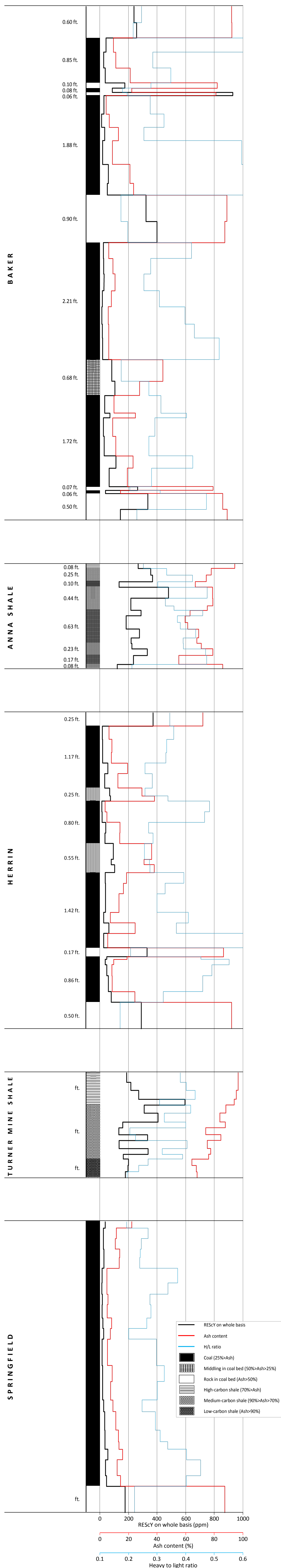


**Variations corresponding to lithological columns of studied sequences in stratigraphic order**



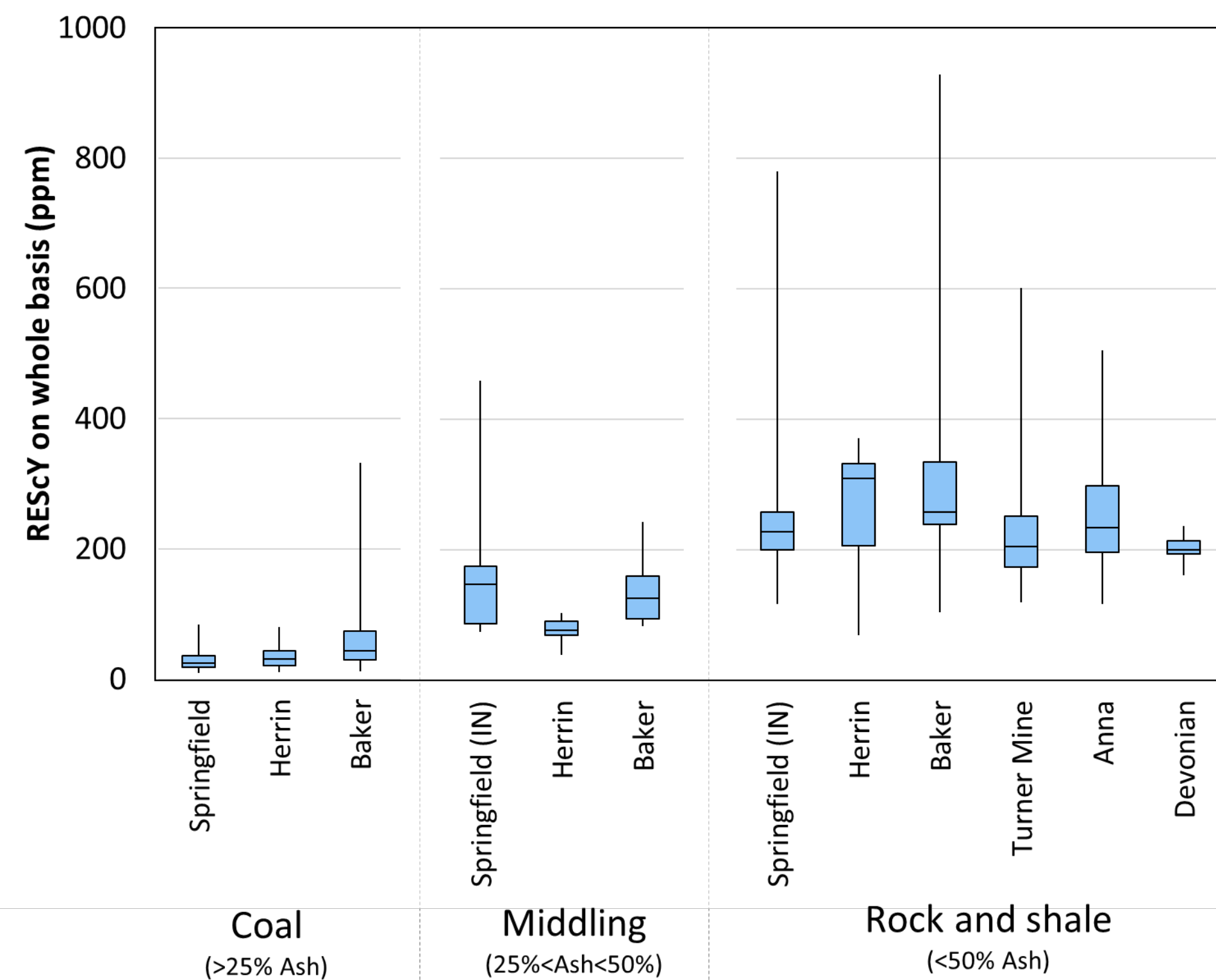
# Identification and Characterization of Illinois Basin Coal and Coal-related Materials Containing High Rare Earth Element Concentrations



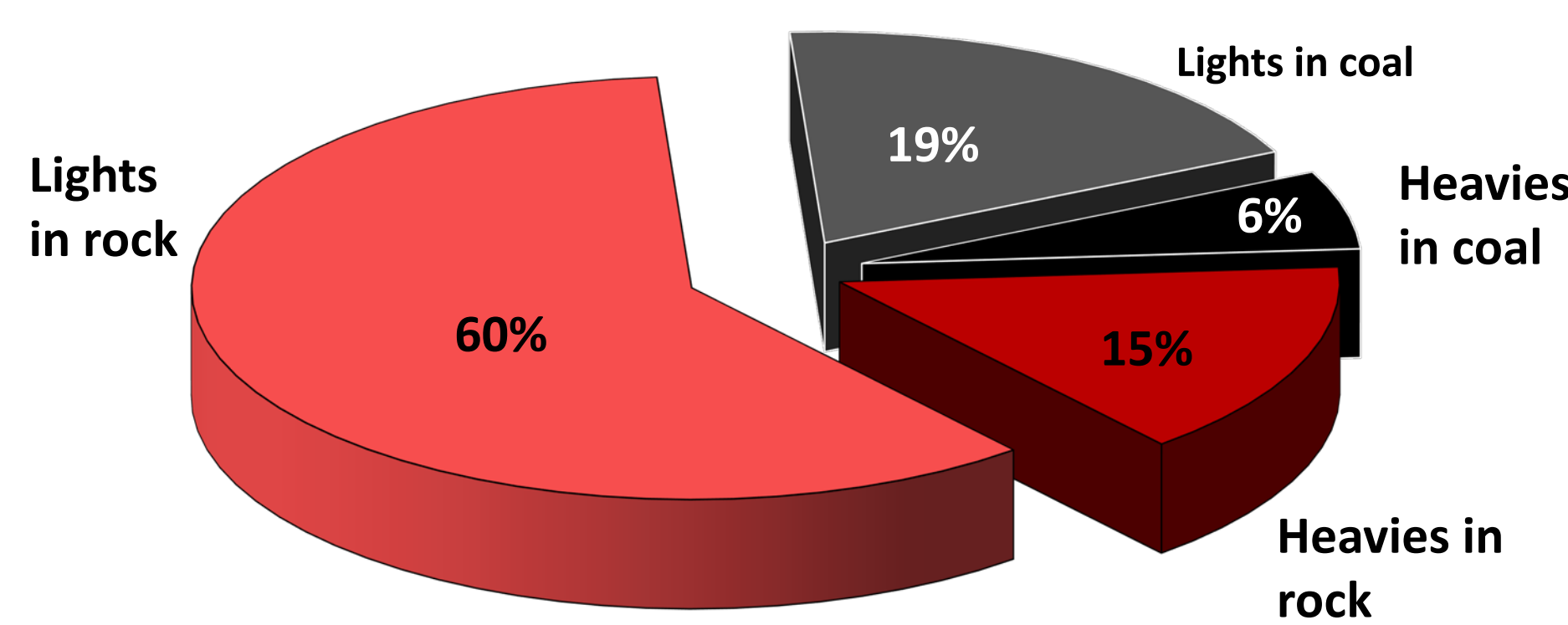
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<sup>1</sup>University of Kentucky, Mining Engineering Department, <sup>2</sup>Kentucky Geological Survey, <sup>3</sup>University of Kentucky, Center for Applied Energy Research

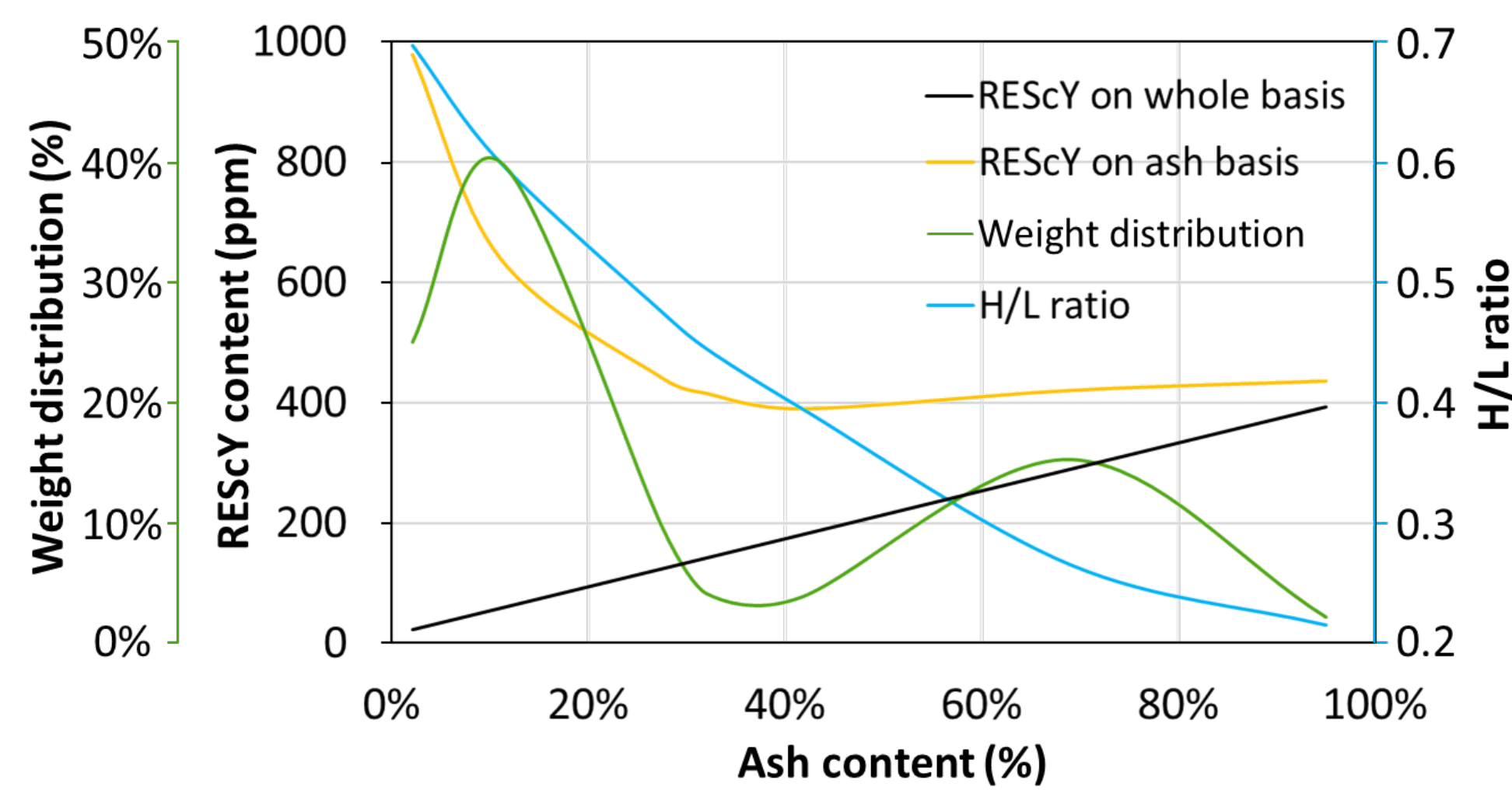
**Quartiles and median of REScY distribution in studied coal beds and shale formations**



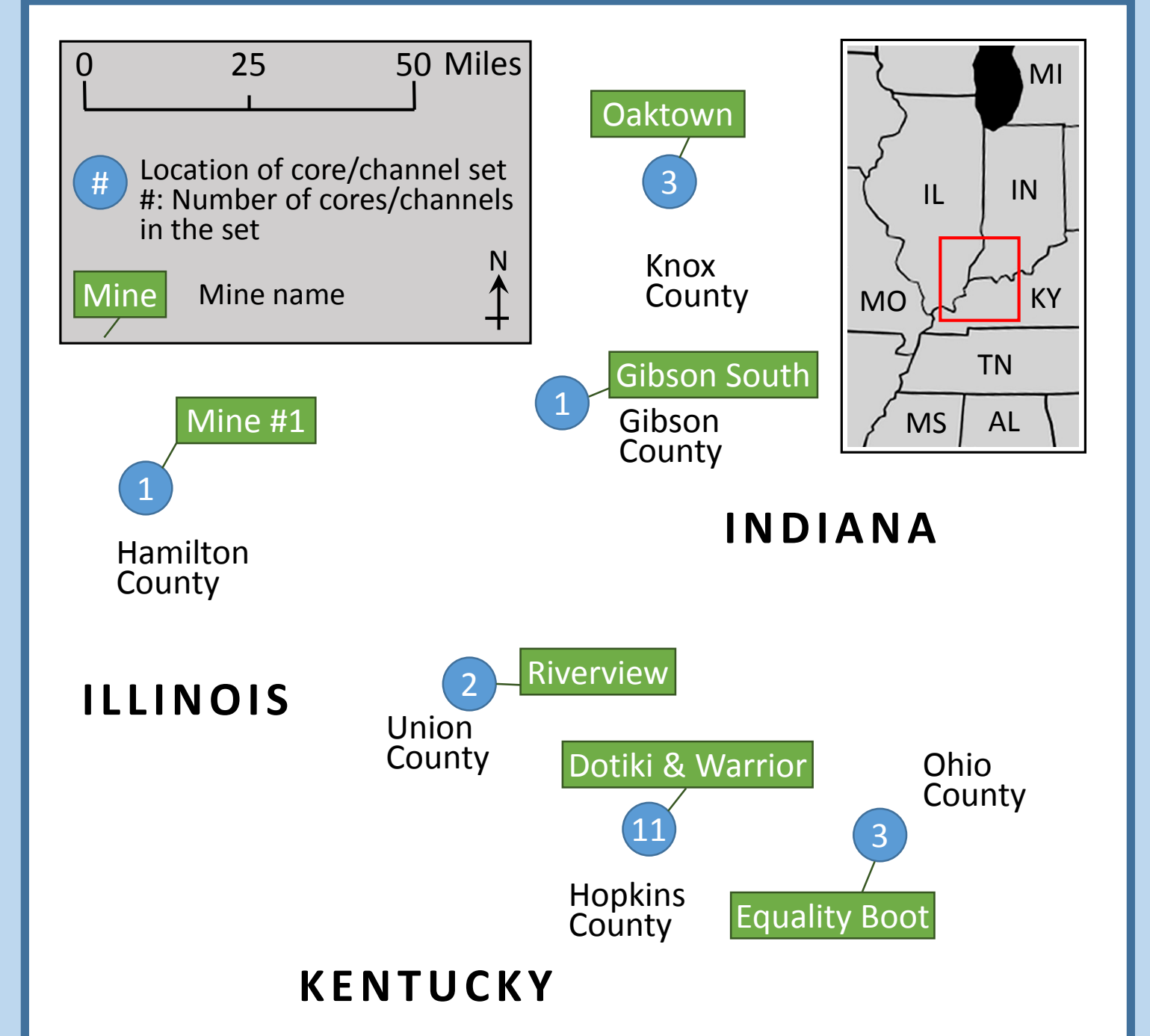
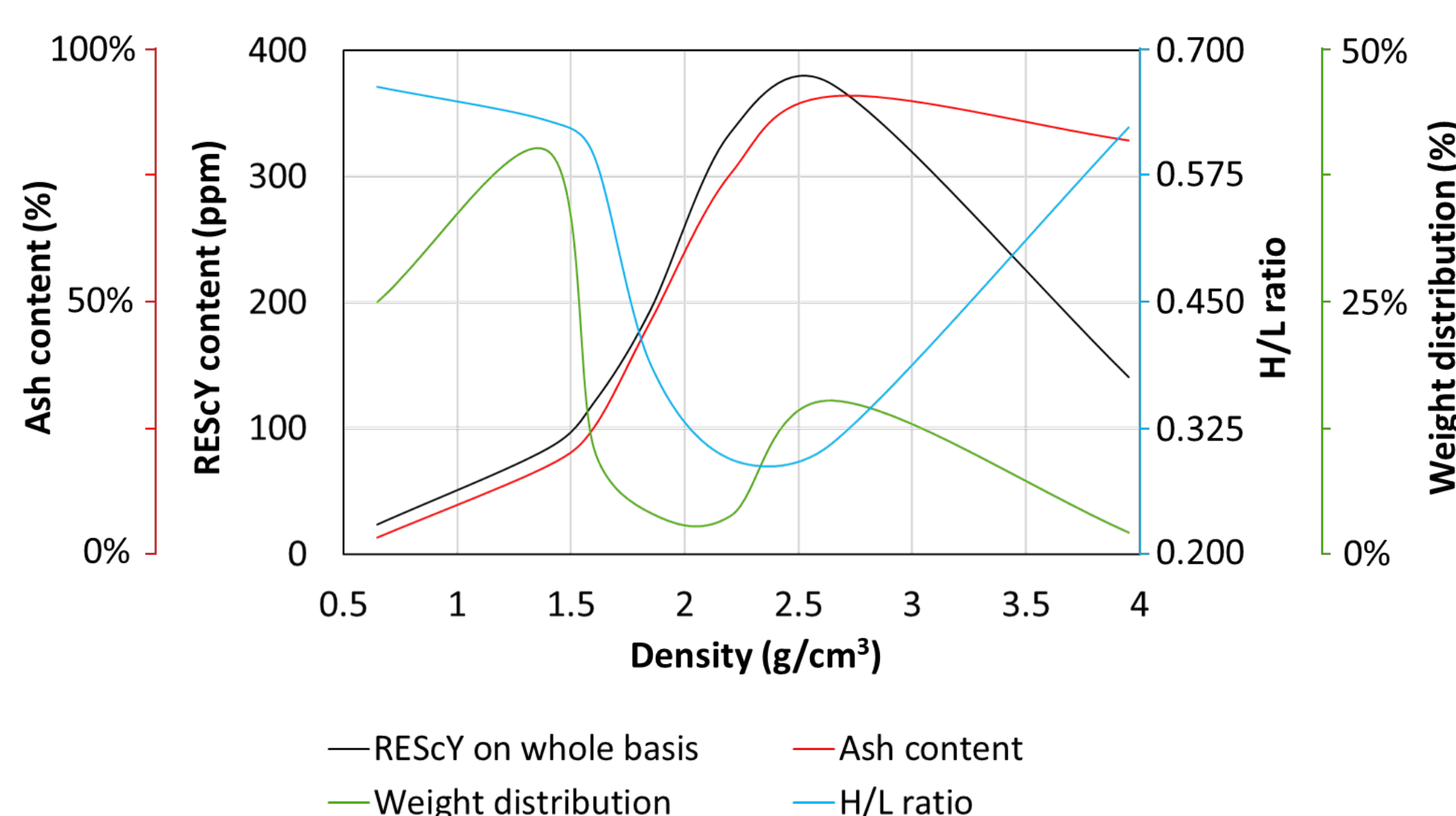
**Distribution of heavies and lights in coal and associated rocks**



**Variations with ash content**



**Variations with density**



**Conclusions**

- Evaluation of 372 layers (243 coal, 129 rock), in 59 cores and channels from Baker, Herrin and Springfield formations showed coal layers were relatively consistent with respect to REScY content.
  - Baker: 61 ppm avg. (14-252 ppm)
  - Herrin: 34 ppm avg. (11-80 ppm)
  - Springfield: 30 ppm avg. (11-128 ppm)
- Rock layers contained elevated concentrations of REScY.
  - Baker: 270 ppm avg. (84 - 929 ppm)
  - Herrin: 161 ppm avg. (39 - 341 ppm)
  - Springfield: 220 ppm avg. (25 - 781 ppm)
- Elevated REScY concentrations occur in density fractions > 2.0 g/cm<sup>3</sup>.
  - Baker: 280 - 410 ppm
  - Herrin: 39 - 341 ppm
  - Springfield: 185 - 200 ppm
- Higher density fractions report to preparation plant middling and coarse refuse products, which contained 240 to 363 ppm REScY.
- On whole basis, REScY content increases linearly with ash content. However, on ash basis, REScY content increase rapidly in ash contents lower than 30%.
- The H/L ratio sharply decreases with increasing ash content.
- Roof shale formations—especially the Anna shale, immediate roof of the Herrin coal—can be investigated as potential sources of REScY.
- Shales have significantly higher H/L ratio compared to layers of similar ash content associated with coal beds.

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