PERRIN CONFERENCES

ENVIRONMENTAL RISK & PFAS LITIGATION CONFERENCE

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Calculating Agricultural PFAS Damages Associated with Biosolids Application

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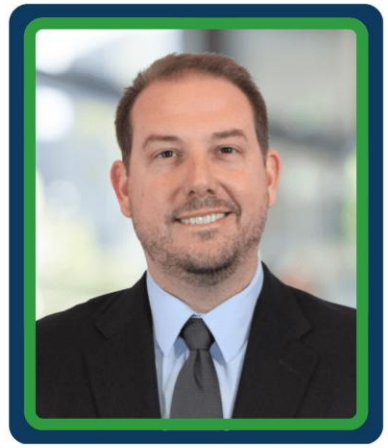

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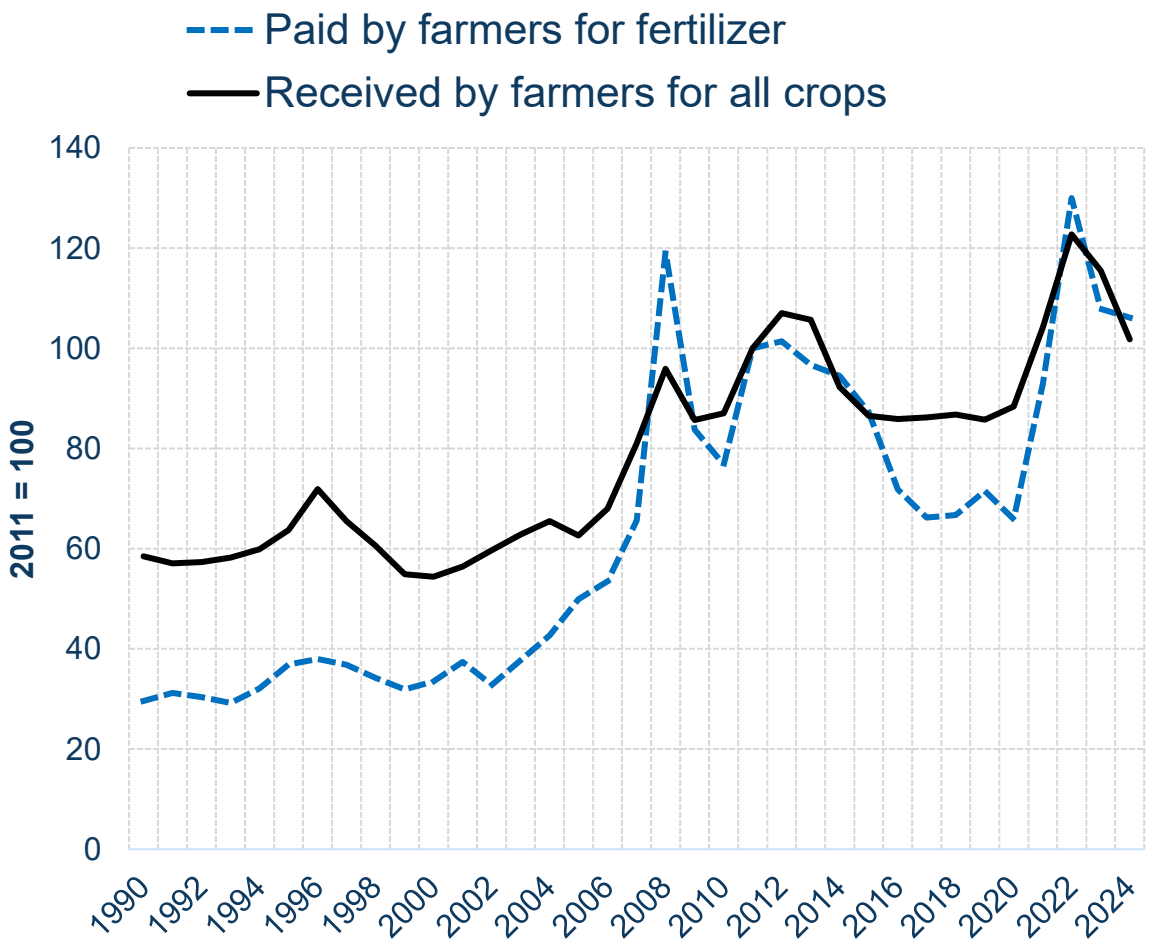
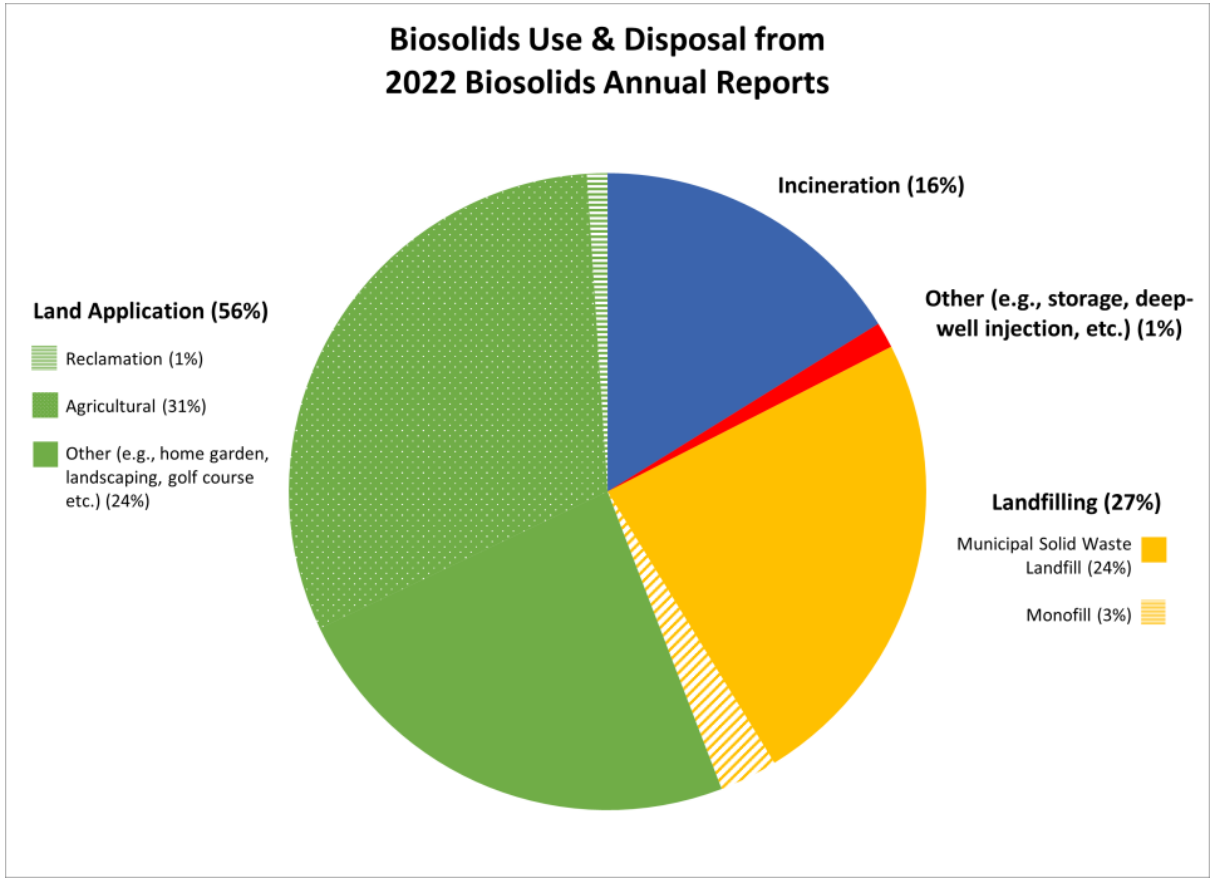
How Did We Get Here?



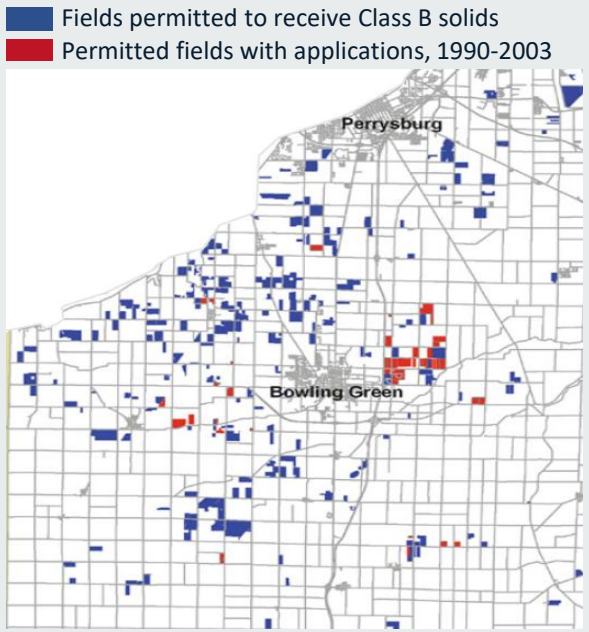


Sources are (i) USDA Economic Research Service, Fertilizer Use and Price, Table 8. Fertilizer Price Indexes, https://www.ers.usda.gov/data-products/fertilizer-use-and-price, (ii) USEPA, Basic Information about Sewage Sludge and Biosolids, Last Updated January 6, 2025, https://www.epa.gov/biosolids/basic-information-about-sewage-sludge-and-biosolids

How Widespread is the Problem?

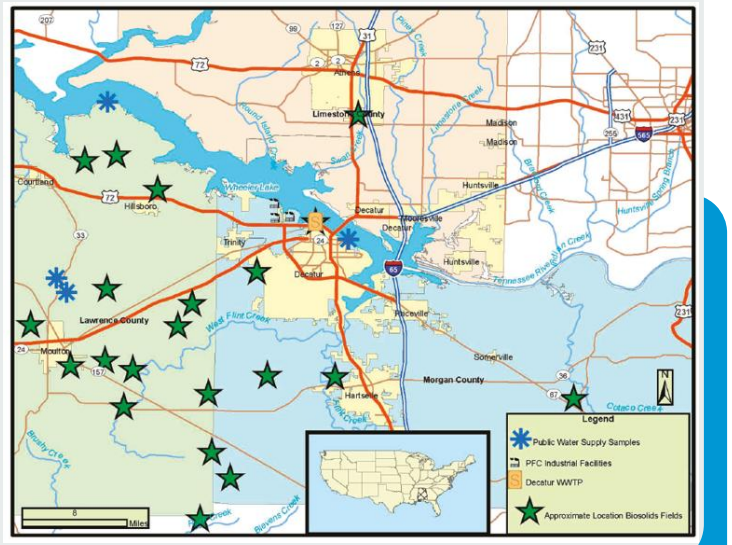
Bowling Green, OH (2010)

~10% of fields over 14 years



Decatur, AL (2011)

~1% of acreage over 18 years



National (2022)

~7% of harvested cropland ever

Sources are (i) Czjakowski, Kevin, April Ames, Bhuiyan Monwar Alam, Robert K. Vincent, "Application of GIS in Evaluating the Potential Impacts of Land Application of Biosolids on Human Health," in Geospatial Technologies in Environmental Management, pp. 165-186. (ii) Lindstrom, Andrew B., Mark J. Strynar, Amy D. Delinsky et al. "Application of WWTP Biosolids and Resulting Perfluorinated Compound Contamination of Surface and Well Water in Decatur, Alabama, USA," Environ. Sci. Technol. 2011, 45, 8015–8021.(iii) Hayes, Jared, "EWG: 'Forever chemicals' may taint nearly 20 million cropland acres," https://www.ewg.org/news-insights/news/2022/04/ewg-forever-chemicals-may-taint-nearly-20-million-cropland-acres, April 14, 2022. (iv.) USDA NASS Census of Agriculture, 2022. Table 9. Land in Farms, Harvested Cropland, and Irrigated Land by Size of Farm: 2022 and 2017

PFAS Claims and Damages Associated with Biosolids

Biosolids Litigation Generates Diverse Legal Claims and Damages

- Property-related damages
  - Investigation and remediation of soil and groundwater
  - Loss of agricultural productivity
  - Loss of use and enjoyment
  - Diminution of property values

Property-Related Damages

- Class action against manufacturers of biosolids-based fertilizers
- Claim land application contaminated soil, surface and well water, and livestock
- Alleged damages =
  - Investigation and remediation costs
  - Lost income and agricultural productivity
  - Diminution of property value
  - Loss of property value, including livestock

Biosolids Litigation Generates Diverse Legal Claims and Damages

- Health-related damages
  - Increased risk of disease/medical monitoring
  - Bodily injury
  - Emotional distress

Health-Related Damages

- Homeowners allege biosolids from waste byproducts spread on nearby properties
- Contaminated land and drinking water wells
- Allegedly caused damage to endocrine and immune systems
- Sought medical monitoring and emotional distress damages - dismissed
- Kept alive possibility of monitoring as damages for other claims

Health-Related Damages

- Claims drinking water contamination from composting operations and fertilizer sold to plaintiff
- Seeks personal injury damages for kidney cancer and steatosis of the liver
  - Pain and suffering
  - Medical expenses
  - Diminution of earning capacity

Biosolids Litigation Generates Diverse Legal Claims and Damages

- Statutory claims and damages
  - Clean Water Act ("CWA")
  - Resource Conservation and Recovery Act ("RCRA")
  - RICO
  - CERCLA?

Statutory Damages - RICO

- Class action for economic damages and medical monitoring
- Claim paper product maker conspired with subsidiary landowner and fertilizer company to dump PFAS waste
- Court found conduct alleged was sufficient for RICO claims
- RICO = treble damages and attorney fees

Statutory Damages - CERCLA

- Will lead to “Superfund” litigation
- Liable parties = current and past owners, generators, and transporters
- Liable for:
  - Cleanup costs
  - Natural resource damages
  - Health assessment costs
- **EPA Enforcement Discretion Policy**

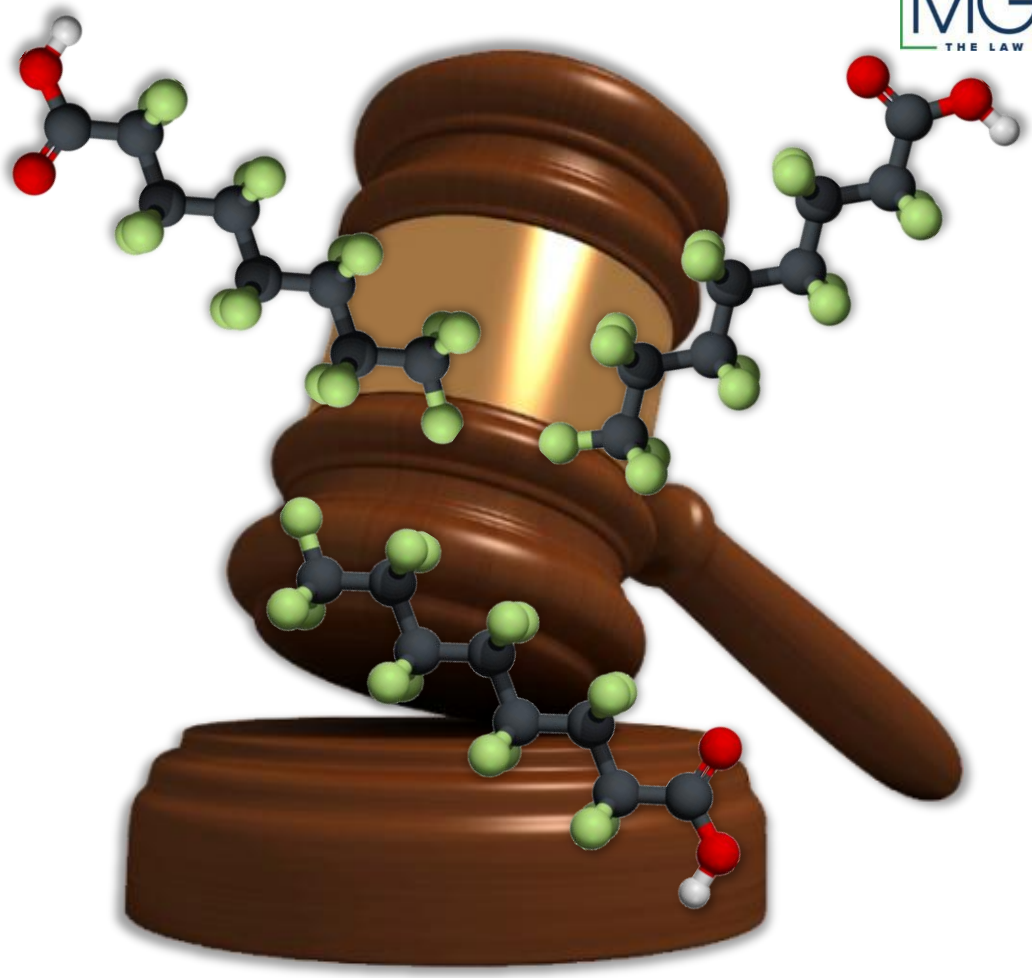
CERCLA Hazardous Substance Designation

- The “normal application of fertilizer” not considered a release of a hazardous substance under CERCLA

Biosolids Settlements

Wastewater Treatment Plant Settlement

- CWA and RCRA citizen suit against Calhoun, GA for land application of biosolids
- Settlement requires:
  - WWTP must pretreat for PFAS
  - Provide public water or POU for 10 yrs
  - Cease land application near rivers and water treatment source waters
  - **Make all reasonable efforts to recover costs to upgrade to meet EPA's MCLs**



The Challenge of Remediating PFAS that Originate in Biosolids – Why is it so Difficult

▷ PFAS (per- and polyfluoroalkyl substances) are a family of thousands of different chemicals with different

- Physical and toxicological characteristics
- Solubility
- Uptake characteristics

▷ The majority are toxic at levels of between two and three orders of magnitude lower than the historic toxic contaminants typically remediated.

▷ Because of their solubility, they are highly mobile in the environment.

▷ They are resistant to biodegradation.

▷ High temperature destruction is the only technology that can currently eliminate them.

PFAS Impacts on WWTPs

▷ Biological treatment, the main treatment processes in WWTPs (Wastewater Treatment Plants) does not breakdown PFAS compounds.

▷ At high enough levels, PFOA – one of the most common PFAS – actually hijacks the treatment process to produce more PFOA.

▷ WWTPs that receive PFAS from primarily industrial sources that have not been pretreated (filtered for PFAS), will have PFAS at the end of the treatment train in its treated effluent unless it is filtered post treatment and in its biosolids.

▷ Biosolids and effluent containing PFAS provide a pathway to the environment.

Current Remediation Options

▷ Excavation and high temperature thermal destruction (incineration) and/or or landfilling:

- limited landfill space make landfilling difficult
- Incineration costs are extremely high

▷ Capping and groundwater recovery and control

- Groundwater/surface water/leachate filtration with GAC (Granular Activated Carbon) or other emerging polymer technologies
- Destruction of recovered PFAS through high temperature thermal destruction (incineration)

Current Remediation Options

PFAS Control and Treatment Technologies	Cost without O/M, Monitoring
Capping	$300,000/acre+
Groundwater Control	$10,000 to $200,000/acre
Water Treatment (filtration) for PFAS removal	$0.75 to $6.00/ gallon
Soil Incineration	$1500/ton +
Transportation	$0.25/ton/mile +
POET Systems	$4,500+

Now and the Future?

▷ Land can be redeveloped for uses such as distribution centers, or solar or wind farms.

▷ Development of new treatment technologies

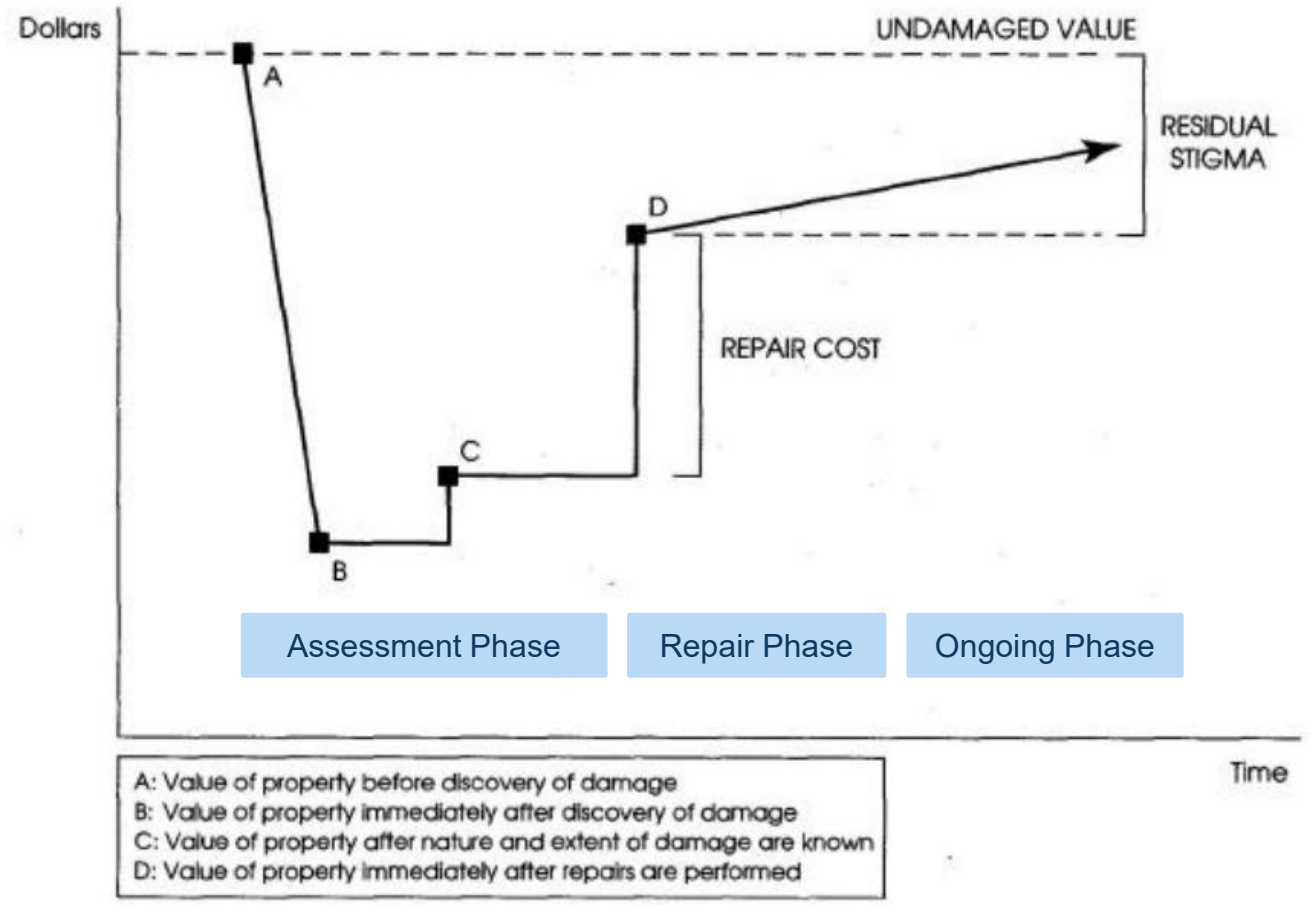
- EPA-funded studies on plant uptake combined with thermal destruction of PFAS plant material

Measures of Real Property Damage Differ by State

Temporary Damage	"Cost of restoration or repair, **even if exceeding diminution in value**" (Arkansas) Reasonable cost of repairs **not to exceed** diminution in fair market value from immediately before to immediately after damage occurred. (Michigan)
Permanent Damage	"Cost of restoration or replacement, not to exceed diminution in value." (Arizona) "The difference between the fair market value of the property **immediately before** the damage and the fair market value **immediately after** the damage." (Alabama)
Unspecified Nature	The **lesser of** (1) the diminution in the property's fair market value, as measured immediately before and immediately after the damage; or (2) the cost to repair the damage and restore the property to its pre-trespass condition, plus the value of any lost use. Repair costs **may exceed diminution in value if plaintiff has a personal reason to restore the property**, as long as repair costs are not disproportionate to diminution in value. (California)

Sources: White and Williams, LLP. "Nationwide Measures of Damages to Property"

Property Value Diminution (PVD) Concepts



Property Value Diminution =

Cost Effects + **Use Effects** + **Risk Effects**

Sources: (a) Sanders, Michael V. "Post-Repair Diminution in Value from Geotechnical Problems". *The Appraisal Journal:* January 1996. (b) Jackson, Thomas O. "Methods and Techniques for Contaminated Property Valuation". *The Appraisal Journal.* October 2003.

Property Value Diminution Methods

- Property appraisal
  - Comparable sales approach
  - Income approach

- Econometric/statistical methods
  - Hedonic price model
  - Repeat sales model

- Survey methods
  - Conjoint (choice modeling)
  - Contingent valuation

- Case studies

Business Value Diminution Methods

- Is the injury temporary or permanent?

- Accepted lost profits approaches
  1. Before-and-After
  2. Yardstick
  3. Market Share

- Three common business valuation approaches
  1. Asset
  2. Income
  3. Market

Case Study #1

Grostic v. Tribar Technologies, Inc.

Farm type: Beef cattle

Location: Livingston County, Michigan

Background/Claims: In January 2022, the State indefinitely barred Grostic's 300-acre farm from selling beef after testing of the soil, groundwater, and meat in 2021. Grostic used biosolids to fertilize his crops of feed/hay, allegedly saving $30K on commercial fertilizer. AG's office planned to seize and kill the cattle and permanently restrict land from use in agriculture. Alleged soil remediation cost is $600 million ($1.5 million/acre).

Outcome: State is currently working with Grostic to reclaim his farmland for agriculture.

Case Study #2

McElmurray v. Augusta-Richmond County

Farm type: Dairy, seeds, grain, peanuts

Location: Hephzibah, Georgia

Claims/Background: McElmurray used biosolids as fertilizer on his 1,730-acre farm from 1979 until 1990. Conducted PFAS testing in 1998, when his cows began dying, and discovered PFAS exceedances up to 2,500x applicable health guidelines standards. McElmurray culled hundreds of dairy cattle and had distributed PFAS-contaminated milk in many states.

Outcome: Most of McElmurray's land has been deemed a “hazardous waste site”. Agricultural use is permanently restricted, and a federal court order barred its sale. In 2003 McElmurray was denied disaster assistance.
In 2008 McElmurray was awarded $1.5 million ($867/acre) for the destruction of his farm by biosolids.

Case Study #3

Stoneridge Farm (Fred Stone)

Farm type: Dairy

Location: Arundel, Maine

Claims/Background: Fred Stone's farm participated in the state-sponsored sewage waste spreading program from 1993 through 2004. In 2016, an EPA testing program found PFAS in well water, drinking water, soil, crops, and blood serum of Stone and his wife, Laura. Stone was banned from selling milk and required to test milk supply. In efforts to save his farm, Stone installed a $23,000 carbon filtration system. After two years of testing/dumping milk, Stone euthanized his cows, and shuttered operations.

Outcome: Stone estimates he lost $0.44MM due to the PFAS contamination, **not including devaluation of property, loss of cattle, and profits**. Overall Stoneridge farm went $1.5 million into debt attempting to mitigate the PFAS contamination on his farm. Stone's former 100-acre farm is now a **solar farm**.

Case Study #3

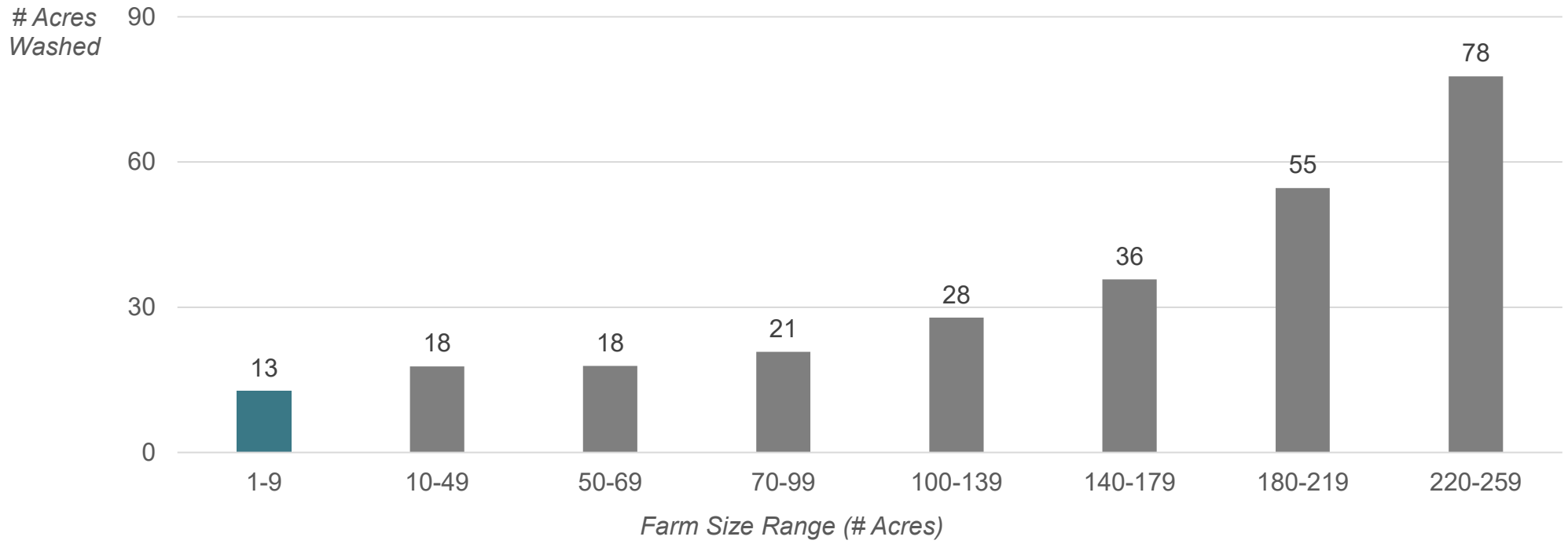
Songbird Farm (Nordell/Davis)

Farm type: Organic grain and vegetable farm

Location: Unity, Maine

Claims/Background: Previous owners allegedly spread biosolids on the farm in the 1990's. Voluntarily halted the sale of produce and grains and shuttered the business.

Outcome: The Maine Farmland Trust purchased the property to research PFAS contamination and how alternative remedial and containment strategies affect soil and crops.



Acres with soil contamination before the cost of soil washing alone exceeds the combined national average farm real estate and farm business value.

Assumptions:
1. Soil washing cost $110 per ton to $35 per ton for a scale of 10,000 tons to 275,000 tons washed.
2. 1,000 tons of soil per acre at a depth of 6-7 inches.
3. Farm real estate and business value based on the maximum farm size for the range.
4. Farm real estate value is the value of land and buildings per acre.
5. Farm business value applies a 10x earnings multiplier to the average cash gain per farm (of those with gains) within the size range.

Sources:
(a) USDA National Agricultural Statistics Service, 2022 Census of Agriculture, Table 71. Summary by Size of Farm: 2022
(b) Quinnan, J., Morrell, C., Nagle, N., & Maynard, K. G. (2022). Ex situ soil washing to remove PFAS absorbed to soils from source zones. *Remediation Journal*, 32, 151-166.
(c) Enterprise Value Multiples by Sector (US), https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/vebitda.html

Off-Farm Property Value Diminution

Estimates for Residential Property Value Diminution from PFAS Contamination

Location	Affected Water Supply	Estimated PVD
Washington County, MN [a, *]	Municipal and Domestic	-3%, -7.7%
Hoosick Falls, NY [b, *]	Municipal and Domestic	-9% to -20%
Cape Fear, NC [c, *]	Municipal and Domestic	-5%
Mather, CA [d, †]	None (Non-Potable)	-2.3%
Fairbanks, AK [d]	Domestic	No Impact to -20%
Mesa, AZ [d, †]	Unclear	No Impact to -20%
Dalton, GA [d]	Municipal and Domestic	No Impact
Madison, WI [d]	Municipal	No Impact

Notes: Sources are (a) Expert Report of David L. Sunding, Ph.D. *(State of Minnesota* v. *3M Company)*, (b) Declaration of Dr. Jeffrey Zabel *(Baker et al. v. St. Gobain et al.)* (c) Expert Report of David Sunding, Ph.D., July 16, 2021, *Victoria Carey, et al. v. E.I. du Pont de Nemours, et al.*, Case No: 7:17-CV-00189, United States District Court for the Eastern District of North Carolina, (d) Anderson, Orell, Chris Yost-Bremm, PhD, Stephen G. Valdez et al., "PFAS Contamination and Residential Property Values A Study of Five US Sites within the Assessment Stage of the Remediation Lifecycle", *The Appraisal Journal*, Winter 2022.
† Indicates a Federal Superfund Site.
* Indicates source is Expert Opinion in litigation.

Damages Calculations Take Aways

- It is critical to Identify whether the loss is temporary or permanent.
- The cost of remediating a farm with biosolids-amended soil (where feasible) will exceed the value of the property and the business.
- On-farm injury involves both real property and business losses.
- Mitigation may be available, but not for all losses.
- There are multiple methodologies and variants for calculating damages; outcomes vary with inputs, assumptions, and other investigator choices.

THANK YOU