

Risks to Private Wells

TEAM 2: PRIVATE WELL RISK ASSESSMENT

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NC PFAS Testing (PFAST) Network, a research program funded by the NC Policy Collaboratory

High Variation in GenX and PFAS in Private Wells Has Been Observed

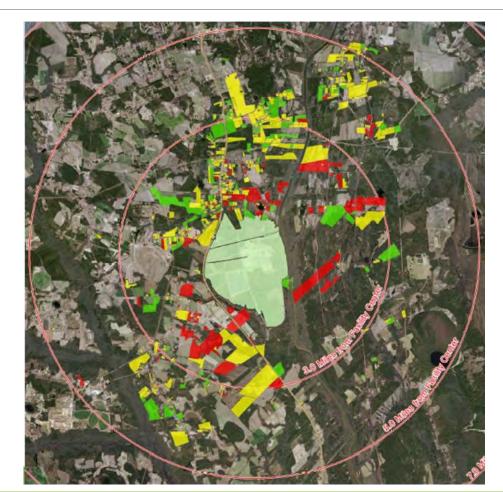
>1200 well water samples tested

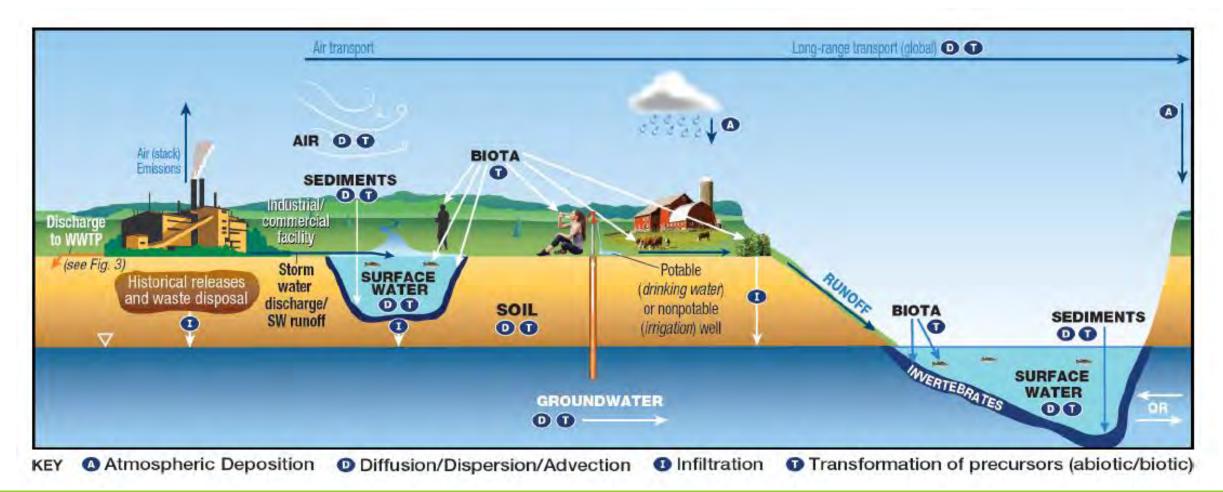
- 19% > health goal
- 31% non-detect

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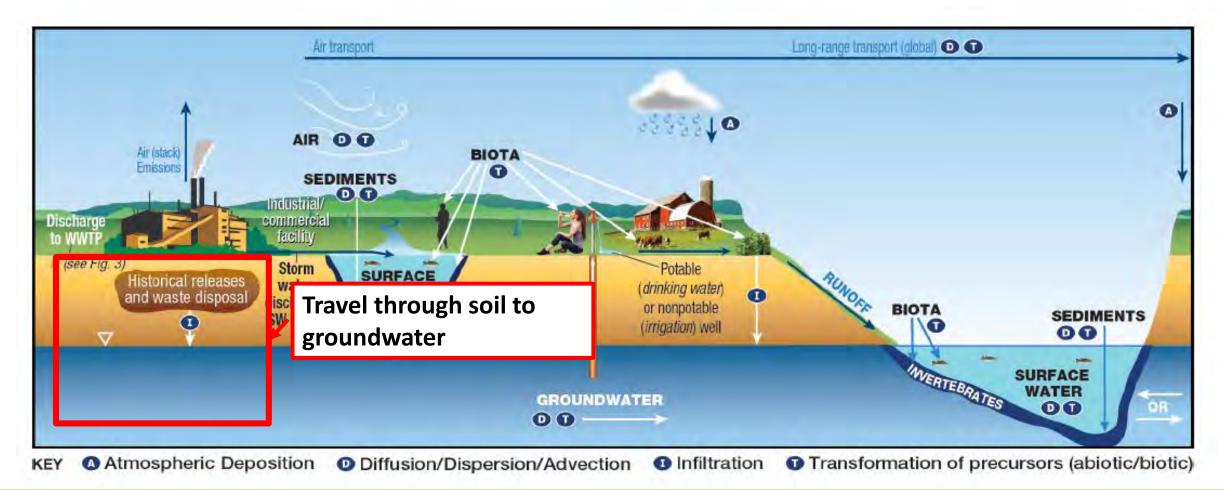
- Red = > 140 ng/L
- Yellow = 0- 140 ng/L
- Green = nondetect

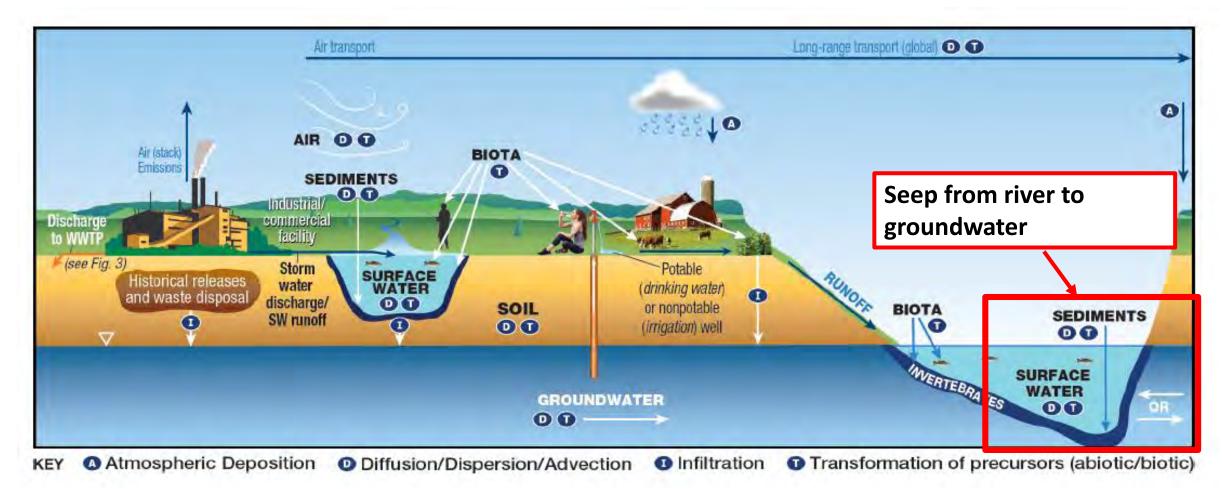
Figure courtesy of DEQ

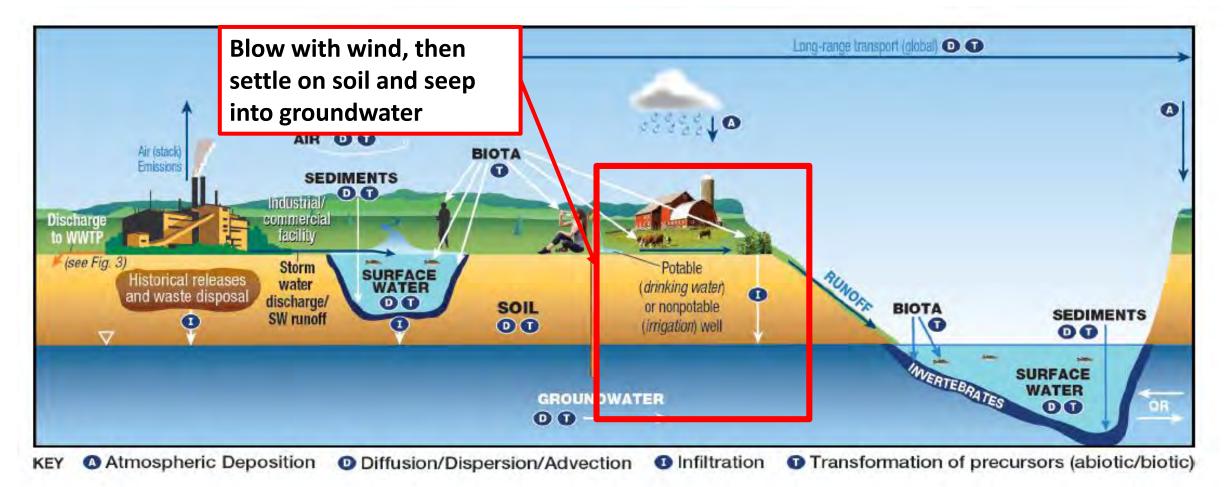




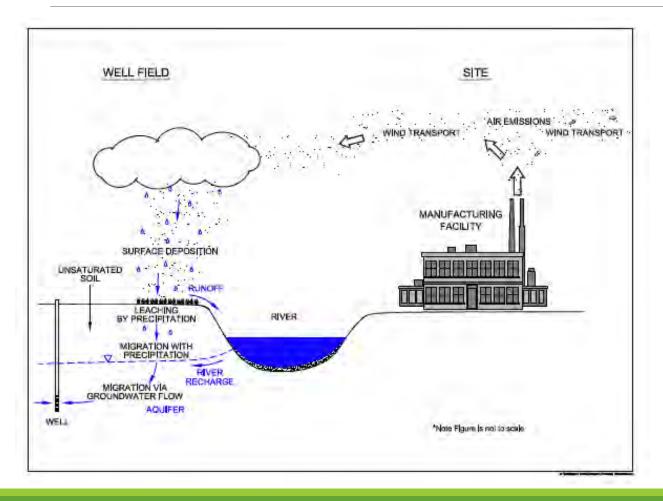
SOURCE: ITRC, 2018







Experience Elsewhere Shows Travel with Wind Can Be the Most Important Source



PFAS spread with wind to water wells near Parkersburg, WV, Chemours facility.

Is wind also important in NC?

Research Objectives

- 1. Determine why some wells are contaminated and others are not.
 - What features of the wells, landscape, geology, weather, and geographic location influence risks to wells?
- 2. Develop user-friendly web site to help private well owners assess risks.
- 3. Estimate how long it will take to "flush out" the PFAS that are already in the groundwater.

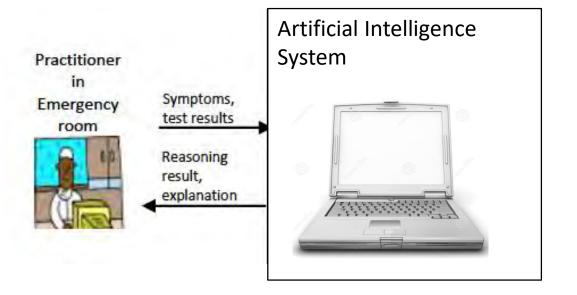
Methods

Use "Artificial Intelligence" to Predict Wells at Risk

U.S. NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE

DOCTORS USE IT TO DIAGNOSE DISEASES

"Artificial intelligence is being called the "new electricity."

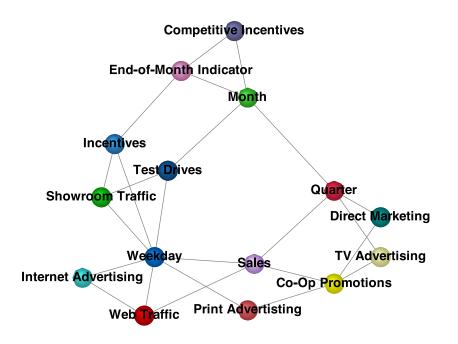


Our Artificial Intelligence Algorithms Search for Patterns in Data

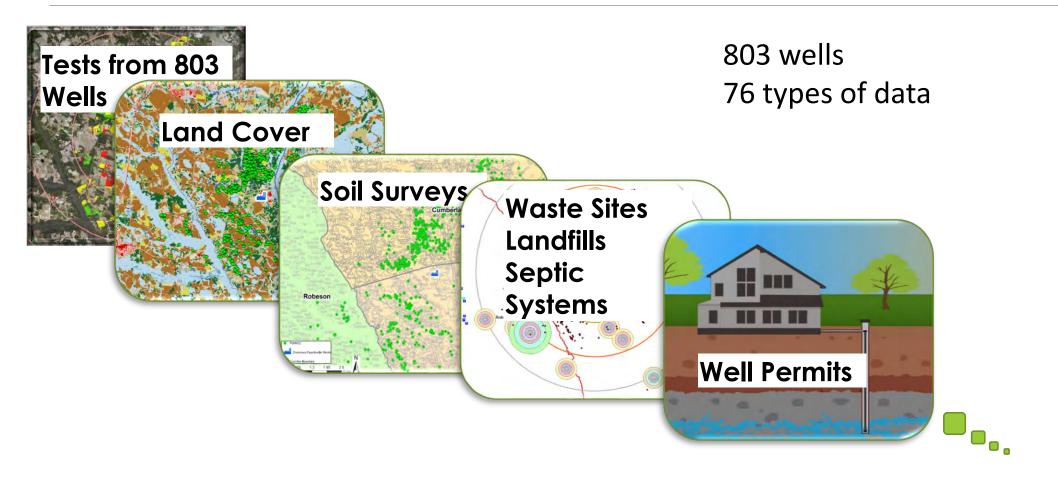
BIG DATABASES TAKE UP A LOT OF SPACE

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IF WE CAN IDENTIFY PATTERNS, NEED LESS SPACE TO STORE DATA

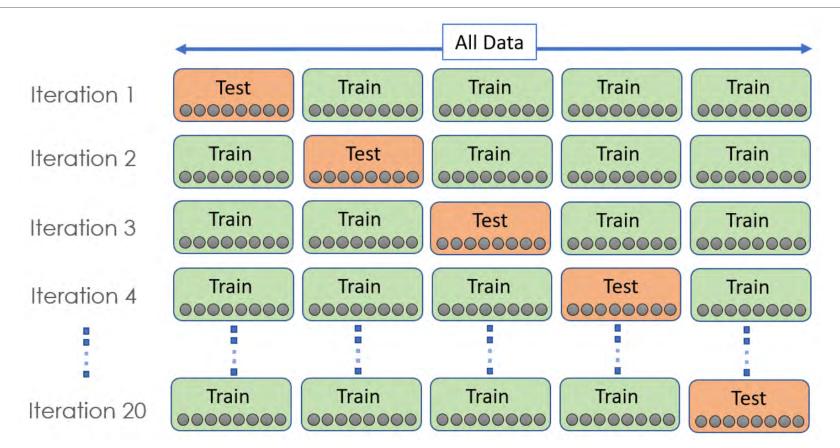


We Built a Database of Multiple Factors That Might Influence GenX in Well Water





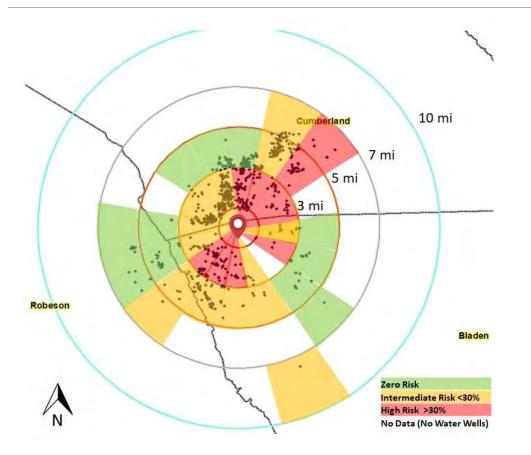
We "Train" the Model on Part of the Data and Test Its Accuracy on the Rest



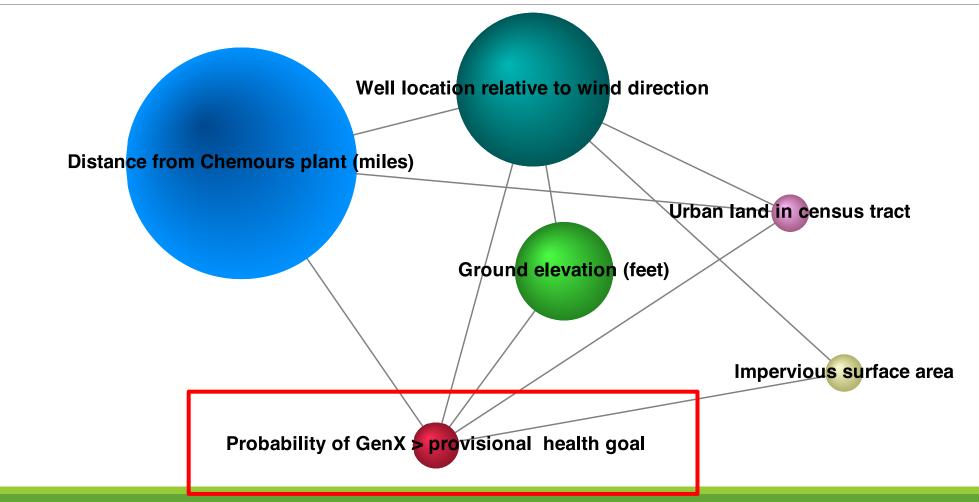


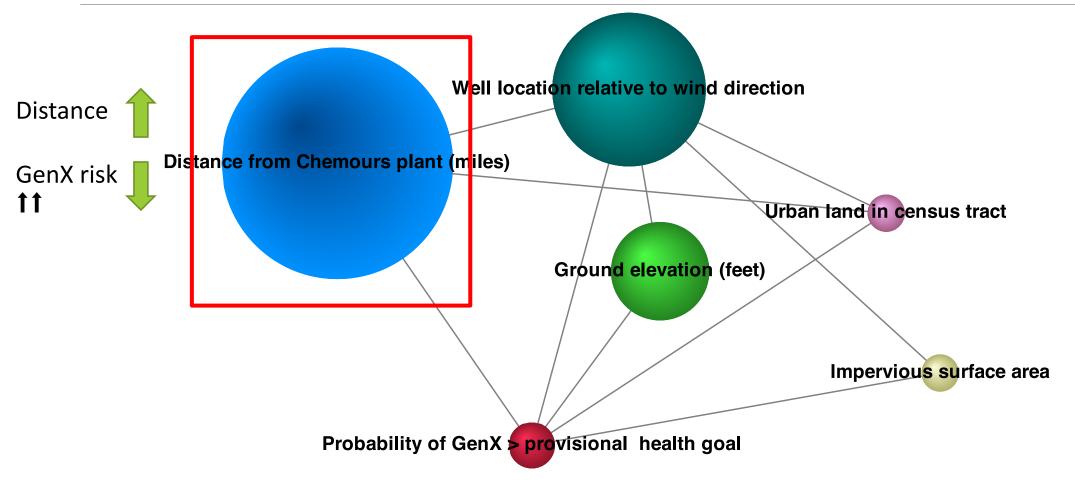
Preliminary Results

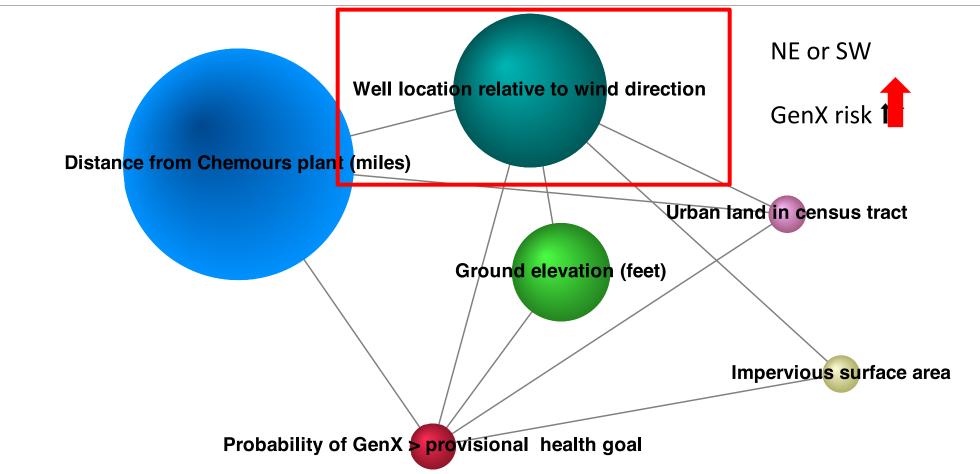
Artificial Intelligence System Predicts Where GenX Is Likely to Exceed Health Goal

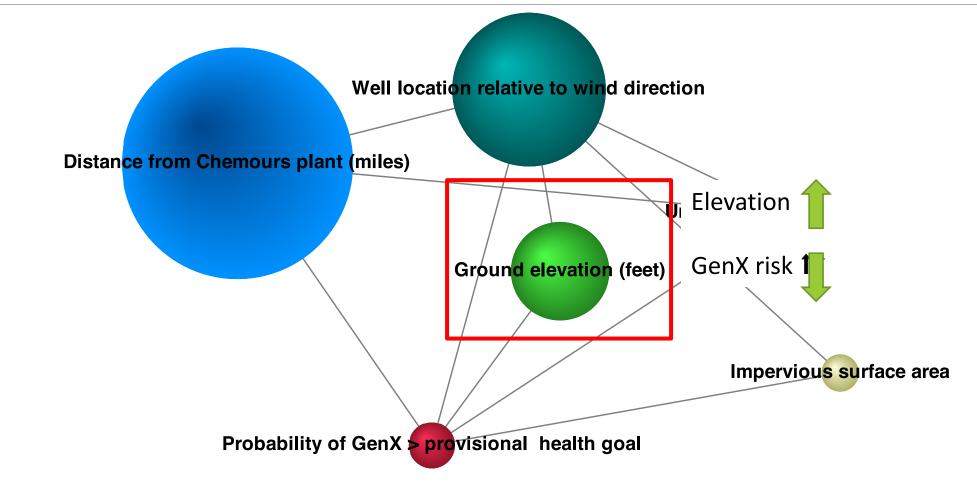


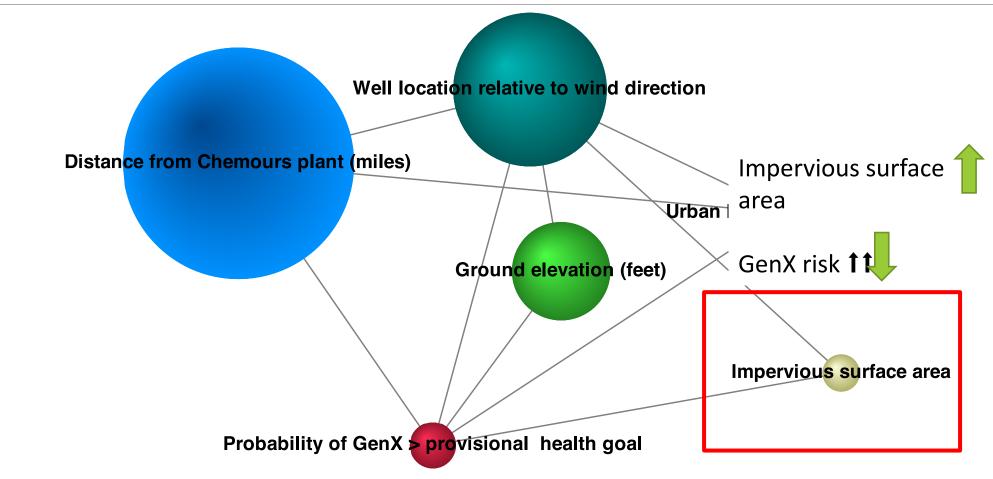
Predicted chance of GenX occurrence above provisional health goal (140 ng/L)

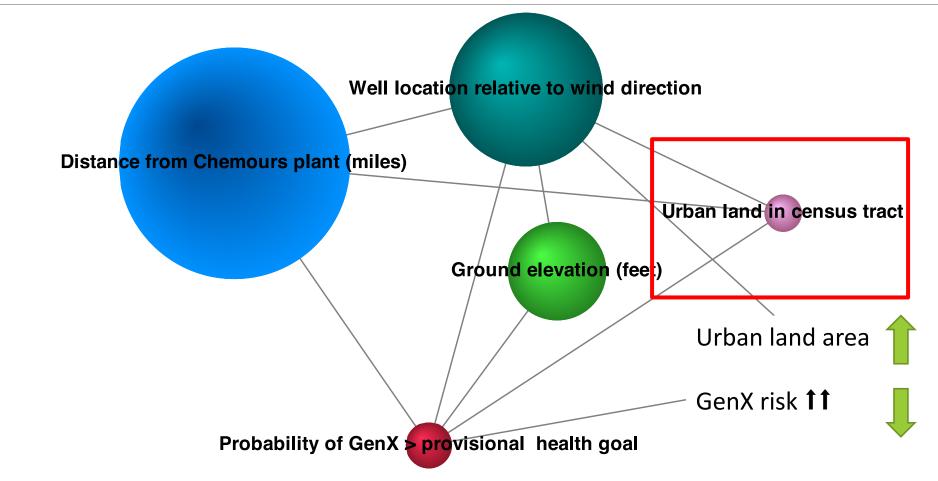












Model Can Achieve High Accuracy In Finding At-Risk Wells (But with "False Positives")

Chance of Finding Wells with High GenX	Chance of a False Positive
91%	57%

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87%	43%

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85%	39%

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Chance of Finding Wells with High GenX	Chance of a False Positive
91%	43%
87%	57%
85%	39%
61%	19%

Prototype Web Version Allows Users to Predict Risks at Untested Wells

Testing Network	Risk of GenX in Private Wells Near th	ne Chemours Facility,	NC
Bayesia Simulator JMG Model 8c JMG for Web 👽 🛈		C O Ø - 1	· # · *
Distance from Chemours plant (miles) Mean	Probability of GenX > provisional health goal <=140 0.81 >140 0.19		
Observed Well location relative to wind direction	>140 0.19		
Ground elevation (feet) Impervious surface area			
Urban land in township			

To Improve Accuracy, We Need Data on Well Characteristics

Depth

- Year constructed
- Construction type

	227 Fountainhead Lane Favetteville NC 28301-	
	(910) 433-3660	
pplication Date: 1/5/2005		Application Number: 2005-15
teason(s) for Applic	ation: NEW WELL	
		PLEASE NOTE
In Number: 0339-99-277		If the information in the application for an
	TY LINE RD FayetLeville NC 28306	improvement, permit is latefled, changed or the site is altered, then the Improvement Permit and
ubdivision	Lot: Phase: Section:	Authorization to Construct shall become invalid.
) vacant 📋 Occupied		
PPLICANT INFORMATI		Copy of Zoning Permit or Zoning Status Form from County Zoning Office MUST BE SUBHITTED with
ame: BILLS WELL DRILLI	1274224	Application for Soil Evaluations.
hone: 9104883740	Alt. Phone:	
ddress: 800 MCARTHUR	RD Fayetteville NC 28311	A Plat drawn by a Registered Land Surveyor (RLS) to a scale of 1 inch equals no more than 60 feet is
ype of Well: Drilled	Type of Establishment: Mobile Home	veld with expiration. Authorization for Wastewater System Construction (ATC) is good for only five (5)
Bedroom 3	Square Footage:	years, at which time it must be renewed.
ear House Bullt:	Date Property Originally Deeded Recorded:	
		** A Site Plan (drawing) is valid for five (5) years.
	I Conditionally by Planning Department	A new application must be filed for the expired unorovement cermit, Authorization for Wastewater
Basement Fixtures Prop	osed	System Construction (ATC) is good for only five (5) wars.
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Summary

Our goals are to

- 1. Predict which wells are at risk of PFAS contamination, and identify factors influencing those risks.
- 2. Develop a user-friendly web tool for well owners to use to predict risks.
- 3. Understand how long it will take for PFAS to "flush out" of the groundwater.

Results so far suggest that

- GenX in private wells may originate from GenX in air.
- Risk can be predicted, even with limited data on well characteristics.

Next Steps

- Collect data on well depth, construction type, age for as may of the 803 wells as possible.
- Refine the predictive model with these new data.
- Make the model available on the Web.
- Answer questions about how long it will take for GenX and other PFAS to flush from the groundwater.

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Organizations

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