State of Washington
DEPARTMENT OF FISH AND WILDLIFE
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October 31, 2016

Senator Jim Honeyford
107 Irv Newhouse Building
PO Box 40415
Olympia, WA 98504

Representative Steve Tharinger
314 John L. O'Brien Building
PO Box 40600
Olympia, WA 98504

Dear Sen. Honeyford and Rep. Tharinger,

Please find attached the Department of Fish and Wildlife's report on the Use of Renewable Biofertilizers on WDFW Lands.

The 2016 Supplemental Capital Budget included Sec. 6004 which directed the Department of Natural Resources (DNR), the Department of Fish and Wildlife (WDFW), and the State Parks and Recreation Commission to evaluate the use of locally-produced renewable biofertilizers and fiber from dairy digester systems. The budget directed the agencies to assess the use of these products; looking into cost-competitiveness and suitability as a substitute for imported conventional fertilizers. The budget requested the agencies to develop a report to the legislature and the Governor's Office due November 1, 2016.

In assessment of these products and in development of this report, WDFW met with State Parks, DNR, the Department of Commerce along with representatives from the biofertilizer industry. While very supportive of treating and recycling dairy waste as biofertilizers, our analysis found that such products are not suitable for use on WDFW lands. These products are not practical for use on WDFW land due to their high nitrogen content, impacts on native plant restoration and potential for spreading bacterial diseases.

The attached report discusses some of the latest science used in our analysis. Please don't hesitate to contact me if you have any questions on this.

Sincerely,

Raquel Crosier
Legislative Liaison
Department of Fish & Wildlife

Disposing of Dairy Digester Solids Demonstrations

Washington Department of Fish & Wildlife

October 31st, 2016

In the United States, more than half of the national output of milk is produced by the less than 3% of the nation's dairies that each milk more than 1,000 cows. This production bias reflects a trend of concentrating milk cows, which also concentrates their output of manure. In many such places, the supply of manure is outstripping the supply of cropland to which it can be safely applied as fertilizer. Anaerobic digestion can be used to address this oversupply; it reduces manure volume while producing methane gas that can be used as fuel. Nevertheless, digester solids also must be disposed of, typically by applying them as fertilizer. The legislature has directed WDFW to demonstrate how digester solids might be used on Departmental lands as a replacement for synthetic fertilizer.

WDFW manages most of approximately 1,000,000 acres of as wildlife habitat, from which it leases approximately 22,000 acres for crop production to provide food and cover for fish and wildlife. WDFW does not control fertilizer use on its leased lands. It does use approximately 100,000 lbs. of synthetic fertilizer annually on approximately 1,000 acres. The majority of these applications are made either on fields of fewer than 50 acres each or on fields with difficult access and treacherous terrain. Further, these applications constitute exceptions to our rule of not amending soil with nutrients. Fertilizers – especially nitrogen - are a detriment rather than an aid to restoring and maintaining native plant communities because supplemental nutrients usually exacerbate weed growth, the single greatest threat to restoration success. Consequently, there is little opportunity to supplant synthetic fertilizers with digester solids on WDFW lands, which is further complicated by potential composition of digester solids.

Digestion mainly reduces carbon in solids, but it does not significantly reduce nitrogen making digester nutrient profiles approximately the inverse of what WDFW would consider using.

Restoration science has shown that high carbon inputs can suppress weed growth by reducing mineralization of nitrogen in soil (e.g. Burke et al. 2013). Digester solids with significant amounts of nutrients, especially nitrogen, are a liability for us. Further, WDFW would use digester solids only if that were compatible with sustainable stewardship of public lands.

The literature on anaerobic digestion suggests that using digester solids could be risky for WDFW. The *Treponema* spp. bacteria that cause both digital dermatitis in dairy cattle and treponeme-associated hoof disease in southwest Washington elk have been isolated from dairy manure (Klitgaard et al. 2014). When functioning properly, anaerobic digesters are thought to destroy pathogens in manure. Nevertheless, proper function depends on keeping conditions in the digester properly balanced. When unbalanced, bacteria in the *Treponema* genus are known to be relatively able to survive the digestion process (Li et al. 2013). Although it is not yet understood how these pathogens move among dairies, or their potential to escape into elk populations, WDFW would use these solids only with abundant caution. Further, management of digital dermatitis and other hoof diseases in dairy cattle often is achieved by using footbaths that contain compounds that survive digestion, like trace metals, or whose fate in digestion is variable, like pharmaceuticals (e.g. Davidsson et al. 2014).

Dairy manure probably is less likely to carry metals than the effluent of municipal sewage systems that treat an admixture of residential waste and industrial waste, but it is also subject to less regulatory scrutiny than municipal sewage when applied to soil. Indeed, some authors consider manure to be the most likely source of developing toxicity in agricultural soils (Hopkins and Ellsworth 2005), and in a published field test, dairy manure has been linked to heavy metal signatures in soil (López-Mosquera et al. 2000).

Because of the risks posed to fish and wildlife by leaks from the storage lagoons that Washington dairies typically use to store manure, WDFW has an interest in supporting dairies willing to reduce storage by using anaerobic digestion. Nevertheless, the impacts outlined above and with the costs of testing digester solids and monitoring demonstrations together greatly exceed the benefit of any demonstrations that WDFW could accomplish.

Burke, I. C., E. E. Bontti, J. E. Barrett, P. N. Lowe, W. K. Lauenroth, and R. Riggle. 2013. Impact of labile and recalcitrant carbon treatments on available nitrogen and plant communities in a semiarid ecosystem. Ecol Appl **23**:537-545.

Davidsson, A., H. Kjerstadius, S. Haghighatafshar, J. Fick, M. Olsson, H. Wachtmeister, E. Eriksson, and J. la Cour Jansen. 2014. Effect of anaerobic digestion at 35, 55 and 60 degrees C on pharmaceuticals and organic contaminants. Water Sci Technol **69**:1282-1288.

Hopkins, B. G. and J. W. Ellsworth. 2005. Trace metal toxicity from manure in Idaho: emphasis on copper.*in* Proceedings of the 2005 Idaho Alfalfa and Forage Conference. University of Idaho Extension, Twin Falls, ID.

Klitgaard, K., M. W. Nielsen, H.-C. Ingerslev, M. Boye, and T. K. Jensen. 2014. Discovery of Bovine Digital Dermatitis-Associated Treponema spp. in the Dairy Herd Environment by a Targeted Deep-Sequencing Approach. Applied and Environmental Microbiology **80**:4427-4432.

Li, A., Y. N. Chu, X. Wang, L. Ren, J. Yu, and X. Liu. 2013. A pyrosequencing-based metagenomic study of methane-producing microbial community in solid-state biogas reactor. Biotechnol Biofuels **6**.

López-Mosquera, M. E., C. Moirón, and E. Carral. 2000. Use of dairy-industry sludge as fertiliser for grasslands in northwest Spain: heavy metal levels in the soil and plants. Resources, Conservation and Recycling **30**:95-109.