Breakout Session C
Session 1
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- what is the relative importance of carbon sequestration in land management choices – is it the primary motivation?
- What is short term and long term? Long term is decades to a century, Short term is now to next 10 years
- Or, Short term is 30-50 years and includes things that can be done now, which don't depend on development of technology, alternative fuels, etc.
- Long term – don't set the horizon beyond the point where actions today can influence the situation
- Short term – 20 years – about the productive life of a power plant (without major replacements)
- Economic long term – 20 years
- Short term and long term – talk about life cycles of relevant plants
- Need a common frame of reference for times (short and long term)
- Short term < 10 years
- Long term – 50-100 years
- Short – time it takes soil to come to equilibrium carbon content
- *For an issue involving many different sectors – short and long term time frames depend on frame of reference (different for different sectors)
- short term – grass, long term – wood
- types of planning and targets need to be keyed to time frame
- * need to link short term and long term goals – aren't independent
- Make short term choices that will make long term goals attainable
- Different reclamation practices tradeoffs: grasses are fast, but not much carbon is sequestered.
- Quantification – how to allocate limited resources among diverse demands
- Need to be able to quantify the benefits of various strategies, put a value on sequestration, direct vs. indirect
- What needs to be quantified?
  - Value of sequestration in $/ton
  - Value of the full effect of the management change you've made (including biodiversity, erosion control, water quality, reduction of sediment levels in streams, etc)

  Ultimate land use drives decision making
- Consider the desired land use – opportunity costs of other options need to be considered
- Long term monitoring is required to quantify change (in sediment loading for instance)
- How can these be quantified in terms of dollars?
- Environmental economics is site specific – difficult to estimate values, need to quantify all that is possible to quantify
- Global values may not accrue to the bottom line of the operator making the decisions – how can the difference be compensated?
- Can we quantify by having a check list of things to look at (endangered species, etc)
- There is a value to a greener image – that can perhaps be quantified
- Quantify as much as possible. Not all measurable things have a dollar value even if we can quantify them. Could use a matrix or +/- for other quantifiable things. Target the desired increase or decrease and use these factors to supplement dollar quantifiable items in decision making
- Need improved methods of quantifying and valuing
- What can we do in economic driven enterprises (like raising corn in Ohio) that will also sequester CO2?(and perhaps in the process like no-till restore the soil quality)
- Does the CS benefit outweigh the use of herbicide
- Broaden the scope of this meeting – include agricultural land use – restoration of degraded ag lands

- Agricultural lands are not/ should not be excluded from consideration of carbon sequestration
- Can mined lands become agricultural lands?
- Consider post mine uses and make reclamation choices based on desired land use – Example – Starfire monitoring of water quality/quantity
- All cropland in OH could be addressed from the standpoint of CS and in terms of increasing organic carbon content.
- What incentives would make people likely to adopt carbon enhancing practices
- And how are you going to quantify
- Is there a great enough benefit in terms of CS to look at it (cropland)
- What is the threshold price to get X% participation in a CS program?
- If the incentive is based on carbon-would be able to compensate people more for trees than crops
- But then back to short term and long term benefits – when would that carbon be sequestered?
- By managing lands for carbon sequestration do you cut off any options? – perhaps land use for development
- What do you do differently than you would do otherwise (to enhance carbon sequestration) and what are the costs of those changes? How much does it cost and what kind of carbon credits do you get?
- Do carbon sequestration practices necessarily translate to increased or maximized collateral benefits (biodiversity, native species, habitat improvement, water quality, etc)
- Is there a risk that other environmental values will get short shrift if lands are managed for CS?

Final Comments
- Jettison short term long term – use years instead?
- Maximizing trade offs – highly land use dependent, economics dependent
- How do you develop the marginal supply curves and how do competing strategies compare?
- Overall maximizing strategy for CS may not maximize or may minimize other benefits.

Summary –
Starred comments were important to the group.
Use of short term and long term depends on frame of reference – all parties in CS should be aware that those frames may be different for others (partners or collaborators).
Need to include consideration of all lands in discussion of carbon sequestration.
Quantification or alternate ways of valuing impacts and benefits were very important to this group.

Session 2 , group 1
Participants
Eric Vance
Mathew Smidt, Auburn University
Don Graves, University of Kentucky
Chuck Schmidt
Rich Birdsey
Jim Amonette
Rick Herd
Paul Rothman

RAW RESPONSES
- What is meant by <u>implications</u>?
- The reclamation (practice chosen) is dependent on approved post mining land use
- Forest optimization choice may preclude other uses in the short term because of rolling land
- How do you determine the post mine land use for the site – there are 11 possible options from which the landowner and operator decide
- Landowner culture is predisposed to making the land flat rather than reforestation
- Market for wood makes landowners more likely to reforest
- Flat land desirable in some communities
- Site characteristics might make CS reclamation less likely or possible

- Regarding perception that site preparation for tree growth was more costly: less $ spent for grading to grow trees, but more cost involved to prepare site for long term use for development (grading or stabilizing soil) after bond release
- Current regulatory atmosphere make operators minimize acreage in trees because it costs more and is harder to get them to bond release (survivability) – this may be a perception, not reality
- How can we change the culture to be more open to CS options?
  - Incentives
  - Education
  - Economic analysis
- How can people be convinced to plan long term
- Reclamation choice depends on the age and perspective of the landowner (trees are a long term choice, grass is a short term choice)
- Is anyone using reclaimed lands for biomass production?
- Future land use could be restricted if credits were received to forest the land
- Part of the inventive package is the product price, so more product will be on the market and the price of product may fall
- Loss of land use options is unappealing to landowners – may affect property value, and opportunity cost
- Provide product specific recognition for products that tie up carbon for a long time (like Trus Joist products, fine furniture)
- Get a credit for putting land immediately back into production
- Consider fossil fuel savings of burning organic matter or using wood as structural members instead of steel
- One tradeoff is the risk of loss by fire of trees planted for carbon sequestration
- Need to take a whole accounting approach to management for carbon – include on site carbon, storage in products, byproducts used for bioenergy
- Monitoring of offsite products is difficult. Who gets the credit (potential for double counting)
- Develop default values for typical management schemes
- Herbaceous ground covers sequester carbon too, When do trees overtake herbaceous cover in terms of carbon sequestration (at what age)
- Carbon in forest soils is more labile than the carbon in grassland soils because of the composition of the plants and how they degrade. Is that considered?
- What's the quality of the organic carbon that's sequestered from different plant covers (in the soil)?
- Normal harvesting leaves 60% of carbon on the ground what happens to the carbon on the ground? (80% is gone after 15 years)
- Tap roots stay in place over multiple rotations. Fine roots turn over
- Go back and measure carbon storage in experimental plots with know management and treatments.
- One reclamation option is to choose multiple land use (forest plus grassland)
- Organizations (NGOs) may find it attractive to invest in a project due to other values like native species, biodiversity, increase habitat. May make otherwise uneconomical treatments possible.
- Keep in mind that in most cases these lands will be managed for something else with carbon as a side benefit.

END OF RAW RESPONSES

Summary: This group had a number of members with very specific knowledge of mined land reclamation and reforestation. The focus was very much on reclamation as is exists now with its current constraints. Of note:

This group talked a lot about the cultural impediments to reclamation practices that enhance terrestrial carbon sequestration. The point was made that the approved post mine land use that guides the reclamation plan is determined jointly by the landowner and the operator (and approved by regulators). Both the landowner and the operator may be predisposed toward the compacted traditional grass or scrub reclamation due to a desire for flat land for development or due to fear of not getting the successful tree growth that would allow bond release with a forested alternative.

There were a lot of questions about carbon values in soils with different treatments and in various kinds of vegetation. There was a suggestion to measure carbon values in experimental plots with known

management and treatment. It was felt that all this information would be helpful in making decisions about options.

Another theme was the need to understand the total picture of costs and benefits – what are the opportunity costs of choosing one practice over another in the short term and in terms of land use choices; what is the fate of carbon on the ground (after harvest), in the soil, in wood products, in landfills, and can some credit be obtained for uses that hold the carbon longer?

Session 2, group 2
Keith Paustian
Gary Kaster
Jim Carey
Richard Barnhisel
Lynn Brickett
Sarah Forbes
Jeff summers
Craig Idso
Chris Barton
Randy Kolka

Q1 What are the long and short term implications of different reclamation practices?
- short term – scope of bond release
- long term – post bond land use
- long and short – how you put the soil back – geo location helps determine the scope of planning/ what is "put back" (bond release)
- the price of coal determines the amount of land reclamation done
- short term strategy – herbaceous plants first
- long term – plant trees
- types of coal fields in KY determine reclamation
- *type of land – site specific – determine (should) how the land is reclaimed (slope, etc) E.KY when trees are cut topsoil is lost
- remediate to "fix environment" to make the most productive environment
- it's important to look at carbon content before the area is mined
- what is the cost associated with reclaiming the land? Maximize vs. carbon storage
- in the short term – 5 years – some carbon storage but for the long term carbon storage is to plant trees

Q2 What are the trade-offs to managing mined land for carbon sequestration? Is it worth it?
- what are the risks? Want bond released – mining co. won't make any $ on a corn field (on a bonding issue) best to sell the land
- good reclamation practices will increase carbon content
- no mandates to fix problems – to plant trees, etc (no carbon cap)
- can grow profitable trees over the long term
- farm nutrients off site – it is costly to put them back and to create ag land
- long term – forest is better for carbon sequestration storage
- mined land is more sensitive to abuse

Q3 Permanence, Leakage, Biodiversity and other benefits: what about the bigger picture:
- Leakage – balance, accountability – long term products vs. paper, deforestation vs. preservation
- *If you have good management practices you can keep most of the carbon in the soil
- on grasslands – no leakage
- regeneration of trees can help cover cost, but you get more carbon with older trees
- total "stocks" have more carbon
- mined land better start for carbon vs. ag land that has been farmed over time
- Identify what "works" to preserve biodiversity
- For carbon sequestration to recover carbon credit, all parties need to be "progressive thinkers" to see the big picture of benefits preserving biodiversity, permanence, etc.

END
No summary – Keith was in this one ☺