

Appendix A

Geologic Sequestration in Pennsylvania: Land Ownership Issues

A paper by Ted Borawski of DCNR¹

Introduction

The issue of subsurface ownership needs to be addressed early in the process of geological sequestration. The complications of land ownership and title in Pennsylvania are complex enough that excellent prospect areas for sequestration projects might be entirely unsuitable due to unresolved ownership issues. Obtaining ownership and CO₂ sequestration rights on private lands could be serious enough to degrade the long term objective of sequestration in Pennsylvania. It is possible that the cost of obtaining the mineral rights, potential access problems with pipeline right-of-ways, and potential liability issues could pose limitations to the large-scale application of sequestration technology. As such, as a last resort, the Commonwealth should consider the possible use of eminent domain to obtain the necessary rights to pave the way.

Land Ownership And Mineral Rights

Fee simple ownership is defined as ownership of land with no reservations. William Penn and his heirs acquired, surveyed, tracted, and sold the lands deeded to him by the Crown, fee simple (without any reservations), to private individuals beginning in 1682. The private owners that acquired lands fee simple were mostly unaware of the possibilities of exploitation of the mineral wealth in the near surface and deep subsurface. Indeed, the vast majority of landowners were farmers whose sole intention was farming their lands for a living.

As Pennsylvania was settled and the majority of its lands transferred to private ownership, the exploration of Pennsylvania for mineral wealth began with the discovery of large amounts of iron ore in the Cornwall region of eastern Pennsylvania in 1734. Soon after, coal was discovered in and around present day Pittsburgh. Since that time, Pennsylvania has had a long history of exploitation of its mineral wealth. This has been accomplished either by the original owner selling the rights to specific minerals (for example, coal and/or oil and gas) to a new owner by deed, or by leasing the mineral rights, with a limited set of rights to exploit the minerals, to an operator who would pay ongoing rentals and royalties to the owner.

Ownership is further complicated by the process known as “severance of rights,” which has been occurring in Pennsylvania since the early 1700’s. This involves severing mineral, wind, timber, and other rights from the original deed title. The major difference

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between a severed title right and lease rights, besides monetary payout factors, is that a lease is limited in term and will expire at some time in the future, whereas a titled right never passes away and may be titled to new owners in an unlimited fashion.

Once severed, the right to some or all subsurface resources can be passed on to successor generations through inheritance, sale, or trade by deed. Thus, the title chain is often unbroken from the time a right has been severed until today where many Pennsylvania landowners own only the surface and none of the subsurface rights. Leases against certain rights might last for generations, but eventually expire when the resource runs out or the economics of the situation no longer make sense and the lease agreement is terminated.

The start of the trend to sever subsurface rights began with the widespread commercial mining of coal in both western and eastern Pennsylvania in the 1800s. At that time, taxes were not assessed against subsurface coal rights, so severing the coal rights put some legal distance between the surface and subsurface owners should the surface owner go into forced sheriff's sale. The counties in Pennsylvania where the severance of subsurface rights and the widespread leasing of subsurface rights are commonly found are shown in Figure 1 and Table 1.

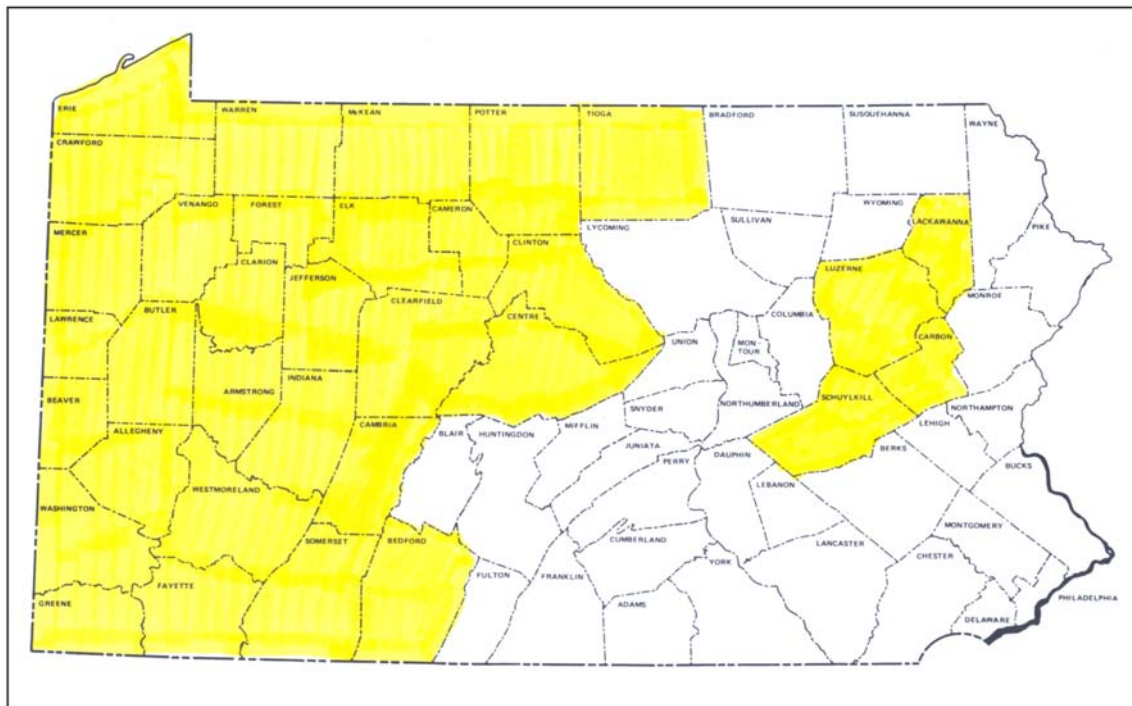


Figure 1. Map of Pennsylvania counties that have been widely affected by severance of subsurface rights from surface ownership.

The severed rights, especially in the oil and gas fields, might have been fractionated as inheritance practices caused division of the rights into smaller and smaller shares. For example, a 100 percent undivided share in the gas rights on a particular tract might have been subdivided into equal or unequal shares based on fractions. Fractional designations

Table 1. Pennsylvania counties affected by severed rights for oil, gas and coal. Names in italics indicate both the oil and gas and coal rights are often severed.

<u>Oil & Gas Rights Reservations Common</u>	<u>Coal Rights Reservations Common</u>
<i>Allegheny</i>	<i>Allegheny</i>
<i>Armstrong</i>	<i>Armstrong</i>
<i>Beaver</i>	<i>Beaver</i>
<i>Bedford</i>	<i>Butler</i>
<i>Butler</i>	<i>Cambria</i>
<i>Cambria</i>	<i>Cameron</i>
<i>Cameron</i>	<i>Carbon</i>
<i>Centre</i>	<i>Clarion</i>
<i>Clarion</i>	<i>Clearfield</i>
<i>Clearfield</i>	<i>Crawford</i>
<i>Clinton</i>	<i>Elk</i>
<i>Crawford</i>	<i>Fayette</i>
<i>Elk</i>	<i>Forest</i>
<i>Erie</i>	<i>Greene</i>
<i>Fayette</i>	<i>Indiana</i>
<i>Forest</i>	<i>Jefferson</i>
<i>Greene</i>	<i>Lackawanna</i>
<i>Indiana</i>	<i>Lawrence</i>
<i>Jefferson</i>	<i>Luzerne</i>
<i>Lawrence</i>	<i>McKean</i>
<i>McKean</i>	<i>Mercer</i>
<i>Mercer</i>	<i>Northumberland</i>
<i>Potter</i>	<i>Schuykill</i>
<i>Somerset</i>	<i>Somerset</i>
<i>Tioga</i>	<i>Tioga</i>
<i>Venango</i>	<i>Venango</i>
<i>Warren</i>	<i>Warren</i>
<i>Washington</i>	<i>Washington</i>
<i>Westmoreland</i>	<i>Westmoreland</i>

of 8ths, 16ths, 32nds, and 64ths are commonly found in deeds. These fractional rights might also be leased to different parties for exploration and development activity.

In the case of leasing, by state law a royalty of at least one eighth (1/8) of whatever is produced must be paid on leased rights for oil and gas, subject to the fractional ownership of the rights.

Gas Storage Rights And Carbon Sequestration

Pennsylvania today is capable of storing 1.2 trillion cubic feet of natural gas in operational gas storage reservoirs, accounting for a significant number of reservoirs that are unavailable for geological sequestration. Still, a much larger number of oil and/or gas reservoirs might be available for sequestration, assuming that primary production has ceased or can be purchased for a reasonable price, or the leases have expired and reverted to the owners. Although a large number of these reservoirs are above the depth where CO₂ will remain in the supercritical

stage when injected, the potential storage capacity is enormous. Because many of them are readily available, close to emitter locations, and their geological and engineering characteristics are already well known, they should not be ignored. In the United States today there are no gas storage operations involving injection into brine filled reservoirs; therefore, these might be the best available reservoirs for carbon sequestration.

Gas storage rights, which can be bought or leased separately from mineral extraction rights, are defined by different companies in different ways. Most corporate legal staffs agree that, to actually own gas storage rights, you must have direct title to the pore space in the rock, or to the minerals that make up the rock. With ownership of the rock pore space, the produced gas or oil simply becomes the fluid currently residing in the space (when it is considered to be depleted, the pore space still has some residual fluid in place). Most oil and gas industry leases, as originally presented to the mineral rights owner, contain language that allows for gas storage to be conducted at the operator's discretion, and the landowner is compensated by rentals equal to the rentals paid for the primary lease. The Commonwealth, and many private landowners, will not cede gas storage rights in their primary gas leases, but keep the rights separate for later utilization if feasible. This means that the vast majority of gas storage rights in Pennsylvania currently are controlled by the lease operators for lands where the leases are still in effect. As a result of this, arrangements to secure the right to store CO₂ in the subsurface often will be subject to prior leasing agreements, where the right to store gases is in private hands.

For the owners or lease holders of the gas storage rights, storing CO₂ in depleted oil and gas reservoirs or in deep saline reservoirs might present a long-term financial gain with little risk. The owner of the gas storage rights at a sequestration site would receive rental payments, for all practical purposes, in perpetuity for the privilege of continuous CO₂ storage. The operator or lease owner probably would require the sequestering entity to assume all liability for leaks and other problems potentially associated with geological sequestration, and require full indemnification for the life of the project (hundreds to thousands of years?). It is unknown how the burden of hundreds of years of storage rental payments would affect the economics of CO₂ storage, but that factor must be taken into account prior to any project initiation.

Operators of producing oil and gas fields and gas storage fields might or might not be willing to sell or lease their reservoirs for carbon storage and forgo any potential future oil and gas production or gas storage opportunities. This will be purely a business decision that will take into account the anticipated value of carbon credits, possible future natural gas storage economics, and the perceived willingness of interested parties to pay at or above market rates for storage privileges.

In the long run, purchasing the gas storage rights in fee from the owner and purchasing the lease rights from the existing lease operator would reduce the long term cost of storage rentals. It is not clear what this might ultimately cost, but in the end it might be better to pay up front to control the situation and ensure the longevity of the project.

Another possibility would be to target state-owned lands where the state has fee simple ownership. Figure 2 illustrates the gross ownership of State Forest lands in Pennsylvania.

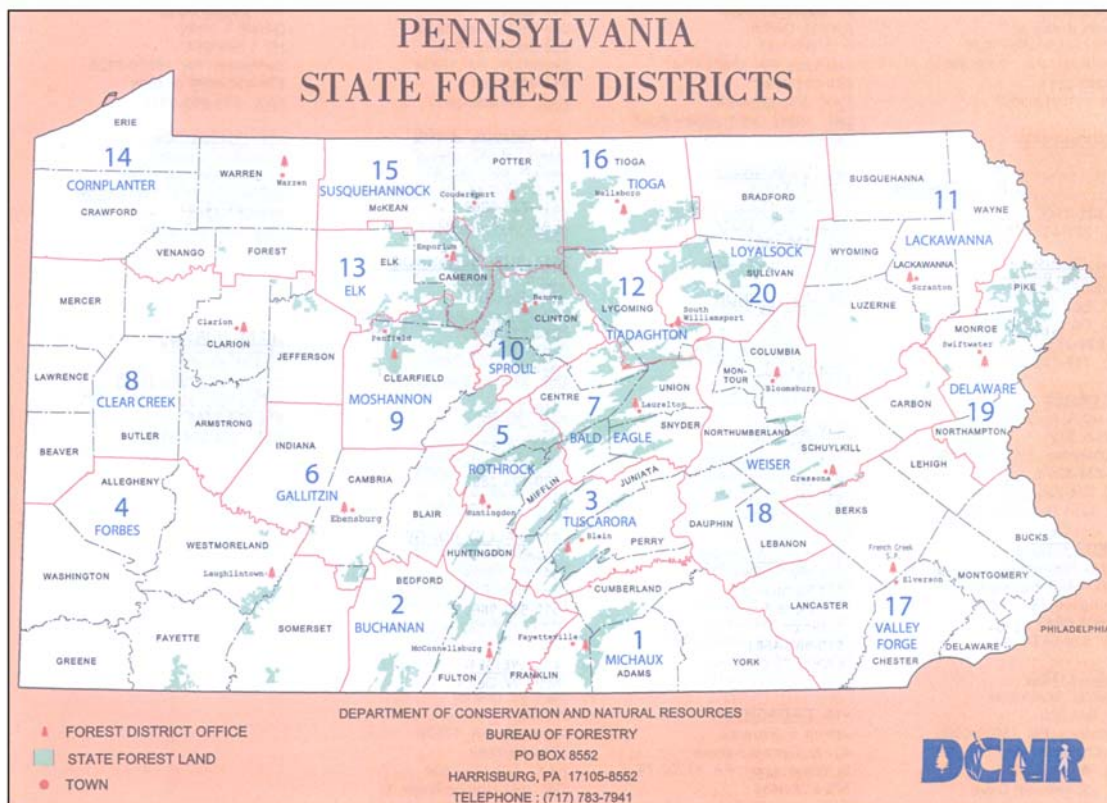


Figure 2. Pennsylvania State Forests and State Forest districts.

The Commonwealth owns approximately 85% of these lands fee simple. Although the vast majority of the State Forest lands are situated well away from population centers where most of the CO₂ is generated in large quantities, many are near future sites of ethanol plants and other manufacturing centers that will emit large quantities of CO₂. Also, it might be most desirable to limit the locations of CO₂ repositories to public lands where future land use could easily be restricted (the long term safeguards for the stored CO₂ includes limiting human activity that may breach the reservoir, allowing large volumes of gas to leak or vent to the surface, groundwater aquifers, and atmosphere). Such restrictions would not be as easy to accomplish on private lands.

Coal Ownership And Carbon Sequestration

Coal ownership and coal rights in Pennsylvania are similar to oil and gas rights. Although the Pennsylvania Supreme Court ruled in 1983 that coalbed methane (CBM) belonged to the coal owner or lessee of a severed title by “ownership-in-place,” this case did not resolve the ownership issue. Claims have been made on behalf of the oil and gas owner or lessee, the surface owner, the coal owner, and combinations of all of them. Despite the court ruling, it should not automatically be construed that a coal owner is the sole owner of the CBM. Instead, the language of the actual deed will determine who owns the

CBM.² This is critical when planning to use CO₂ sequestration to enhance CBM recovery. Also, the right to inject CO₂ into a coal seam would have to be acquired from the owner in some sort of storage agreement, probably similar to a gas storage agreement in a conventional reservoir. If the coal seam has never been exploited for its gas content the owner might demand payment for his gas up front, in addition to the storage fees. Alternatively, the storage operator might lease or buy the CBM rights and use the sequestered CO₂ for enhanced CBM recovery, with the lessee receiving rental and royalty from the production.

² Markowski, A. K., 2001, *Reconnaissance of the coal-bed methane resources of Pennsylvania*. Pennsylvania Geological Survey, 4th ser., Mineral Resource Report 95, 134 p.