Technical Progress Report on Application and Development of Appropriate Tools and Technologies for Cost-Effective Carbon Sequestration

Quarterly Report
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DISCLAIMER

ABSTRACT

The Nature Conservancy is participating in a Cooperative Agreement with the Department of Energy (DOE) National Energy Technology Laboratory (NETL) to explore the compatibility of carbon sequestration in terrestrial ecosystems and the conservation of biodiversity. The title of the research project is "Application and Development of Appropriate Tools and Technologies for Cost-Effective Carbon Sequestration".

The objectives of the project are to: 1) improve carbon offset estimates produced in both the planning and implementation phases of projects; 2) build valid and standardized approaches to estimate project carbon benefits at a reasonable cost; and 3) lay the groundwork for implementing cost-effective projects, providing new testing ground for biodiversity protection and restoration projects that store additional atmospheric carbon. This Technical Progress Report discusses preliminary results of the six specific tasks that The Nature Conservancy is undertaking to answer research needs while facilitating the development of real projects with measurable greenhouse gas impacts. The research described in this report occurred between April 1st , 2005 and June 30th, 2005. The specific tasks discussed include:

- Task 1: carbon inventory advancements
- Task 2: emerging technologies for remote sensing of terrestrial carbon
- Task 3: baseline method development
- Task 4: third-party technical advisory panel meetings
- Task 5: new project feasibility studies
- Task 6: development of new project software screening tool

Work is being carried out in Brazil, Belize, Chile, Peru and the USA. Partners include the Winrock International Institute for Agricultural Development, The Sampson Group, Programme for Belize, Society for Wildlife Conservation (SPVS), Universidad Austral de Chile, Stephen F. Austin University, Geographical Modeling Services, Inc., Los Alamos National Laboratory, Century Ecosystem Services, Mirant, General Motors, American Electric Power, Salt River Project, UC Berkeley, Michael Lefsky, Colorado State University and the Carnegie Institution of Washington.

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EXECUTIVE SUMMARY

The April - June 2005 quarter is the first reporting period since the signing of the extension of the co-operative agreement between The Nature Conservancy and the Department of Energy. The new extension of the grant is to undertake two distinct research projects:

- ***"Monitoring Forest Carbon and Impacts of Climate Change with Forest Inventories, High-Resolution Satellite Images, and LIDAR"***

- ***"North East Carbon Feasibility Study"***

Work was initiated on the California project with fieldwork by Nature Conservancy staff and partners to choose the exact research sites in North Yuba River Area, Tahoe National Forest and in the Garcia River Forest, Mailliard Redwoods State Reserve, CA. Similarly work was started immediately on the North East Carbon Feasibility Study with two kick off meetings with stakeholders in the Northeast Region.

During this quarter a number of the remaining topical reports for research which has taken place over the last 3 years were completed. Winrock International completed their remaining reports on the results of the multi-spectral three dimensional imagery in Belize and the Delta National Forest, in addition to their review of the methods for automatic crown delineation. Patrick Gonzalez, TNC scientist, working with partners completed his review of three methods to project future baseline carbon emissions in temperate rainforest in Chile. The new project software screening tool was completed, and submitted to the Department of Energy and distributed to Nature Conservancy staff.

EXPERIMENTAL

Task 1 Carbon Inventory Advancements

Carbon Inventories can be increased and costs lowered through improved techniques. Forest Inventories have been carried for a number of reasons; to use for M3DADI calibration (task 2), for use in carbon baseline development (task 3) and for development of new regression equations and improved estimates of biomass for different terrestrial systems. Laser Induced Breakdown Spectroscopy (LIBS) calibration will also be carried out as a part of this carbon inventory effort in Brazil.

Task 2 Emerging technologies for remote sensing of terrestrial carbon

Emerging remote sensing technologies, including high-resolution satellites such as QuickBird and Light Detection and Ranging (LIDAR), provide potential tools to scale up carbon estimates from hectare-scale forest inventory plots to landscapes of hundreds of square kilometers. We will test the capabilities of three technologies, QuickBird 0.6 m resolution imagery, LIDAR, and digital videography to quantify aboveground forest carbon at three sites in the United States.

We will employ QuickBird and LIDAR in an applied research project "Monitoring Forest Carbon and Impacts of Climate Change with Forest Inventories, High-Resolution Satellite Images, and LIDAR." The project is a collaboration of the California Department of Parks and Recreation, Carnegie Institution of Washington, the Conservation Fund, Colorado State University, the Nature Conservancy, Stanford University, USDA Forest Service, U.S. Department of Energy, and the University of California, Berkeley.

Multispectral 3-D Aerial Digital Imagery (M3DADI) studies will be conducted by Winrock International. M3DADI uses GPS-base mosaicing techniques and off-the-shelf equipment with camera mounts that can be attached to any Cessna aircraft to generate accurate raster-based photomaps. After the videography is flown, 3-dimensional (3D) reconstruction are developed from video that identifies terrain features and vegetation types and measures the height and mass of individual trees. The measurements from the videography are then calibrated with the carbon inventory data and regression equations from Task 1 to estimate carbon remotely.

Task 3 Carbon Baseline Method Development

We will develop and refine spatially explicit methods for estimating the carbon sequestration baseline for proposed forest conservation and reforestation projects at three sites in the United States and five sites in Latin America. The methods project possible future deforestation and reforestation trends and permit the calculation of carbon offsets from project activities.

Task 4 Third-Party Technical Advisory Panel Meetings

Standardizing measurement procedures and methods for carbon monitoring is a major step in the demonstration that land use projects should be creditable under any future regulatory

mechanism. The Technical Advisory Panel (TAP) will gather a group of experts to evaluate existing methods and to develop standardized carbon offset measurement guidelines for use in all land-use change and forestry projects.

Task 5 New Project Feasibility Study
While there seem to be a variety of project ideas that would lead to cost-effective sequestration and biodiversity protection, there has been little work accomplished to explore the feasibility of these ideas. Within the United States, we have yet to develop sound knowledge of the potential for implementing specific forestry and agricultural carbon sequestration projects. By assessing the cost and potential carbon benefits of different domestic projects we can learn more about how conservation and carbon sequestration projects may or may not be compatible.

Task 6 Development of new project software screening tool
Carbon measurement and monitoring costs are unique transaction costs for forest-based carbon sequestration projects. Project developers need to weigh the costs of carbon measurement and monitoring against the potential benefits of the sale of carbon offsets (carbon revenue). Carbon benefit data from USDA Forest Service inventories will be combined with carbon measurement and monitoring variables in a spreadsheet-based tool to allow users to compare potential carbon costs and revenues on a project level.

RESULTS AND DISCUSSION

Task 1: Carbon Inventory Advancements

Brazil

SPVS in collaboration with Winrock International and The Nature Conservancy carried out destructive sampling of a total of 23 trees (DBH>20 cm) to check the accuracy of the biomass regression equation that were used to estimate forest carbon tree stocks. Using the destructive sampling data the measured biomass was compared with estimates of biomass using the wet and moist equations (from Brown 1997). During this quarter The Nature Conservancy (Brazil) and SPVS worked on previous integrating comments given from Climate Change on their topical report which covers a discussion of the results of this research. SPVS´s team is working on the analysis of destructive sampling data in order to write a publication about this theme.

California

In collaboration with the Carnegie Institution of Washington at Stanford, Colorado State University, and the University of California, Berkeley, Nature Conservancy staff finalized the research methods and research plan for the project "Monitoring Forest Carbon and Impacts of Climate Change with Forest Inventories, High-Resolution Satellite Images, and LIDAR." We have hired a forest inventory crew to start in July, Figures 6 and 7 show the research sites in two ecologically significant, high carbon density areas in California. (see Appendix 1 and 2)

Task 2: Remote Sensing for Carbon Analysis

Progress:

California

For the work in California work the QuickBird satellite has been tasked for an August acquisition of data, and arrangements have started for LIDAR flights in August.

Belize

The completion of the topical report " Application of Multispectral 3-D Aerial Digital Imagery for Estimating Carbon Stocks in a Closed Tropical Forest" was delayed because of extra forest inventory fieldwork which had to be completed in Belize. The first draft of the report has now been submitted to the Nature Conservancy by Winrock International for review. The executive summary is below:

Executive Summary of Topical Report: "*Application of Multispectral 3-D Aerial Digital Imagery for Estimating Carbon Stocks in a Closed Tropical Forest"*

The M3DADI (Multispectral Three-Dimensional Aerial Digital Imagery) system offers the potential for the accurate, precise and cost effective measurement of carbon stocks. M3DADI collects high resolution overlapping stereo imagery (≤ 10 cm pixels) from which a virtual forest can be created where crown area and height of individual plants and trees can be measured. The

M3DADI system has been tested in highly heterogeneous savanna and homogeneous temperate forest. To date, however, there has not been a full test of the ability of M3DADI to determine carbon stocks in closed tropical forest such as exists in the Rio Bravo Conservation Management Area (RBCMA) in Belize, Central America.

In 2003, 117 km of transects were flown over the closed forest of RBMCA in Belize using the M3DADI system. Thirty-nine aerial imagery plots were analyzed representing 1.45 % of the collected aerial data. On these plots the height and crown area of each tree was measured. To extrapolate biomass from measurements of crown area and height, 86 trees were measured by Programme for Belize and correlations created that link the facets measurable in aerial imagery with biomass (derived from diameter at breast height).

This study shows that aerial analysis can be an effective and efficient method of biomass determination over closed tropical forest in Belize. Just 39 plots were needed to estimate biomass carbon with 95 % confidence intervals equal to 7.4 % of the mean. In contrast 101 ground plots measured in 2000 produced a comparable estimate with confidence intervals equal to 8.5 % of the mean. So 39 aerial plots produced an estimate that was more precise than the estimate that was measured with 62 more plots on the ground.

This study had the auxiliary benefit of identifying an error previously attained in the analysis of the ground data collected in 2000. The original ground analysis showed a mean carbon density across the unburnt strata of 75.2 t C/ha (Brown et al 2001), which compares very poorly with the density estimated from the aerial imagery of 117.3 t C/ha. Reanalysis of the ground data identified an error in analysis and a recalculated carbon density of 124.4 t C/ha.

This marks the third complete study of the effectiveness of the M3DADI system for the determination of carbon stocks.

- In the Belize savanna the very high spatial variability meant that, for the very large number of plots required, aerial analysis was more efficient (high fixed costs but low costs for additional plots analyzed).
- In Delta National Forest in Mississippi relatively few plots were required for aerial or ground analysis but aerial analysis removed the complications and dangers of traversing the flooded topography.
- Here in the closed forest in Belize for the first time a significantly lower number of plots were required for aerial analysis as opposed to ground measurements.

This study shows that the complex canopy of tropical forests is well suited to the M3DADI system. The complex multi-layered canopy facilitates the identification and measurement of separate tree crowns. The studied area is particularly suited due to its flat topography. In the closed forest it was often complex to measure ground height adjacent to each tree, if topography were varied it would be necessary to use an alternate equation that does not employ tree height and would therefore be less precise.

Delta National Forest

In March 2005 The Nature Conservancy received from Winrock International a first draft of the topical report "*Application of Multi-Spectral 3-D Aerial Digital Imagery for Estimating Carbon Stocks in a Bottomland Hardwood Forest*". This report was reviewed by Nature Conservancy staff and returned to Winrock International with comments. The revised version of the report has now been received by The Nature Conservancy and is awaiting second review. The final version

will of this report will be sent to the Department of Energy in the next month. The executive summary is below:

Executive Summary of Topical Report: "Application of Multi-Spectral 3-D Aerial Digital Imagery for Estimating Carbon Stocks in a Bottomland Hardwood Forest"

The purpose of this study was to determine the ability of Winrock's aerial imagery system (M3DADI) to accurately and precisely sample biomass carbon in a homogeneous closed crown system such as Delta National Forest.

From 30 aerial imagery plots we estimated an aboveground live biomass carbon value of 100.4 t C/ha ± 6.7 (mean ± 95% confidence interval). The 95 % confidence interval from these measurements represents just 6.7 % of the mean.

Previous field measurements in Delta National Forest determined an aboveground live biomass carbon estimate of 114.9 t C/ha ± 15.8. The range of values from the 23 measured field plots was 34 – 174 t C/ha. The range from the aerial plots was 61 – 127 t C/ha.

From the variance of the estimates it was determined that 39 plots would be required to achieve a 95 % confidence interval equal to 10 % of the mean if measurements were on the ground. From aerial measurements just 13 plots would be required. The terrain in Delta National Forest is very hard to traverse with flooded swamps and sloughs. The advantages of aerial measurement are therefore immediately apparent.

Biomass carbon estimates from the aerial data were derived using biomass regressions to crown area. Height was not used in the regressions due to a difficulty in determining ground height through the homogeneously closed canopy. Straight-line relationships were used as the homogeneous crown created the potential for high rates of error in delineating individual crowns. We determined here that in a broadleaf forest such as exists in Delta NF, calculating crown area from the area of an ellipse (determined through measuring two crown diameters) led to an 8 % overestimation. As the biomass regression equations were derived in this manner we created a correction factor to remove this source of error.

Automatic Crown Delineation

Winrock International submitted the report "Review of current techniques for automatic crown delineation three dimensional aerial imagery" to The Nature Conservancy, which was later submitted to the U.S. Department of Energy National Energy Technology Laboratory. The executive summary is below:

Executive summary: Review of current techniques for automatic crown delineation three dimensional aerial imagery

We have shown that it is possible to estimate the carbon stocks in forests a combination of very high resolution 3D digital imagery of forests and the collection of ground data for individual trees in the region to develop the local regressions based on parameters that one can measure from the imagery. We then systematically sample the imagery, install image plots, and delineate the crowns and extract the heights for all of the trees within the sample plot. Presently, an expert image interpreter delineates crown areas, determines height, and identifies species groups—a time consuming step in the process. However, due to the recent advances in high-resolution imagery and sophisticated software, automating these processes may be possible. We have, therefore, reviewed the recent literature and tested four of the current products to determine if the

technology is developed enough to do this effectively with our image products over complex forests. We conclude that after testing these four software products (keeping in mind that these companies would like to be successful so that they could sell us their products) on our imagery for complex broadleaf forests, the ability to automatically delineate tree crowns and heights in these forest types is not possible at present.

Cost Comparison of M3DADI and Conventional Field Methods

The completion of the "Synthesis report on cost analyses from all studies (Belize closed forest and pine savanna and the Delta National Forest) including opportunities for reducing costs", has been delayed. The delay in completion by Winrock International resulted from the delay in the completion of the closed forest Belize report which is a necessary precursor. This report is now on target for delivery at the end of July.

Task 3: Baseline Method Development

Chile

In April 2005, Nature Conservancy staff visited temperate rainforest in the Reserva Costera Valdiviana, Chile to plan for a final carbon baseline analysis in the high carbon density area. Scientists from the Nature Conservancy and the Univeristy Austral de Chile developed a research plan "Forest Cover and Carbon Changes in Coastal Temperate Rainforest, Chile" that will:

1. Quantify past forest cover and forest carbon changes for the section of coastal temperate rainforest (bosque humido templado de la cordillera de la costa) between Rio Calle Calle and Rio Huevelhue, Chile

2. Project possible future forest cover in the area of analysis using forest restoration carbon analysis (FRCA) method

3. Estimate potential forest carbon sequestration of restoration of native forest in the Reserva Costera Valdiviana

We will use the land cover data layer already derived in previous work under this cooperative agreement from a 1986 Landsat image. We have acquired a 2004 Landsat image to determine recent land cover. We have trained Universidad Austral de Chile staff in FRCA. They have begun to define the extent of coastal temperate rainforest as the area of analysis and to geo-reference the 2004 image.

Based on a land cover layer already derived in previous work under this cooperative agreement from a 1999 Landsat image, Nature Conservancy scientist Patrick Gonzalez completed an FRCA for temperate rainforest in the proposed Curiñanco conservation area, Chile and completed a milestone report for the U.S. Department of Energy National Energy Technology Laboratory "Comparison of Three Methods to Project Future Baseline Carbon Emissions in Temperate Rainforest, Curiñanco, Chile." Below is the abstract:

Abstract for Milestone Topical Report: Comparison of Three Methods to Project Future Baseline Carbon Emissions in Temperate Rainforest, Curiñanco, Chile

Deforestation of temperate rainforests in Chile has decreased the provision of ecosystem services, including watershed protection, biodiversity conservation, and carbon sequestration. Forest conservation can restore those ecosystem services. Greenhouse gas policies that offer financing for the carbon emissions avoided by preventing deforestation require a projection of future baseline carbon emissions for an area if no forest conservation occurs. For a proposed 570 km^2 conservation area in temperate rainforest around the rural community of Curiñanco, Chile, we compared three methods to project future baseline carbon emissions: extrapolation from Landsat observations, Geomod, and Forest Restoration Carbon Analysis (FRCA). Analyses of forest inventory and Landsat remote sensing data show 1986-1999 net deforestation of 1900 ha in the analysis area, proceeding at a rate of 0.0003 y^{-1}. The gross rate of loss of closed natural forest was 0.042 y^{-1}. In the period 1986-1999, closed natural forest decreased from 20 000 ha to 11 000 ha, with timber companies clearing natural forest to establish plantations of non-native species. Analyses of previous field measurements of species-specific forest biomass, tree allometry, and the carbon content of vegetation show that the dominant native forest type, broadleaf evergreen *(bosque siempreverde),* contains 370 ± 170 t ha^{-1} carbon, compared to the carbon density of non-native *Pinus radiata* plantations of 240 ± 60 t ha^{-1}. The 1986-1999 conversion of closed broadleaf evergreen forest to open broadleaf evergreen forest, *Pinus radiata* plantations, shrublands, grasslands, urban areas, and bare ground decreased the carbon density from 370 ± 170 t ha^{-1} carbon to an average of 100 t ha^{-1} (maximum 160 t ha^{-1}, minimum 50 t ha^{-1}). Consequently, the conversion released 1.1 million t carbon. These analyses of forest inventory and Landsat remote sensing data provided the data to evaluate the three methods to project future baseline carbon emissions. Extrapolation from Landsat change detection uses the observed rate of change to estimate change in the near future. Geomod is a software program that models the geographic distribution of change using a defined rate of change. FRCA is an integrated spatial analysis of forest inventory, biodiversity, and remote sensing that produces estimates of forest biodiversity and forest carbon density, spatial data layers of future probabilities of reforestation and deforestation, and a projection of future baseline forest carbon sequestration and emissions for an ecologically-defined area of analysis. For the period 1999-2012, extrapolation from Landsat change detection estimated a loss of 5000 ha and 520 000 t carbon from closed natural forest; Geomod modeled a loss of 2500 ha and 250 000 t; FRCA projected a loss of 4700 ± 100 ha and 480 000 t (maximum 760 000 t, minimum 220 000 t). Concerning labor time, extrapolation for Landsat required 90 actual days or 120 days normalized to Bachelor degree level wages; Geomod required 240 actual days or 310 normalized days; FRCA required 110 actual days or 170 normalized days. Users experienced difficulties with an MS-DOS version of Geomod before turning to the Idrisi version. For organizations with limited time and financing, extrapolation from Landsat change provides a cost-effective method. Organizations with more time and financing could use FRCA, the only method where that calculates the deforestation rate as a dependent variable rather than assuming a deforestation rate as an independent variable. This research indicates that best practices for the projection of baseline carbon emissions include integration of forest inventory and remote sensing tasks from the beginning of the analysis, definition of an analysis area using ecological characteristics, use of standard and widely used geographic information systems (GIS) software applications, and the use of species-specific allometric equations and wood densities developed for local species.

Albemarle Peninsula Baseline Study, North Carolina

Jenny Henman completed a review of the literature relevant to the impacts of flooding from sea level rise on the peat deposits of North Carolina. The report specifically focused on likely changes in respiration in the peat, and emissions of carbon dioxide and methane from the process. The literature review concluded that it is difficult to make predictions on the impact of sea water inundation on peat. The literature illustrates the uncertainty which exists in processes that would occur, especially without a clear understanding of peat dynamics and processes currently on Albemarle Peninsula. No studies report research specifically on the effect of flooding of peat with sea water. Controls on sulphate reduction are complex, and need to be better understood in the context of current conditions on Albemarle Peninsula, before projecting future changes with flooding and increased salinity can be estimated. The likely impact on the currently flooded freshwater peatlands versus the currently drained peatlands will be distinct. Salinity levels from sea level rise, as well as other impacts on the peat from increasing temperatures will be important factors to consider in predicting the impact of peat on the Peninsula.
This review was distributed to other Nature Conservancy staff and scientists at Duke University for their review and comments. A meeting is planned to discuss these conclusions further.

Task 4: Third-party technical advisory panel meeting

The next third-party technical advisory panel meeting is being planned for the autumn of 2005. The contents of the meeting has been discussed with John Litynski and will focus on methodologies for certifying carbon emission reductions for land based and forestry activities. The detailed agenda and list of invitees is currently being drawn up by Nature Conservancy staff.

Task 5 New Project Feasibility Studies

New England Carbon Feasibility Project

Stakeholder outreach and input/ Stakeholder kickoff meetings
The project team launched this project by carrying out two stakeholder kickoff meetings. The goals of these meetings were to introduce key stakeholders to the project, outline the scope of work and methodology, present preliminary data results, and specify the input from the stakeholders that would bolster our results. In particular, we were seeking suggestions on local, state or regional data sets and input on the barriers and challenges to executing various land use activities.

The key stakeholders for this project include, state public officials, representatives of environmental organizations, business representatives and some academics. Of the state officials, we sought to include representation from each state covered by this regional study and state officials who would be most interested in the outcome of the research as well as those who might be useful in providing data and input on our proposed methodology and assumptions. Thus we invited a state forester, a state soil conservation official, and a senior natural resources policy official.

The presentations, agendas and invitee and attendance lists for these meetings are in appendices 3-10.

On March 16th, the first stakeholder kickoff meeting was held in Newark, NJ at the offices of PSEG. Representatives from NY, NJ, PA, MD and DE were invited to attend as well as representatives of the environmental community, business representatives, and the US Forest Service. In all, in addition to team members, there were 26 participants at the meeting. State officials from all states but DE were in attendance.

On March 18th, the second stakeholder kickoff meeting was held in Durham, NH at the Three Chimney Inn. Invites were sent to participants from ME, NH, VT, MA, CT and RI. In all, in addition to team members, there were 23 participants at the meeting. State officials from all states but CT were in attendance, as well as academics, environmental organization and business representatives as well as an official from the US Forest Service.

Key Input and Feedback from the Meetings
The minutes for each meeting are in appendices 5 and 6.
The following is a summary of the key issues raised and comments made at each stakeholder meeting.

<u>Newark, NJ</u>

- Consider threats from deer and other invasive species in how they affect ability to regenerate biomass.

- Will we produce maps of and take into consideration various threats from invasive species, fire, storms, etc.?

- There was an interest from some for the study to analyze the benefits from urban forests.

- Forested wetlands should be included in the analysis in terms of future carbon sequestration benefits.

- Some states have priority areas that differ from those of The Nature Conservancy. Can the state defined priority areas be incorporated into the biodiversity analysis?
- Can the study present the air quality benefits achieved through the planting of trees?

Durham, NH

- Questions were raised and discussion occurred on the issue of how development will be handled in the study in terms of assumptions related to quantity of carbon lost and what type of forest is being lost to development.

- A desire was expressed for the study to address climate change buffers/corridors in co-benefit piece, to make sure there is room for species to migrate north.

- There was a question raised as to whether or not forest products would be included in the analysis.

- Agriculture and pasture lands in New England can be key aspects of the landscape and in some regions are "protected" and the stakeholders suggested that we should eliminate some areas considered for afforestation in the analysis to take this issue into account.

- Some stakeholders expressed that afforestation opportunities are likely limited in New England, while representatives from ME and NY expressed that there were afforestation opportunities in their states.

- Some stakeholders commented that forestry management presents the greatest opportunity in New England and management of forests to produce biomass for energy use has a high potential.

Ongoing stakeholder communication

There have been numerous conversations and emails with representatives from the various states related to providing data and overall comments related to our study. We will continue to proactively reach out to the states related to our data needs as well as respond to their input.

We are attempting to set up specific outreach meetings with staff in Connecticut and Delaware who were not represented in the stakeholder meetings.

Finally, based on the input at the first meeting and a desire to get additional feedback sooner rather than later on our draft findings, it is likely that our second round of stakeholder meetings will occur earlier than we had originally planned. Originally, we had thought we would schedule these at the end of the project to present the results. Our current thinking is to hold this set of meetings when we have draft results so that we can gain additional feedback and perhaps use the input to refine or adjust the results based on the input we receive.

Identify and estimate sources and sinks in the Northeast region/ Classify carbon storage opportunities/Identify classes of lands in the region:
For both report sections ii.b. and ii.c., The Sampson Group has been working on producing a draft of the characterization of the Northeast region including a description of the land, climate, land-use, population. The information and data will be presented in tables by state and other information presented in GIS maps by county. In addition to the basic data presented, historical trends and future projections will be depicted for some of the information.

A draft of this section will be included in our next quarterly report. As part of this effort, The Nature Conservancy will provide the most updated (as of 2005) GIS data on public managed lands that we have collected from each of our state chapter offices.

Identify suite of land-use changes that could increase carbon sequestration:
The following suite of land use activities that could increase sequestration activities will be considered in our study:

- Improving the cropping systems on agriculture land through fertilization and other activities.
- Shifting agriculture land to conservation tillage and keep cropping it
- Converting agriculture or otherwise fallow land to grass and use it for pasture or hayland.
- Foresting agricultural land (crop and grass) with native species to restore natural forests
- Foresting agricultural land (crop and grass) with appropriate forest species and managing it for production forestry.
- Conducting a variety of sustainable forestry management practices on existing forest lands not currently managed sustainably.
- Planting a biomass crop such as hybrid willow or hybrid poplar and take credit for the sequestration in the crop as well as the energy offset potential in the biomass.

Longleaf Pine Study in the South-Eastern United States

Winrock International their first draft of the feasibility study entitled "An Assessment of Carbon Sequestration Potential of Longleaf Pine Restoration on Existing Production Timberland in NW Florida". The Nature Conservancy Staff and John Litynski reviewed this report, and sent back comments to Winrock International. The revised version of this report has recently been received by The Nature Conservancy. The executive summary of this report is below:

Executive Summary: An Assessment of Carbon Sequestration Potential of Longleaf Pine Restoration on Existing Production Timberland in NW Florida"

To reverse the losses of longleaf pine forests in the southeastern USA, the potential for financing longleaf pine restoration with carbon payments was examined. Such a study requires data on current and potential future land uses in combination with the carbon stocks under each of the land uses. The goals of this study were:

- Examine the extent and direction of recent changes in timberland in northwest Florida and the availability of land for restoration projects.
- Estimate the change in carbon stocks resulting from different approaches to reforesting with longleaf pine in northwest Florida through conversion of a slash pine plantation with different expected future land uses. Carbon data were obtained from the literature and from field measurements made in northwest Florida.

The dominant trend in change in ownership of US forestlands is from industrial management to TIMOs (Timberland Investment Management Organizations). Estimates suggest as much as 12-15 million acres of industrial timberland in the US will be transferred out of industry ownership in the next decade. However, this ownership change is not accompanied by any significant change in carbon stocks. Carbon benefits arise where forest clearance is prevented. In northwest Florida there is a trend of development on forestlands.

The study focused on three counties in northwestern Florida to serve as representative examples of areas of development and where restoring longleaf pine forests appeared to have potential as a competing use. Analysis of satellite imagery determined a loss of 38,763 ha (95,749 acres) of evergreen forest in Escambia, Okaloosa and Santa Rosa counties between 1992 and 2001. This is equal to a loss of 4,307 ha/year (10,638 acres/year).

Field measurement of carbon stocks in northwest Florida (supported by inventory data) revealed an estimated 45 metric tons of C/ha (66.6 metric tons of CO2 equivalent/acre) in mature longleaf pine stands.

For the economic analysis two scenarios were considered for the conversion of industrial timberland to natural longleaf pine forest: clearcut and gradual conversion. Baselines for TIMO management and development were also included.

The gradual conversion strategy has both ecological and economic benefits. The economic benefit results from the staggered harvests over a 20-year conversion period, allowing the timber crop to mature and yield a higher proportion of high value sawtimber relative to pulpwood. The greater significance of timber sale revenue results from: (1) the higher per unit value of timber products, and (2) timber revenue is realized in the first 20 years and is thus discounted less than the bulk of carbon benefits.

The TIMO baseline presents a clear economic disadvantage in that carbon revenue is delayed, at which point the discounted revenues from carbon pale in comparison to the considerable immediate, and un-discounted, cost of land acquisition (nearly $56 million for 26,000 acres). Due to the land acquisition cost, none of the scenarios assessed even approached breaking-even (Table 5), nor did carbon revenues make a significant contribution to net present values (Table 6). Even at the higher price of $15 per metric ton of CO_2, land values would have to drop to around $300 (immediate conversion with TIMO baseline), $540 (gradual conversion), or $640 per acre (immediate conversion with development baseline) to break even.

Task 6: Development of new project software screening tool

The Carbon Project Evaluation Tool was completed. A CD of the tool was made and sent to the Department of Energy and John Litynski. This tool was also posted on conserve online: http://conserveonline.org/2005/06/r/Carbon_Project_Evaluation_Tool . The tool was also announced in an @TNC article (a weekly bulletin sent out to all staff across the Nature Conservancy) The tool is also posted on The nAture Conservancy's website nature.org.

Conclusions

During the April to June 2005 quarter considerable progress was made concluding the research from the first 3 years of research carried out under this co-operative agreement. Winrock International completed their topical reports on the Multi-spectral three dimensional digital imagery work carried out in both the closed canopy forest of Belize, and in the broadleaf Delta National Forest. In addition the report reviewing automatic crown delineation and the longleaf pine restoration in the Southeastern United States were finished by Winrock International. The Nature Conservancy completed the milestone report "Comparison of Three Methods to Project Future Baseline Carbon Emissions in Temperate Raiforest, Curinanco, Chile".

In this quarter work has started on the new work in California and the North East region. The North East feasibility study was launched with two stakeholder workshops held in the south and north of the region. Planning and field visits to select the field sites have been undertaken in California in the Tahoe National Forest and the Mailliard Redwoods State Reserve.

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List of Appendices

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Appendix 3 - Agenda Stakeholder Meeting 5-16-05.final.pdf

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Appendix 5 - Minutes_Durham_meeting_DOE

Appendix 6 - Minutes_Newark_meeting_DOE

Appendix 7 - List of Stakeholder Meeting Invitees

Appendix 8 - List of Stakeholder Meeting Attendees

Appendix 9 - TNC presentation at the Newark Stakeholder Meeting

Appendix 10 - TNC presentation at the Durham Stakeholder Meeting

Figure 6.

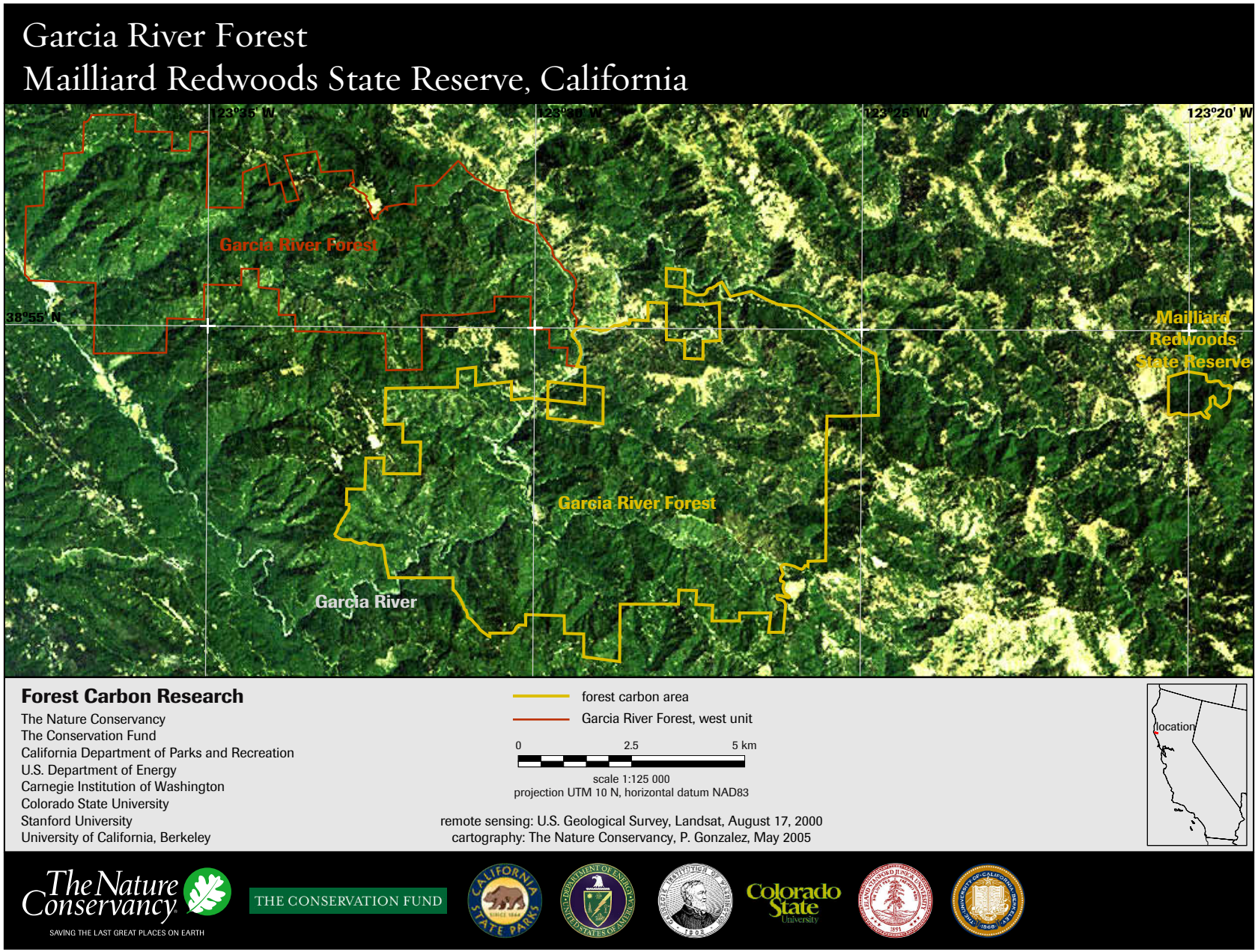
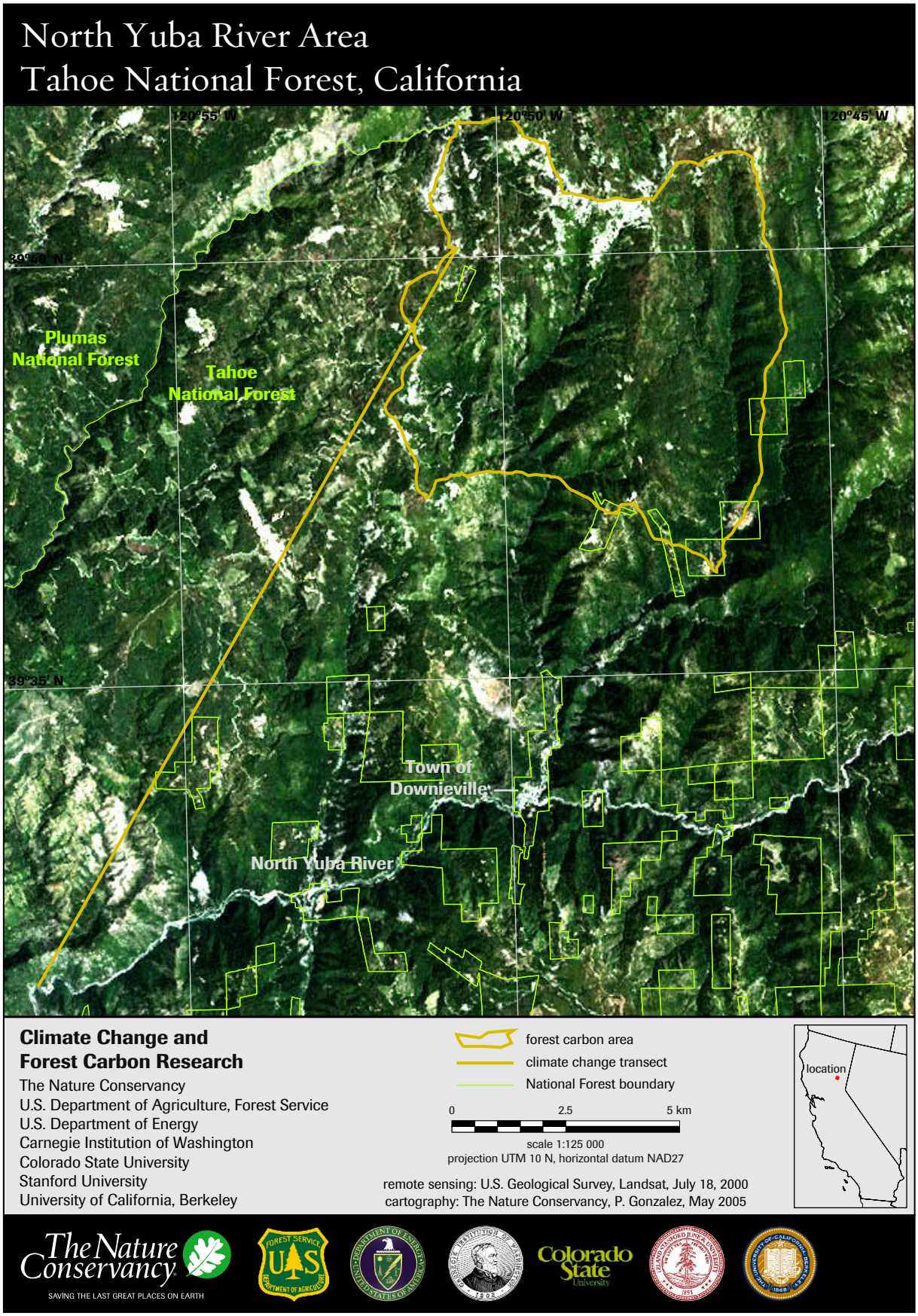

Garcia River Forest
Mailliard Redwoods State Reserve, California
123°35' W
123°30' W
123°25' W
123°20' W
38°55' N
Garcia River Forest
Mailliard Redwoods State Reserve
Garcia River Forest
Garcia River
Forest Carbon Research
The Nature Conservancy
The Conservation Fund
California Department of Parks and Recreation
U.S. Department of Energy
Carnegie Institution of Washington
Colorado State University
Stanford University
University of California, Berkeley
forest carbon area
Garcia River Forest, west unit
0
2.5
5 km
scale 1:125 000
projection UTM 10 N, horizontal datum NAD83
remote sensing: U.S. Geological Survey, Landsat, August 17, 2000
cartography: The Nature Conservancy, P. Gonzalez, May 2005
location
The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH
THE CONSERVATION FUND
Colorado State University

Figure 7.


North Yuba River Area
Tahoe National Forest, California
120°55' W
120°50' W
120°45' W
39°40' N
39°35' N
Plumas
National Forest
Tahoe
National Forest
Town of
Downieville
North Yuba River
Climate Change and
Forest Carbon Research
The Nature Conservancy
U.S. Department of Agriculture, Forest Service
U.S. Department of Energy
Carnegie Institution of Washington
Colorado State University
Stanford University
University of California, Berkeley
forest carbon area
climate change transect
National Forest boundary
0
2.5
5 km
scale 1:125 000
projection UTM 10 N, horizontal datum NAD27
remote sensing: U.S. Geological Survey, Landsat, July 18, 2000
cartography: The Nature Conservancy, P. Gonzalez, May 2005
location
The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH
Colorado State University

Northeast Carbon Feasibility Project
Stakeholder Meeting Agenda
May 16, 2005

Offices of PSEG
Newark, NJ

10:30am – 10:50am	I.	Welcome and Introductions	PSEG & All
10:50am - 11:10am	II.	Overview of the Project	Nature Conservancy
11:10am - 11:35am	III.	DOE NETL – Overview of Programs	John Litynski – DOE
11:35pm – 12:15pm	IV.	Overview of project methodology and approach	Neil Sampson – The Sampson Group
12:15pm – 1:15pm	V.	Lunch and break	
1:15 pm – 1:55pm	VI.	Carbon supply from agriculture and forest lands—approach and example results from selected southern states	Sandra Brown - Winrock
1:55pm - 2:15pm	VII.	Questions and Discussion	
2:15pm – 2:45pm	VIII.	Helpful input a. State or regional data sets b. Regional/state/local land-use activities, trends c. Regional/state/local challenges and/or barriers to carrying out certain land-use activities	Sampson/Winrock Present overview Facilitated discussion – ALL
2:45pm – 3:00pm	IX.	Next Steps & Wrap Up a. One on one follow up b. Peer review of results c. Stakeholder meeting to present results	TNC

Northeast Carbon Feasibility Project
Stakeholder Meeting Agenda
May 18, 2005

Three Chimneys Inn
Durham, NH

10:30am – 10:50am	I.	Welcome and Introductions	TNC & All
10:50am- 11:10am	II.	Summary Overview of the Project	Nature Conservancy
11:10am – 11:35am	III.	NESCAUM Carbon Registry	Kelly Levin - NESCAUM
11:35am – 12:15pm	IV.	Overview of Project Methodology and Approach	Neil Sampson – The Sampson Group
12:15pm – 1:15pm	V.	Break and Get Lunch	
1:15pm – 1:55pm	VI.	Carbon supply from agriculture and forest lands – approach and example results from selected southern states	Sandra Brown - Winrock
1:55pm – 2:15 pm	VII.	Questions and Discussion	ALL
2:15pm – 2:45pm	VIII.	Helpful input a. State or regional data sets b. Regional/state/local land-use activities, trends c. Regional/state/local challenges and/or barriers to carrying out certain land-use activities	Sampson/Winrock Present overview Facilitated discussion – ALL
2:45pm – 3:00pm	IX.	Next Steps – Follow Up a. One on one follow up b. Peer review of results c. Stakeholder meeting to present results	TNC

Minutes from the New Hampshire Stakeholder Kick-Off Meeting – May 18th 2005

Kelly Levin from NESCAUM (association of air quality division of six Northeast States) gave a power point presentation. NESCAUM is working to develop a Northeast greenhouse gas registry. NESCAUM is building a registry as they see a lot of shortcomings under 1605b. Weaknesses include weak definition of "entity", loose "intensity" definition and technical problems with the calculation methods. They don't think record keeping of three years alone is enough, and they think third party validation should be mandatory.

They are finalizing the design of the registry. www.rggr.us They have been developing tech. guidelines for stationary sources with World Resources Institute.
Within the Design Elements:

- Definition of geographical and organizational boundaries
- Gases covered
- Direct sources covered
- Scope of emissions covered
- Verification
- Reporting Frequency
- Methodology for adjusting base year

(All these fit in with World Resources Institute greenhouse gas reporting methodology)

Team Presentations

Q: Are we going to look at wider implications beyond carbon of the trend data that Neil will generate?

Q: How are we going to look at conversion of forest to sub/urban development?
A: We don't have much information on the dynamics of that.

Comment: "Suburban Forest" - that is where the rural forest is going. How fast is parcelization happening? Yale study in Connecticut using GEOMOD projects changes in forest from development. It is important to consider that much of the forest that is being lost is actually scruffy secondary forest.

Comment: Leakage issue came up. Which activities might lead to leakage? Lengthening rotation wouldn't, but conservation easements that prevent development in one place might. We could hand that over to Regional Greenhouse Gas Initiative (RGGI) staff and then they apply a discount rate. Leakage could be a big issue in the New England area.

Comment: Look at climate change buffers/corridors in co-benefit piece, to make sure there is room for species to migrate north.

General Discussion

Q: You can build harvest into yield curve. How does carbon in products get factored in?
A: We will look at net carbon using the 1605b second method for forest products. We will look at reporting for the Northeast.

Comment: Importance of and opportunities for afforestation is questioned in this region. For example, there are programs explicitly to protect farmlands. There is a social value to not reforesting in many places.

Q: Why are they protecting Ag?
A: It is a cultural thing protecting it. If farmer wanted to change back to forest they couldn't in some cases.

Comment: Agriculture and Pastures - it is key for tourism. We should eliminate some areas for afforestation in the analysis to take this issue into account. Afforestation piece in New England is not the way to go.

Q:What about in Riparian Buffer for reforestation?
A: In NH, there are a very small percentage of areas available for this.

Yet, for RGGI, as the proposal now stands, the only opportunities are for afforestation. This study may help to provide information to RGGI on how limited the options are.

Comment: Maine representative thinks agriculture issue is a little different there. There are abandoned agriculture lands. How can this state specific issue be validated? We're hoping they will help us by working directly with us and sharing knowledge.

Comment: In New York felt that afforestation could happen. It is already happening on abandoned forest land in the last 25 yrs.

Comments on land development issue: Here the intensity of management will change for example forests probably will be neglected when land plots bought up for housing. How are we going to get the data to back this up to put numbers in?

Comment: Forestry management is where the opportunities are and in particular management of forests to produce biomass for energy use has a high potential.

There are high biomass forests in this area.

There was some discussion of the fossil fuel emissions avoidance and how we might account for this in our study.
A: We explained that our model will not take into account emission avoidance from use of biomass, and merely deal with the carbon accounting of the wood stream.

Comment: Some of the leakage issue from easements could be overcome by changes in zoning and the issues under the jurisdiction by large administrative bodies. This project could be more useful for landscape planning.

Comment: The carbon dynamic does not usually drive landscape dynamics.

Comment: Soil carbon will not be included. Soil carbon is different in post agriculture systems. It is the change in stocks which we're looking at here.

Minutes from the Newark, NJ Meeting - May 16th 2005

Initial welcome from PSEG. PSEG were impressed by the opportunities of forestry for carbon sequestration. They recognized it as having multiple benefits: as a way to reduce emissions, improve biodiversity and see local benefits.

This project is officially separate from the Northeast Regional Greenhouse Gas Initiative (RGGI) program. The issue of whether credits from PA and MD can be sold into RGGI market is yet to be decided. The model rule is due out in August 2005. At this time, Afforestation/reforestation is likely to be allowed offset project activities, and other land use activities will likely be considered as the program moves forward. We (the project team) are advocating for including land use based offsets in the RGGI model rule because it provides flexibility and because carbon benefits are measurable and verifiable.

Q: Will Neil's analysis of trends be at the parcel level?
A: Not really, the study will look at trends on a broader/ region wide basis. Per parcel would be too complex and time intensive, although GEOMOD could do that type of analysis.

Q: What about urban forestry opportunities and how will this be looked at?
A: FIA data best for analysis of this, but Neil is yet to do this. We may be able to include a brief discussion of urban forests in the report, but we do not plan any in-depth mapping or analysis in this study.

Q: Does developing forest within urban areas have other benefits?
A: Air pollution reduction, temperature. CitiGreen/GEOMOD could be used for analysis although unlikely to be done for this project.

Q: Will fragmentation of the landscape be looked at in the biodiversity analysis?
A: The biodiversity analysis as part of this study will include the benefits of de-fragmenting the landscape.

Comment: Invasive species and deer populations can lead to decrease in understory biomass and also lead to difficulties in regeneration of young reforestation.
How can this be controlled? Better fencing? Deer hunting?
Comment from the team: Deer fencing can be added in as a project cost.

Comment: There is an input of nutrients into the Northeast from Midwest e.g. calcium deposits from acid rain. . Many of Northeast air quality problems come from elsewhere. He suggested that we look at input/export models once regional models are built up.

Q: Are trends going to be extrapolated into the future?
A: Neil - says there is a great risk of extrapolation without good data on which to base the analysis. We might be able to get some data from the states and try this out.

Q: NJ expects to have new satellite imagery soon - they will have the whole state by this Christmas.? Can that more up-to-date information be used instead of the outdated 1992 land cover maps?
A: We are limiting datasets to those which exists for all states so all analysis is uniform. But we will consider some incorporation of newer information if feasible.

Q: Are we going to look at unforested wetlands?
A: Yes, in terms of what carbon sequestration benefits exist from conserving or managing this land.

Sandra Brown - Presentation

Q: Are we going to generate spatial risk maps for fires/invasives/pests?
A: Ideally yes, maps would be the best, but we're not going to generate them. We will simply discuss the various risks in the report and discuss how this might affect our results.

Comment: Forest Service has risk management maps. Jason Denham of NY has some experience with these maps. We are not going to make our own risk maps but we might use existing maps if feasible.

Comment: MD has its own priority areas; these might be different than The Nature Conservancy's priority areas. Could this analysis be broken up so states can use data later to tailor to their own priorities? Can capacity be built in states to tailor analyses to own purposes? Could the project team even incorporate this analysis? If they give us their state priority areas we could include that in the analysis.
A: We hope to be able to make the maps available to all so that they might layer their own data sets onto ours so as to make this analysis. Or if we are able to get this data layer from states we can try to incorporate it into the biodiversity analysis work.

Comment: The importance of reforestation to Aquatic Systems was highlighted. There will be more benefits from reforesting riparian buffers. Look at riparian forests.

Comment: There are many potential important co-benefits of carbon sequestration projects such as groundwater, stream water, air pollution, and habitat preservation.

Related to water quality benefits and priority areas - look at Chesapeake Bay Assessment produced. They have a peer reviewed assessment on whether planting trees will be beneficial. Good model. Cornell University also did something similar.

Comment – Air quality issues are important. Baltimore area wants to get urban trees in their 2007 plan. Suggested that we could look at non-attainment areas and overlay with planned reforestation.
Comment from project team: We will not be addressing air quality issues in this report and are not likely to do any depth of analysis related to urban forestry.

Q: In NJ there has been a detailed study of threatened species. Could this be used even if it is only in NJ?
A: In terms of biodiversity analysis, we might be able to overlay their data layers if they are in the correct format.

Invite List for Carbon Feasibility Project Stakeholder NJ Kick Off Meeting

Last Name	First Name	Title	Salutation	Email	Affiliation	State/Org. Type	Response
Teetz	Robert		Mr.	rteetz@keyspanenergy.com	KeySpan E	BUS	N
Lynch	Paul			plynch@keyspanenergy.com	KeySpan E	BUS	Y
Keller	Robert	Director	Mr.	rkeller@keyspanenergy.com	KeySpan E	BUS	N
Neely	Christine	Director, Foss	Ms.	christine.neely@pseg.com	PSEG	BUS	Y
Svenson	Eric	Director, Corp	Mr.	eric.svenson@pseg.com	PSEG	BUS	Y
Buzel	Mark	Regional Dire	Mr.	mark.buzel@aes.com	AES	BUS	N
James	Chris	Air	Mr.	chris.james@po.state.ct.us	DEP	CT	N
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Baron	Monique	Philanthropy	Ms.	mbaron@tnc.org	TNC	ENV	Y
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Davies	Rob	Division Direc	Mr.	rkdavies@gw.dec.state.ny.us	DEC	NY	N
Rausch	Ron	Soil Conserva	Mr.	ron.rausch@agmkt.state.ny.us		NY	Y
Sherick	Joe	Energy and c	Mr.	josherrick@state.pa.us	PA DEP - (	PA	Y
Just	Sally	Forestry	Ms.	sjust@state.pa.us		PA	Y
Hepperly	Paul		Dr.	paul.hepperly@rodaleinst.org	Rodale Ins	PA	Y
Price	Will	Program Ass	Mr.	willprice@pinchot.org	Pinchot Fo	PA	Y
Grace	Jim	PA State For	Mr.	jagrace@state.pa.us		PA	Y
Litynski	John	Environmenta	Mr.	john.litynski@netl.doe.gov	DOE	Sponsor	Y
Murdock	Sarah					TEAM	Y
Sampson	Neil					TEAM	Y
Brown	Sandra					TEAM	Y
Stanley	Bill					TEAM	Y
Garrido	Selma					TEAM	N
Henman	Jenny					TEAM	Y

Invite List for Carbon Feasibility Project Stakeholder NJ Kick Off Meeting

Last Name	First Name	Title	Salutation	Email	Affiliation	State	Phone	Email Sent	Response
Teetz	Robert		Mr.	rteetz@keyspanenergy.com	KeySpan E	BUS			N
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Keller	Robert	Director	Mr.	rkeller@keyspanenergy.com	KeySpan E	BUS			N
Neely	Christine	Director, Foss	Ms.	christine.neely@pseg.com	PSEG	BUS	973-430-5521		Y
Svenson	Eric	Director, Corp	Mr.	eric.svenson@pseg.com	PSEG	BUS	973-430-5857		Y
Buzel	Mark	Regional Dire	Mr.	mark.buzel@aes.com	AES	BUS			N
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Smith	Donald	State Foreste	Mr.	don.smith@po.state.ct.us	DEP	CT	860-424-3630	4/5/2005	N
Wallace	Margo	Director	Ms.	margo.wallace@ct.usda.gov	USDA - Na	CT	860-871-4011	4/5/2005	N
Leff	David	Deputy Comr	Mr.	david.leff@po.state.ct.us	DEP	CT		4/5/2005	N
Hughes	John	Secretary	Secretary	john.hughes@state.de.us	DNREC	DE	302-739-9000	3/22/2005	N
Scuse	Michael	Secretary	Secretary	michael.scuse@state.de.us	Dept. of Ag	DE	800-282-8685 x4	3/22/2005	N
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Baron	Monique	Philanthropy	Ms.	mbaron@tnc.org	TNC	ENV		3/24/2005	Y
Ramsey	Ron	Dir. GR	Mr.	rramsey@tnc.org		ENV		3/22/2005	N
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Murrow	Derek	Director	Mr.	dmurrow@env-ne.org	Environme	ENV	(203) 495-8224	3/22/2005	N
Holiday	Jessica		Ms.	JHolliday@environmentaldefense.org	Environme	ENV		4/6/2005	Y
Pena	Naomi		Ms.	penan@pewclimate.org	Pew Cente	ENV	703-516-4146	3/24/2005	Y
Decurtis	Chuck	Dir. Conserva	Mr.	cdecurtis@tnc.org	TNC	ENV	717-232-6001x104		Y
Sullivan	Terry	Regional Gov	Mr.	terry_sullivan@tnc.org	TNC	ENV	401-270-9132		N
Hooper	Helen	Director, Eas	Ms.	hhooper@tnc.org	TNC	ENV	(301) 897-8570 x230		Y
McCreery	Lew		Mr.	lmccreery@fs.fed.us	USDA - FS	GOV			Y
Nowak	David	Project Leade	Mr.	dnowak@fs.fed.us	USDA - Fo	GOV	(315) 448-3212	4/5/2005	N
Higa	Gene	RGGI rep	Mr.	ghiga@mde.state.md.us	MDE	MD	410-537-3353		N
Scott	Doug	Manager of S	Mr.	scottdd@mda.state.md.us	MD Depart	MD	410-841-5865	3/22/2005	N
Koehn	Steve	Director, Stat	Mr.	skoehn@dnr.state.md.us	DNR	MD	410-260-8501	3/22/2005	N
Conn	Chistine	Acting Divisio	Ms./Dr.	CConn@dnr.state.md.us	Maryland D	MD	(410) 260-8802		Y
Sherry	Chris		Mr.	christopher.sherry@dep.state.nj.us	NJDEP - B	NJ	609-292-6818	3/22/2005	N
Aucott	Michael	Research Sci	Mr.	michael.aucott@dep.state.nj.us	NJDEP - D	NJ		3/28/2005	Y
Mates	William	Research Sci	Mr.	william.mates@dep.state.nj.us	NJDEP - D	NJ	609-292-7692	3/28/2005	Y
Chen	Sandra	Nature and H	Ms.	sandra.chen@dep.state.nj.us	NJDEP	NJ		3/28/2005	Y

Matsil	Marc	Asst. Commis	Mr.	marc.matsil@dep.state.nj.us	NJDEP	NJ	609-633-1295	3/28/2005	Y
Fernandez	Jose	Director	Mr.	jose.fernandez@dep.state.nj.us	NJDEP-Na	NJ	609-292-2733	3/28/2005	N
New	Lois		Ms.	lanew@gw.dec.state.ny.us	DEC	NY	518-402-8239	3/22/2005	N
Denham	Jason	Senior Forest	Mr.	jpdenham@gw.dec.state.ny.us	DEC	NY	518-402-9425	3/22/2005	Y
Davies	Rob	Division Direc	Mr.	rkdavies@gw.dec.state.ny.us	DEC	NY	518-402-9405	3/22/2005	N
Rausch	Ron	Soil Conserva	Mr.	ron.rausch@agmkt.state.ny.us		NY	518-457-4918	3/28/2005	Y
Sherick	Joe	Energy and c	Mr.	josherrick@state.pa.us	PA DEP - (	PA	(717) 772-8944	3/22/2005	Y
Just	Sally	Forestry	Ms.	sjust@state.pa.us		PA	717-787-3212	3/22/2005	Y
Hepperly	Paul		Dr.	paul.hepperly@rodaleinst.org	Rodale Ins	PA	610-683-1461	3/22/2005	Y
Price	Will	Program Ass	Mr.	willprice@pinchot.org	Pinchot Fo	PA	570-296-9626	3/22/2005	Y
Grace	Jim	PA State For	Mr.	jagrace@state.pa.us		PA	717-787-2703	3/22/2005	Y
Litynski	John	Environmenta	Mr.	john.litynski@netl.doe.gov	DOE	Sponsor	304-285-1339		Y
Murdock	Sarah					TEAM			Y
Sampson	Neil					TEAM			Y
Brown	Sandra					TEAM			Y
Stanley	Bill					TEAM			Y
Garrido	Selma					TEAM			N
Henman	Jenny					TEAM			Y

Northeast Carbon Feasibility Project

The Nature Conservancy
Winrock International
The Sampson Group

Offices of PSEG
May 16, 2005

Bill Stanley, Acting Director
Global Climate Change Initiative
703-841-5823; bstanley@tnc.org

Sarah Woodhouse Murdock
Senior Policy Advisor
617-542-1908 x204; smurdock@tnc.org

Today's Agenda

- Project overview
- DOE's National Energy Technology Lab
- Project methodology and approach
- Lunch
- More on approach and sample results
- Q&A
- Our information needs
- Next steps and conclusion

The Nature Conservancy

Presentation Overview

- Project Sponsors and Team
- Project Overview
- Why We Are Doing this Project
- Your Role

The Nature Conservancy

Project Sponsors

PSEG Power LLC

KEYSPAN Foundation

AES

The Nature Conservancy

Project Team Members

The Nature Conservancy

SAVING THE LAST GREAT PLACES ON EARTH

WINROCK INTERNATIONAL

Putting Ideas to Work

The Sampson Group

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TNC Global Climate Change Initiative

- "Global warming is a major threat to TNC's mission", Board of Governors, Jan. 2004

- TNC GCCI work to protect conservation investments:
  - Assess and communicate global warming impacts and risks
    - Focus on risks to natural areas
  - Support and engage in practical approaches to reduce emissions
    - On-the ground land management projects that have conservation value
    - International (Kyoto), National (McCain-Lieberman), Regional (RGGI), States (ME, CT, CA) policies
  - Protect natural lands and waters against inevitable impacts (adaptation)

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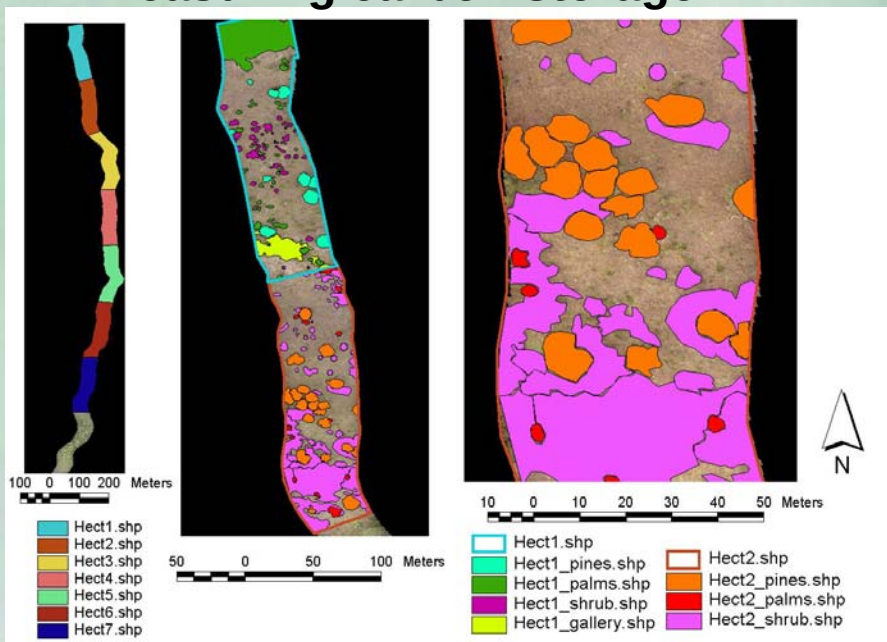
Carbon Projects

$35 million ➔1.7 million acres ➔ 32 million tons CO^2

- **Conservation and Restoration Projects in the US, Belize, Bolivia, and Brazil**
- **Research and project development in six other countries**

Measuring carbon storage



Climate Change Initiative

Carbon sequestration projects

1. Bayou Pierre, Louisiana, USA
2. Big Walnut, Indiana, USA
3. Brush Creek, Ohio, USA
4. Guaraqueçaba, Brazil
5. Noel Kempff Mercado, Bolivia
6. Rio Bravo, Belize

Carbon sequestration research

7. Albemarle Sound, North Carolina, USA
8. Calakmul, Mexico
9. Chesapeake Rivers, Virginia, USA
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19. Una, Brazil
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Climate adaptation research

7. Albemarle Sound, North Carolina, USA
21. Arctic Coast Ecoregion, Alaska, USA
5. Noel Kempff Mercado, Bolivia
22. Yunnan, P.R. China

satellite image: NASA, September 2001
cartography: P. Gonzalez, May 2004

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SAVING THE LAST GREAT PLACES ON EARTH

Carbon and adaptation research and project sites

The Nature Conservancy

Project Goals

- Identify greatest opportunities for sequestering carbon in the Northeast

- Through project results and products, facilitate and guide carbon projects:
  - to areas of highest carbon potential,
  - at lowest cost, and
  - greatest degree of environmental co-benefits.

The Nature Conservancy

Project Summary

- Identify land-use activities
- Calculate the carbon quantities and map
- Estimate potential cost (per ton) and map
- Identify the greatest co-benefits and map:

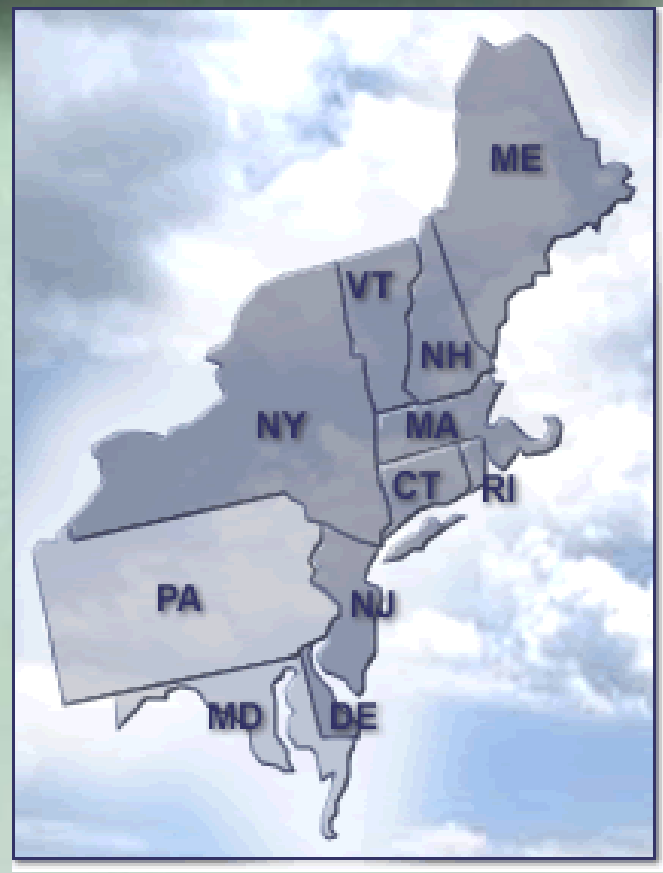
  Examples:

  - Water quality
  - Wildlife habitat protection

The Nature Conservancy

Project Details

- Will cover: ME, VT, NH, MA, RI, NY, NU, DE, PA and MD
- Project to be completed 12/06
  - Stakeholder meeting to be held at end
- Envision contact with each state during project
- May release interim or milestone results



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Why Are We Doing This Project?

- Deforestation contributes to 20-25% of global warming.
- In NE, between 1987-1990, forest destruction led to190 M tons of CO2 emissions.
- Information could leverage broader state or regional incentives to reduce emissions from land-based activities.
- Co-benefits of carrying out projects.

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NE Regional Greenhouse Gas Initiative

- RGGI provides an opportunity for providing monetary value to carbon credits
- Initial rule will cap carbon dioxide from power plants
- Began work in Sept ’03; rule expected in August ‘05
- TNC goal is to implement regulations leading to:
  - real emissions reductions
  - a program can be transferred to other regions
- Increases flexibility of regulation and can lower cost of meeting emission reduction goals.
- Proven methods exist for reliably measuring, monitoring and verifying land-based carbon offsets.

The Nature Conservancy

Conclusion

- First systematic study of carbon quantities and estimated costs in the NE
- Project results will:
  - Be a resource to public agencies to inform programmatic decisions re: land use and carbon potential
  - Provide an estimate of costs associated with identified activities
  - Inform formation of rules and parameters for RGGI, the NE carbon registry, or other market based systems
  - Guide and facilitate high quality projects
  - Highlight projects with greatest co-benefits

The Nature Conservancy

Northeast Carbon Feasibility Project

The Nature Conservancy
Winrock International
The Sampson Group

Three Chimneys Inn
May 18, 2005

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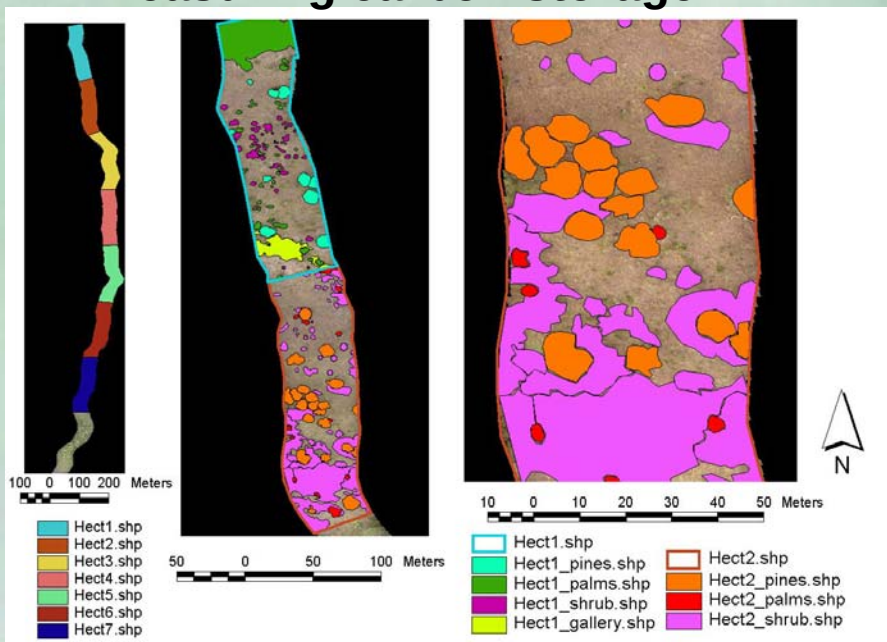

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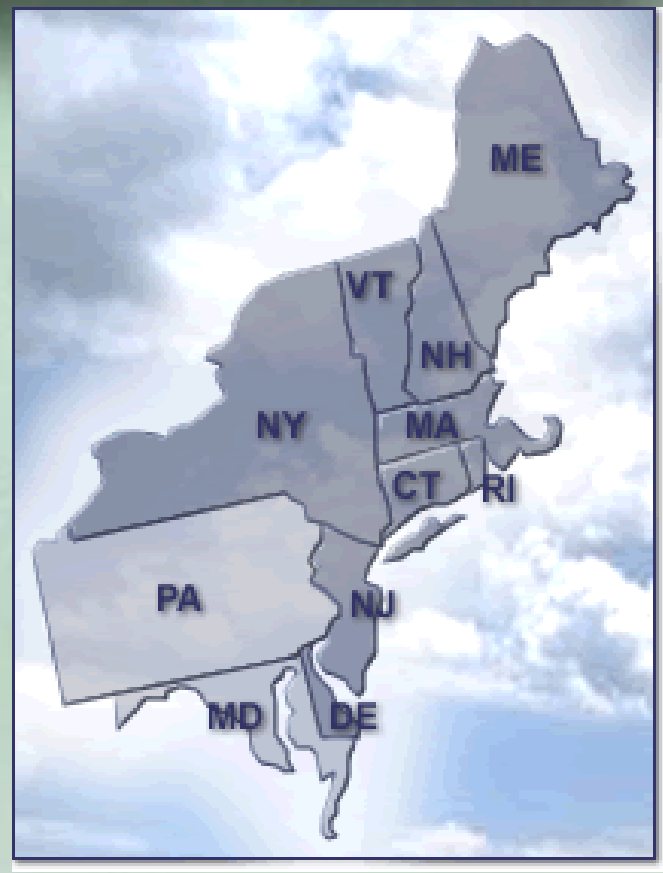

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