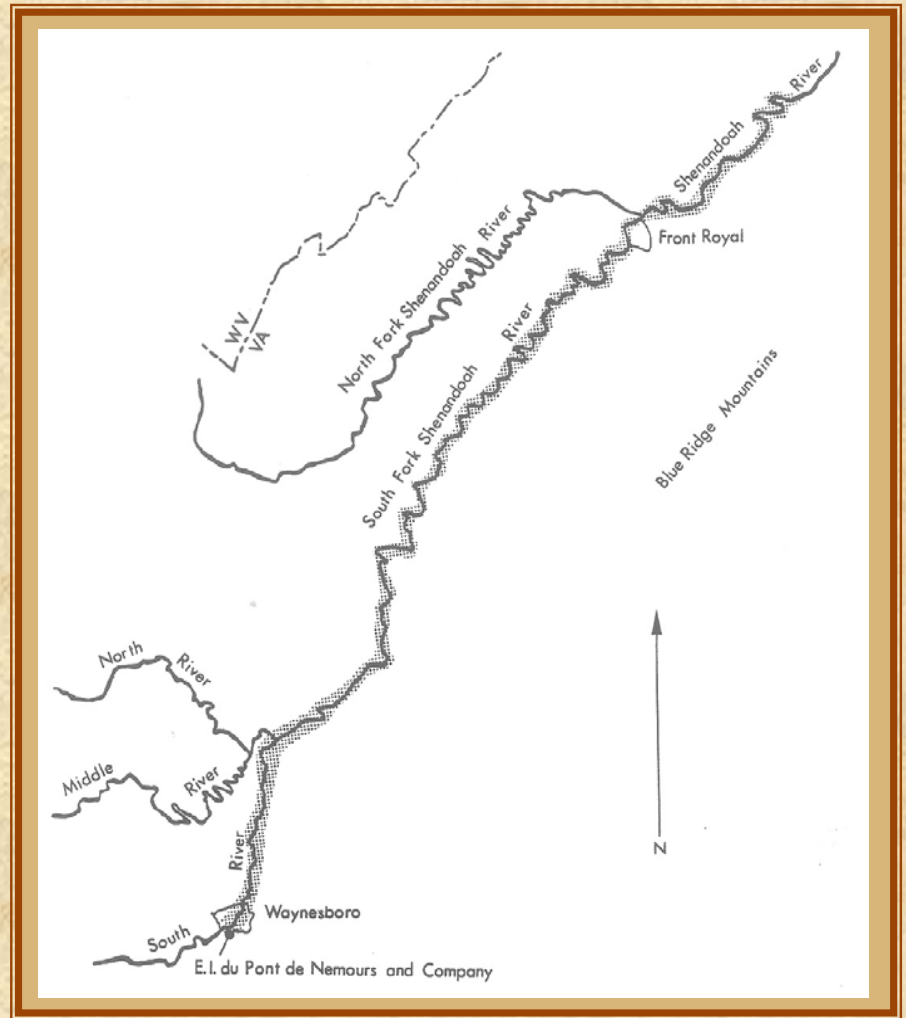


Patterns of Atmospheric Mercury Deposition in Waynesboro and Harrisonburg, VA.

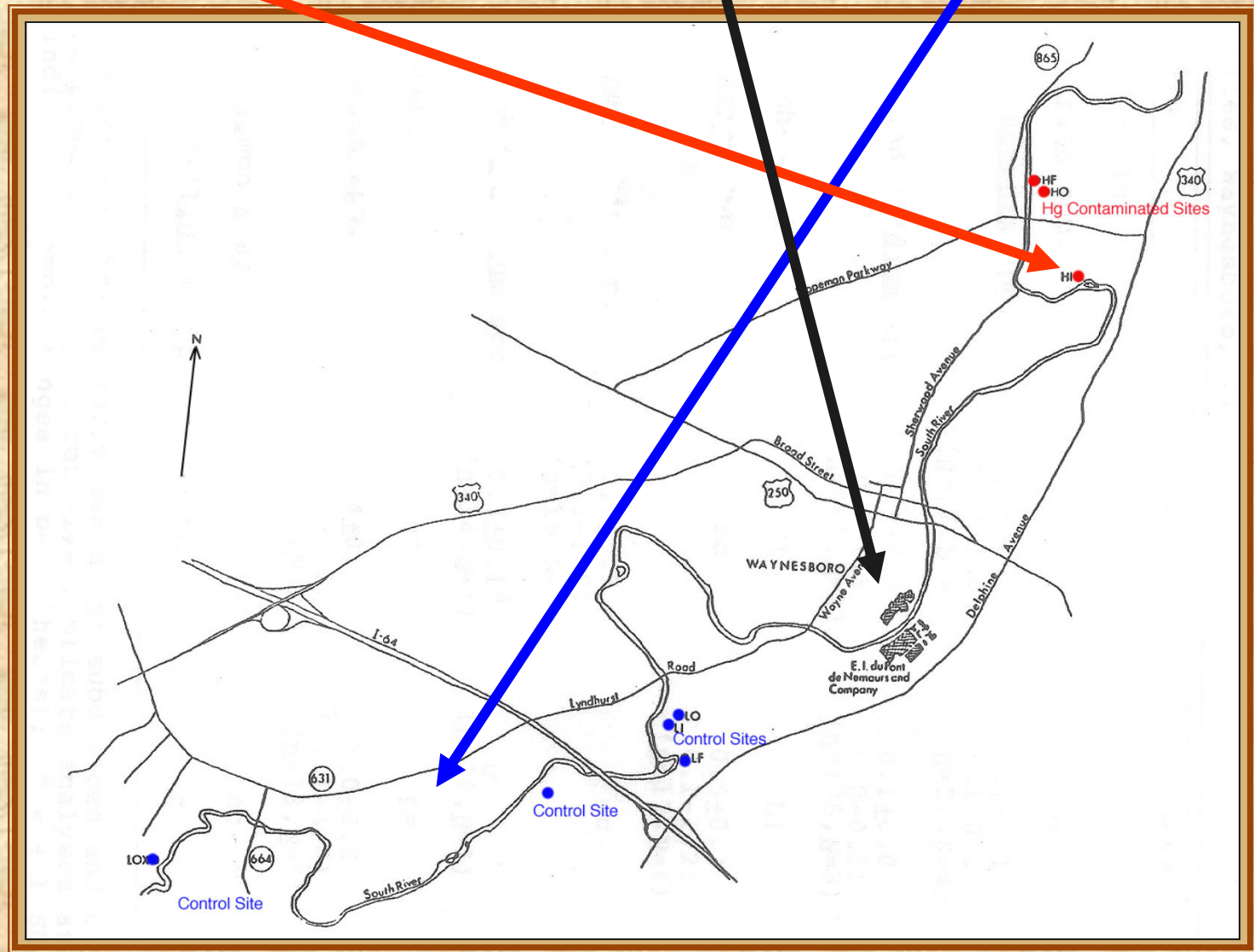
Dean Cocking, Amir Allak, and Wendy Pendleton

Department of Biology, James Madison University, Harrisonburg, VA 22807

Mercury Contamination on the South River Floodplain



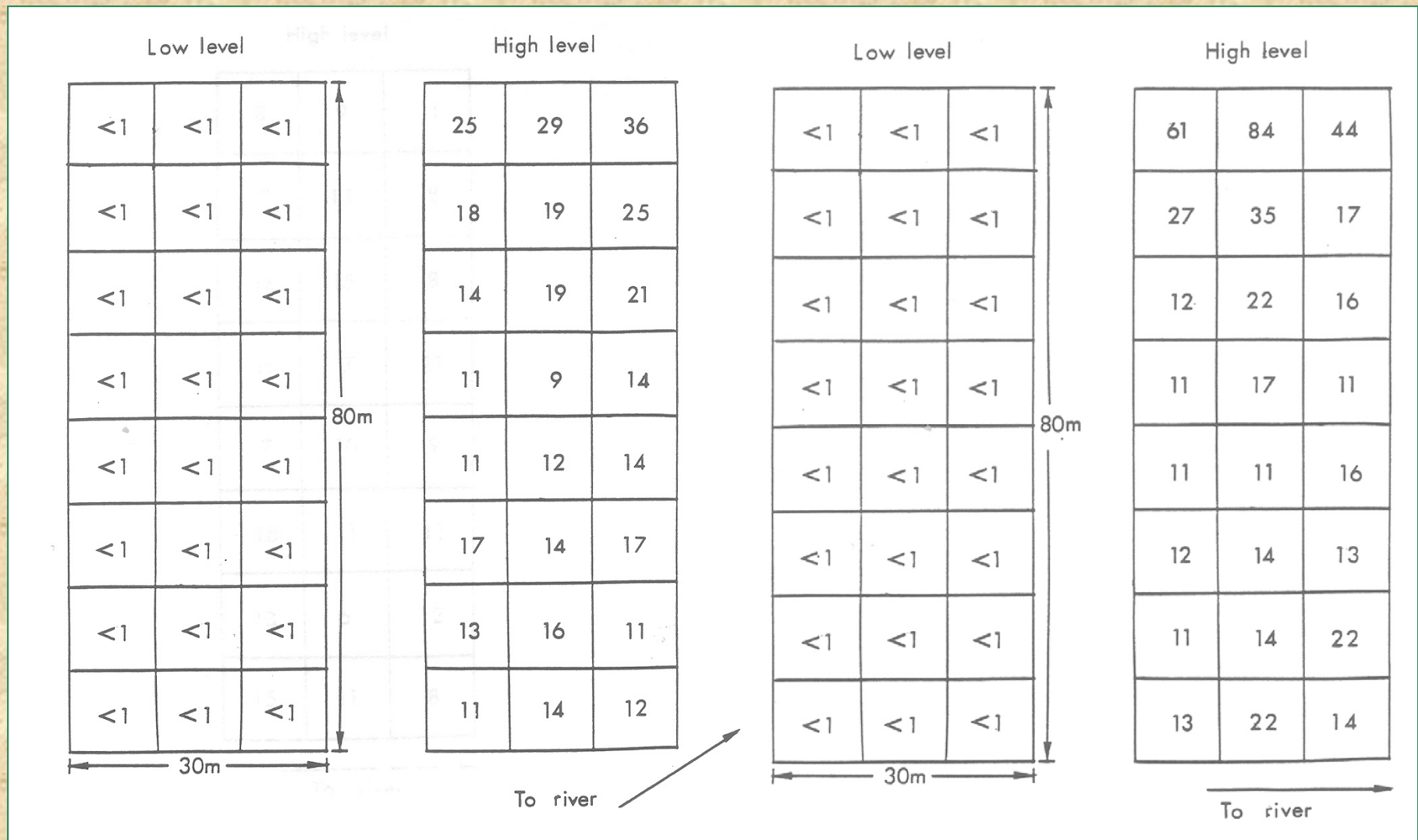
We selected floodplain research sites upstream and downstream from the Dupont facility.



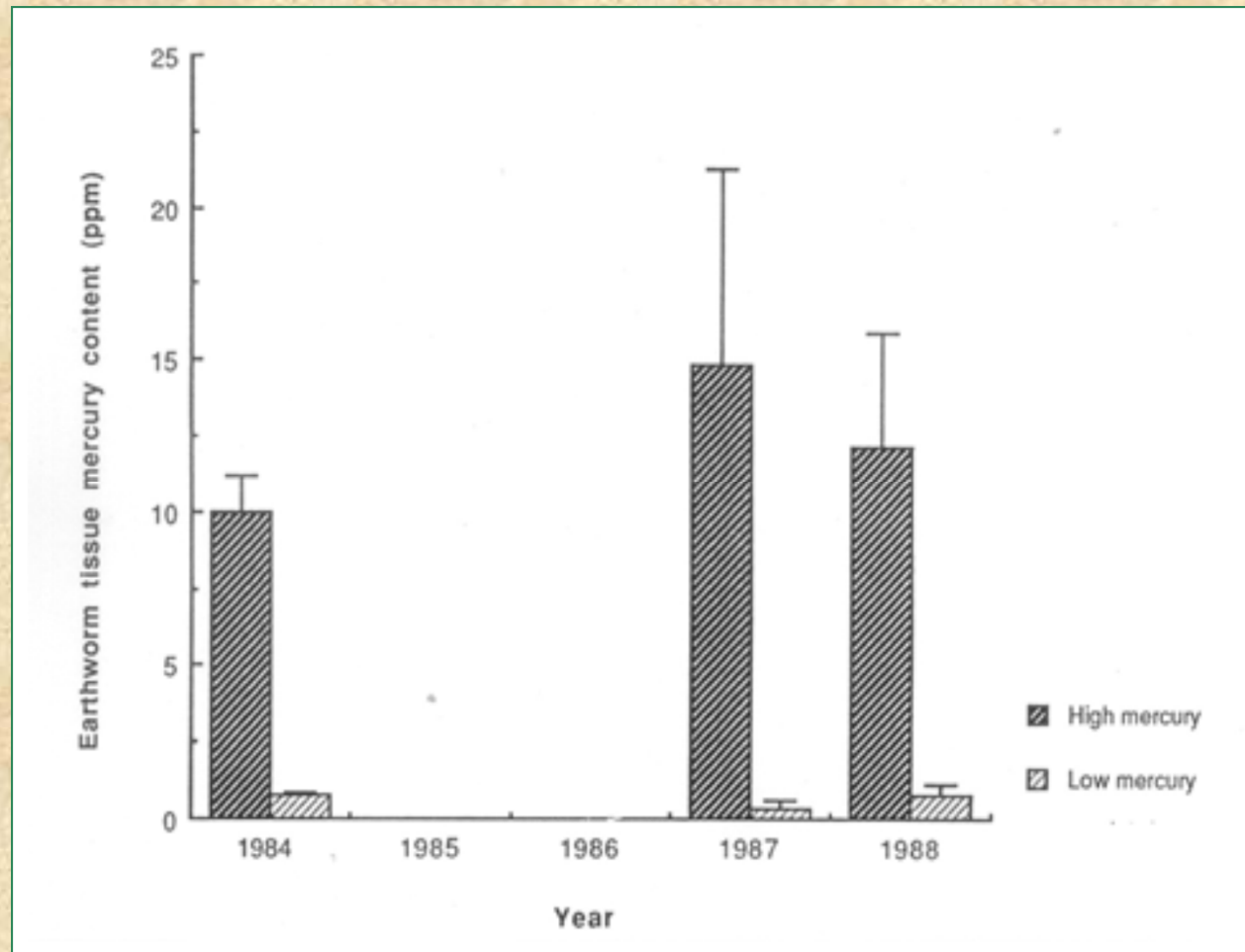
Floodplain Soil Hg Concentration ($\mu\text{g Hg gdw}^{-1}$)

Old Field Ecosystems

Forested Ecosystems



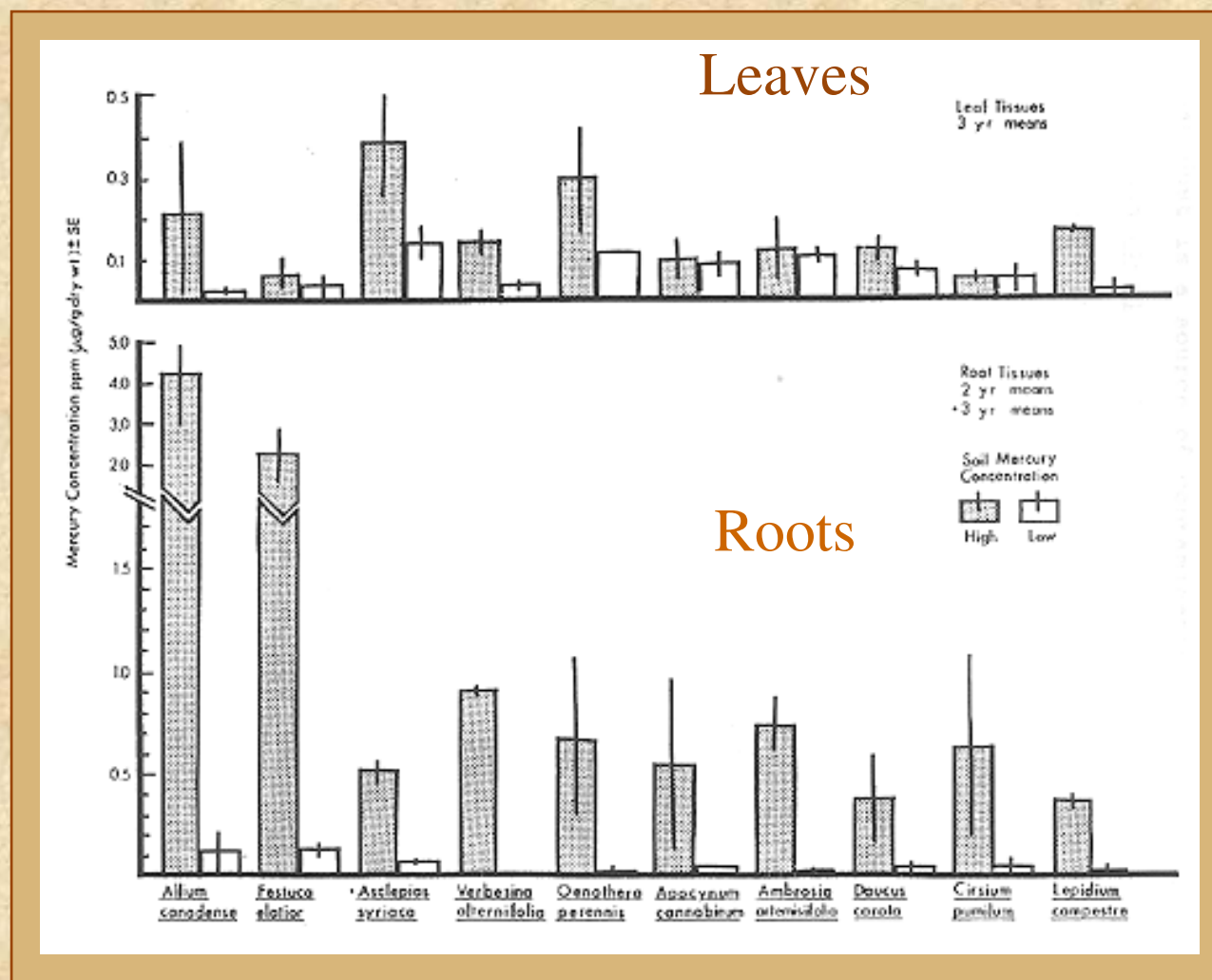
Hg Concentration in soil and earthworms within Old field site at Hopeman Parkway. ($\mu\text{g Hg gdw}^{-1}$)



Note: The tissues were freeze dried. Therefore, assuming 90% H_2O , in animal tissues, earthworms living in contaminated soil contained approximately 1 - 1.5 $\mu\text{g Hg / g}$ fresh weight

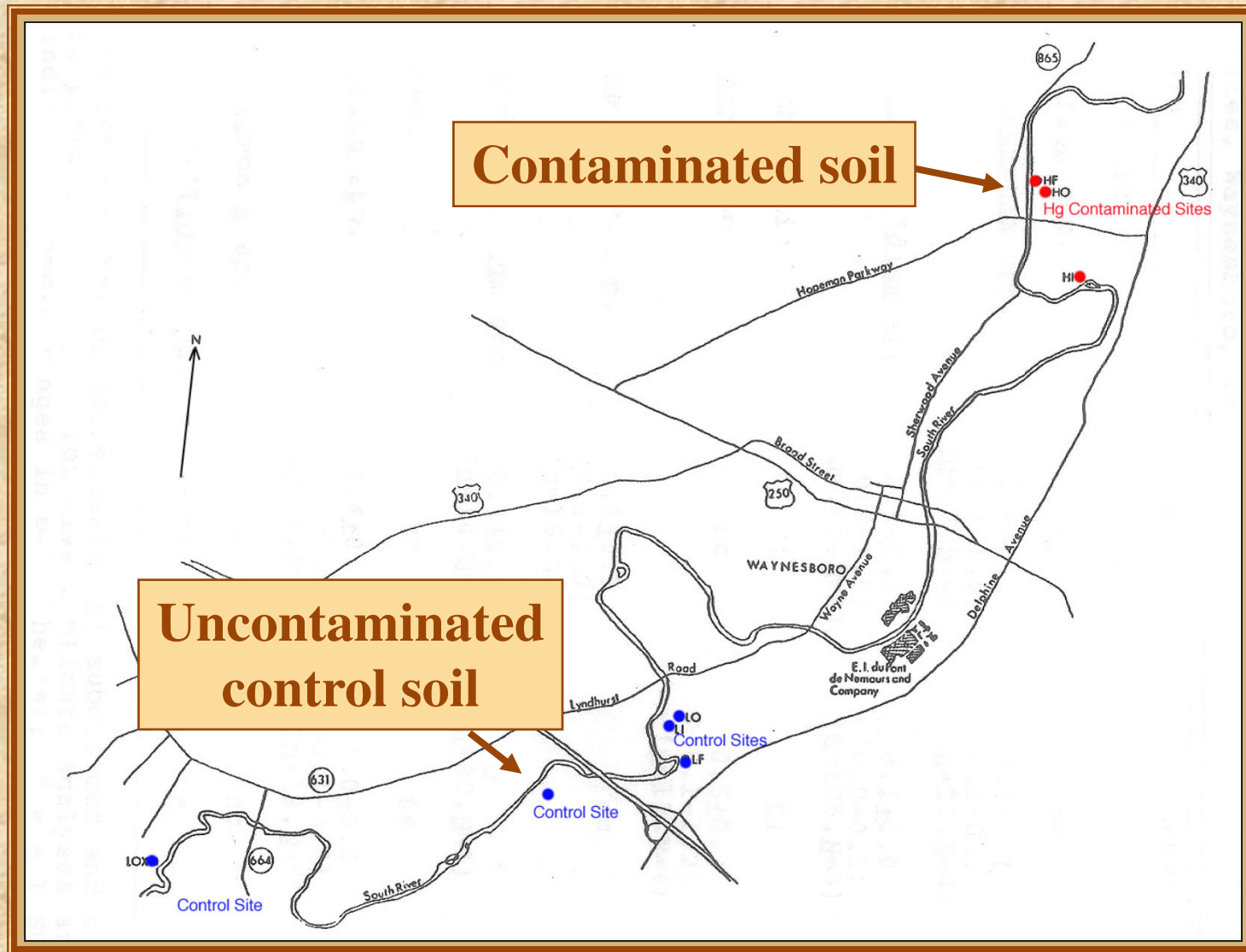
King, 1989

Acid washed herb tissue from contaminated old field sites contains Hg, particularly in roots.

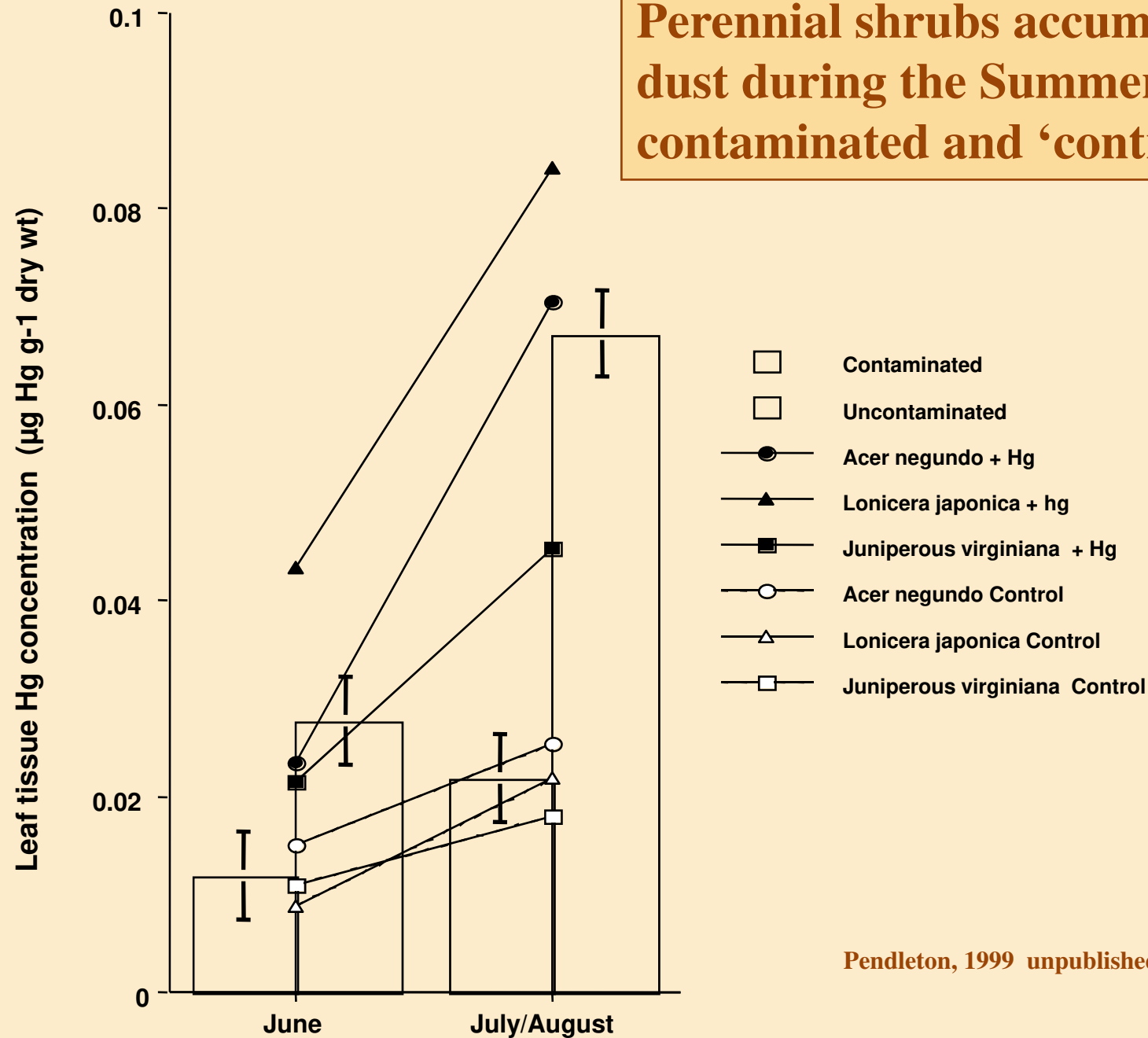


($\mu\text{g Hg g}^{-1}$ dry wt)

Ward, 1986 MS thesis



Perennial shrubs accumulate dust during the Summer at both contaminated and 'control' sites



Pendleton, 1999 unpublished study

A preliminary study of dust deposition in the Waynesboro vicinity was initiated in 2000

- Plastic petri plates were poured with a diluted solution of “Tanglefoot” insect trap adhesive .
- Over a hundred pairs of these plates were attached to telephone poles, or other relatively permanent objects, at various locations within the area.

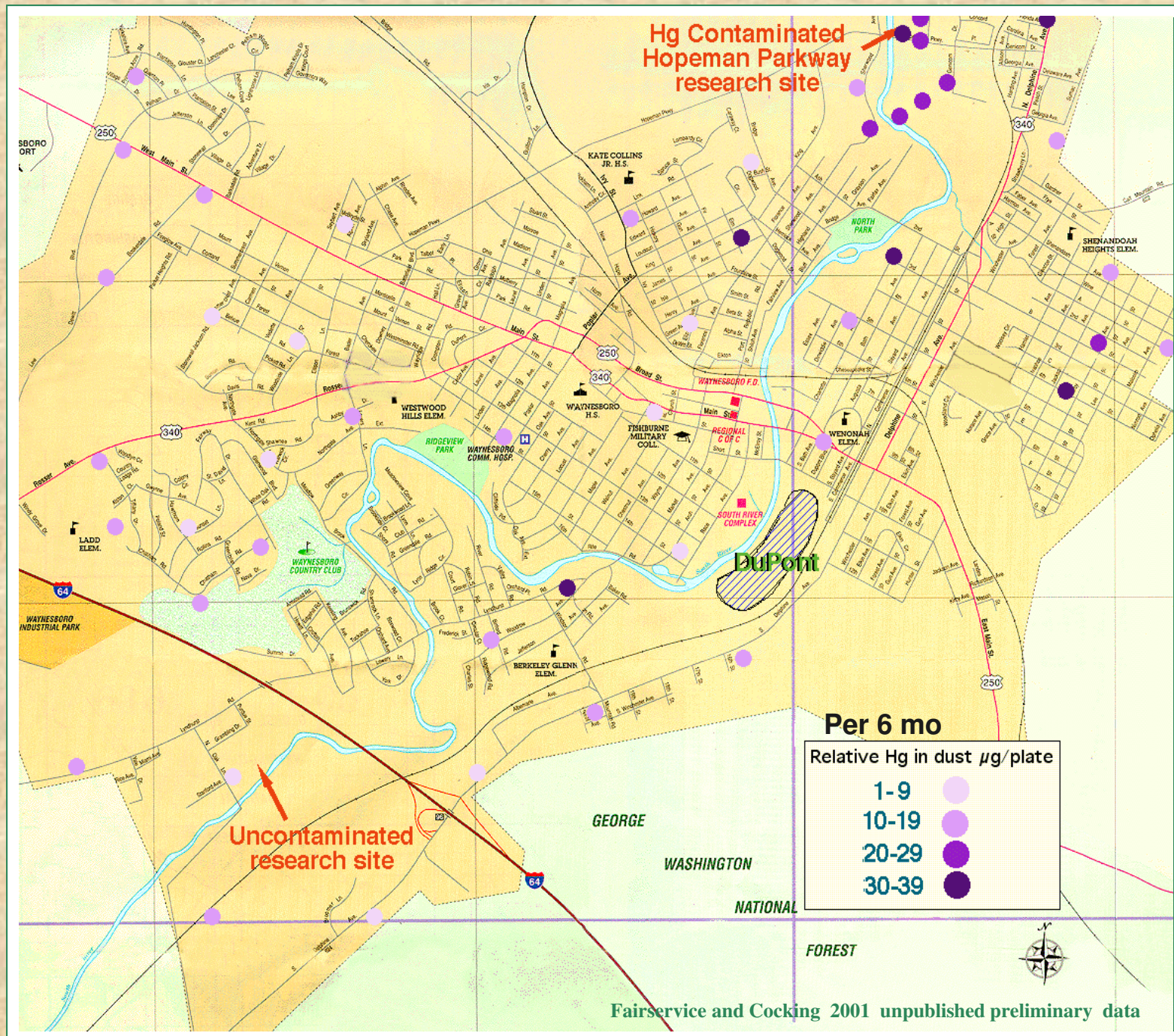






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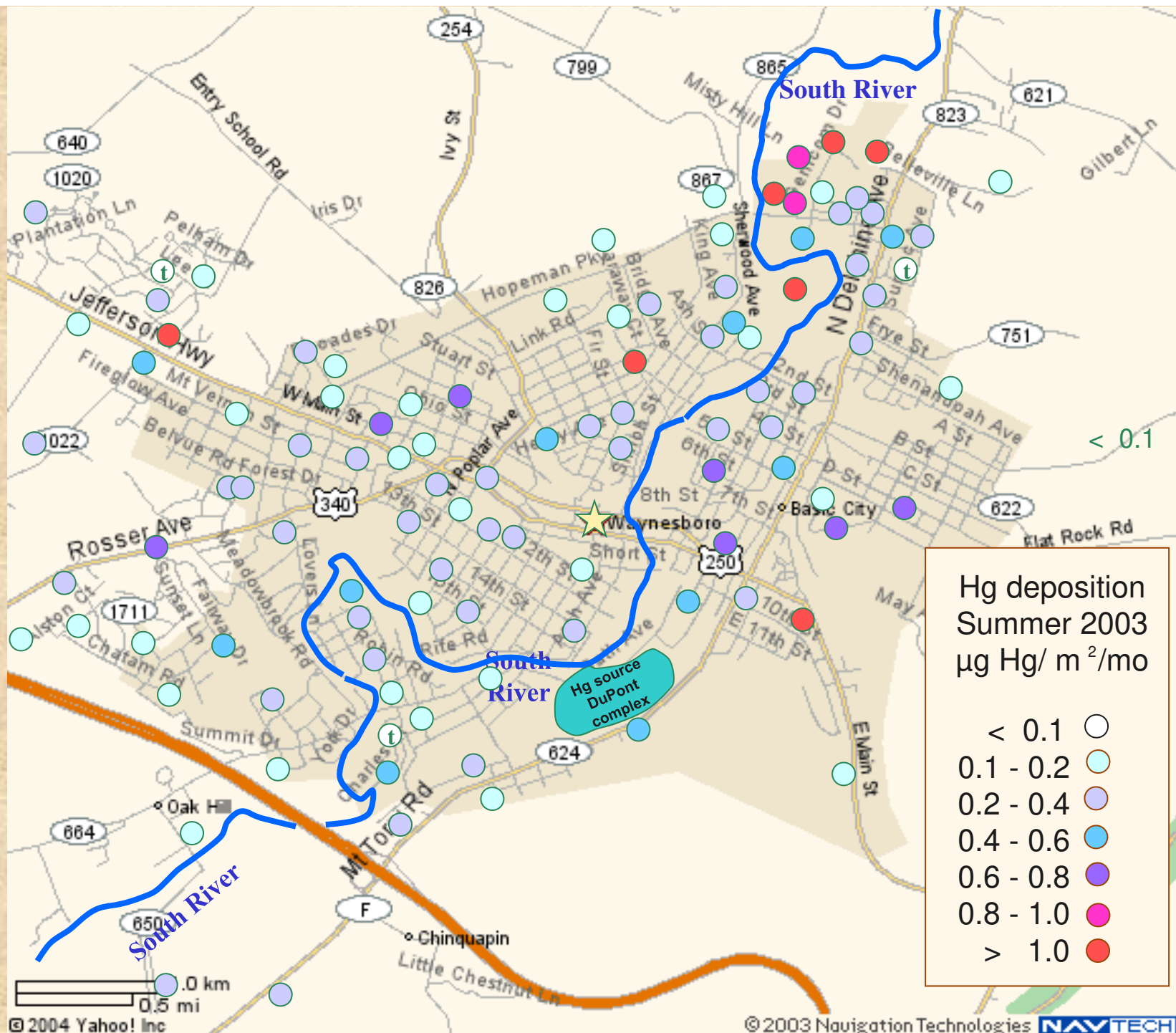
- Plastic petri plates were poured with a diluted solution of “Tanglefoot” insect trap adhesive .
- Over a hundred pairs of these plates were attached to telephone poles, or other relatively permanent objects, at various locations within the area.
- **Vandalism was high, as might be expected, but fifty locations provided data.**
- **After six months the plates were collected and analyzed for total Hg in digested residue.**
- **Some of the Hg could be from insects or fine organic debris, but most is likely to be from accumulated dust.**

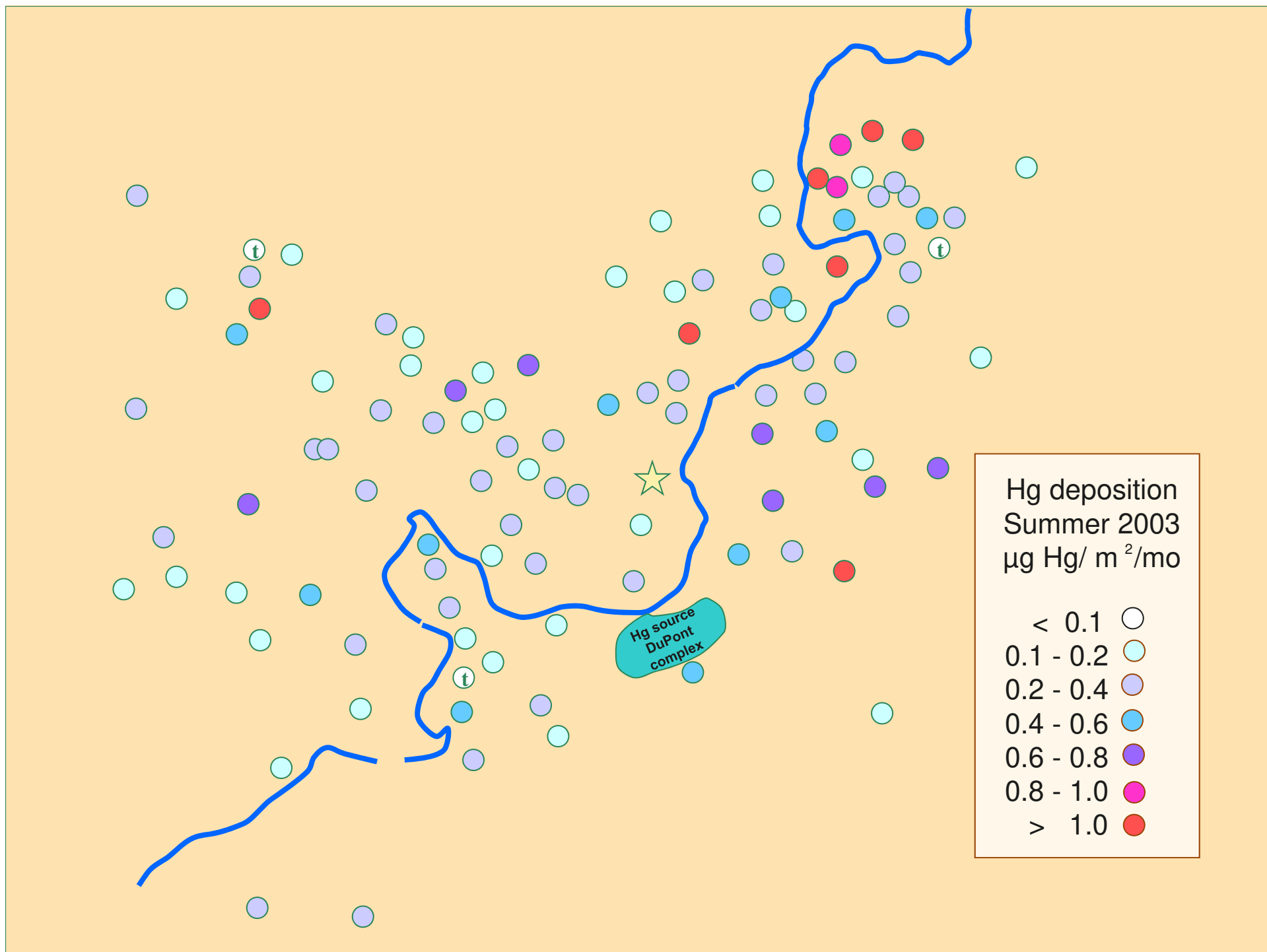


A follow-up study of dust deposition in the Waynesboro vicinity was initiated in Summer 2003

- **Plastic petri plates were poured.**
- **230 plates were attached to 115 telephone poles including most sites from the preliminary study.**
- **They were installed in June and removed in October for a four month sampling period.**
- **The FIMS Perkin Elmer atomic absorption spectrophotometer was again used to measure Hg in hot nitric and sulfuric acid digested samples.**







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- The FIMS Perkin Elmer atomic absorption spectrophotometer was again used to measure Hg in hot nitric and sulfuric acid digested samples.
- 50 plates were also attached to 25 telephone poles in Harrisonburg, VA, a location 60 km distant and not located on the South River. These were thought to be control locations which would monitor regional fallout.

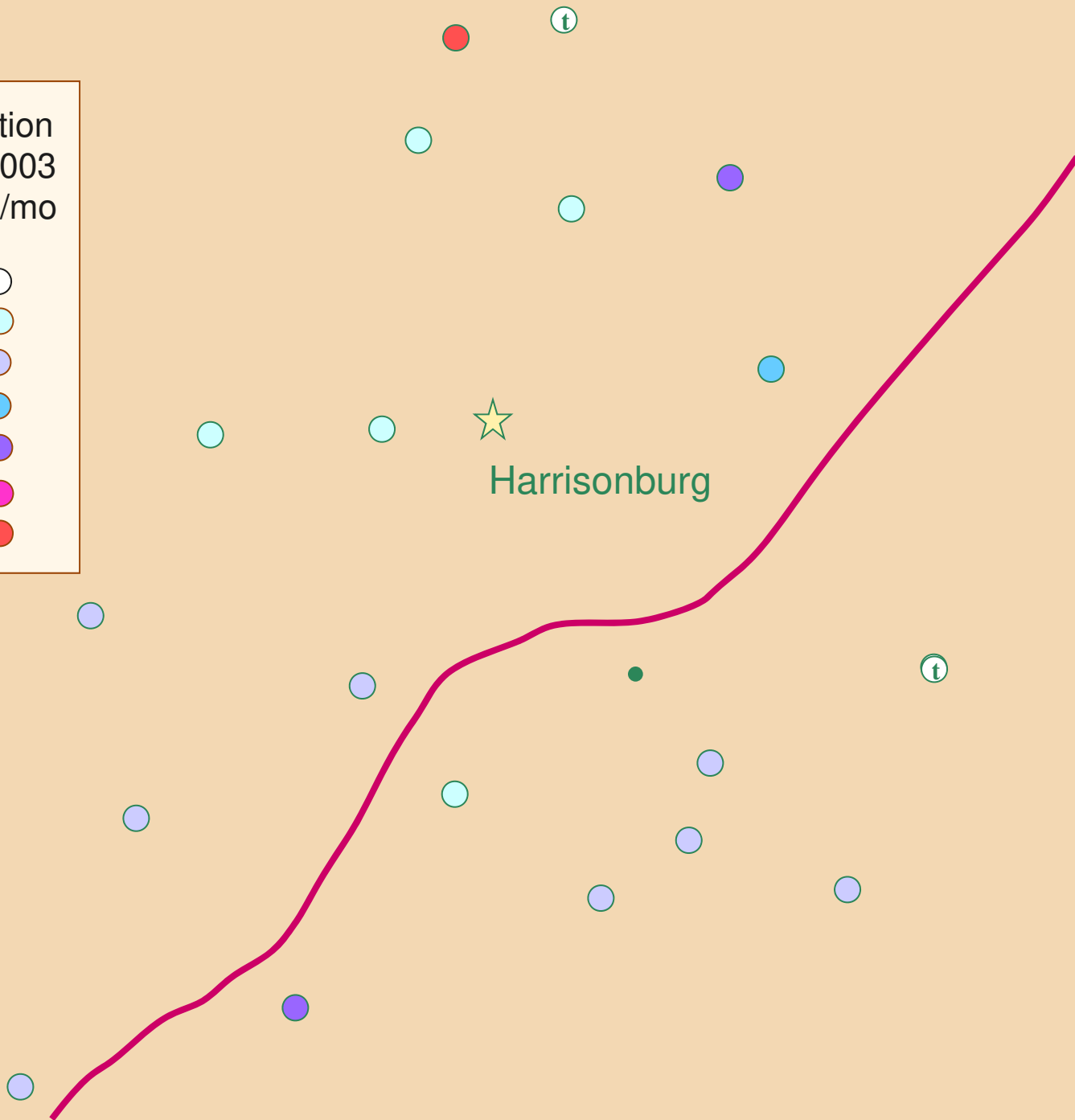




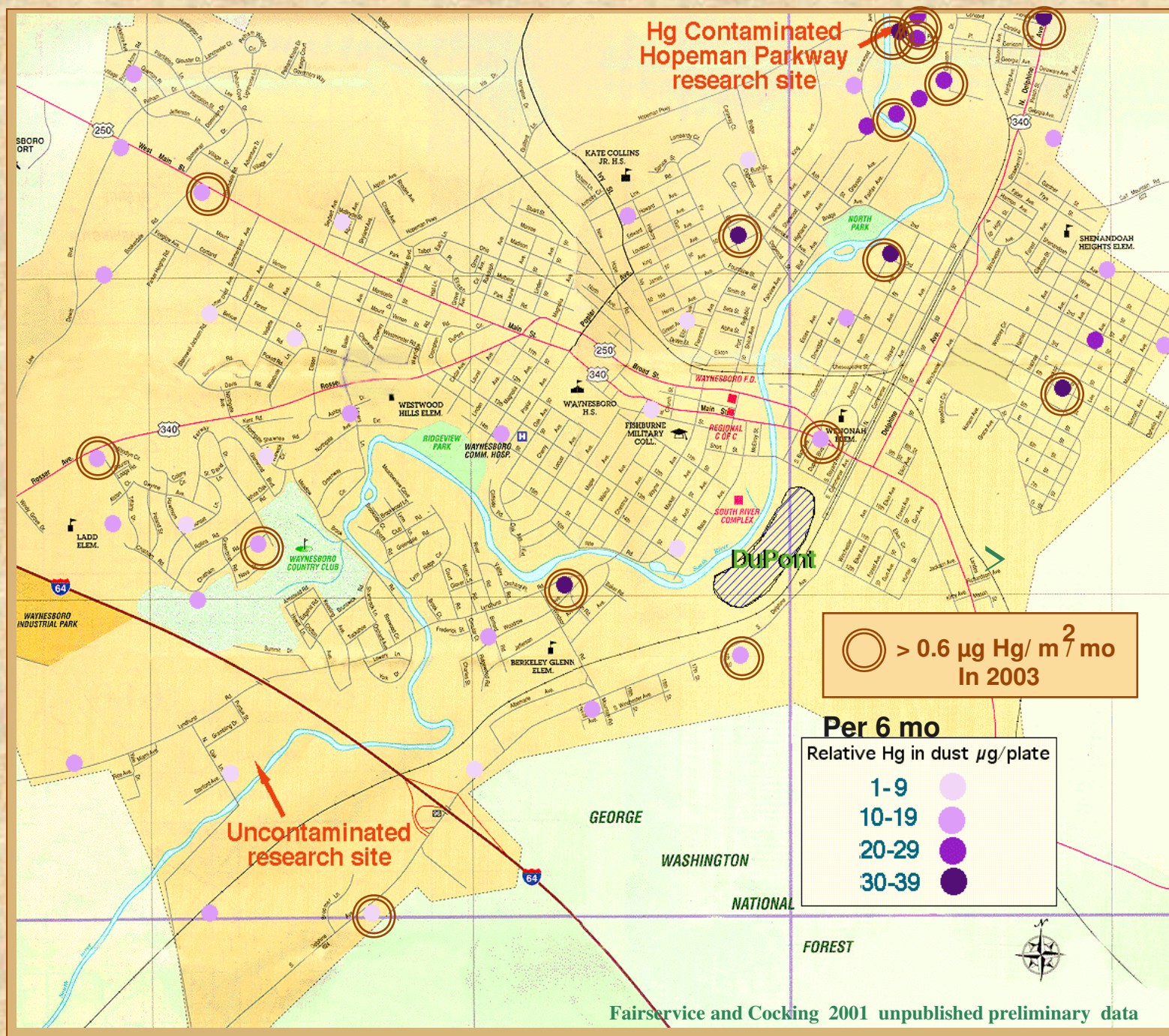
Hg deposition
Summer 2003
 $\mu\text{g Hg/ m}^2/\text{mo}$



Harrisonburg



How does this match up with the preliminary sample?



How does this match up with the preliminary sample?

What sampling is going on at the present time?

- **There are 125 sites with plates in Waynesboro and 25 sites each in Staunton and Harrisonburg.**
- **These will be collected for analysis in early August after a 10 mo exposure and replacements set out for a 4 mo late Summer-Fall sample.**
Student research is by Ally Kelly
(2004 DuPont intern for the Garden Study)
- **A study looking at the local anomalies in Rockingham and Page counties due to mercurial fungicides and/or other sources will be initiated this summer by an NSF supported student in the JMU. Undergraduate mentoring in Environmental Biology (UMEB) program.**
Student research is by Mary Susan Temple

How does this match up with the preliminary sample?

What sampling is going on at the present time?

**Does this confirm surfaces as collecting sites for
atmospheric mercury?**

How does this match up with the preliminary sample?

What sampling is going on at the present time?

Does this confirm surfaces as collecting sites for atmospheric mercury?

Is this a significant entry point for the toxin mercury into terrestrial food chains?

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Does this confirm surfaces as collecting sites for atmospheric mercury?

Is this a significant entry point for the toxin mercury into terrestrial food chains?

Are local patterns of Hg deposition in other locations distant from contaminated SouthRiver flood plain soils comparable to those in Waynesboro?

NULL HYPOTHESIS for future study

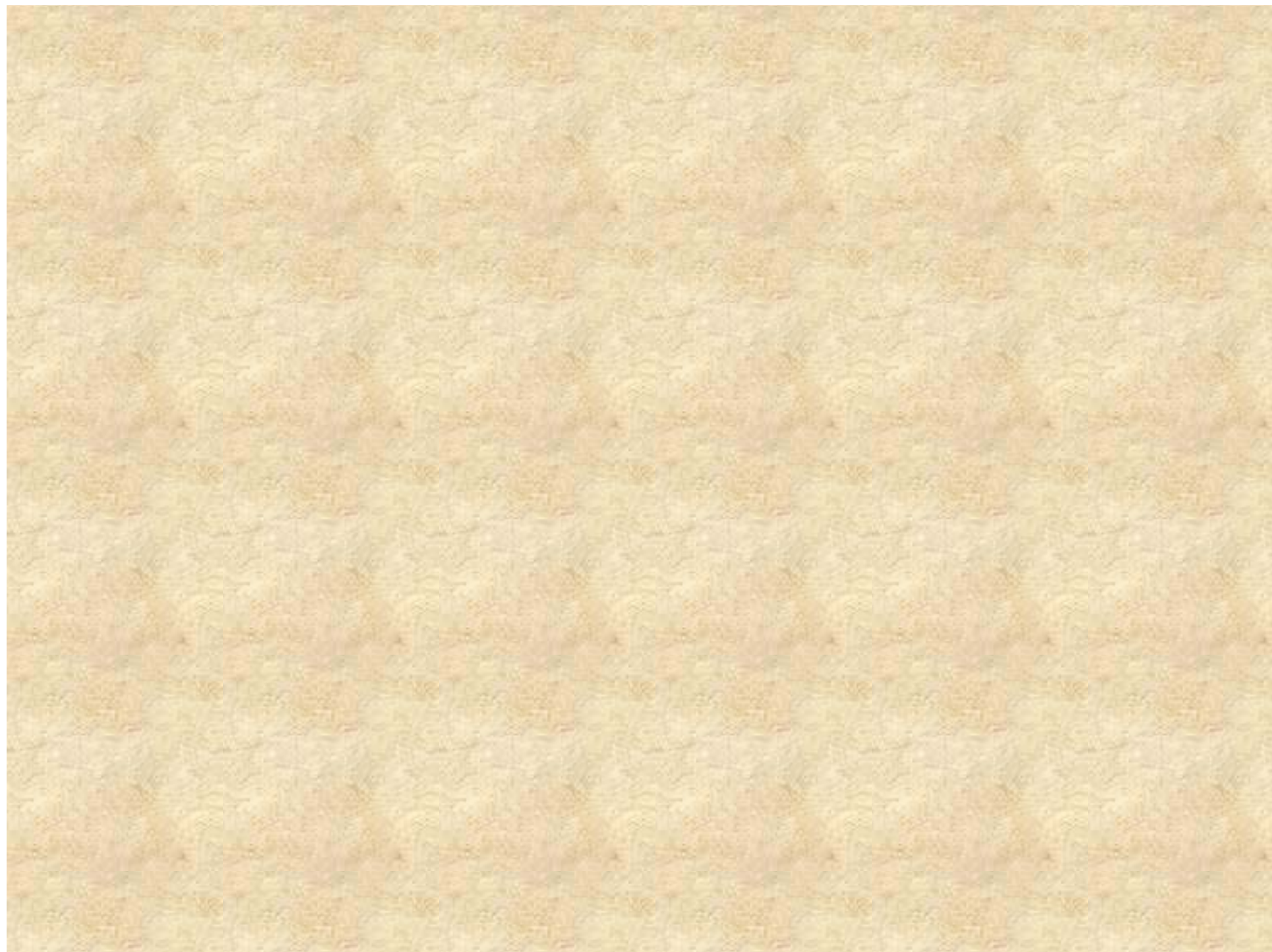
H₀ There is no significant difference in the nature of local scale atmospheric deposition when the South River influenced landscape is compared to that in other regions of the Shenandoah Valley.

H₁ Both South River and non-South River sources of contamination affect local patterns of deposition.

H₂ Local sources make contributions that are superimposed on a more random regional atmospheric cloud.

H₃ A single weather station atmospheric deposition network point may misrepresent regional conditions due local heterogeneity.

H₄ Atmospheric deposition East and West of the South River at different distances from the flood plain may be non-random.



Hg deposition
Summer 2003
 $\mu\text{g Hg/ m}^2/\text{mo}$



QuickTime™ and a
GIF decompressor
are needed to see this picture.

