Fire as a Management Tool

• Benefits of controlled burns:
  – Stimulates growth
  – Removes invasive species
  – Increased palatability and nutrition value of recently burned forages
  – Reduces weed pressures and disease infestations
  – Can reduces intensity and frequency of wild fires
Fire as a Management Tool

• Detrimental impacts of wild fires:
  – Increases risk of soil erosion
  – Eliminates stock piled forage
  – Destruction of property
  – Dangerous!
• YouTube Video
Conversion of CRP to Agricultural uses

- Significant improvements in soil physical, chemical and biological properties have occurred during the 10-30 years that soils have been under CRP management.
- CRP lands were/are planted to a perennial grass, with grazing or haying only allowed during droughts.
- Periodic controlled fires are utilized within some management plans.
- No fertilizer is applied.
Conversion of CRP to Agricultural Uses

• Soil properties that are improved include:
  – Total carbon (organic matter)
  – Total Nitrogen
  – Water infiltration
  – Aggregation
  – Porosity
  – Water holding capacity

• Efforts should be made to maintain these improvements during conversion, especially if no-till management is utilized after conversion
Conversion of CRP to Agricultural Uses

- Soil characteristics can be maintained if minimum tillage and/or timely herbicide applications are used.
- Termination of perennial grasses can be very challenging in drought prone areas.
- Systemic herbicides such as Glyphosate must be applied during active translocation of carbohydrates to the roots.
- This occurs during mid summer for warm season grasses.
Conversion of CRP to Agricultural Uses

• No-till conversion is best option for conservation of improved soil characteristics, However:
  – Under good condition herbicide termination will require multiple applications
    • Especially in far western OK and high plains
  – No-till conversion may result in rough surface.
  – Grassy weeds will be challenging to control during first years
    • Must be considered when developing plan for crop rotation.
    • Utilization of glyphosate resistant crops in the first years will allow for continued applications
Minimum Tillage Conversion

• Use of minimum tillage may be more effective option for dry regions such as the high plains
• Under cut grasses during dry conditions to expose and kill roots and maintain residue on the surface
• This will prevent erosion of highly erodible land
• Much of the improved soil characteristics can be maintained as long as tillage is limited to the first year of conversion
Fertility Management after Conversion

- Soil test to assess pH, K and P
- In sandy soils in old CRP lands, nutritional characteristics of soil may have improved over time due to nutrient cycling.
- Nitrogen requirements will be higher in the first years after conversion due to immobilization during decomposition of grass residues
- Planting leguminous cover crops will aid in building N content in soil and may aid in weed control prior to planting cash crop
Soil Degradation in Forested Systems

• Natural undisturbed forested systems produce the least runoff and soil erosion among all land uses.

• Therefore, disturbance of forested systems can have significant impacts on the hydrology of watersheds.
Deforestation and Soil Degradation

- Deforestation is responsible for the ongoing decline in the extent of forest
- Currently this decline is most rapid in topical regions
- Forests are being cleared for crop production, grazing and urbanization.
- Deforestation does not always mean a complete clearing of trees.
- More accurate to say that the structure and function has been altered
- Google maps
Deforestation and Soil Degradation

- Deforestation in the U.S.

Soil Erosion in deforested areas

• Generally, the soils remaining in forest today are often highly susceptible to erosion
• As mentioned in the beginning of the semester. Continued demand for crop and grazing lands cause deforestation to occur on these highly erodible lands.
• In some systems no-till management can maintain soil characteristic and prevent erosion
Cropland reclamation in Southern Brazil

- Data provided by Romulo Lollato, Graduate Student in Plant and Soil Sciences
- Soil carbon monitored on cropland since 1978
- Deforested in 1976.
- Converted to no-till management in 1983
- Rotation was corn, edible beans and spring wheat with no fallow period.
Changes in Organic Carbon Concentrations

- Tillage caused a rapid decline
- Conversion to no till allowed for accumulations of SOC to levels equivalent to native forests
No-till Providing Affective Erosion Control

Cultivated to Remove Ruts
Global Implications of Deforestation

- Alters global carbon cycle
- Alters global and regional water cycles
- These factors in turn impact local and global heat and air fluxes.
- Deforestation decreases terrestrial assimilation of atmospheric CO2
Regional implications of deforestation

• Decreased biodiversity
• Increases runoff quantity and decreased quality can deteriorate regional water supplies
• Will impact the ecosystems of sensitive surface water bodies.