

P. O. Box 539
Ophelia VA 22530
June 12, 2006

L. Preston Bryant, Jr., Secretary of Natural Resources
Office of the Governor, Patrick Henry Building
1111 East Broad Street
Richmond VA 23219

Dear Sec. Bryant:

Regarding your reply of 04/26/06 to my letter of 03/31/06 addressing the inefficiency of animal waste as fertilizer, you stated that "... DCR does not agree with the absolute magnitude of the nutrient losses ..." I presented the following table, containing the pounds of animal waste land-applied in 2003, supplied to me by VDH (Dr. Calmet Sawyer, 12/21/04), DEQ (Mr. Jon van Soestbergen, 12/25/05) and DCR (Mr. H. R. Perkinson, 12/04/05). The fraction N in the animal waste and the fraction of the N not used by crops (pollution) are from DCR's "2005 Nutrient Management Standards" Tables 8-2, 8-4 and 9-1.

	<u>Pounds applied</u>	*	<u>fraction N</u>	*	<u>fraction N not used</u>	=	<u>pounds N pollution</u>
Sewage sludge	494,648,000	*	0.02	*	0.48	=	4,749,000
Poultry litter	1,115,268,000	*	0.03	*	0.40	=	13,383,000
Cattle, swine	468,509,000	*	0.03	*	0.60	=	8,433,000
							26,565,000

26 million pounds of nitrogen were land-applied (disposed) in 2003 but not used by crops according to these figures. If any of the numbers are in error, I would appreciate having them corrected. I request that the State certify how many million pounds of nitrogen were land-applied in 2003, but not used by crops, and what fraction of the animal waste was derived from out-of-state. Does the State agree with the concluding statement: "N pollution from the land-application of animal waste is of the same magnitude as the discharge of N from wastewater treatment facilities...?" You have only tacitly acknowledged my assertion that the use of animal waste as fertilizer causes far more nitrogen pollution than would be true of conventional chemical fertilizers, stating "... it is most likely that nitrogen losses to the environment are greater on a per acre basis with manure and sewage sludge [and poultry litter] as compared to use of commercial fertilizer nitrogen..." In fact, the State must confirm that the difference in Nitrogen Use Efficiency (NUE) between the two forms of fertilization is very large.

Do you dispute my observations, stated in my previous letter, and reproduced below, regarding DCR's nutrient management criteria for the land-application of municipal sewage sludge? I would like to have the fact acknowledged, by you and by Mr. Maroon, that the land-application of sewage sludge, mostly from out-of-state, according to existing nutrient management criteria, disposes of huge amounts of nitrogen (nearly 5 million pounds in 2003) to no benefit of crops. In the particular case I documented (reproduced below from my letter of 03/31/06), at least ten tons of nitrogen pollution resulted.

I observed the land-application of sewage sludge in Northumberland County in March of 2004, and believe that the property owner and spreader adhered strictly to current policies of the VDH, albeit in violation of Virginia Statute [12VAC5-585-550.A]. Based on the submitted Nutrient Management Plan, 24,770 pounds of N were spread on 72.4 acres in accordance with Table 9-1 in "Standards". If chemical fertilizer had been used, 7,431 pounds of N would have been applied [and only about 5000 pounds actually removed by the crop]. Lime-stabilized sewage sludge is applied on the basis that 30% of the N is crop-available the first year ($24,770 * 0.3 = 7,431$), 10% the second and third years, and 5 % the fourth year. This means that 55% of the N is presumed to be crop-available over four years and the remaining 45% is pollution.

You also stated "Not all the nitrogen that is unused by the crop is lost to the environment." I challenge you to defend this incorrect statement. If the applied nitrogen is not sequestered in the crop or in the soil, it must be lost to the environment in one form or another in order to achieve material balance. There exist no other "sinks" for the applied nitrogen except for the crop, the soil, or the environment. All the applied nitrogen must be accounted.

I hope you understand that Virginia's shallow coastal plain groundwater is massively contaminated with nitrate. A 2004 study of groundwater in the Delmarva Peninsula by the United States Geological Survey (USGS Circular 1228) documented an average nitrate concentration of 5.4 ppm. They stated (p. 2) "**Concentrations of nitrate and herbicide concentrations in ground water of the Delmarva Peninsula are among the highest in the Nation.**" and (p. 7) "**Nitrate concentrations increase in shallow, near-surface ground water with increasing amounts of overlying agriculture.**" In Northumberland County the average nitrate concentration in groundwater is 4.7 ppm (www.napsva.org/shallow.pdf). The nitrate-laden shallow groundwater discharges directly to rivers or tidal waterways.

Nitrogen biogeochemistry is fascinating and complex (a good summary is in "Biogeochemistry" by William H. Schlesinger, Academic Press, 1997). The nitrogen content of soils remains relatively constant over many crop cycles. The excess nitrogen not used by crops is released to the environment where most of it ends up as nitrate, the thermodynamically stable species in contact with Earth's atmosphere. We know that oxidizing soils are not sites of large amounts of denitrification (<2 kg/ Ha-year - Schlesinger, p. 203). Denitrification is not perfectly understood, but high nitrate concentrations in groundwater associated with agricultural practices prove beyond all doubt that massive nitrate pollution occurs as a result of conventional agricultural fertilization practices. We know that current agricultural practices are extremely inefficient in regards to NUE (e. g. Agronomy Journal, 1999, v. 91, p. 357-363). Your laudable goal of improving NUE "... toward the top of the range [70%]..." can never be achieved as long as the land-application of animal waste is sanctioned.

Farmers understand the inefficiencies involved in using animal waste as fertilizer, compared to chemical fertilizer. They know that roughly twice as much nitrogen is applied to the land using animal waste to grow exactly the same crop. As long as the State sanctions the permissive land-application practice, how can you expect farmers to voluntarily apply BMPs such as split fertilizer application and unfertilized winter cover crops? These BMPs cost farmers money, and the nitrogen pollution reduction they achieve is less than the pollution caused by the use of (free) animal waste.

You wrote "Some of the organic nitrogen forms are resistant to decomposition and likely remain in soils for very long times." It is true that the plethora of nitrogen-containing substances in animal waste are refractory to various degrees, but virtually none of them are "inert." It makes no difference if the nitrogen is released during the next crop cycle or a decade later. Unless the organic nitrogen is compensated by reduction in conventional nitrogen fertilizer, it constitutes pollution.

You solicited suggestions. Aside from banning the use of animal waste as fertilizer, especially on porous Coastal Plain soils close to tidal water where pathogen contamination of tidal water is virtually assured (see the correspondence posted at www.napsva.org), and mandating BMPs such as split fertilizer application and unfertilized winter cover crops, the most effective way to reduce pollution is with efficient riparian buffers.

The only remedy for existing high nitrate groundwater is to enforce (it is not being enforced) and strengthen the Bay Act with regard to riparian buffers. 100-foot buffers should be mandated everywhere, affecting everyone, farmers, foresters and waterfront property owners alike. The desire of some citizens for a chemically maintained lawn free of trees adjacent to the water must be resisted. Mature trees, pruned of their lower limbs if a view is desired, with an overlapping leaf canopy (guaranteeing a deep and overlapping root network) is the only reasonable remedy for existing high nitrate groundwater. It is especially important that riparian buffers be mandated and enforced on agricultural land adjacent to water irrespective of the amount of land taken out of production, or the reduction in productivity caused by the shade cast by mature trees.

Water quality in Chesapeake Bay cannot be improved without economic consequences. The State has the responsibility to mandate potentially unpopular regulations such as banning the land-application of municipal sewage sludge and poultry litter (mostly imported from out-of-state) or mandating immediate upgrades of wastewater treatment facilities that actually improve water quality. At the same time the State must ensure that the unavoidable economic burden is shared.

Looking forward to your response, and I am,

Yours sincerely,

Dr. Lynton S. Land
Emeritus Prof. Geological Sciences and
E. Allday Centennial Chair in Sub-
surface Geology, Univ. Texas, Austin

cc: Gov. Kaine; Hon. M. Tavenner, Sec. Health and Human Resources;
Joseph H. Maroon, Director, DCR; David K. Paylor, Director, DEQ; Del.
Rob Wittman