

# Determining the influence of land-use on urea sources and transport within the Chesapeake Bay watershed

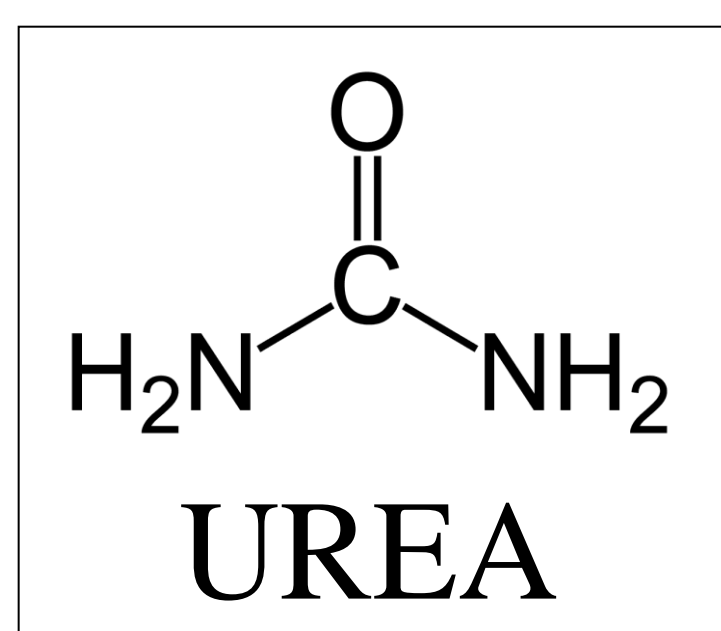


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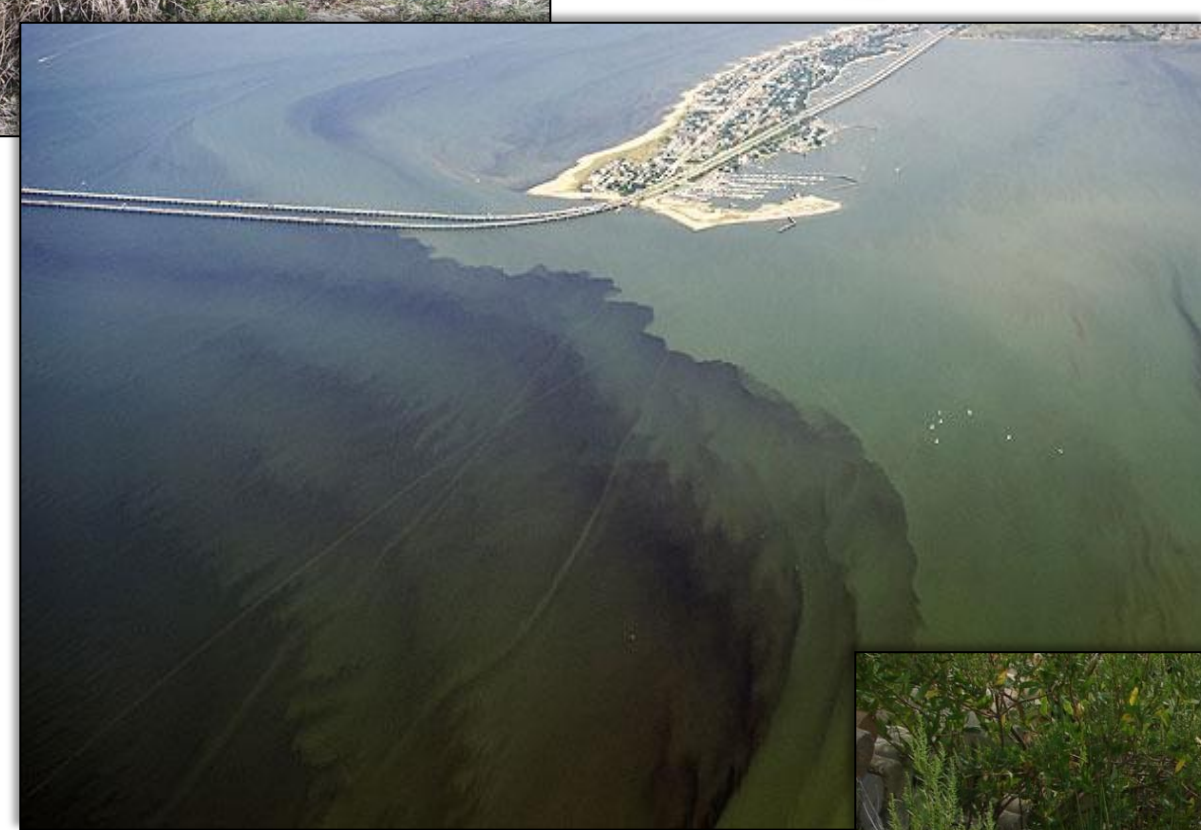
## INTRODUCTION

Urea, a form of organic nitrogen found in fertilizers, manures and septic waste, has increasingly been discovered in surface waters throughout the Chesapeake Bay watershed and similar coastal systems. This nutrient is gaining recognition as a driver for the development of harmful algal blooms that produce the biotoxin domoic acid.



Urea is delivered to surface waters from agricultural and urban land-uses.

Elevated urea concentrations in the Chesapeake Bay can lead to harmful algal blooms.



Harmful algal blooms can produce biotoxins such as domoic acid, which can harm fish and shellfish.

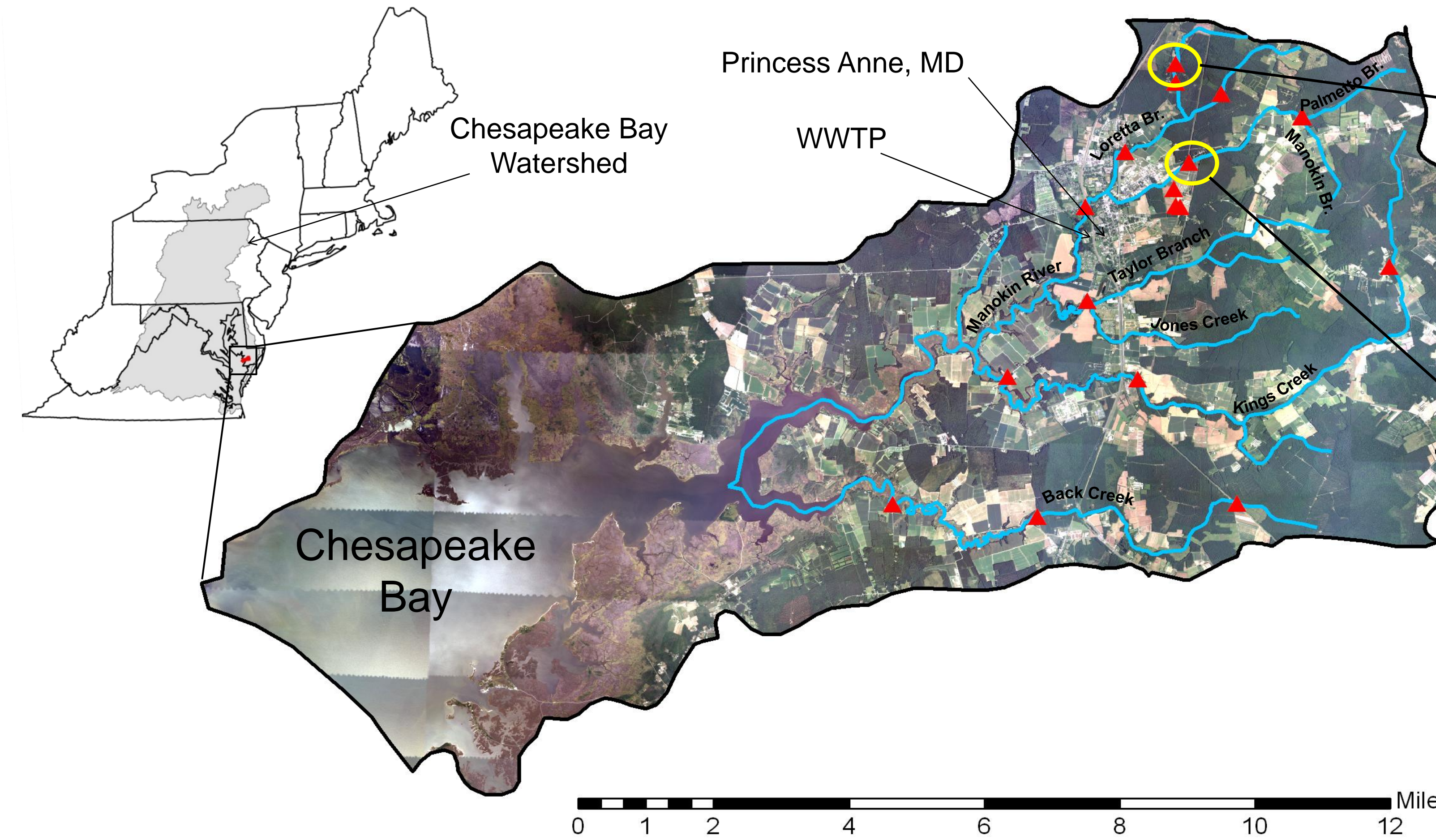


## OBJECTIVES

Advance understanding of the sources, delivery mechanisms and transport pathways of urea within a coastal plain watershed on the Delmarva Peninsula. Specific questions we address in this poster are:

1. Do environmentally significant urea concentrations occur in streams and agricultural ditches and where are they found?
2. How do urea concentrations change during storms at sites under different land management?

## MANOKIN RIVER WATERSHED



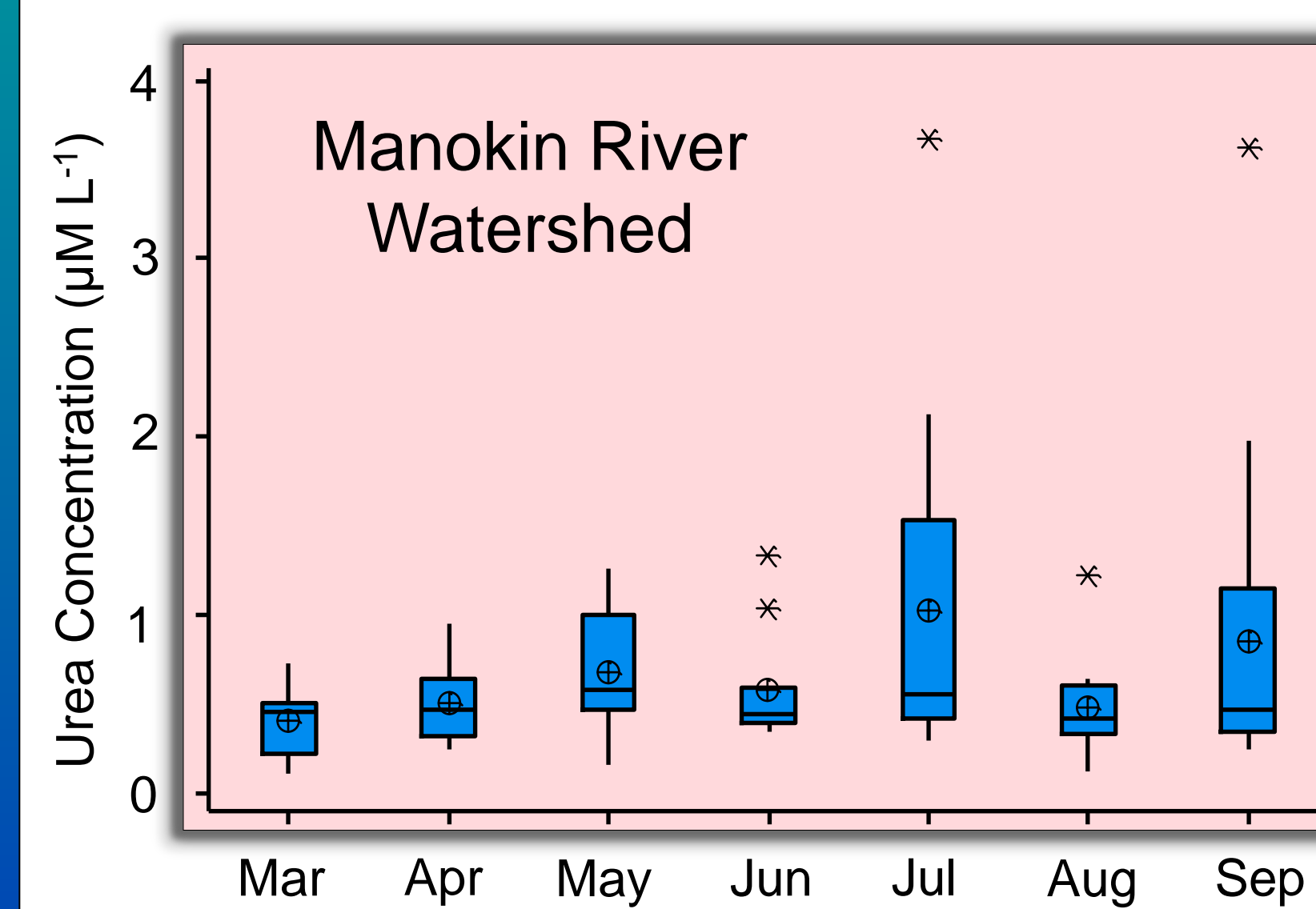
Our study focuses on the Manokin River watershed, which drains directly into the Chesapeake Bay and is predominantly influenced by agricultural practices, specifically poultry production. We have established 20 in-stream sampling sites to represent a wide range of hydrologic and land-use conditions.

## SYNOPTIC SAMPLING

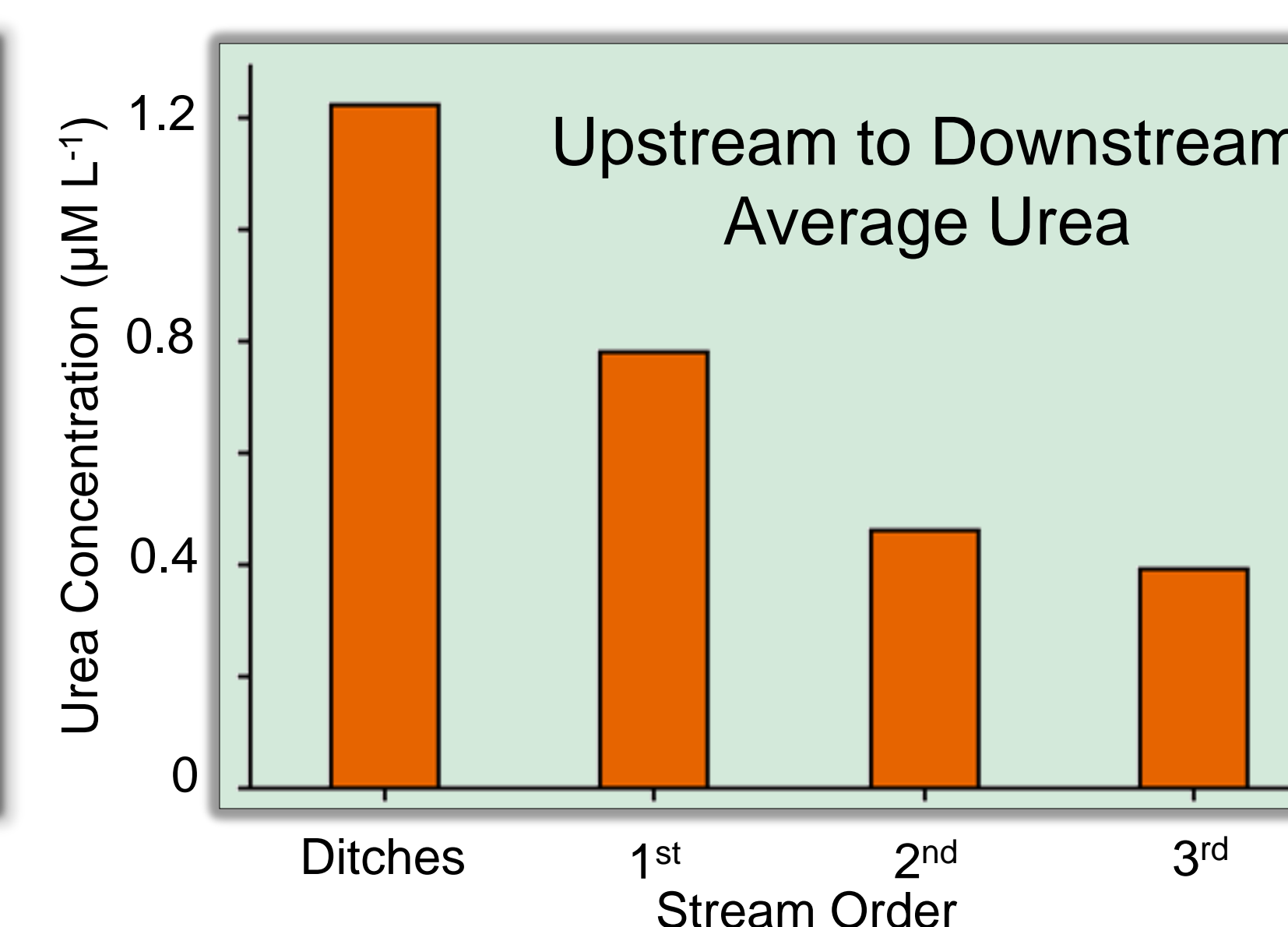
Synoptic sampling is being conducted throughout the Manokin River watershed during baseflow and stormflow conditions to develop trends in urea concentrations with land-use and hydrology.



## BASEFLOW TRENDS

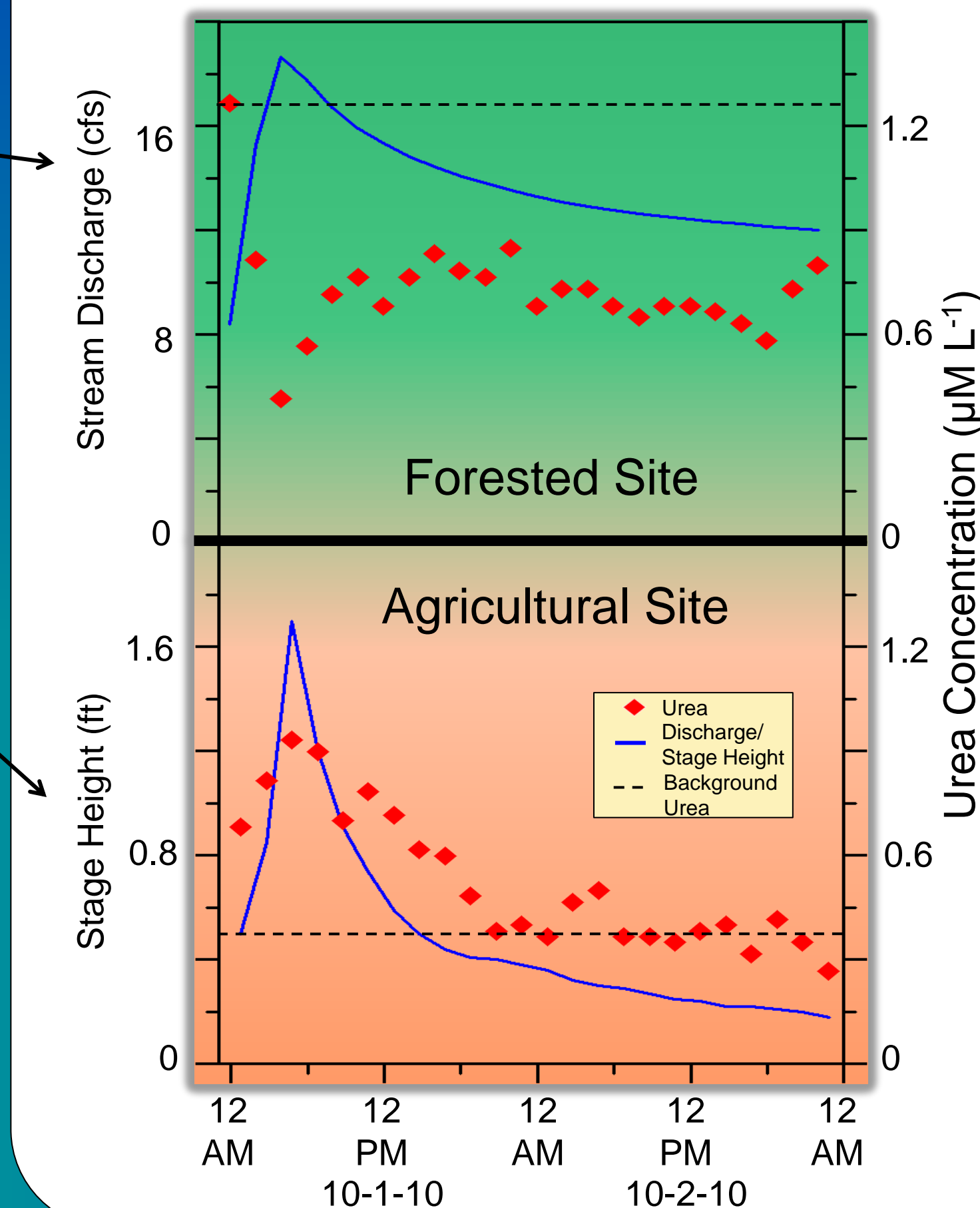


Temporal trends (2010) illustrate monthly urea concentrations generally less than 1 µM L<sup>-1</sup> with peaks during July and September.



Spatial trends show higher baseflow concentrations in the ditches and headwaters and decreasing concentrations moving downstream.

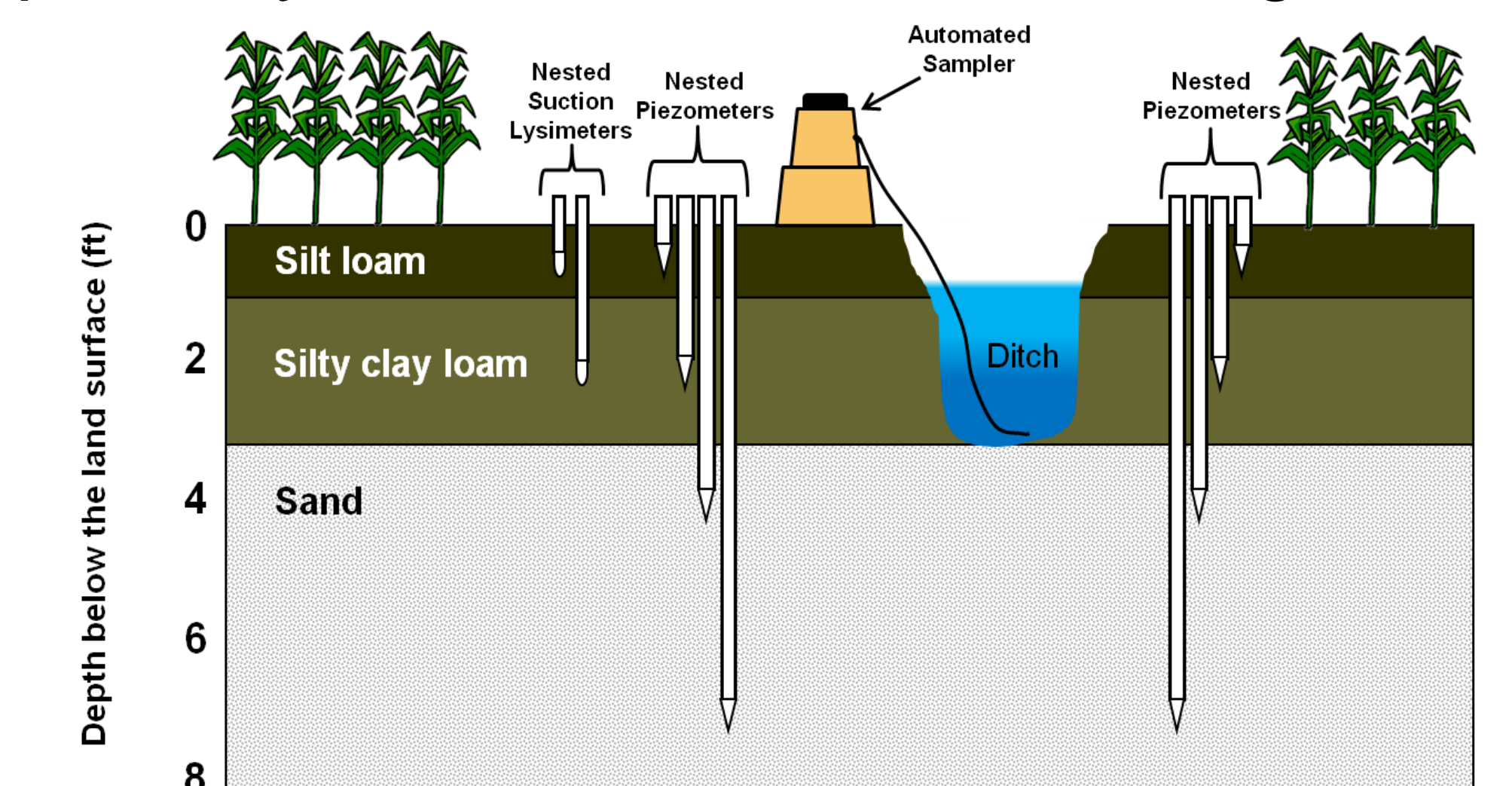
## CHANGES DURING STORMS



- Urea concentrations were monitored during an intense early October storm (2 inches of rainfall over 4 hours).
- As stage increased at a mostly forested site, urea decreased.
- Urea increased with discharge at a predominantly agricultural site.

## TRANSPORT PATHWAYS

In the future we will determine where urea is stored within an agricultural landscape and characterize the pathways for urea movement during storms.



We will perform monthly and event-based sampling of soil water, groundwater, and ditch water near a fertilized field.

## CONCLUSIONS AND IMPLICATIONS

- Environmentally significant urea concentrations were found throughout the Manokin River and its tributaries. In particular, data from this study suggest that agriculture represents the predominant source of urea during baseflow and stormflow conditions.
- Results from this study will be used to determine whether there is a link between urea delivery from the Manokin River and harmful algal blooms in the Chesapeake Bay as well as to guide the development of best management practices to control urea loss from agricultural activities.