 10	11 through 15	16 through 20	21 through 25	26 through 30
South Central	Elm-ash-cottonwood	1.823	2.000	2.052	2.031	2.104	2.041
South Central	Loblolly-shortleaf pine	2.284	2.482	2.367	2.147	2.199	2.010
South Central	Oak-gum-cypress	1.152	1.948	2.534	2.419	2.345	2.104
South Central	Oak-hickory	2.053	2.252	2.220	2.073	2.042	1.958
South Central	Oak-pine	1.844	2.304	2.535	2.262	2.157	1.989





Verification

- All projects subject to verification by independent, third-party CCX-approved verifier
- Texas Forest Service is a CCX approved verifier
- Verification ensures that project protocols are properly followed and that the appropriate volumes of carbon dioxide are being recorded
- Offset projects subject to an initial verification and subsequent annual verifications





Verification Procedures

- Number of acres
- Species
- Tree Density (must be > 250 TPA)
- Planting date (must be after Jan 1, 1990)
- Carbon quantification method per CCX rules
- Prior land status (must be open on Dec. 31, 1989)
- Legal ownership
- Land Acquisitions/dispositions, damages noted
- Signed contracts, intent to maintain enrolled land





2007 Texas Pool Verification

Completed May 2008 (Feb – Dec 2007 pool)

- 129 Texas Family Forest Owners
- Afforestation Projects Only
- Approximately 14,000 Acres
- 269,458 MT CO₂e enrolled / **210,088 MT CO₂e verified**
- Some credits have been sold / Landowners paid (8/08)





Estimated Return for 2007 TX Pool

- 210,100 credits * \$5.00/credit

= **\$1,050,500**

- \$ 469,780 (fees and 20% reserve)

\$ 580,720

– \$41/acre revenue upfront for 2003-2007 credits

(Median landowner receives \$2,911)

– \$8/acre/yr for 2008 – 2010

– \$24/acre in 2011 (reserve credits released)





Anticipated Fees

- Aggregator – 10%
- Associate aggregator – 10%
- Verification – \$.15/credit
- CCX Transaction fees - \$.20/credit
- Reserve – 20% of credits held back





Anticipated Returns

- Amount of Credits Dependent on
 - Species
 - Geographic Location / Site Index
 - Management Intensity
 - Standing Volume
- Market Conditions





An Example of Potential Additional Return from CCX Forest Offset Programs





Assumptions

- One acre loblolly pine plantation
- Site Index (Base 25) = 60
- Trees per acre @ age 1 = 750
- Thinning and Final Harvest

Thinning and Final Harvest

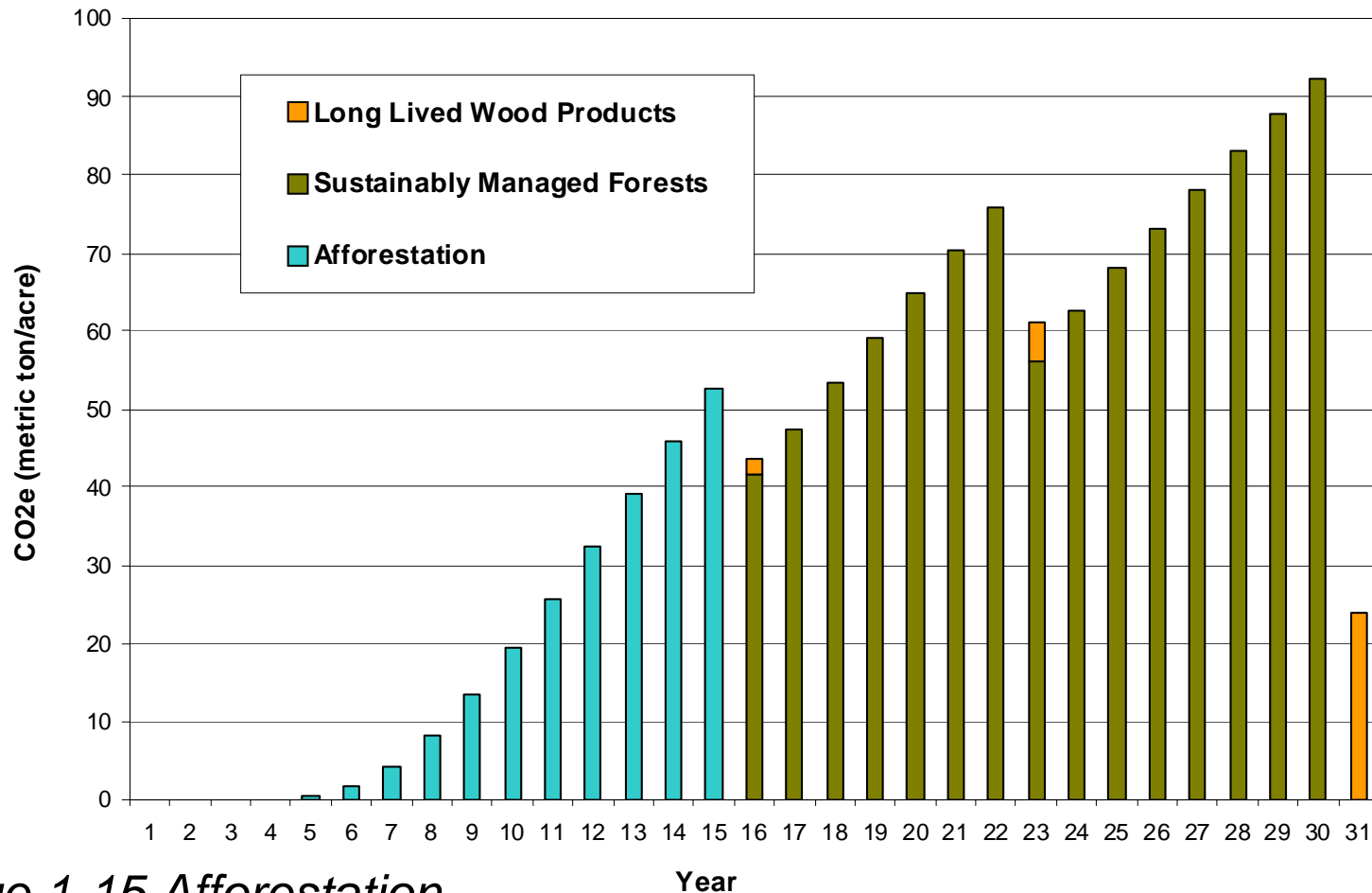
Year	Intensity
16	30%
23	30%
31	100%





Carbon Credits by Protocol

Cumulative Carbon Credits from a Loblolly Pine Plantation
in East Texas by Offset Protocol

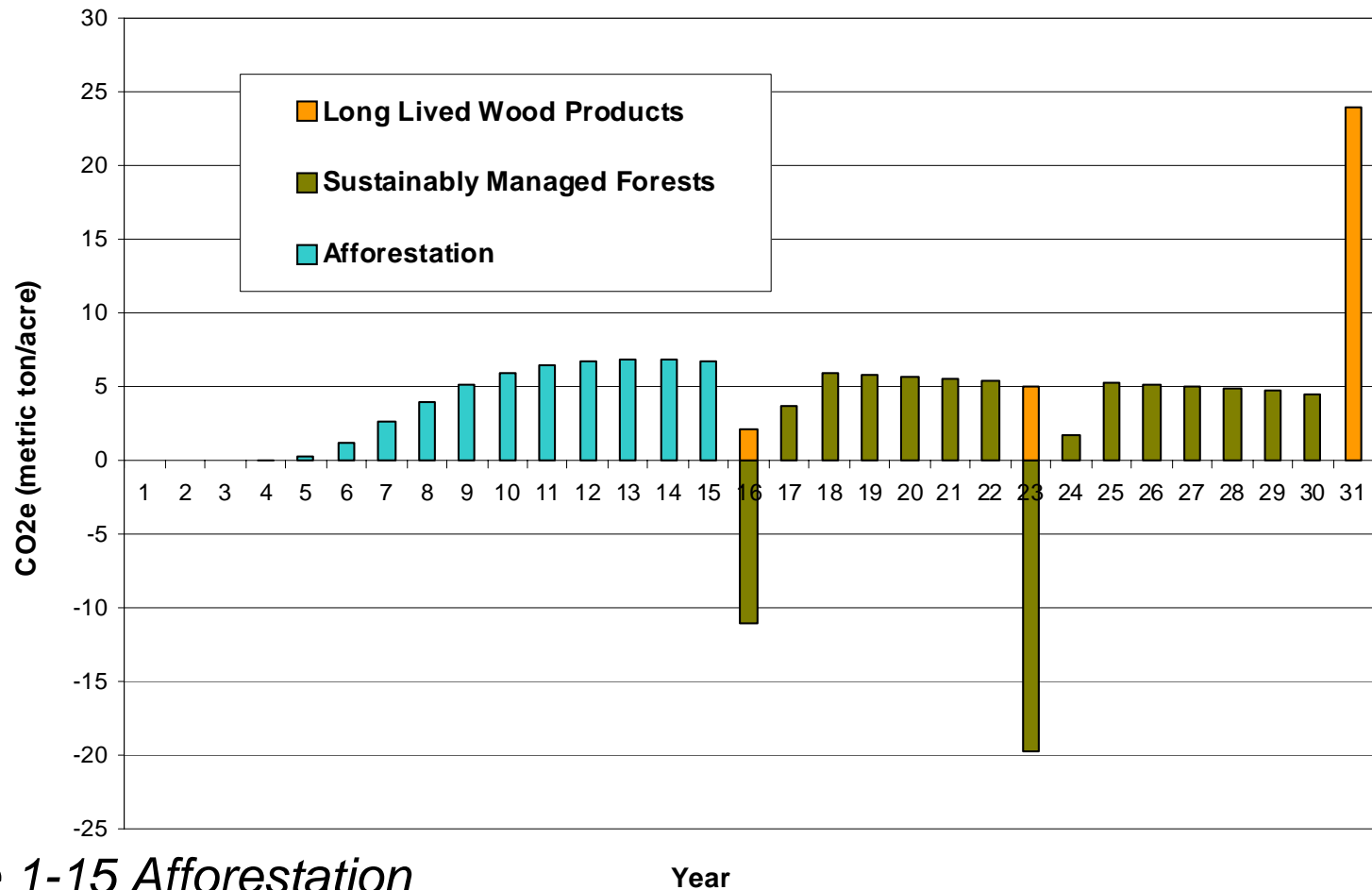


- *Age 1-15 Afforestation*
- *Age 16-30 Managed Forest*
- *Age 16, 23, and 31 Thinning & final harvest, long lived wood products*



Carbon Credits by Protocol

Incremental Carbon Credits from a Loblolly Pine Plantation
in East Texas by Offset Protocol

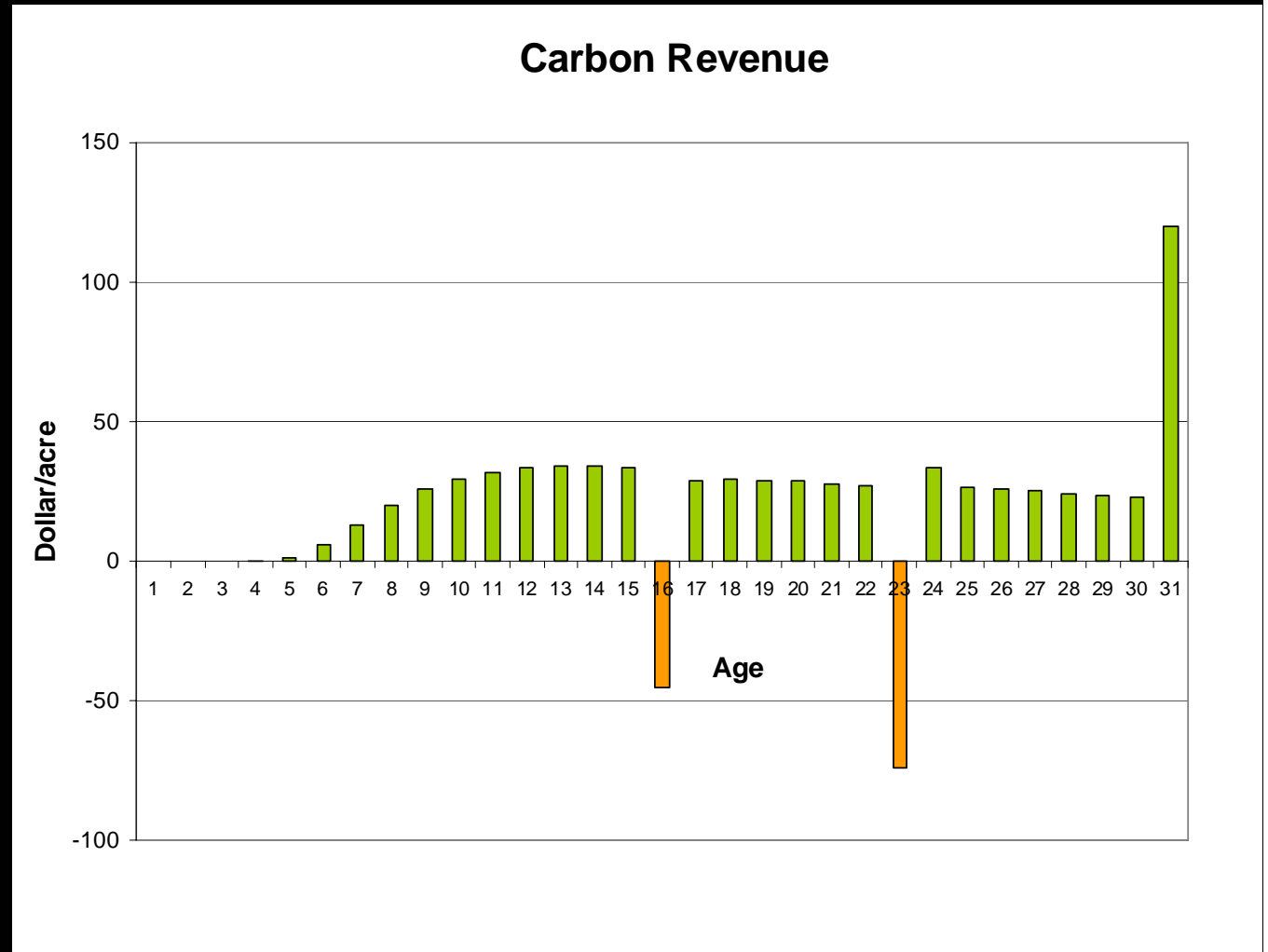


- Age 1-15 Afforestation
- Age 16-30 Managed Forest
- Age 16, 23, and 31 Thinning & final harvest, long lived wood products



Carbon Revenue by Program

- Assuming \$5/CO₂e
- Thinning has negative effect on carbon revenue
- Final harvest has positive effect on carbon revenue





Financial Returns for One Rotation

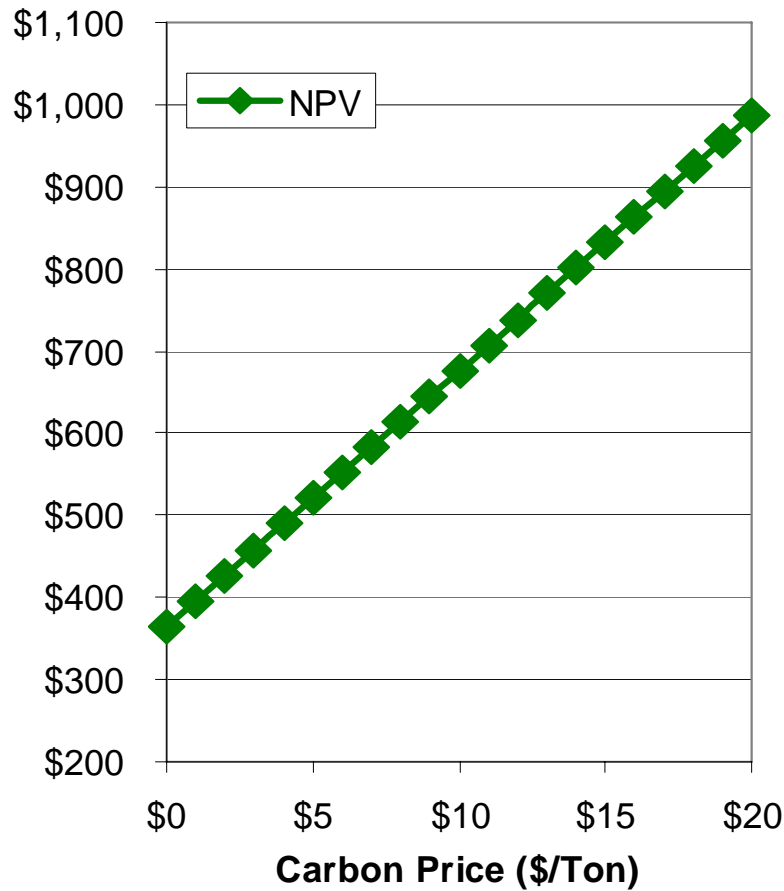
	NPV	IRR
With Carbon	\$520.49	9.2%
Without Carbon	\$364.73	7.9%



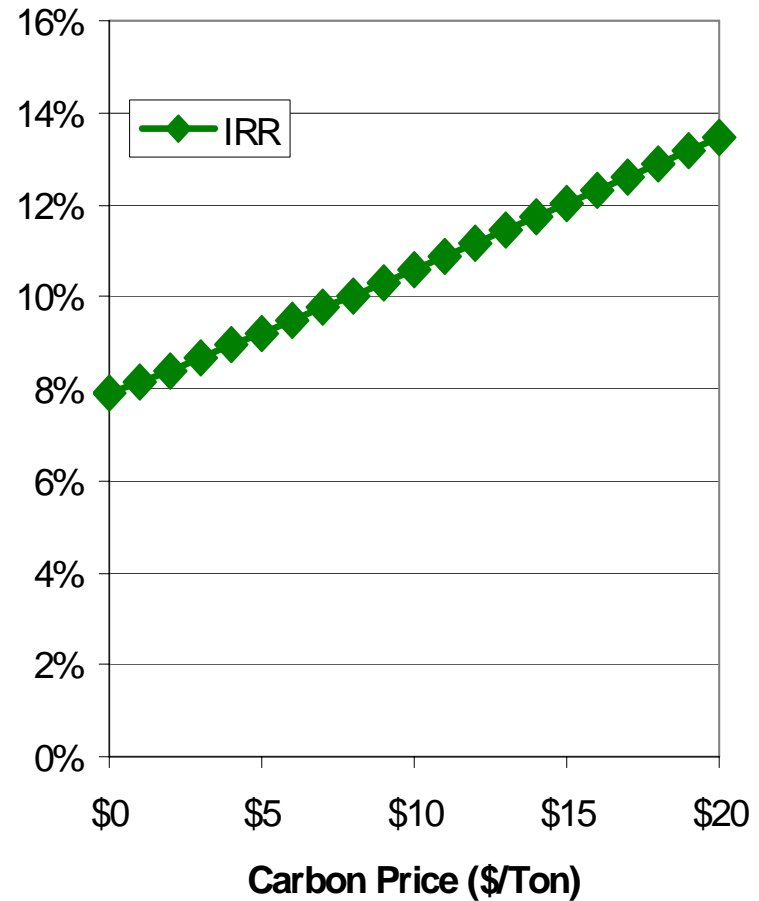


Substantially Improve Financial Returns

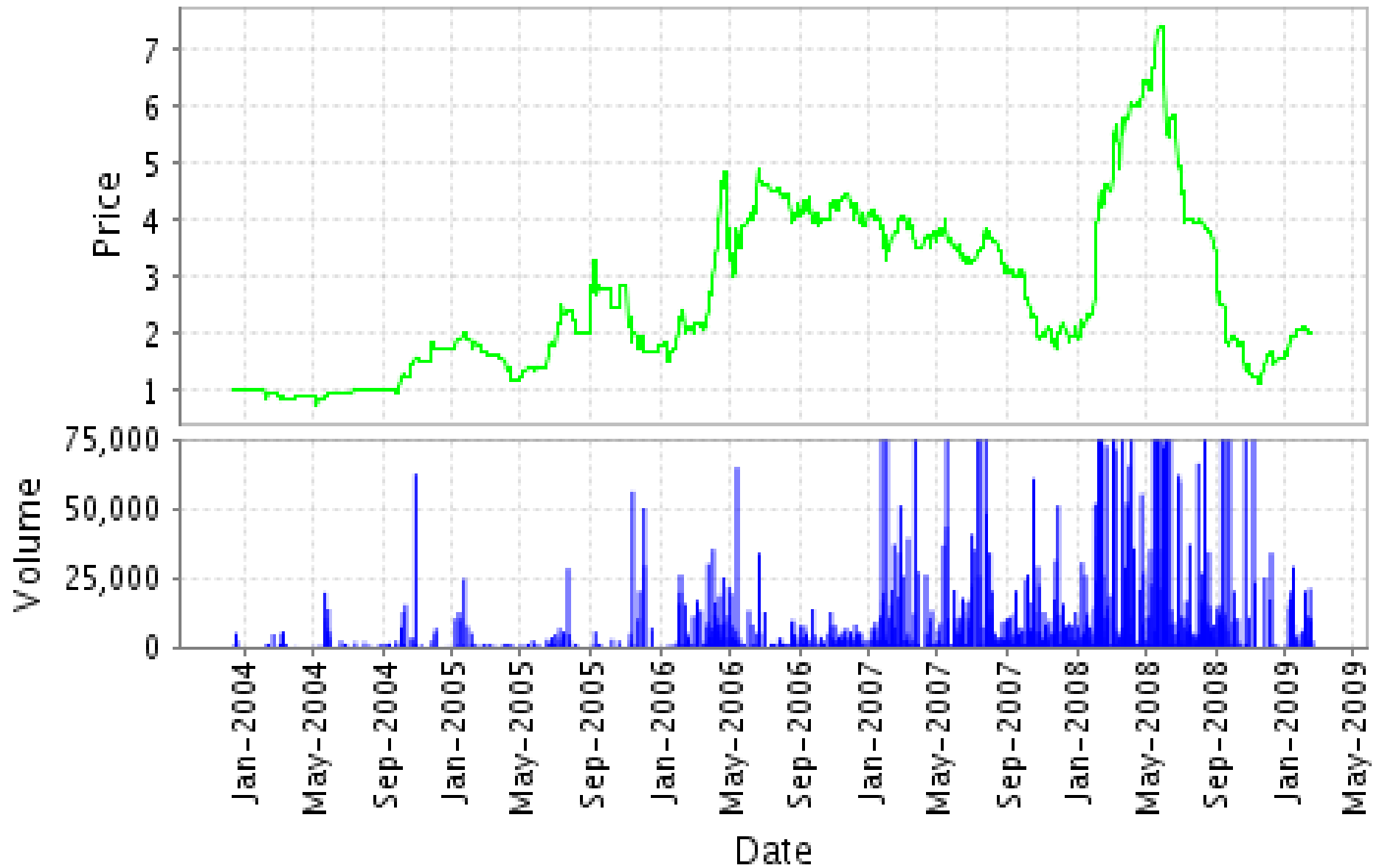
NPV



IRR



CCX Carbon Financial Instrument (CFI) Contracts Daily Report





Landowner Participation in TX

2009 Texas Pool (Jan 2008 – June 2009)

- Afforestation / Managed Forests projects
- Pine plantations, mixed forests, bottomlands
- 30 - 40,000 total acres
- May have separate 10,000 acre pool





SGSF Forest C Offset Rec's

Eligible Activities

- Afforestation/Reforestation
- Forest Management
- Urban Forestry
- Avoided Forest Conversion
- Harvested Wood Products





SGSF Forest C Offset Rec's

Eligible Carbon Pools

- Aboveground Live Biomass
- Belowground Live Biomass
- Harvested Wood products
- Soil Carbon in Afforestation projects
- **Other pools should be optional**





SGSF Forest C Offset Rec's

Measurement and Monitoring

- Reference tables and G/Y modeling
- “True up” inventories
- Statistically designed, re-measurable inventory plots
- Sliding scale discounts applied based on statistical precision





SGSF Forest C Offset Rec's

Verification

- Conducted by independent, third party
- Government oversight
- National GIS database to track projects
- Methods and results should be made public





SGSF Forest C Offset Rec's

Baselines and Additionality

- Base year approach
- Carbon achieved above baseline should be credible





SGSF Forest C Offset Rec's

Leakage

- Entity wide reporting to address internal leakage
- When applicable, forest certification
- Pending further data, external leakage should be ignored





SGSF Forest C Offset Rec's

Permanence

- Short term, renewable contracts
- Employ C reversal mitigation strategies
 - Buffer pools
 - Insurance
 - Like-kind pools
 - Biological risk management





SGSF Forest C Offset Rec's

Forest Sustainability

- State Forest Stewardship Plan
- 3rd party certification if applicable (ATFS, SFI, FSC)





SGSF Forest C Offset Rec's

Contracts

- Project length
- Monitoring
- Verification
- Carbon maintenance/replacement
- Penalties for noncompliance
- Dispute resolution





SGSF Forest C Offset Rec's

General Recommendations

- Protocol development delegated to USDA, not legislated
- Develop non offset incentive program
- Allow “stacking” environmental credits
- Give priority because of Co-benefits

