Cropland Reclamation Under SMCRA: Forty Three Years Later

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Abstract. The reclamation of prime farmland was a significant issue for the passage of SMCRA in 1977. Midwestern states with large acreages of both prime farmland and strippable coal reserves had the potential for large impacts. Although at that time there was limited information about how to successfully restore reclaimed farmland and how to demonstrate the capability of success; solutions were found as issues developed and now cropland reclamation is somewhat of a cookbook process. Over 31,000 acres of reclaimed cropland have been successfully been restored in Illinois. As Illinois mining shifts to underground mining, much of what has been learned about soil compaction will be transferable to reclaiming cropland which has been disturbed by surface activities at underground mines.

Introduction One of the most controversial items of 1977 Surface Mine Control and Reclamation Act (SMCRA, PL 95-87) was the prime farmland provisions. Earlier versions of the law contained complete and partial moratoriums of surface mining of prime farmland . A thorough discussion of this may be found on the OSM website https://www.osmre.gov/resources/Coalex.shtm under COALEX Report 51. Illinois and other midwestern states were on the forefront of this controversy. In Illinois, with almost one half million acres of prime farmland underlain by strippable coal reserves, this was particularly a significant issue. Every surface mine had a least some prime farmland within its boundaries. In addition, a large additional acreage was covered by the state's preexisting cropland standard which included soils that were commonly cropped but not quite prime by definition and prime farmland that would have been excluded by grandfathering for existing mines. These are known as High Capability soils. Collectively they are called cropland capable soils.

Under the adopted SMCRA, part of the legislative compromise was to provide for a demonstration that full restoration within a reasonable time could be achieved

in order to get a permit. To avoid the proverbial Catch-22 problem of demonstrating you could do it before getting a permit to prove you could do it, the congressional record allowed the use of "expert opinion." To say the least is there were many "experts" of differing opinions.

All of that controversy included numerous court battles over several years including the Flannery decisions (DDC 79-1144), see COALEX report 51, and all the regulations that came and went as a result. These dealt with applicability to underground mines, soil removal and replacement, subsoil mixing, compaction and ultimately how do you measure if the crop productivity has been restored. Could this be done by following a soil reconstruction plan and meet certain physical and chemical specifications through a soil model, or must crops be grown to achieve certain yields?

Once it was established that crops had to be grown, the issue became what crops to measure, how many successful yields, what is a reasonable time, (establishing test plots on the mined ground or planting entire fields to crops. In addition, what would be the yield targets? Would reference areas be used or yield estimates established by the universities or the Natural Resources Conservation Service be the targets? How would annual local growing conditions factor into the target yields? Who would do the testing and what statistical methods would be used for yield comparisons to determine a yield pass or a fail?

With all the above controversies, in Illinois it took 9 years to develop and get initial approval from OSM to have a methodology for the yield testing of reclaimed cropland. Another 10 years was needed to fine tune it based on continued federal rulemaking and field experience. This method is called the Agricultural Land Productivity Formula (ALPF). New improvements are being integrated to take advantage of advances in technology such as GIS and satellite imagery – The National Agricultural Statistics Service CropScape program , GPS and yield monitors on harvest equipment, and the GIS based Natural Resources Conservation Service Web Soil Survey.

The basic reference source of ALPF uses the soil productivity values assigned by the University of Illinois Cooperative Extension Service, Bulletin 811. These are the same values that are used for the state's farmland property tax base.

Using ALPF, the soil map units for the permit by regulatory standard, prime or high are tabulated and an acreage weighted yield target using Bulletin 811 is established using the formula below.

Soil map unit acreage x Bulletin 811 yield x % of total ac per regulatory standard

Permit Yield Target = the sum of all the weighted yields

Similarly, the soil map units for the county are tabulated. A further refinement is made for the county by determining the acreage of those soils are actually used as cropland. This reduces the influence of the acreage of the poor quality and steep soils that are not typically cropped. This process then sets up an acreage weighted yield target for the county as well using the formula below.

Soil map unit acreage x Bulletin 811 yield x % of total ac of cropland

County Cropland Yield Target = the sum of all the weighted yields

The county's cropland thus becomes the reference area. Each year the USDA produces a county average yield for most of the crops typically grown, corn, soybeans, wheat and hay. This yield becomes the reflection of local growing conditions for the county. That annual yield, up or down from the county target yield, becomes an annual adjustment percentage for permit yield targets. It is called the County Success Factor.

County Average Yield / County Cropland Target Yield = County Success Factor

County Success Factor X Permit Target Yield = Annual Adjusted Permit Target Yield

Over the years Pass/Fail yields were evaluated and trends were observed. Early in the program it was determined , through extensive research, that soil physical condition (compaction) was the most significant limiting factor for not achieving the required yields. In response the mining industry, in cooperation with the universities, state and federal regulators , and the tillage industry, experimented with several pieces of compaction alleviation (deep tillage) implements and also in compaction prevention, i.e., limiting traffic during soil replacement. The shift in mining technology from using scrapers to the use of haul trucks also assisted in this effort to focus on compaction prevention.

Experimentation also showed that compaction alleviation was not only beneficial, but long lasting, hence not a short lived, augmentative practice. In addition with the use of trucks, what compaction that does occur was not as deep, allowing deep tillage to 36 inches rather than the initial 48 inches to be successful. As a result, when needed, the current use has been narrowed down to one deep tillage implement, the DM3. A comparison of two southern Illinois surface mines with truck soil haulage and comparable soils revealed that incorporating deep tillage into the management shortened the time frames to bond release eligibility on prime farmland by two years.

Deep tillage is considered a standard practice as part of the management program for many companies. For those companies who do not incorporate deep tillage as part of their management, the regulations require this to be implemented in the event of five crop failures, although this rule is not commonly needed due to compaction prevention. There are no fields that have failed to achieve success after deep tillage.

In the early 1980s surface mining in Illinois peaked at about 5000 aces per year whereas now with the economics of underground mining and the best surface mining reserves having been mined, the annual surface mined acreage has averaged 500 acres per year for the last few years. Ninety five percent of the state's coal production is now from underground production. The acreage of cropland reclamation from surface disturbances from the underground mines is significantly less, but soil compaction is still considered the primary limiting factor to achieving full productivity restoration.

Conclusion The ALPF testing system has now been used on over 1400 reclaimed farm fields. Over 1100 fields have passed through the system meeting all the required targets yields for cropland. Those passing fields represent over 31,000 acres. All cropland, whether the required three year 100% target passes for prime farmland, or the two year 90% target passes for high capability land in a cropland land use, must include a successful corn crop. Corn is considered the hardest of the four crops allowed (corn, soybeans, wheat or hay) to achieve targets as it is pollinating at a time when the plant usually must rely on subsoil moisture to make up any shortfalls from rain. Therefore soil physical condition is critical to make water available to plant roots.

The remaining 300 plus fields in the system are newer fields in the process of being tested. Due to declining surface mining acreage, less new acreage is coming into the system than is going out. Testing is discontinued once yield requirements are met due to limited resources, however a review of land use on reclaimed cropland capable soils shows most are continued to be farmed in grain or hay crops after bond release. Much of what has been learned about soil compaction will be transferable to reclaimed cropland which has been disturbed by surface activities at underground mines.