

# Using Semi-Permeable Membrane Device (SPMD) Samplers in Cave Environments to Detect PCBs

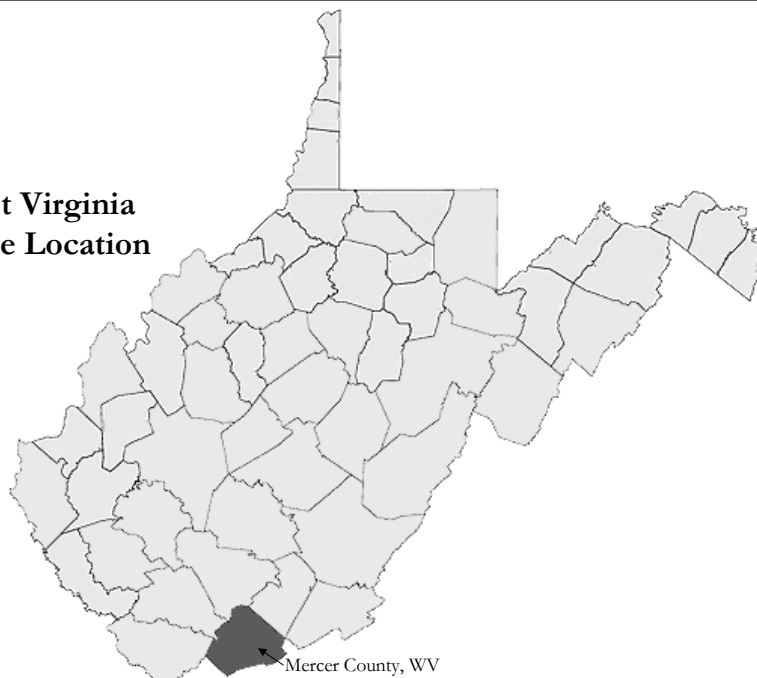
Presented by: Julie Schaer

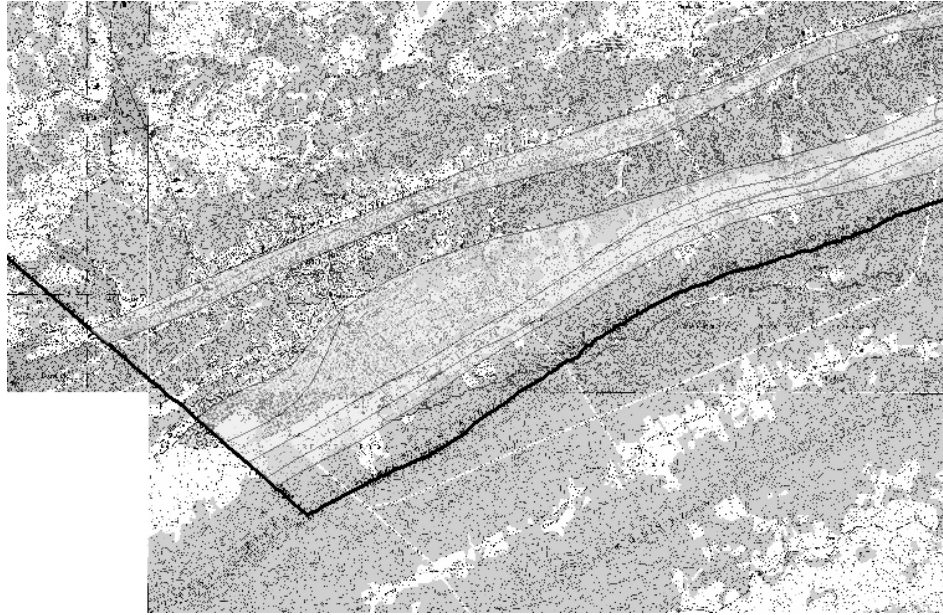


**Beaver Pond Resurgence at  
the West Virginia/ Virginia  
State Line**



**Map of West Virginia  
Showing Site Location**

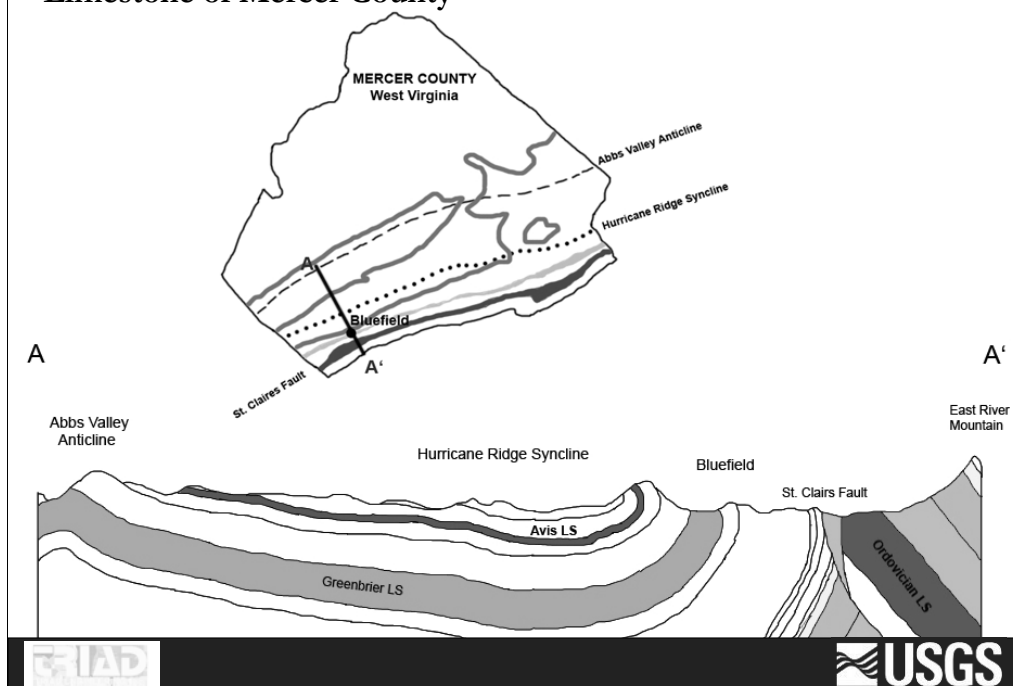


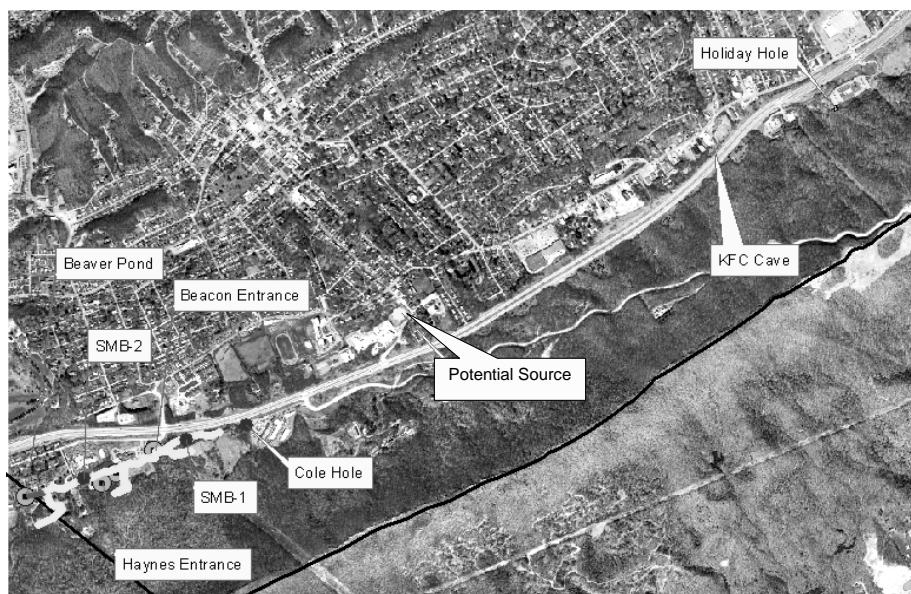


**Topographical Map of study area with overlay of Limestone Bedrock**



## Limestone of Mercer County





Cave Entrance Locations





**Beaver Pond Resurgence**



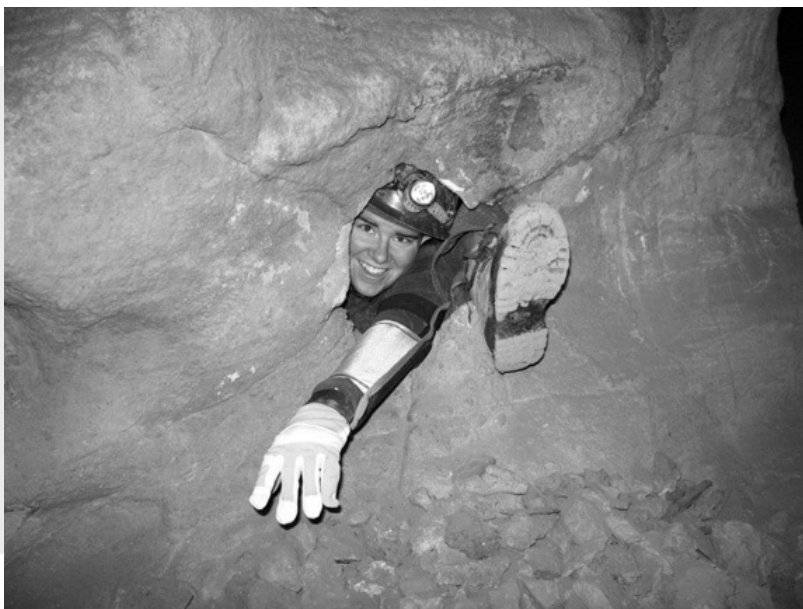
**View Into Cave at  
Resurgence**

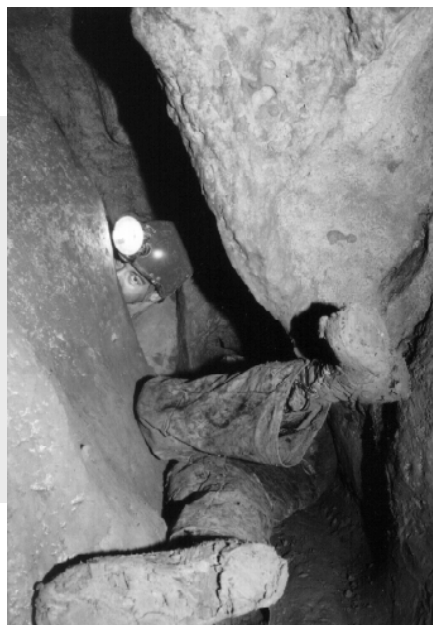
















**Beacon Cave Entrance**







**A Walking Passage in Beacon Cave**







Assembling SPMD Housings





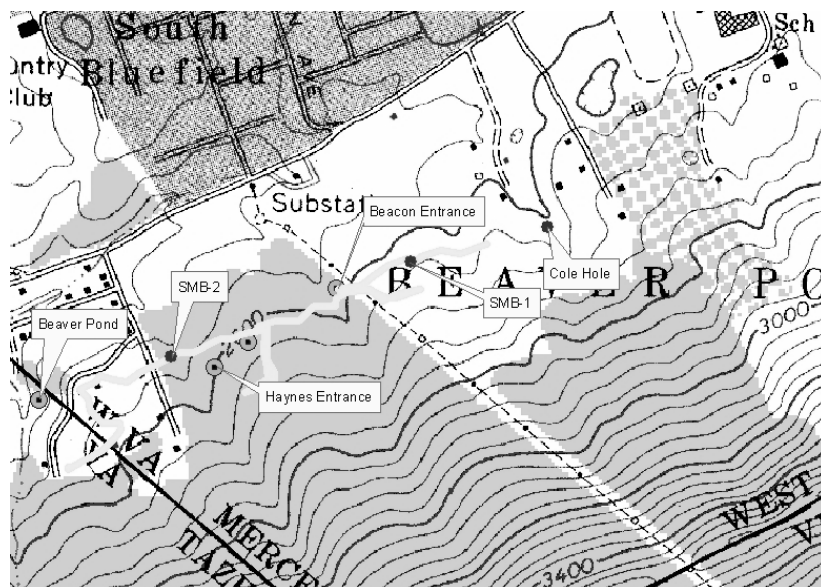
Assembling SPMD Housings





Deploying the SPMD Housings





Topographical Map with Overlay of Beacon Cave Footprint



## Results

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- The SPMDs installed into Beacon Cave yielded the most significant PCB detections in the study area
- The detections from SPMDs installed into Beacon Cave were approximately double that of the next highest “hits”

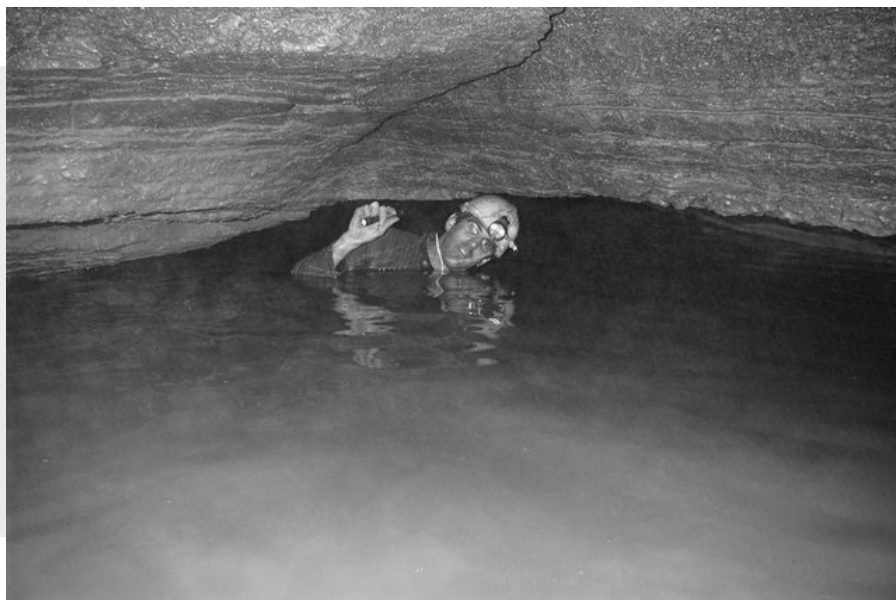


## **Installation Challenges/ Differences from Above Ground**

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- Packaging to transport through a cave
- Finding a location with steady water
- Securing SPMD samplers for surge events
- Hiding the SPMD Sampler or
- Labeling the SPMD Sampler for your anticipated finders  
(Cavers vs. Spelunkers)





A "DAMP" Cave

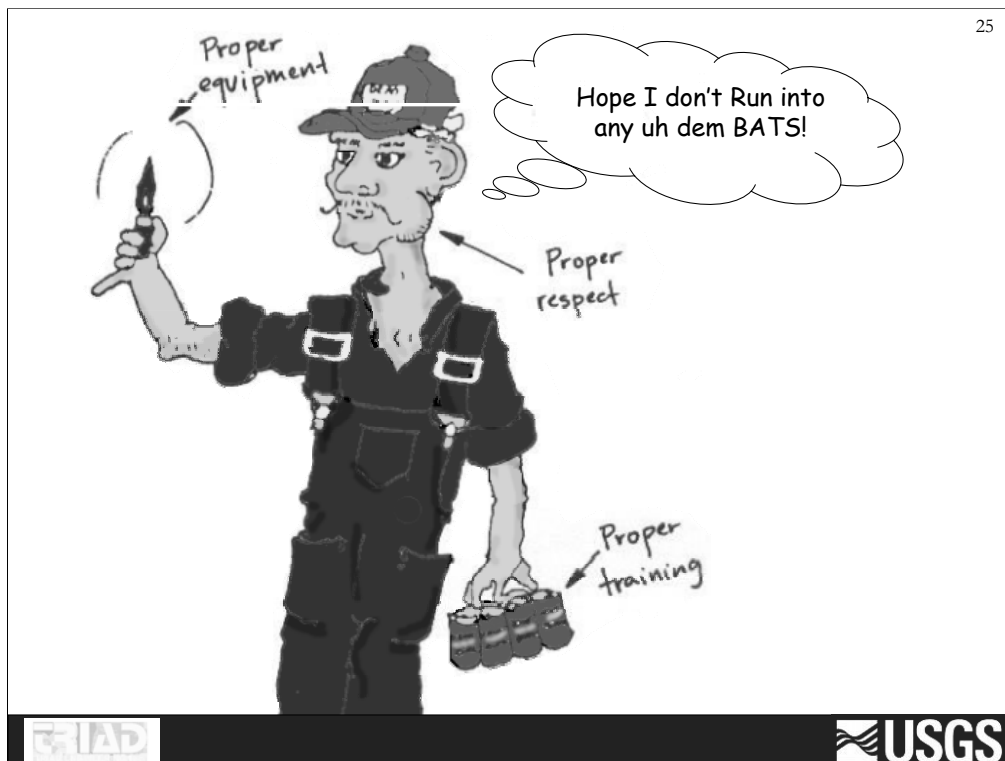


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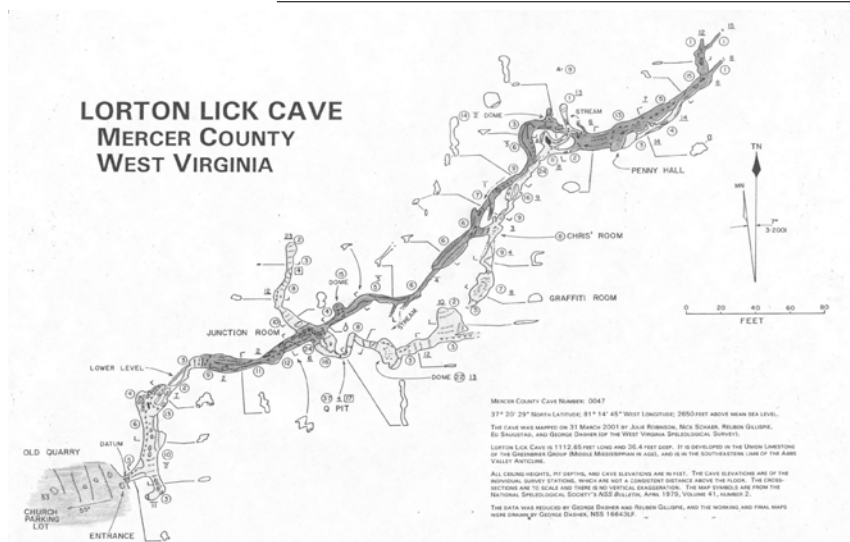
## Potential Resources

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- **National Speleological Society (NSS)**
  - Local Grottos
  - Area Cavers
- **State Cave Surveys**
  - West Virginia Speleological Survey (WVaSS)
  - Kentucky, Virginia, Tennessee, etc...



## Cave Map Example



LIAD

USGS

### Beacon Cave System Overview

Cave Name	Cave Length (Ft.)	Groundwater Travel Time to Beaver Pond Resurgence
Holiday Hole	250	Unknown
KFC Cave	504	2 Days
Cole Hole	500+	Under 6 hours
Beacon Cave	15,000	Under 1 hour
Beaver Pond Cave	247	N/A
<b>Total</b>	<b>16,501</b>	



## Acknowledgements and Photo Credits

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- Nick Schaer and George Dasher , WV DEP
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- Jerry Fuller
- Tri-State Grotto

