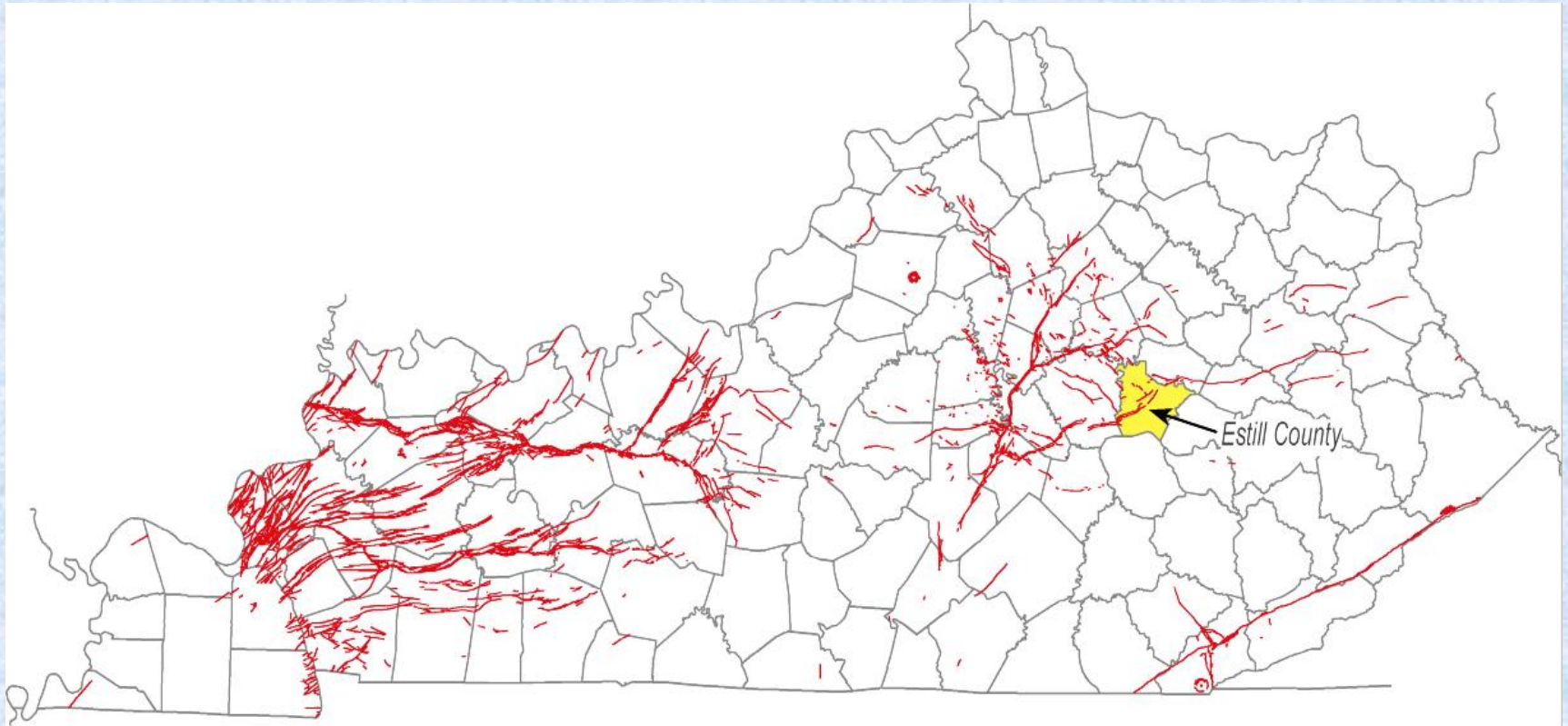




Foundation Problems and Pyrite Oxidation in the Chattanooga (Ohio) Shale Estill County, Kentucky

**John Kiefer, Kiefer@uky.edu
Warren H. Anderson, Wanderson@uky.edu
Kentucky Geological Survey
University of Kentucky**

Project Location

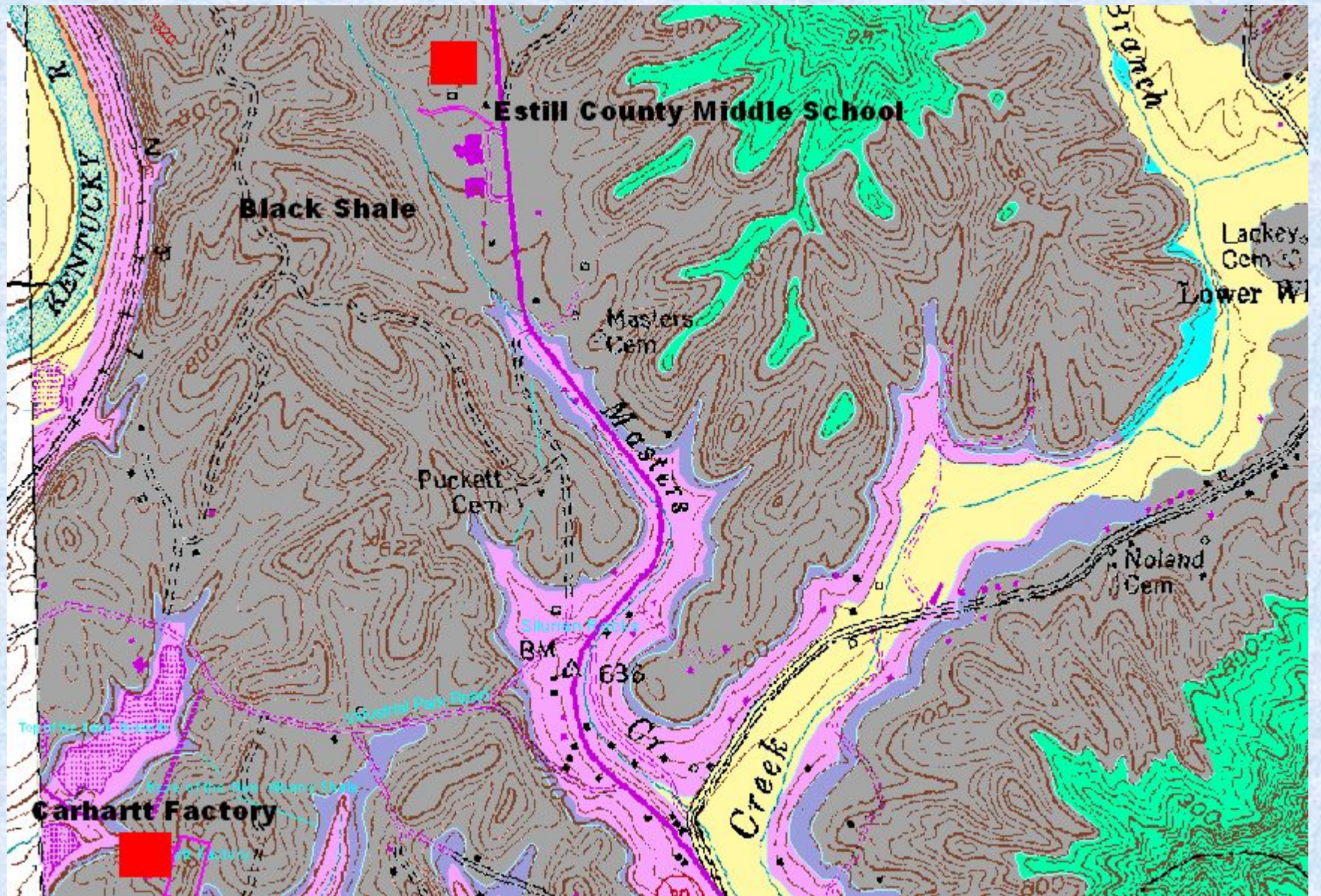


DVGQ's

- Digitally Vectorized Geologic Quadrangles
- Digital GQ data for the entire state
- Useful in Planning, Design, Construction and Remediation

Irvine DOQQ





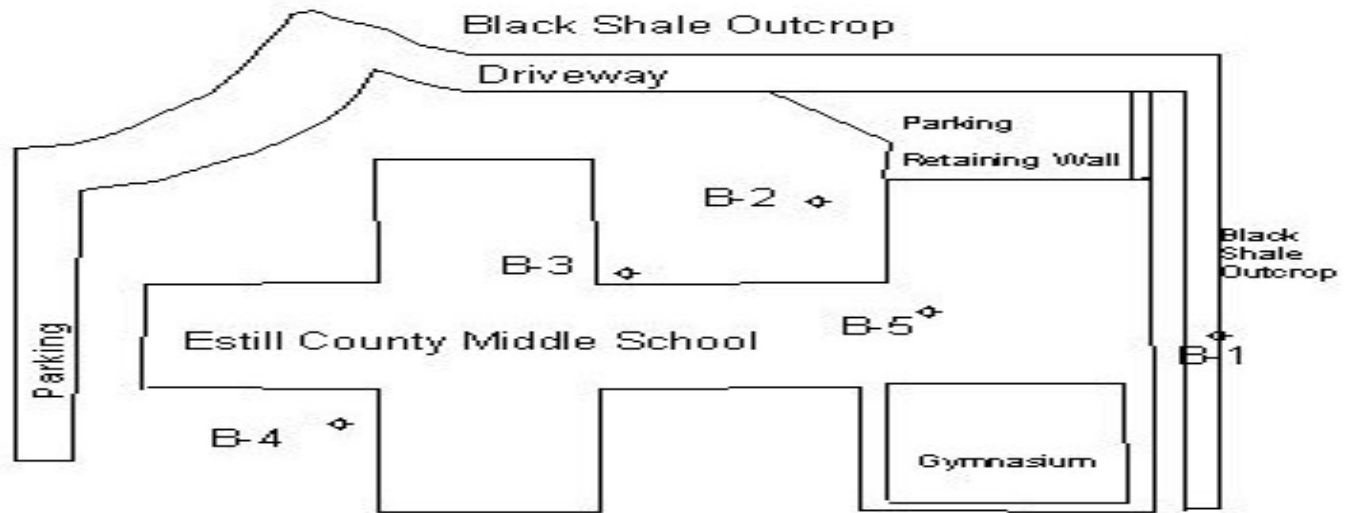
Estill County Middle School



Black Shale Outcrop

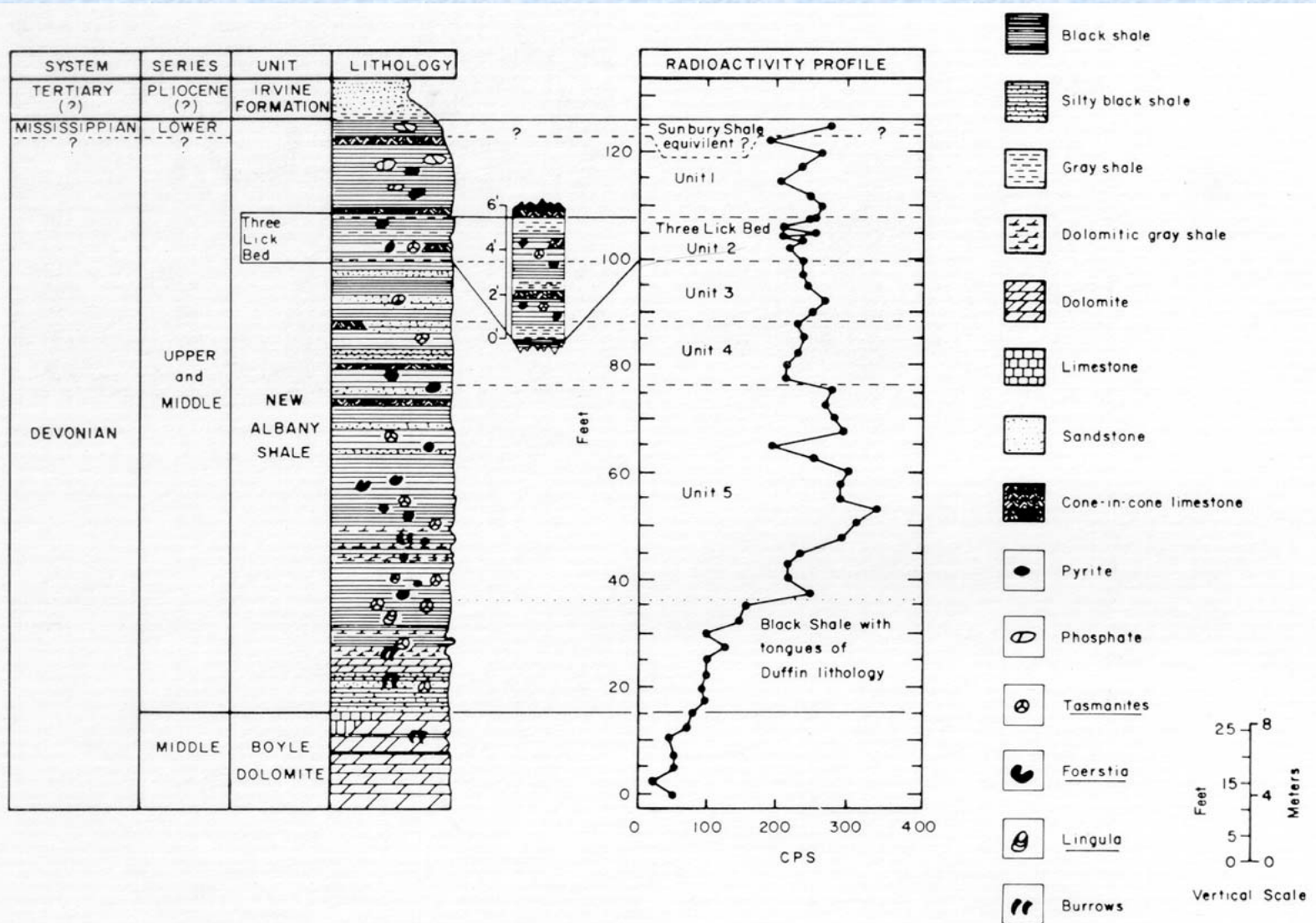


Plan of Middle School



Route 89

Stratigraphic Section



Foundation Problems in School



Tension fractures in retaining wall



Sulfate precipitates in drain tile



Iron Stain on Black Shale



Sulfate efflorescence on Shale



Cleats, fractures in subcrop



Copiapite along cleat



Pyrite nodule zone in Black Shale



Gymnasium Repair



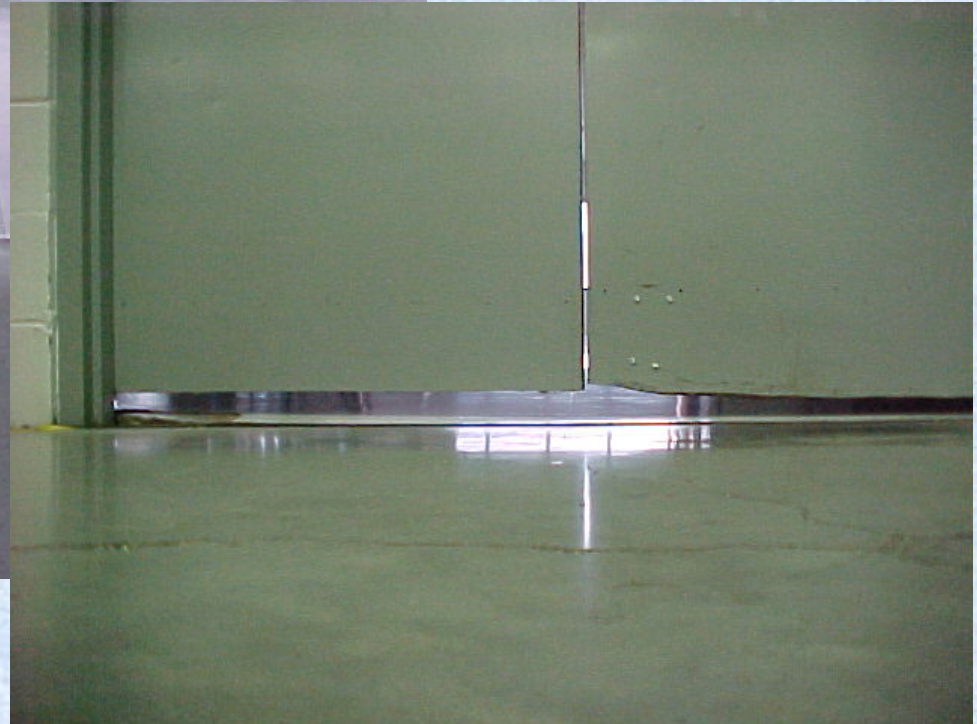
Black Shale subcrop in School



Carhartt Factory



Foundation Problems in Factory



Heaved flooring adjacent to load bearing wall



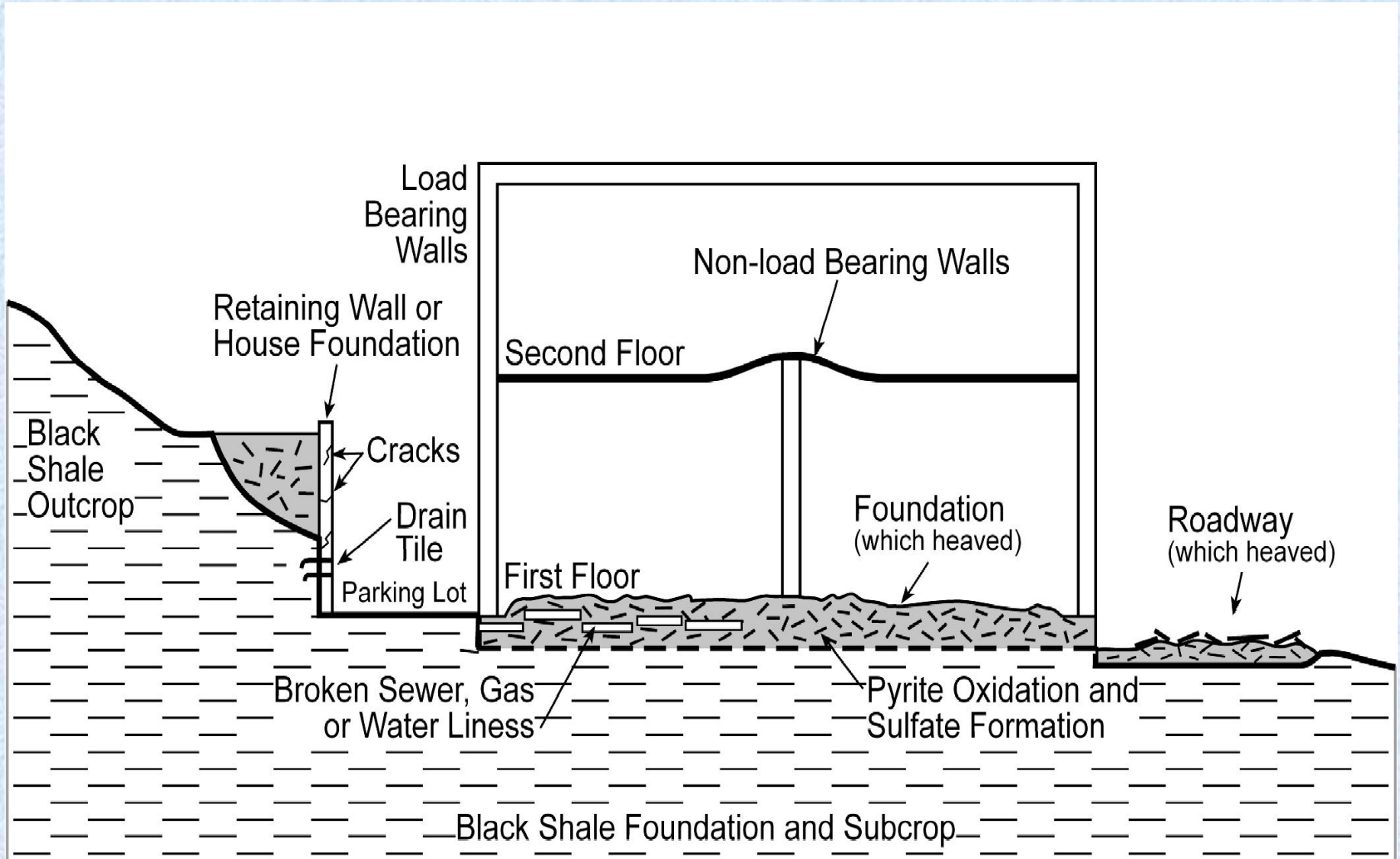
Loading area



Marcum Wallace Hospital



Schematic Diagram



Non-load bearing wall heaving



Repaired room adjacent to load bearing wall



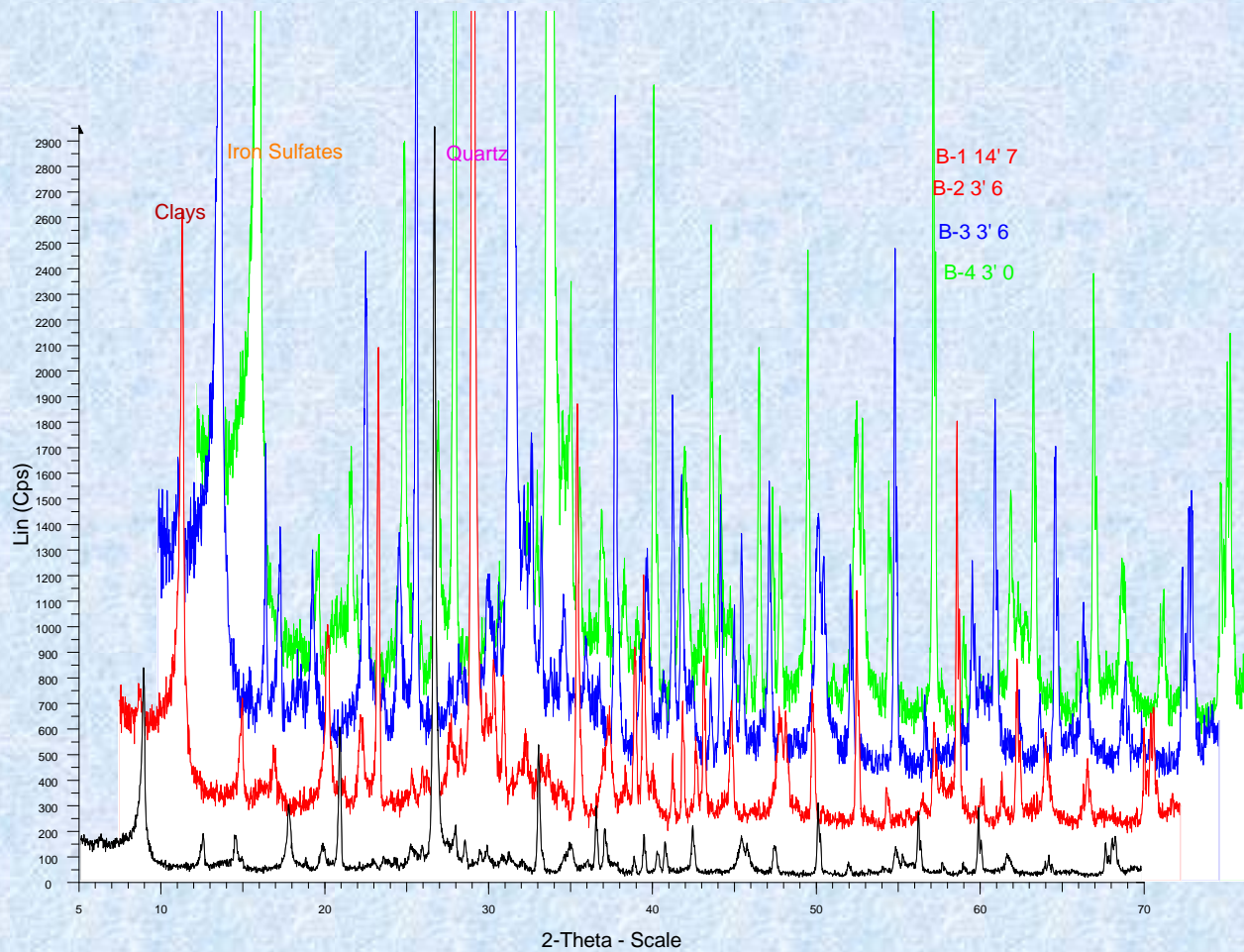
Irvine Bypass built on Crab Orchard



Sulfates

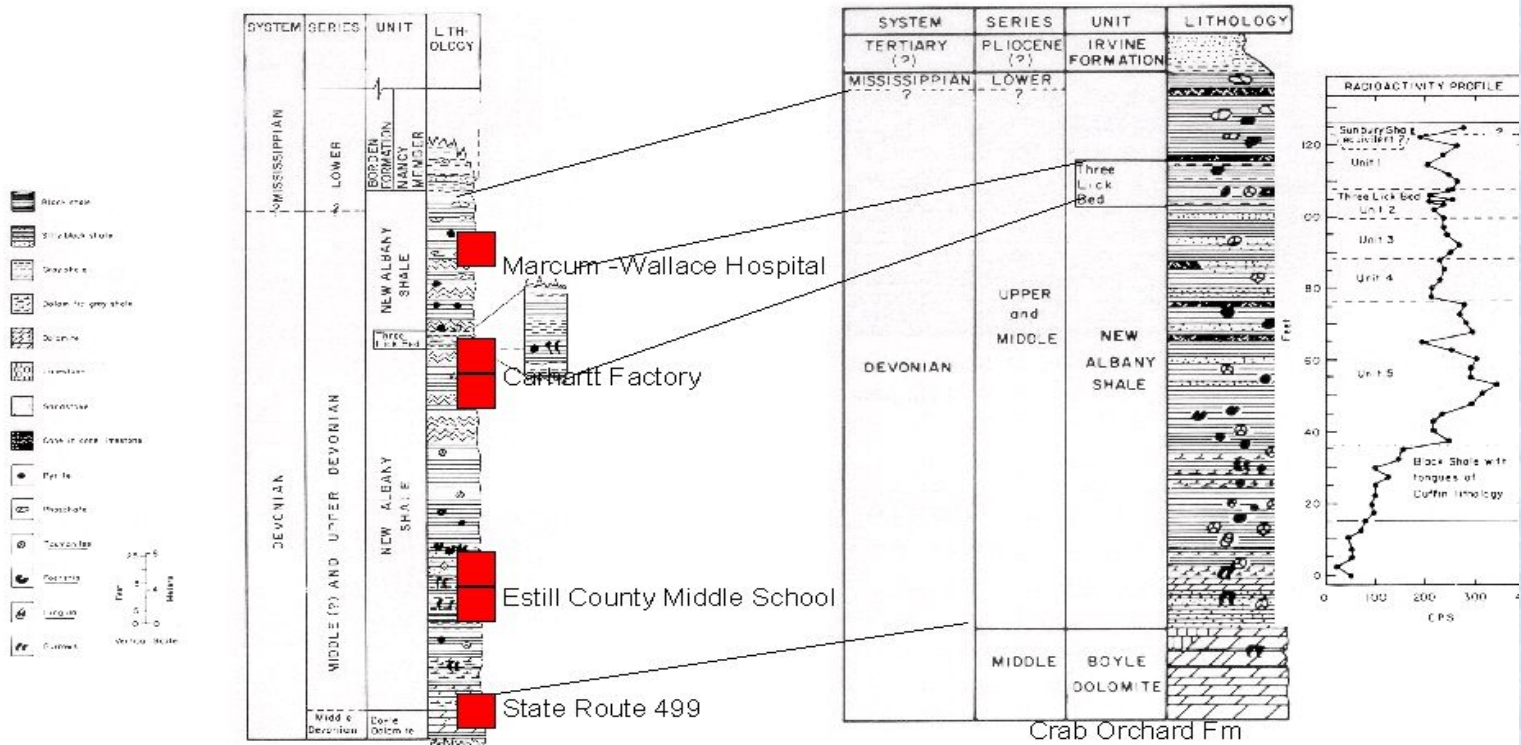


X-Ray Diffractogram



Stratigraphic position of buildings

Stratigraphic Location of Buildings Examined in North Irvine Area.



Causes of Foundation Failure

- Oxidation of pyrite and growth of secondary sulfates in the shale.
- The shale degrades into various clay and sulfate minerals and has a lack of shear strength when subjected to loads.
- Parts of the school building and factory appear to be constructed on shale fill.

RECOMMENDATIONS

- **Pre-construction prevention**
- **Remediation solutions**
 - **Remove foundation material and fill, and replace with impermeable water/moisture barrier. Create new sub-floor bearing walls or piers, and refill with non-shale aggregate**

Future Work

- Statewide Geochemical Study of the Chattanooga (Ohio) shales to determine areas of high iron or pyrite content.
- Detailed work in the Estill County area to further define the high iron areas.

Acknowledgements

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BLACK SHALE PROBLEMS IN POWELL COUNTY



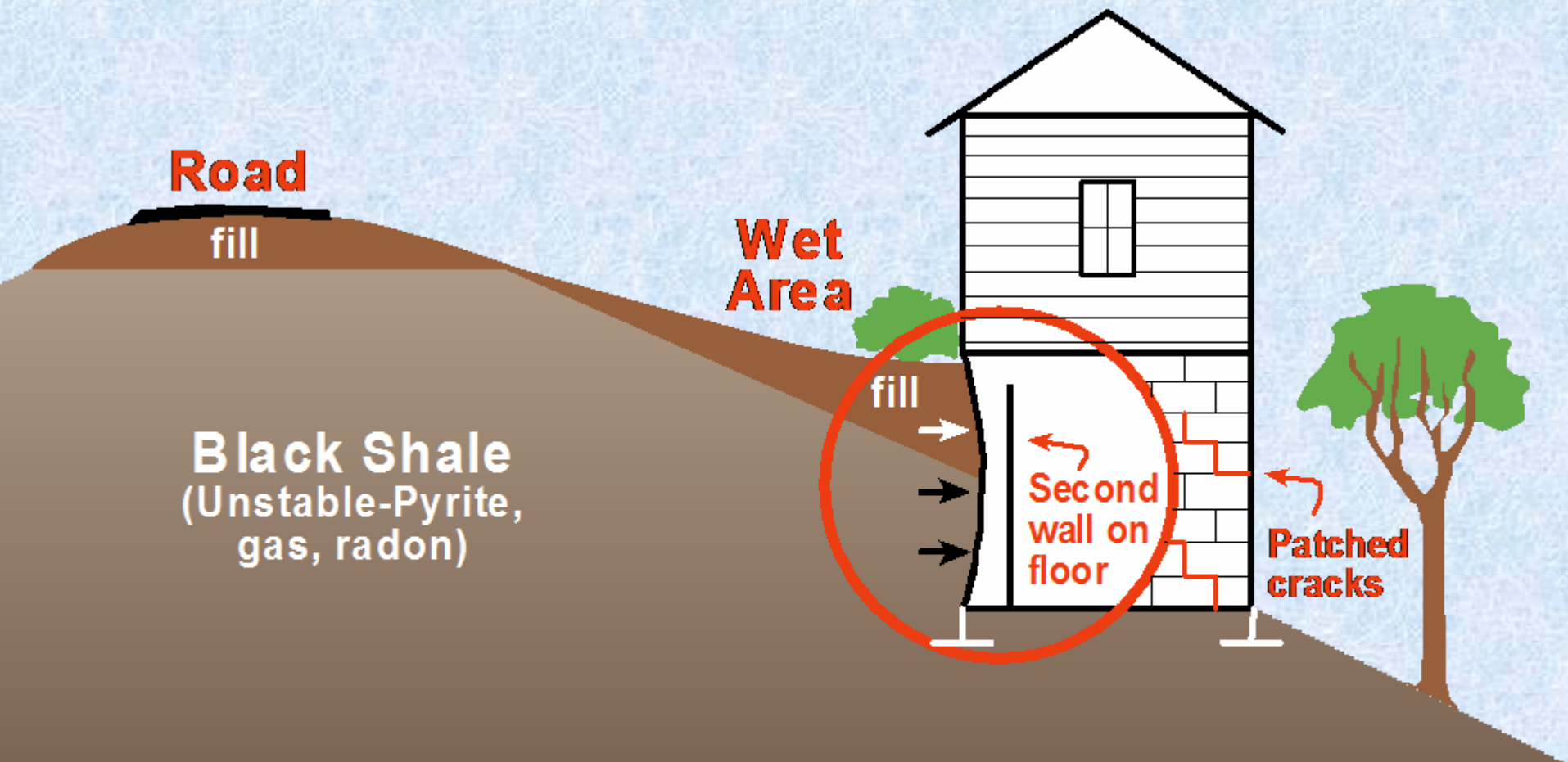


POWELL COUNTY – REAR CORNER OF HOUSE WAS PATCHED BECAUSE THE CISTERN BLEW UP. NATURAL GAS FROM THE SHALE WAS SEEPING IN



POWELL COUNTY – YARD SLOPED DOWNWARD FROM ROAD ALLOWING WATER TO BUILD UP AGAINST HOUSE AND SEEP UNDERNEATH. NOTE CRACKS IN NEIGHBORS HOUSE.

Black Shale Problems











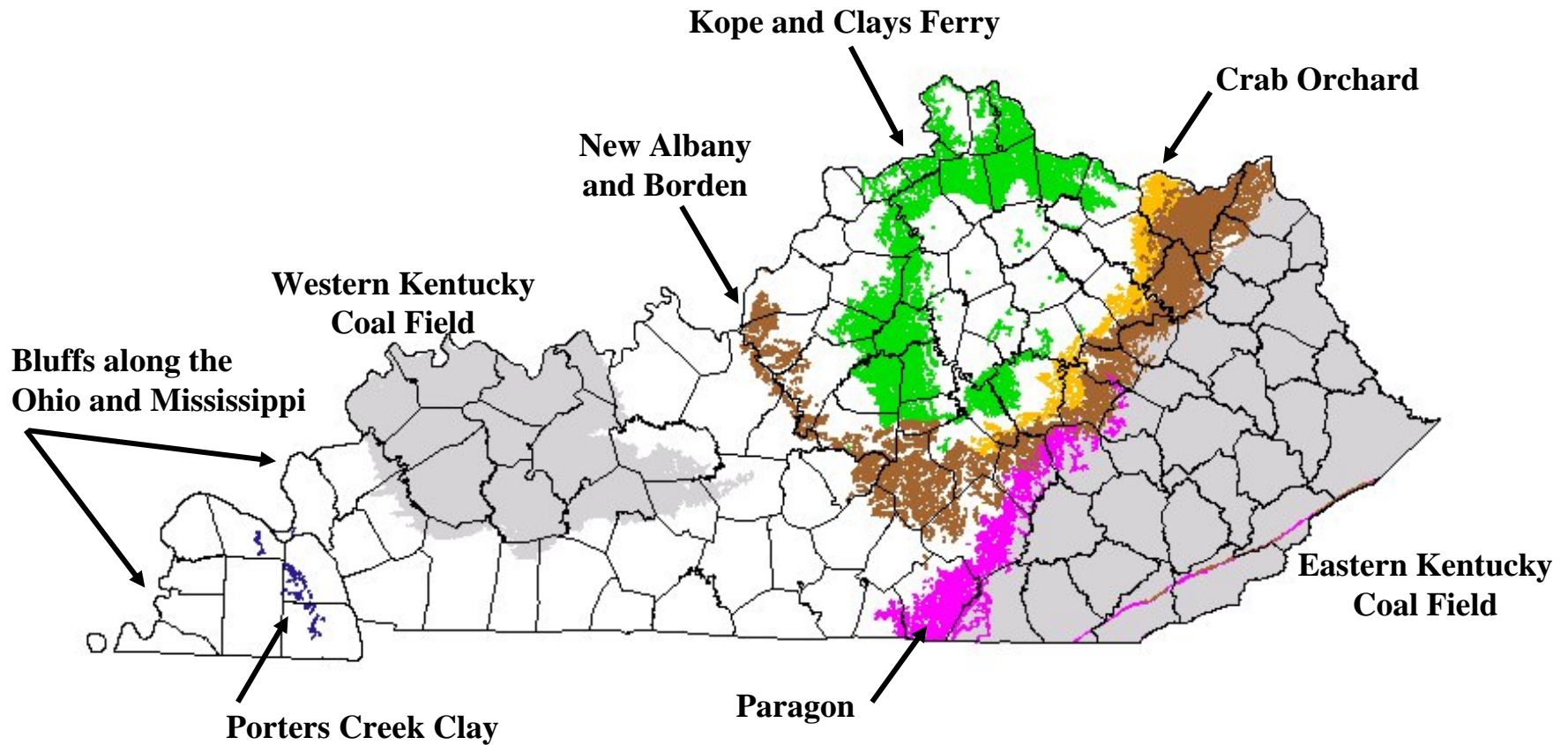








Landslide-prone Areas of Kentucky



OUTCROP OF OIL SHALES IN KENTUCKY





A photograph showing a large pile of dark shale rock in the background, partially covered with brown autumn leaves. In the foreground, there is a green lawn and a white sign on a metal frame. To the left, a portion of a house with white siding is visible. A utility pole with power lines stands on the right side of the image. The sky is overcast and grey.

Shale
For Sale
957-5909
543-529

