

Beneficial Reuse of Agricultural, Industrial and Municipal Byproducts for Environmental Sustainability

Impact Statement

INVESTIGATORS

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SUMMARY

A team within the School of Environment and Natural Resources (SENR) is researching beneficial reuse of industrial, municipal, and agricultural wastes, including foundry sand, water treatment residuals, and biosolids. The team works closely with regulatory agencies to craft science-based regulations and reuse policy. Millions of tons of materials have been diverted from costly non-sustainable landfilling and incineration practices, and degraded land in Chicago and Ohio has been restored, with significant economic and societal benefits.

SITUATION

Approximately 10 billion tons of industrial, municipal, and agricultural solid waste (byproducts) are generated annually in the U.S. Most of this **waste is disposed of in costly landfills or incinerated**. Ohio and other industrial Midwestern states generate a large amount of the industrial waste, and their cities generate municipal waste. **Many of these wastes can be reused** to restore land degraded by urbanization, mining, or other former industrial activity. **Wastes can be incorporated directly into degraded soils** or blended (with compost, manures, or foundry sand) to make high quality topsoil for land restoration. Beneficial reuse of wastes allows Ohio industry to become more competitive, municipalities to become more resourceful, and facilitates startup industries and jobs in Ohio focused on production and marketing of soil blend materials and restoration of the degraded land. Our group's research focuses on development of beneficial reuse of solid waste consistent with OEPA (Ohio Environmental Protection Agency) and USEPA regulations.

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THE OHIO STATE UNIVERSITY

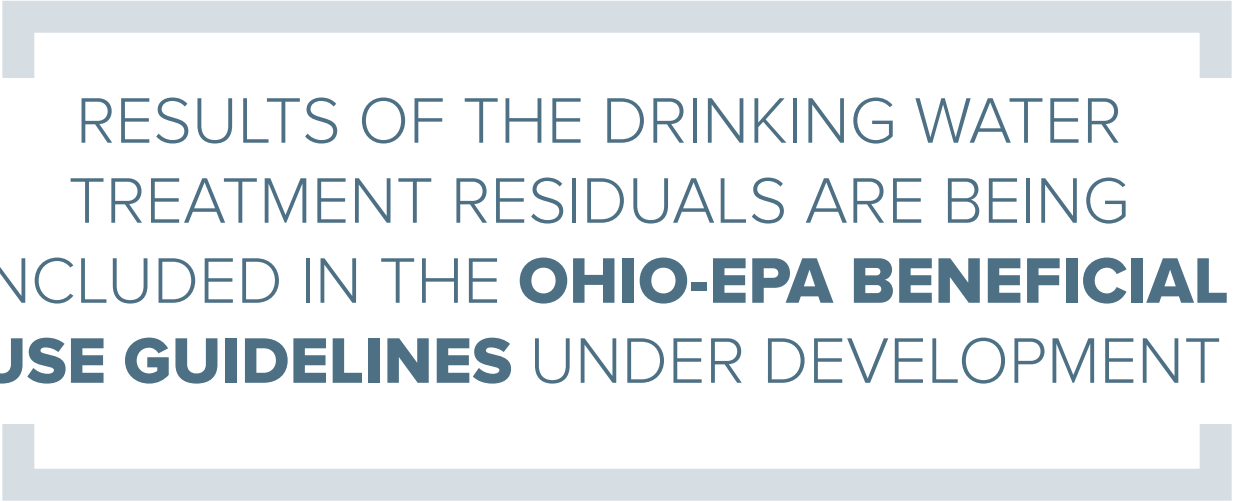
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RESPONSE

SENR applies novel methodology to study use of by-products through land application, and traces fate of by-products, including:

- Use of biosolids and municipal waste blends to **restore ecosystem function** in degraded urban and contaminated soils.
- In conjunction with the USDA, USEPA, **development of methodology to evaluate suitability** of municipal wastes and byproducts, including biosolids-blend, for land application.
- Development of soil blend “recipes” to satisfy specifications for **reuse of dredge material** in manufactured soils.
- Incorporation of Cleveland dredge and compost as a **management strategy to improve soil health** and urban agricultural food production while **reducing soil contamination and protecting human health**.
- Development of a characterization scheme for safety, fertility, pH and soil-like characteristics such as texture, organic matter and plant available water **for beneficial reuse of drinking water treatment residuals** as topsoil or as soil blending material.



RESULTS OF THE DRINKING WATER TREATMENT RESIDUALS ARE BEING INCLUDED IN THE **OHIO-EPA BENEFICIAL USE GUIDELINES** UNDER DEVELOPMENT

IMPACT

Over a wide range of soil blend texture and organic matter contents, Toledo Harbor dredge performed well as a landscape soil. **We developed predictive relationships** that can be used to tailor dredge-based soil blends to meet desired performance specifications. Results of the cost-benefit analysis showed that when financial, social, and environmental impacts are considered for each alternative, open lake placement has a unit cost of \$30.09 per cubic yd, and an optimized processing center has a unit cost of \$0.55 per cubic yd. Since the unit cost is negative for the optimized processing center, it results in a net benefit. Results of the drinking water treatment residuals research are being included in Ohio-EPA Beneficial Use Guidelines under development.

Currently, a small amount of City of Cleveland dredge is blended with yard clippings and sold as topsoil. Our research results show most, not some, of the **dredge can be blended with compost and incorporated into vacant urban lots in Cleveland hence solving the “what to do with all this dredge” problem ahead of a 2020 deadline**. Ohio EPA knows some of the urban lots have historical contaminants and is very interested in an urban soil management solution which can be applied for urban agriculture without having to test each lot. Incorporation of dredge blend into urban lot soil is a soil management solution that meets OEPA needs.

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