Supplying ecosystem services: Conservation & management decisions of farmers in eastern North Carolina

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Farm operator land mgmt and ecosystem services

Phase 1: Farm operator survey about knowledge, attitude and behavior regarding conservation programs, ecosystem services, and red wolf conservation

Phase 2: Cash flow modeling of farm operator land mgmt decisions

Source: Ryan Nordsven, U.S. Fish and Wildlife Service
Red Wolves

- Extinct in wild by 1980
- Reintroduced in eastern NC in 1987
- Currently in 5 NC counties covering ~1.7 million acres
- 100-130 individuals, 18-22 packs
- U.S. Fish & Wildlife Service runs Red Wolf Recovery Program

Source: http://www.fws.gov/redwolf/
Farm Operator Mail Survey

• 297 returned usable surveys

• Respondents:
  – Avg age – 60yrs
  – Avg years farmed – 30 yrs
  – 92% owned land

• Land management
  – Agriculture primary use (84%)
  – Corn, soybeans, cotton
  – Acres in permanent easement (7%)
## Conservation program participation

<table>
<thead>
<tr>
<th>Past participation in conservation program</th>
<th>Current participation in conservation program</th>
<th>Consider participating in PES program</th>
</tr>
</thead>
<tbody>
<tr>
<td>51% YES</td>
<td>33% YES</td>
<td>63% YES</td>
</tr>
<tr>
<td>45% NO</td>
<td>63% NO</td>
<td>7% NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30% Don’t know</td>
</tr>
</tbody>
</table>
Cash Flow Analysis of Farmer Land Management

Goal: Explore how market-based incentives may encourage greater habitat conservation effort by private landowners

• Create “representative” farms for major farm types in area

• Form “baseline” scenario for farm cash flow

• Compare w/ scenarios that include:
  – USDA conservation programs
  – Afforestation & no-till activities to generate carbon credits
## Representative Farm Attributes

<table>
<thead>
<tr>
<th>Farm Attributes</th>
<th>FARM A</th>
<th>FARM B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>West of Hwy 32</td>
<td>East of Hwy 32</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>500 acres</td>
<td>1000 acres</td>
</tr>
<tr>
<td><strong>Land use mix:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crops</td>
<td>300 acres (60%)</td>
<td>750 acres (75.0%)</td>
</tr>
<tr>
<td>Planted forest</td>
<td>125 acres (25%)</td>
<td>125 acres (12.5%)</td>
</tr>
<tr>
<td>Natural forest</td>
<td>75 acres (15%)</td>
<td>125 acres (12.5%)</td>
</tr>
<tr>
<td><strong>Crop mix</strong></td>
<td>Corn 30%</td>
<td>Corn 30%</td>
</tr>
<tr>
<td></td>
<td>Cotton 25%</td>
<td>Cotton 20%</td>
</tr>
<tr>
<td></td>
<td>Soy 15%</td>
<td>Soy 30%</td>
</tr>
<tr>
<td></td>
<td>Peanuts 30%</td>
<td>Wheat 20%</td>
</tr>
</tbody>
</table>

Informed by NC Extension agents, survey results, and USDA data.
## Scenarios in Analysis

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Conditions</th>
</tr>
</thead>
</table>
| **Business as Usual (BAU)** | • Annual crops harvested  
                          • Timber harvested at end of 40-yr period |
| **Conservation**       |                                                                             |
| Low                    | • 20% cropland $\rightarrow$ CRP  
                          • Soybeans $\rightarrow$ No till |
| High                   | • Same as Low  
                          • 15% cropland $\rightarrow$ WRP |
| **Carbon Stacked**     |                                                                             |
| Low                    | • Most cropland $\rightarrow$ No till  
                          • Sell carbon from CRP & WRP land  
                          • $5/\text{tCO}_2$ |
| High                   | • Most cropland $\rightarrow$ No till  
                          • Sell carbon from CRP & WRP land  
                          • $30/\text{tCO}_2$ |
Calculation of On-farm Carbon Values: Offset Project types

• Conservation tillage
  – Measure how much carbon stored with no-till vs. conventional tillage
  – Using 1.65 tCO2/acre/yr (Franzluebbers 2010)

• Afforestation = planting trees on land where crops are currently
  • US Forest Service tables for carbon stored per acre of forest by forest type for Southeast region
Red Wolves & Land management practices

• Conservation Tillage
  • Better habitat for deer and small mammals b/c
    – Crop residue increases wildlife cover & food
    – Less frequent disturbance by farm equipment

• Afforesting native tree species
  – Better landscape connectivity; corridors for travel
  – Native spp mix provides better habitat for prey
Conservation and Carbon Scenario Returns – Farm B

- BAU
- Conservation low
- Conservation high

NPV/acre

$1,000

$1,200

$1,400

$1,600

$1,800

$2,000
Conservation and Carbon Scenario Returns – Farm B

NPV/acre

<table>
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<th>Scenario</th>
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<tbody>
<tr>
<td>BAU</td>
<td></td>
</tr>
<tr>
<td>Conservation low</td>
<td></td>
</tr>
<tr>
<td>Conservation high</td>
<td></td>
</tr>
<tr>
<td>Carbon stacked $5</td>
<td></td>
</tr>
<tr>
<td>Carbon stacked $30</td>
<td></td>
</tr>
</tbody>
</table>
Cash Flow Analysis Results

• Carbon Stacked returns
  • $5/tCO2: 6% above Business-as-Usual
  • $30/tCO2: 29% above BAU

• Carbon only scenarios
  • $5/tCO2: 23% below BAU
  • $30/tCO2: 0.3% below BAU
  • Breakeven price ~ $30/tCO2
Discussion - Cash Flow Analysis

- Why farmers might not participate in conservation or carbon markets:
  - “concern about govt restrictions on private property”
  - Do not want to change land mgmt practices
  - Transaction costs - paperwork, hassle, etc.
  - Expect profit premium of 10-20% to change mgmt

- Reasons to try alternative land mgmt
  - Diversify income stream
  - Conservation payments stable through time
  - Carbon variable but potential upside
Discussion – Carbon Markets

• Stacked carbon payments could provide additional incentive for landowners to do conservation, thereby enhancing red wolf habitat

• Federal cap-and-trade program best way to put price on carbon...but not likely near-term
  • State or regional efforts underway
  • Funding for mitigation practices through other govt programs
  • Voluntary market buyers (pre-compliance)
Conclusions

• Mgmt alternatives could be combined profitably with conventional land mgmt

• Stacking carbon payments on Farm Bill programs could be profitable to landowners and benefit red wolves
  • Aggregator/intermediary needed to facilitate this
  • Could stack PES payments on CRP instead

• Conservation tillage may be more attractive than afforestation since farmer still growing crops

• Habitat connectivity (via afforestation) maximized by targeting certain properties
THANKS
Ecosystem Services, Markets, and Red Wolf Habitat: Results from a Farm Operator Survey

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ECOSYSTEM SERVICES SERIES
Pocosin Restoration Returns

NPV/acre

- BAU
- Conservation low
- Conservation high
- Pocosin $30
- Pocosin stacked $30

$1,000 - $2,600