

Development of a Protocol to Soil Survey Reclaimed Mine Land in North Dakota



Participants

- USDA-Natural Resource Conservation Service (Perry Sullivan, Mike Ulmer, Jeanne Heilig, Paul Benedict, Joe Brennan)
- NDPSC-Reclamation Division
- Falkirk Mining Company, Coteau Properties Company, Dakota Westmoreland Company, & BNI Coal



- Approximately 70,000 acres of anthropogenically disturbed land in ND without adequate soil survey
- Largest category (50,000+ acres) is reclaimed surface coal mine lands
- Participation in federal farm program requires soil survey



Mapping Reclaimed Soils

- Natural landscape models fail to capture the nature of reclaimed soils and landscapes
- Reclaimed soil genetic processes and rates of change are poorly understood

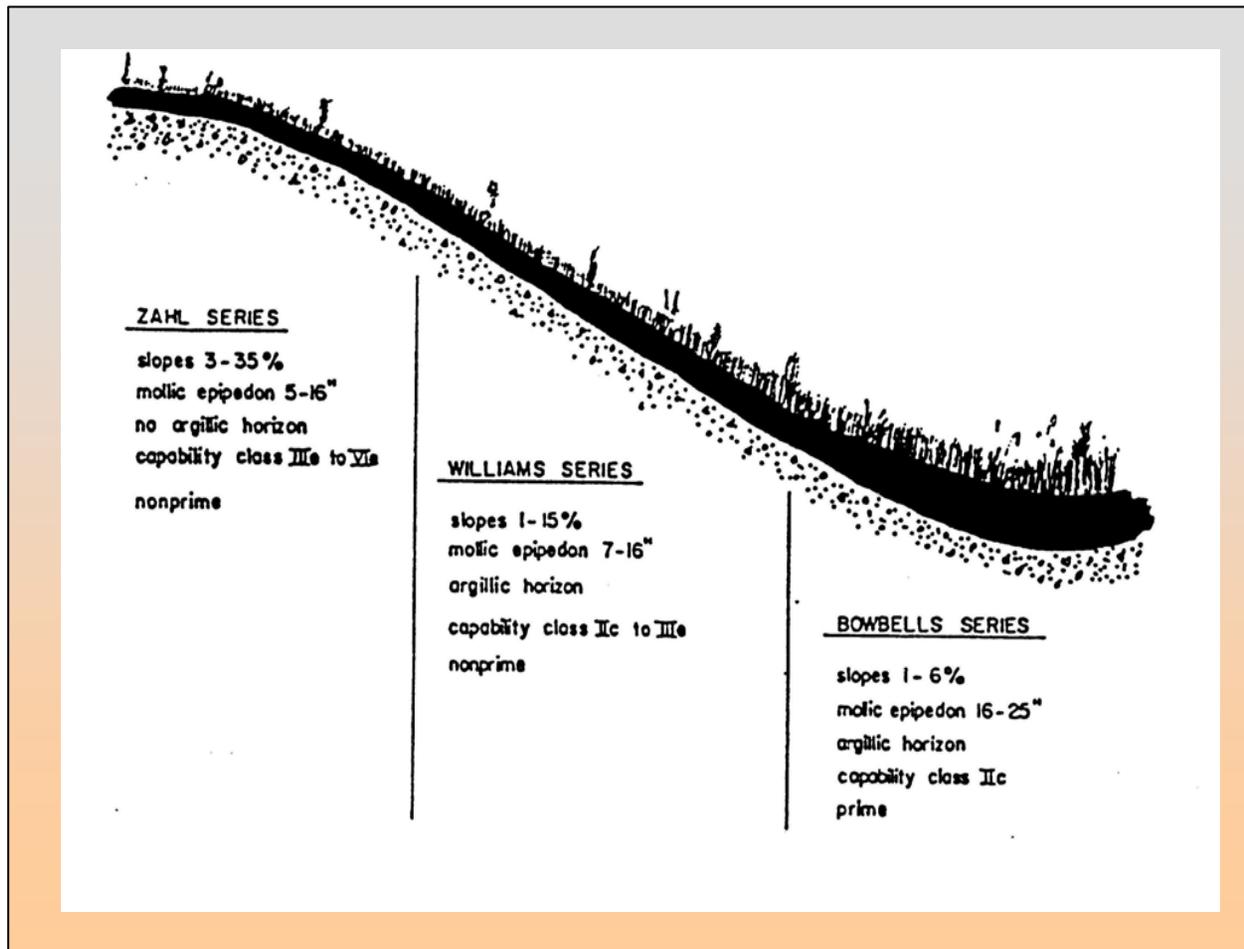


5 Soil Forming Factors

- Climate
- Time
- Vegetation
- Parent Material
- Topography



Pre-Mine Soil/Landscape Relationship



Post-Mine Soil/Landscape Relationship

- Generally less sloping than premine
- Uniform soil respread thickness



Reclaimed Soil Properties

- Thickness of topsoil and subsoil
- Chemical properties (SAR, EC, OM, CCE, etc.)
- Physical properties (texture, structure, compaction, water holding capacity)
- Underlying spoil quality
- Map Unit Criteria (slope & landscape position, drainage class, inclusions, etc.)



- USDA-NRCS initiated project to map, classify, and interpret reclaimed soils
- Goal was to use as much existing data as possible
- Use tools such as GIS to model the landscape
- Data from a variety of sources: the mines, PSC, research agencies, etc.



Project Phases

- Mapping (spatial delineations based on surface topography and soil respread thicknesses)
- Create reclaimed soils database (rely on previously collected information)
- Field work (ground truth, soil investigations, etc.)

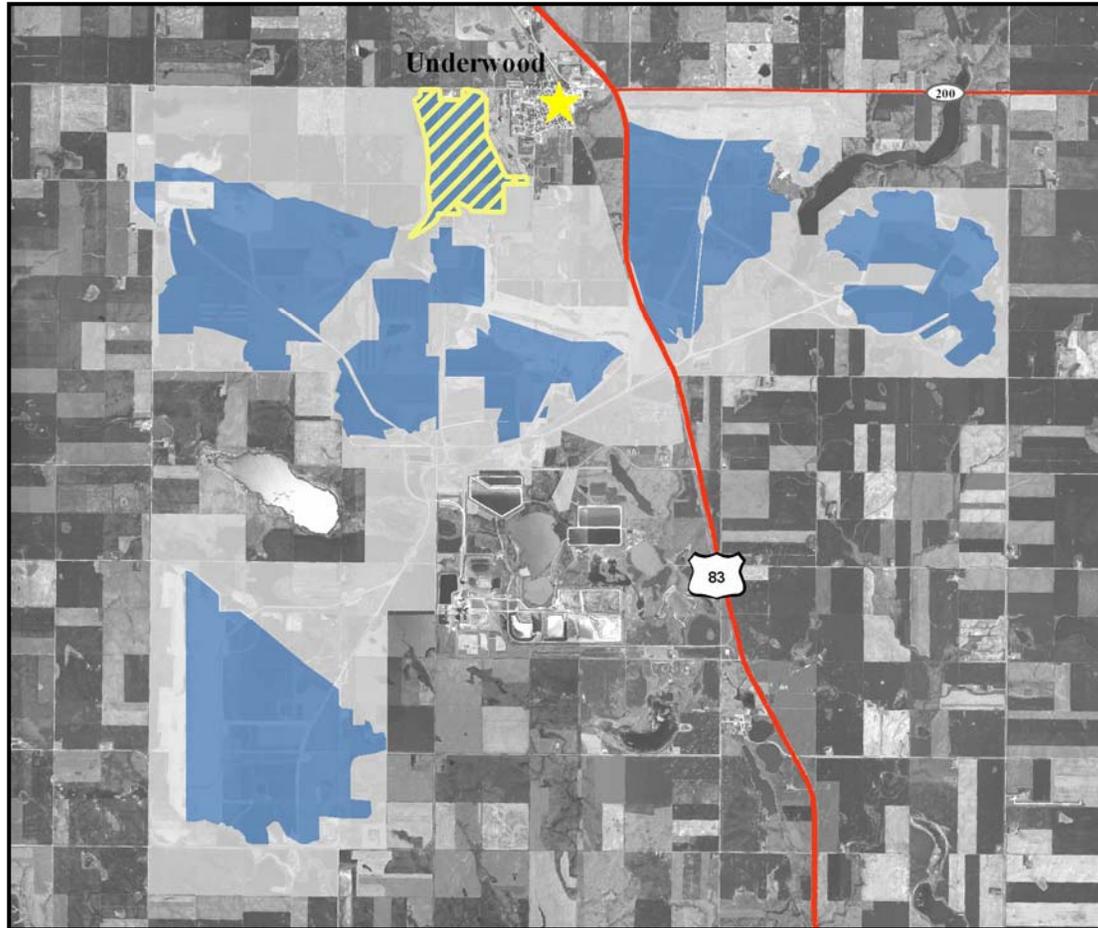


The Project

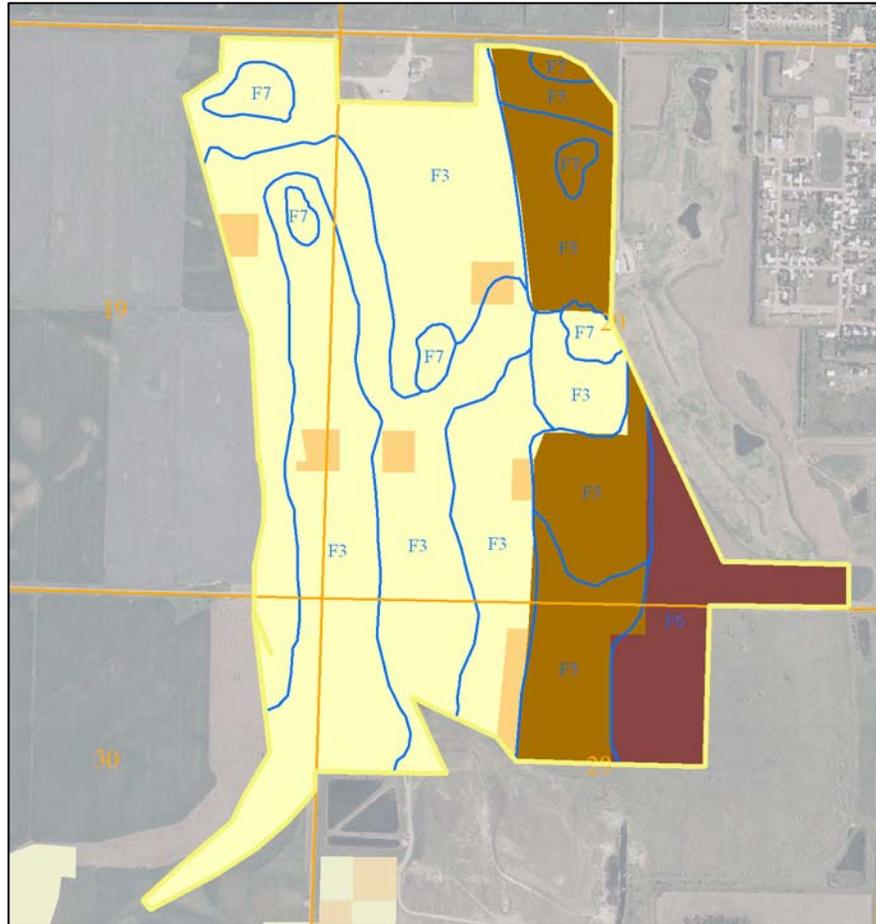
- Falkirk Mine was chosen as the pilot project
- Approximately 5000 acres of reclaimed land at the Falkirk Mine
- Generally uniform spoil and soil quality
- Low relief
- Mostly 24" & 36" total respread thickness



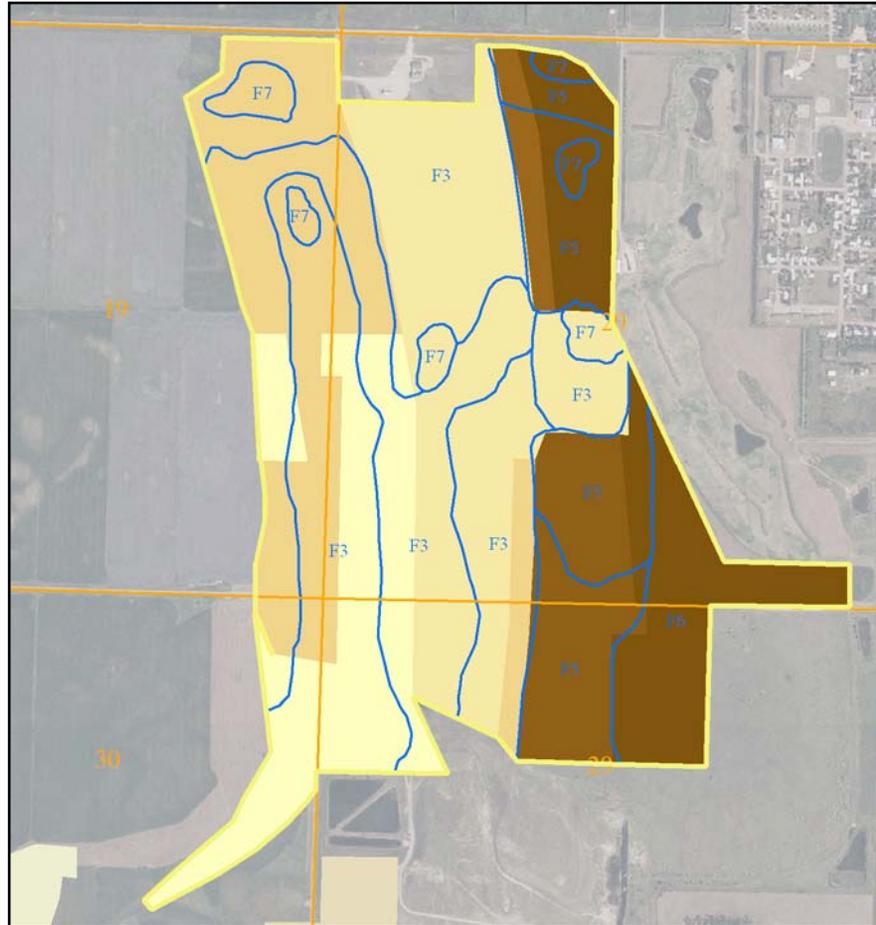
Falkirk Mine



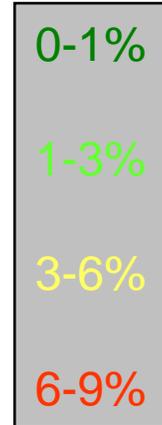
Total Respread Thickness



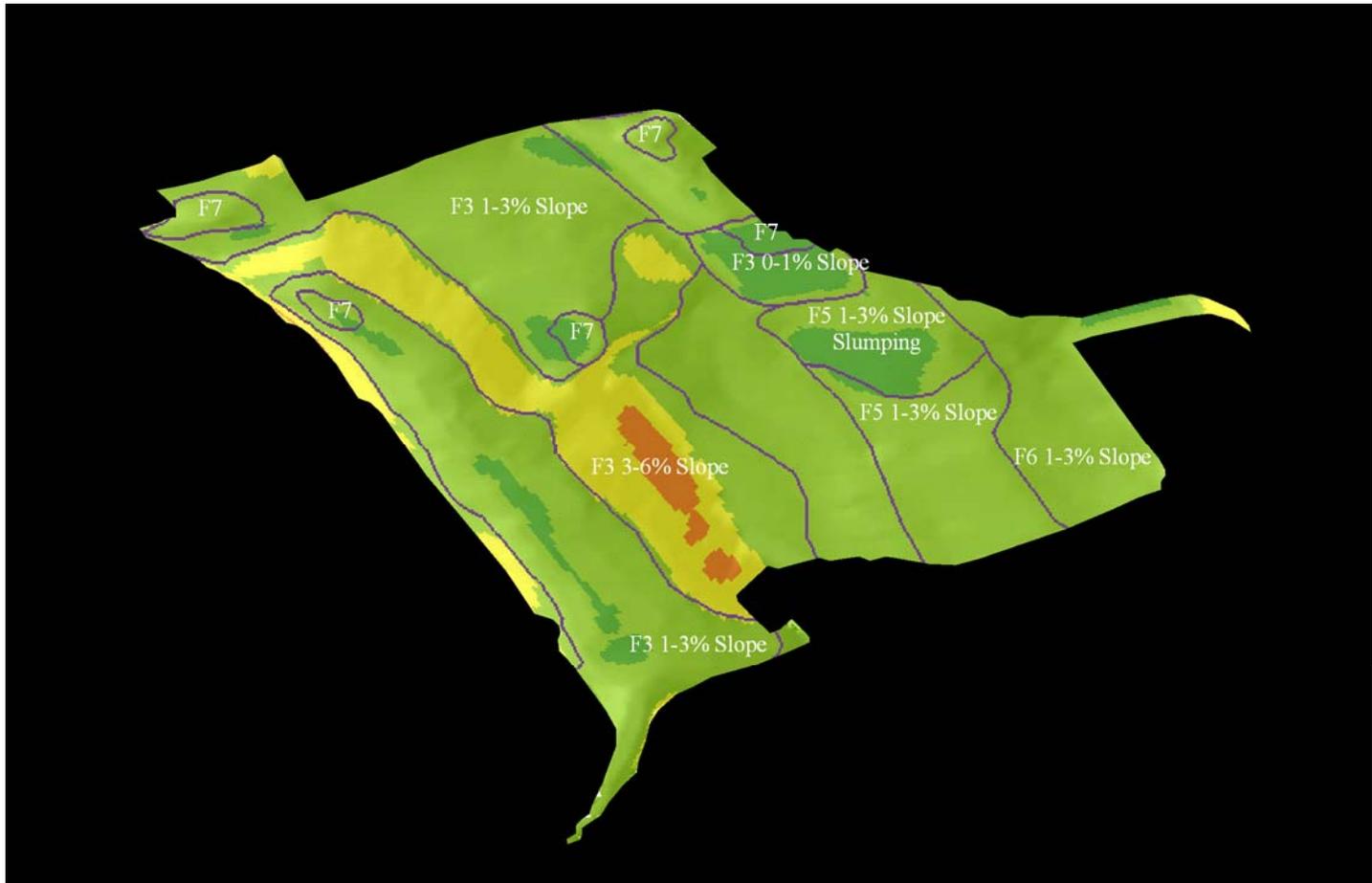
Topsoil Thickness



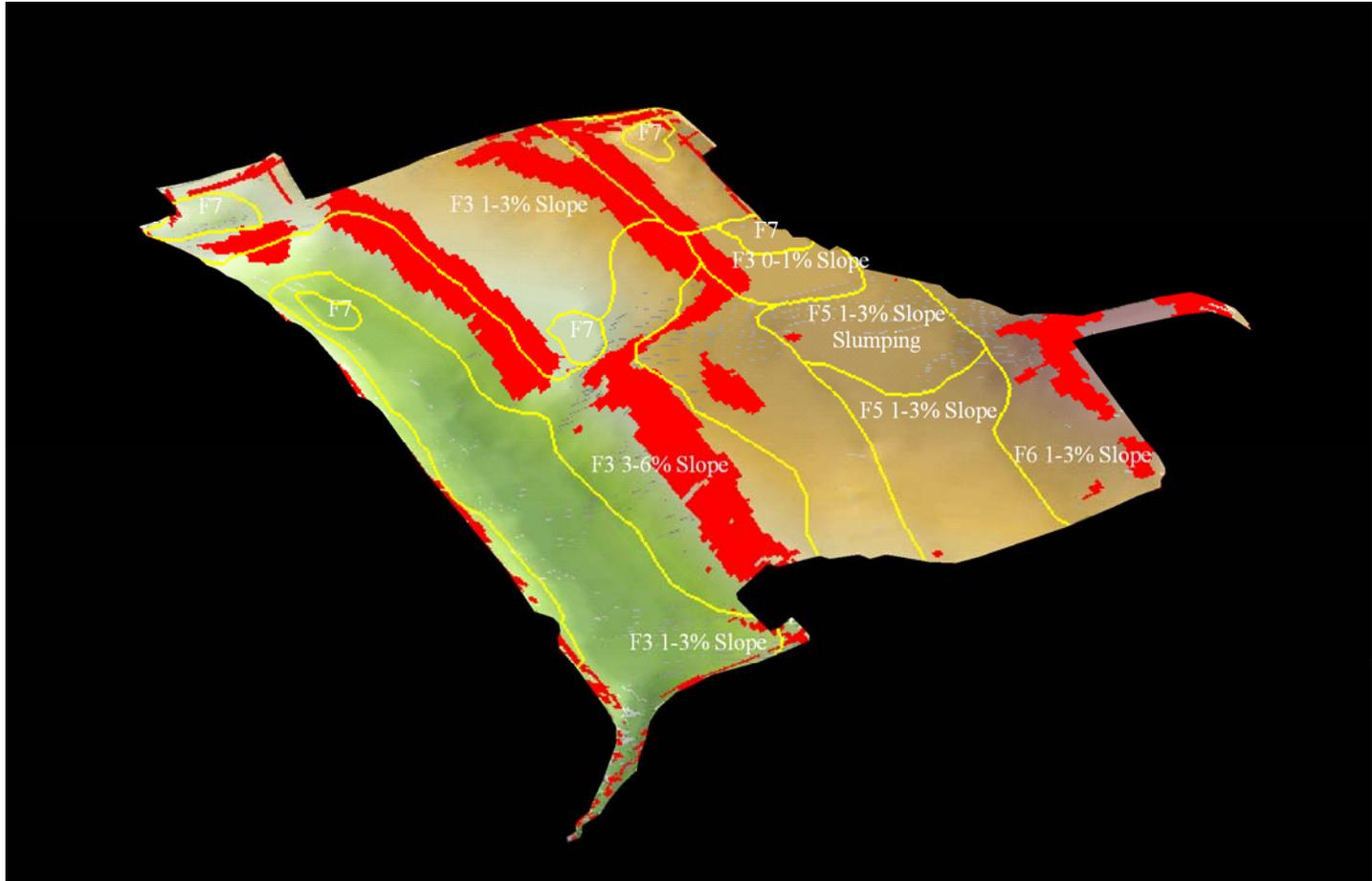
Slope Map



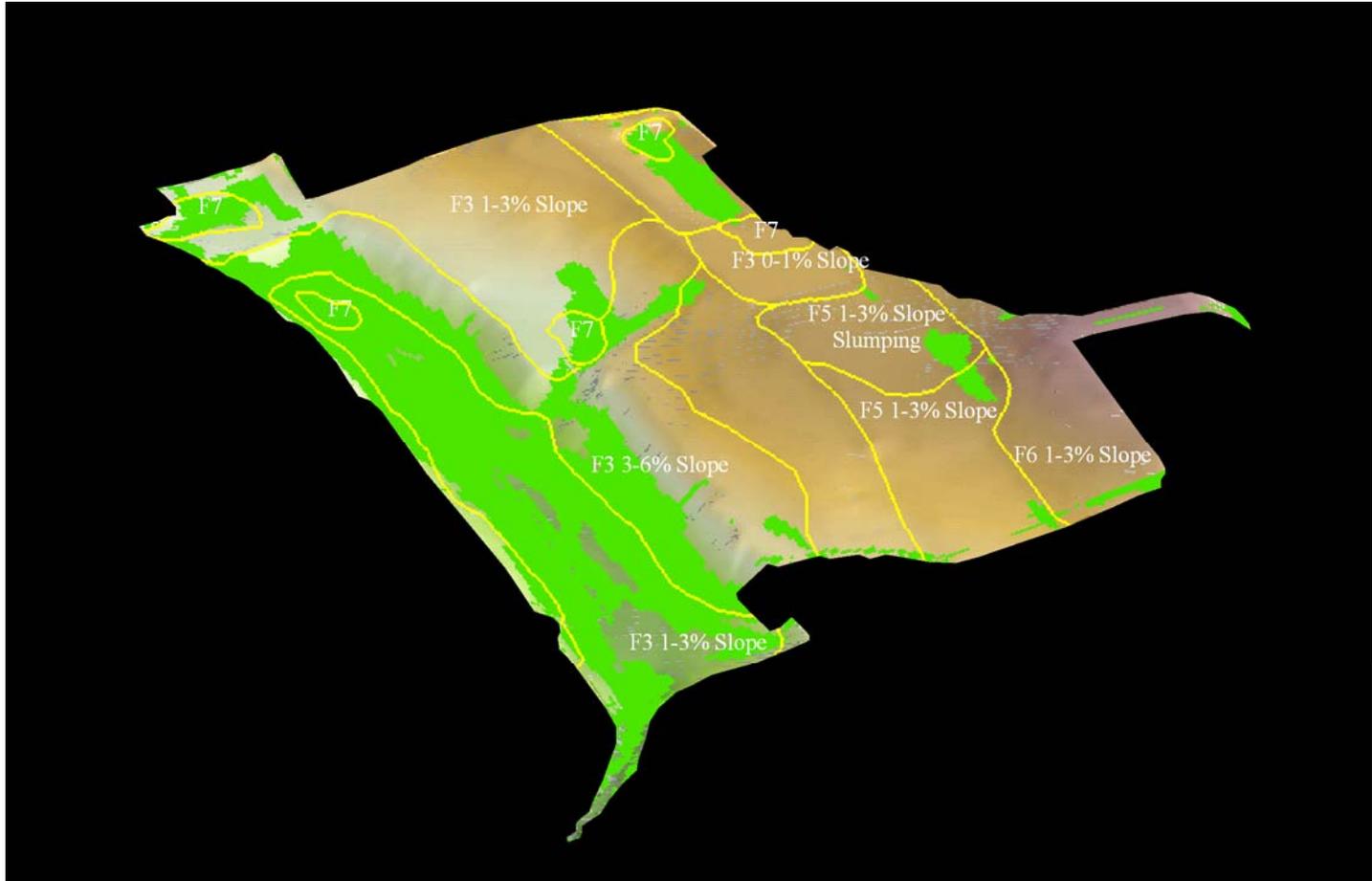
3D Slope Map



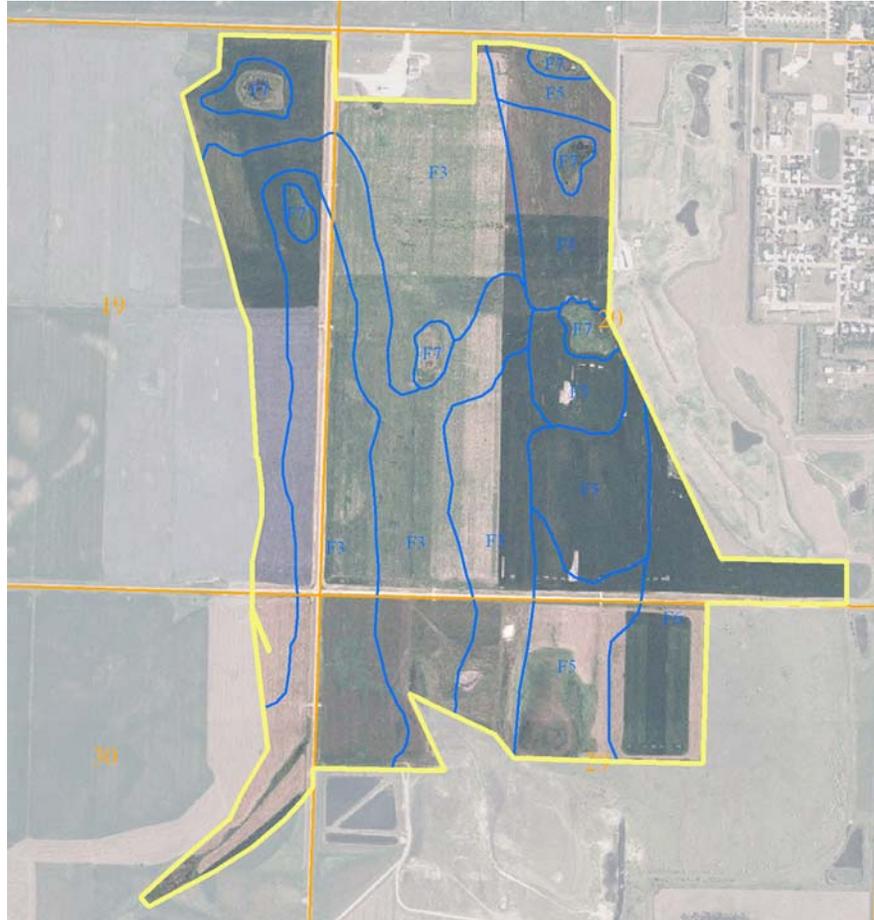
Run-Off Map



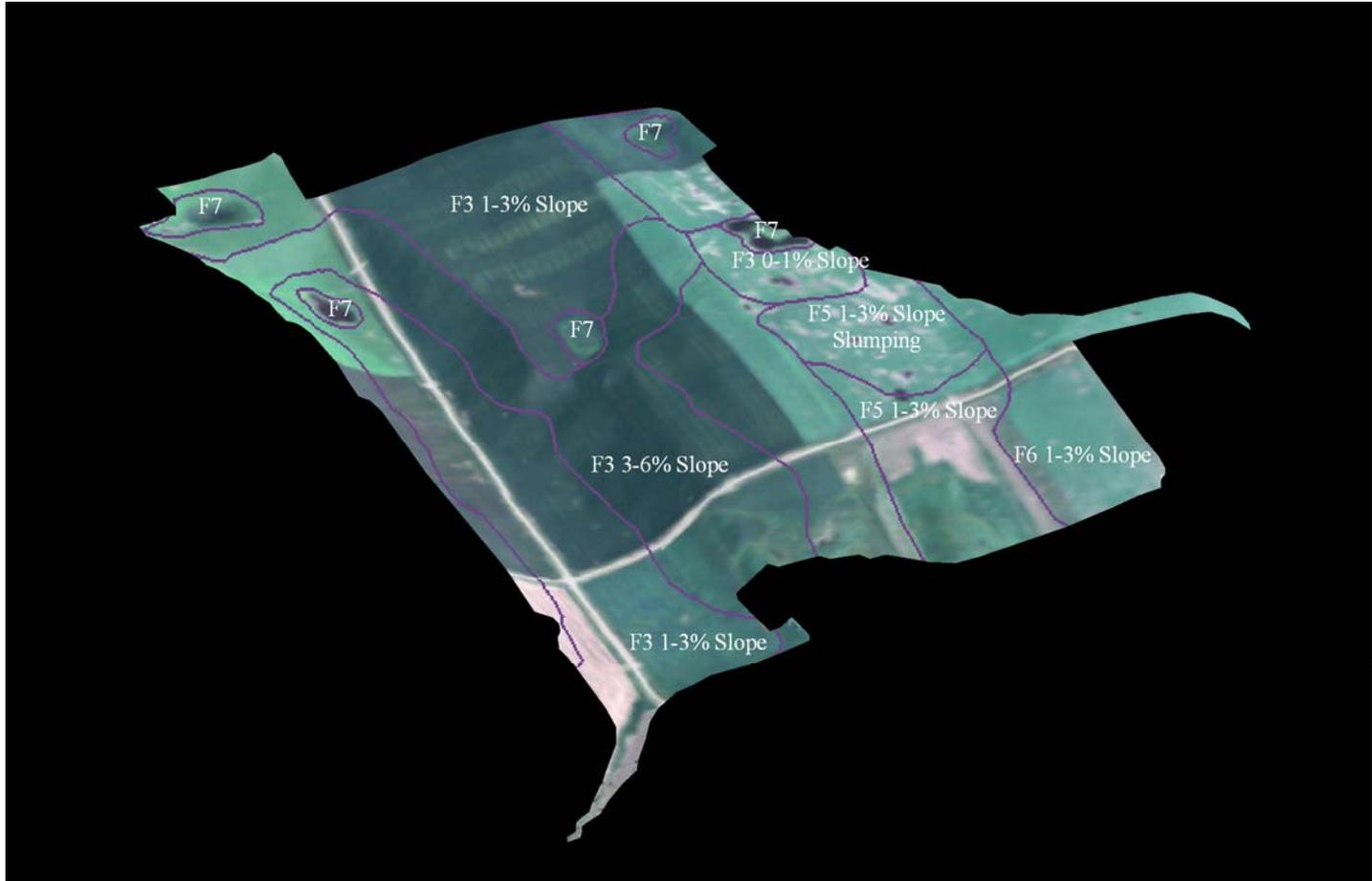
Run-On Map



Soils Map



Soils Topo Map



Remaining Work

- Correlating and classifying the reclaimed soils.
- Providing the necessary interpretations
- Completing the soil survey of reclaimed lands at the other mines
- Making the information available to the public and agencies



Conclusions

- Reclaimed soils can be mapped and classified using existing data
- Reclaimed soils tend to be somewhat homogenized; differences are primarily related to landscape position and soil respread thicknesses
- GIS was useful in determining landscape positions and slope breaks and compiling information

