Recovery of Deckers Creek from Acid Mine Drainage

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Friends of Deckers Creek

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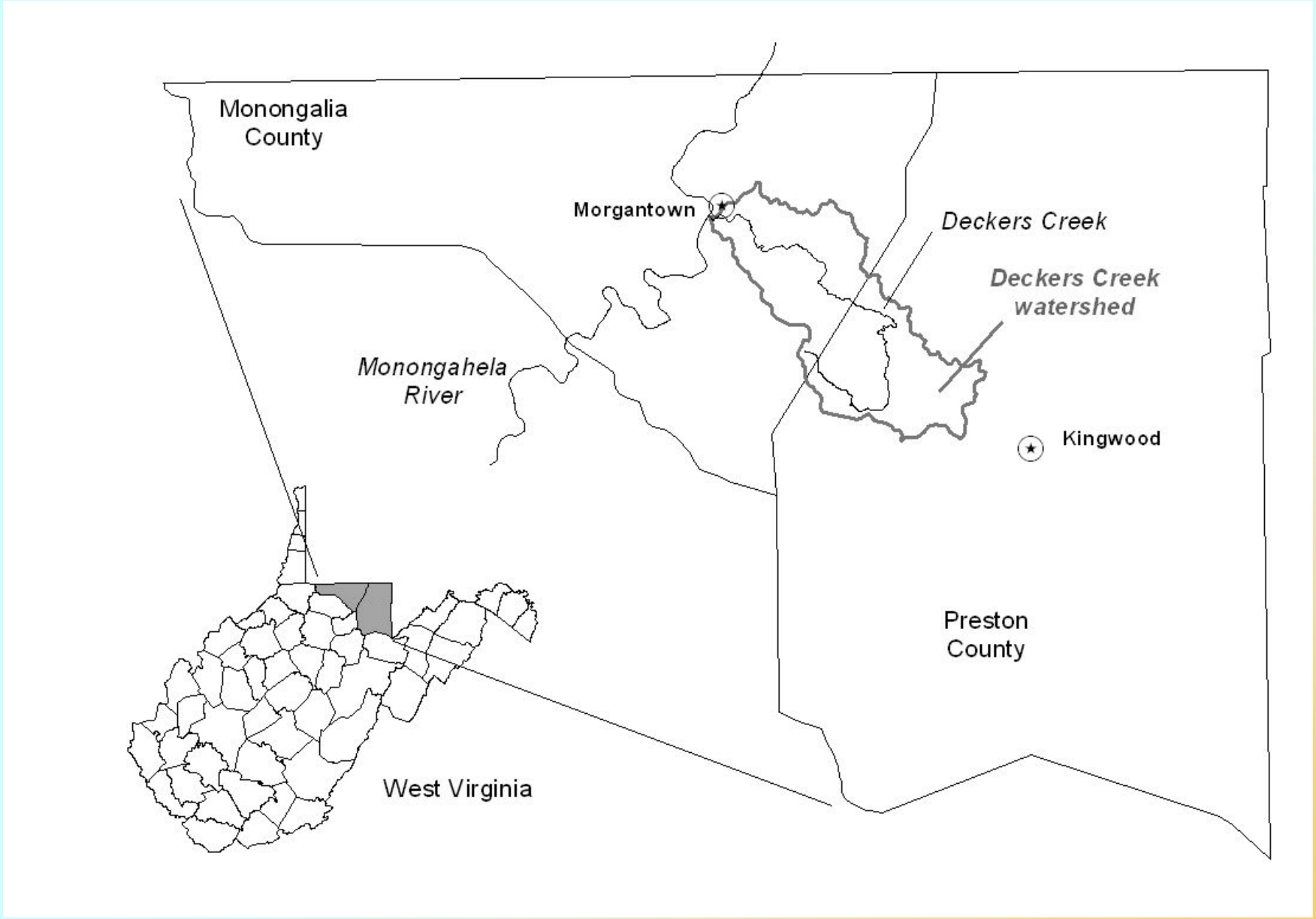
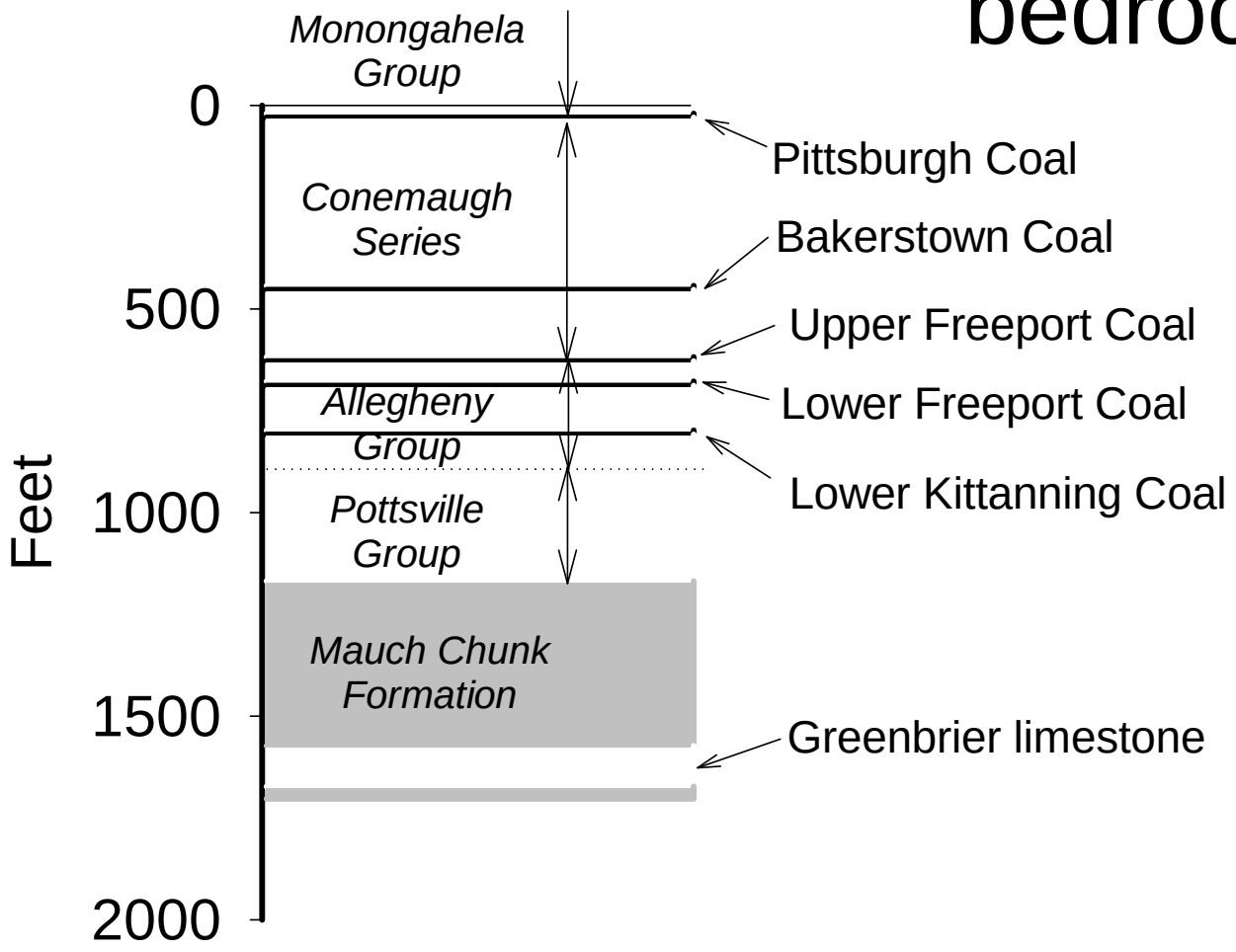
Location of the Deckers Creek watershed



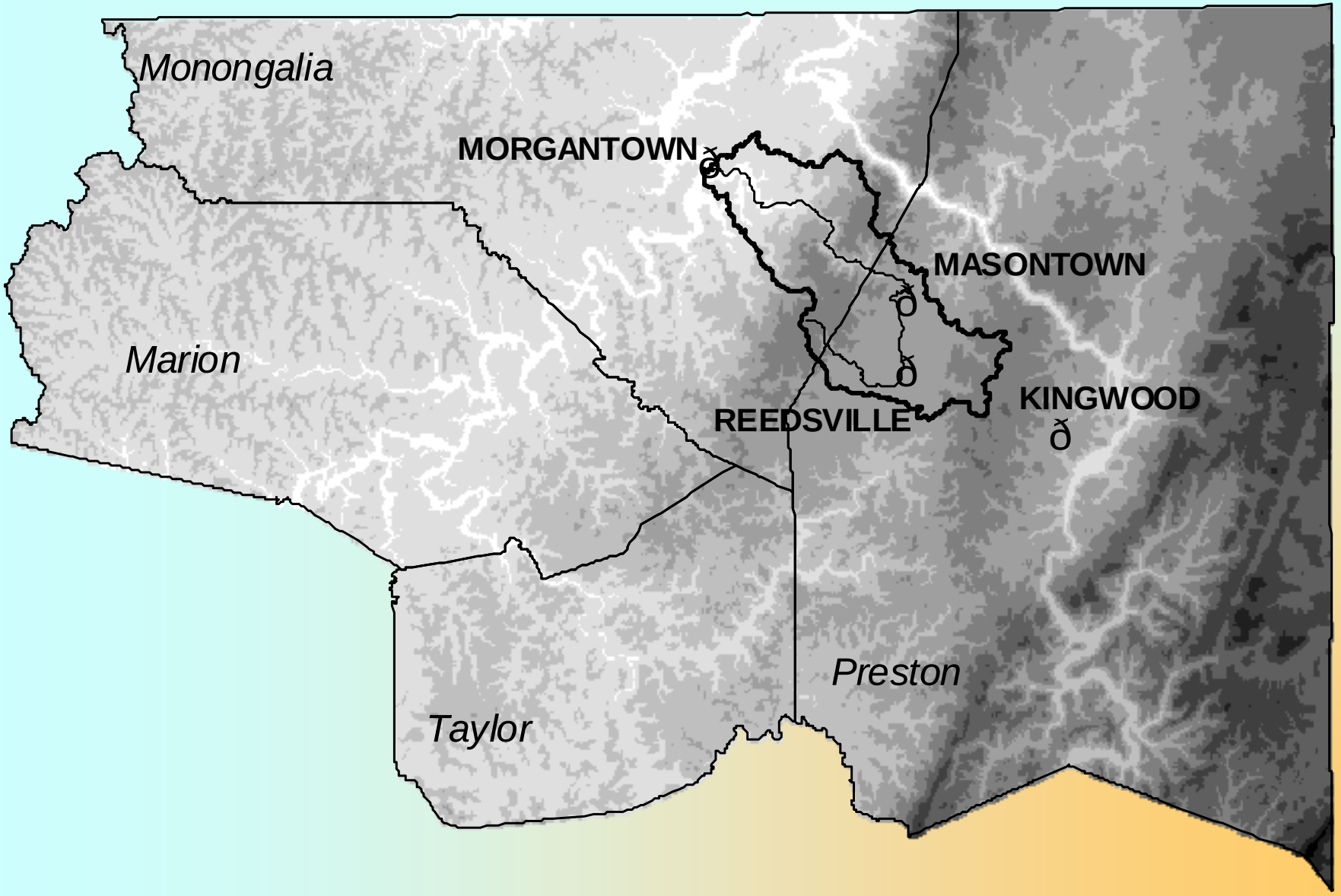
Features of the Deckers Creek watershed

- **Towns of Reedsville, Masontown and Morgantown**
- **Arthurdale Heritage site**
- **Whitewater kayaking destination in scenic gorge**
- **Deckers Creek Trail: a 19-mile rail-trail along Deckers Creek and its tributary, Kanes Creek**

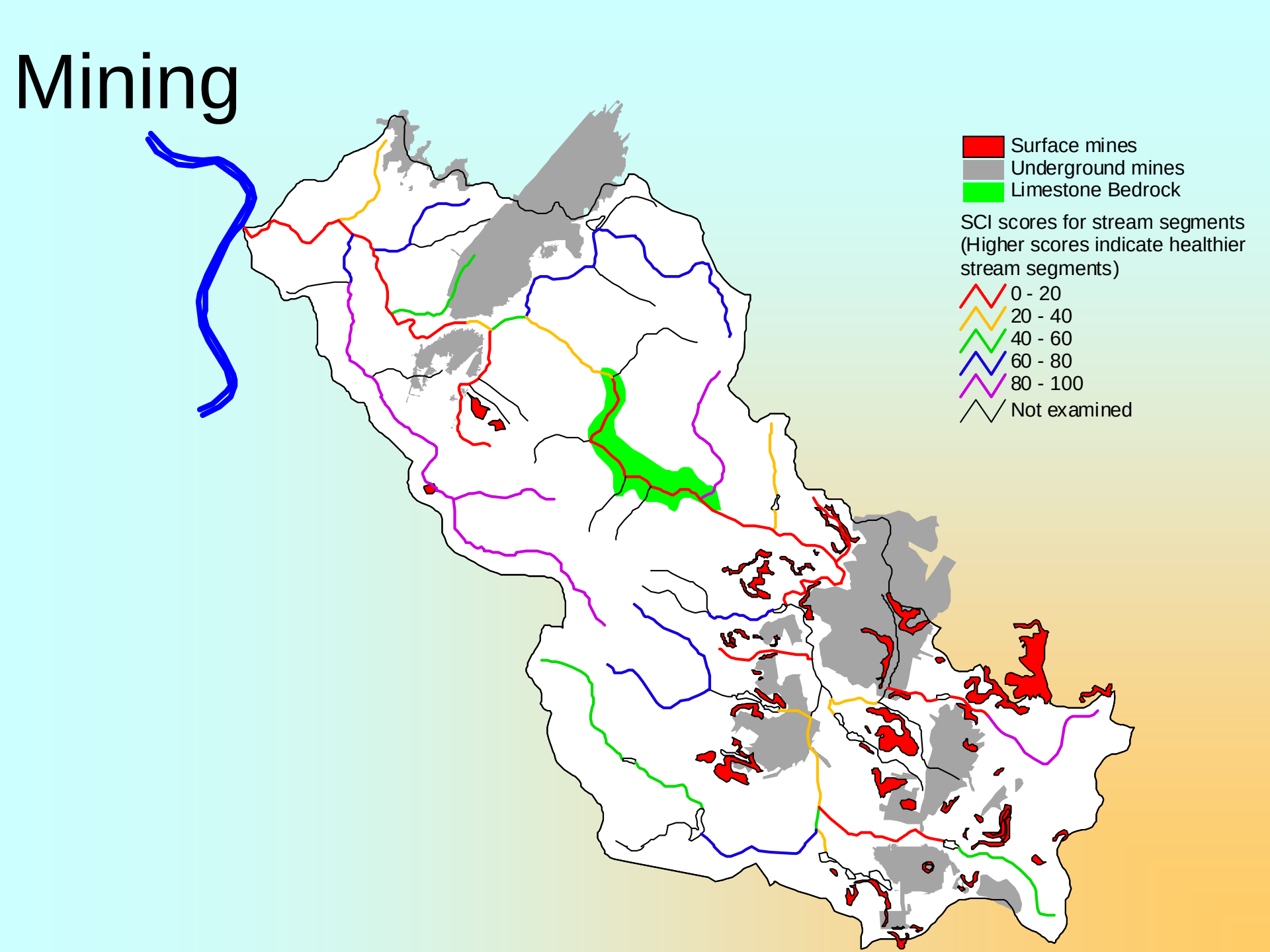
Geology: bedrock profile



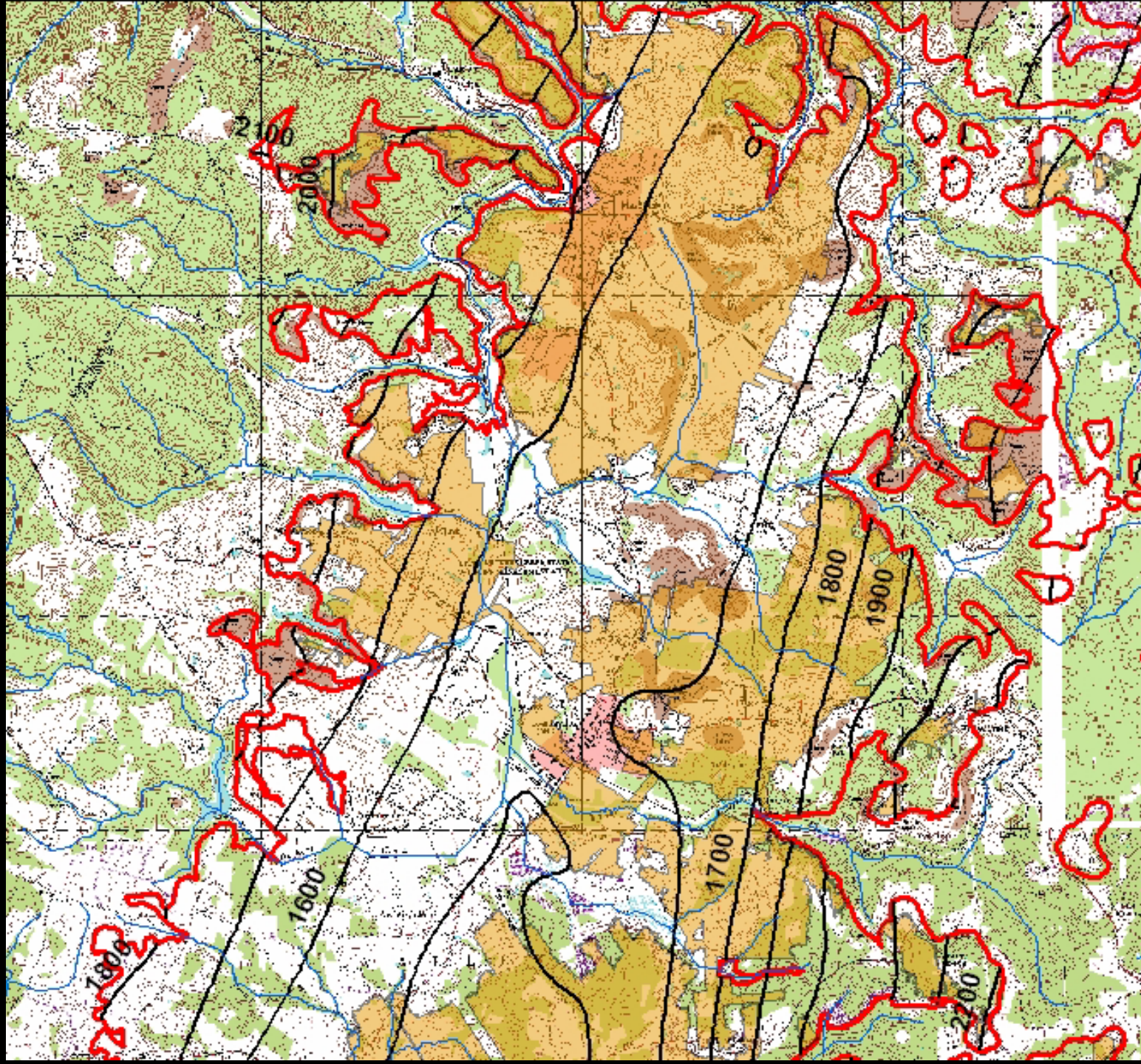
Topographical Setting



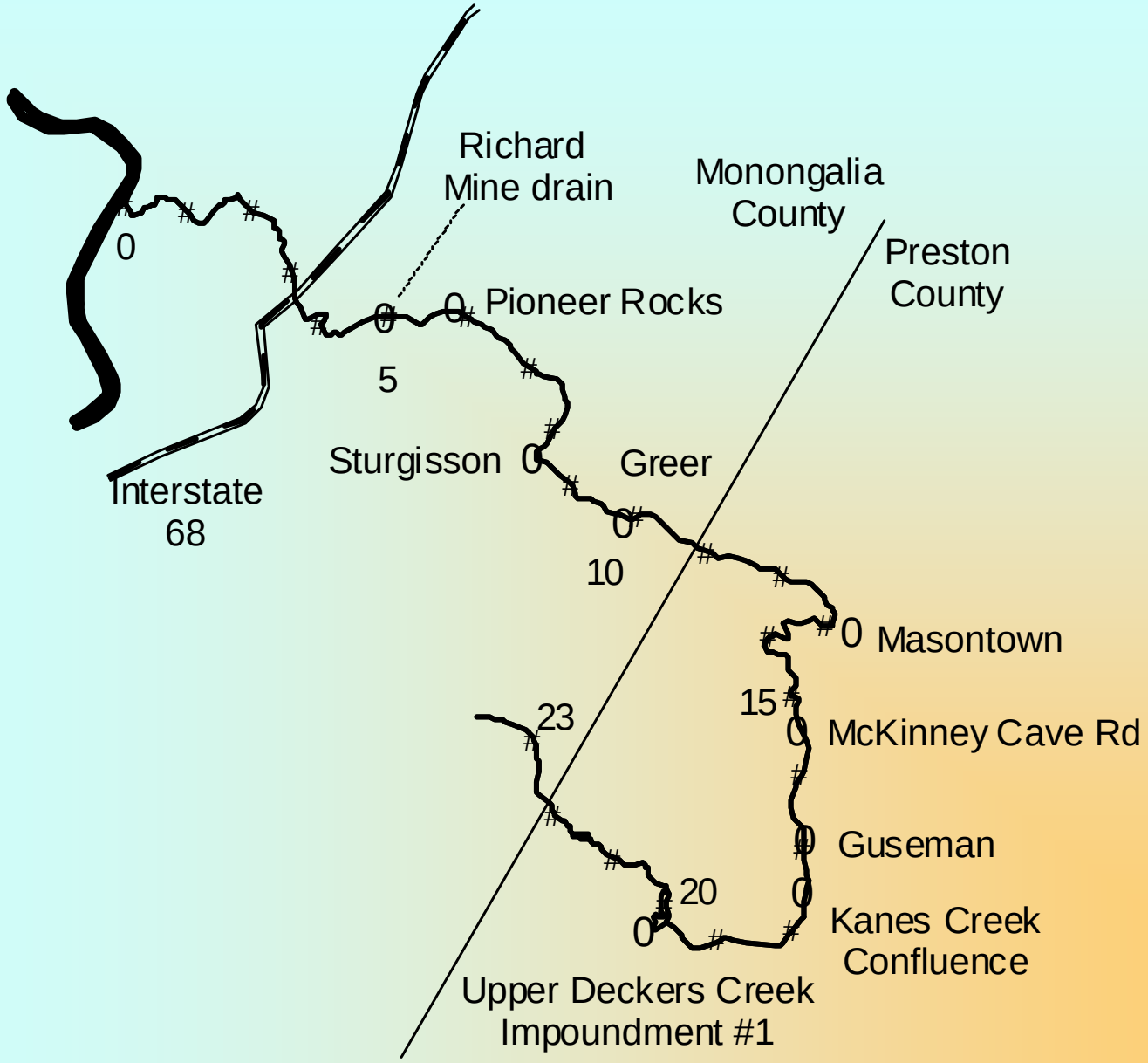
Mining


Surface mines
Underground mines
Limestone Bedrock
SCI scores for stream segments
(Higher scores indicate healthier
stream segments)
0 - 20
20 - 40
40 - 60
60 - 80
80 - 100
Not examined

Mining

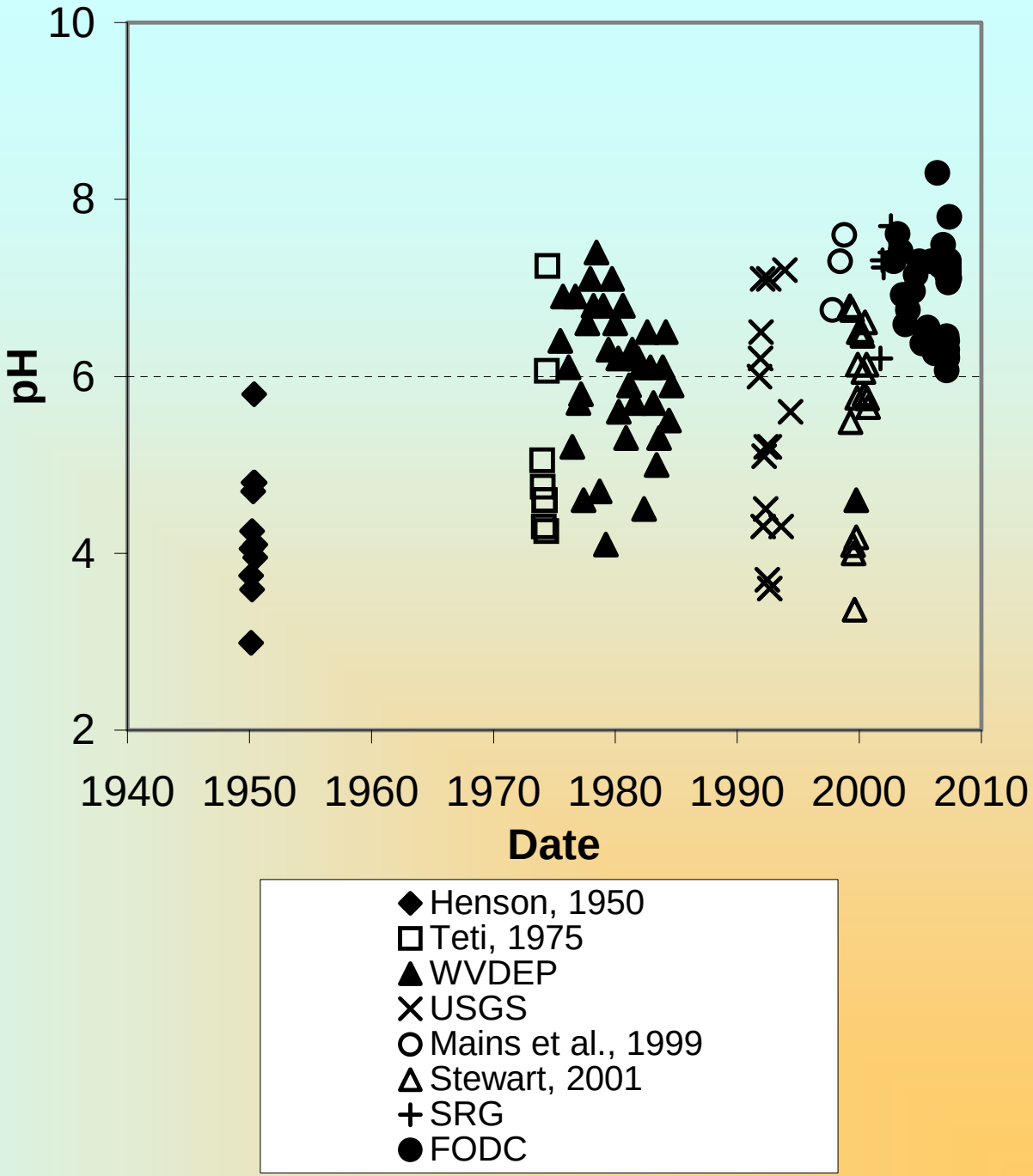


Overview of water quality

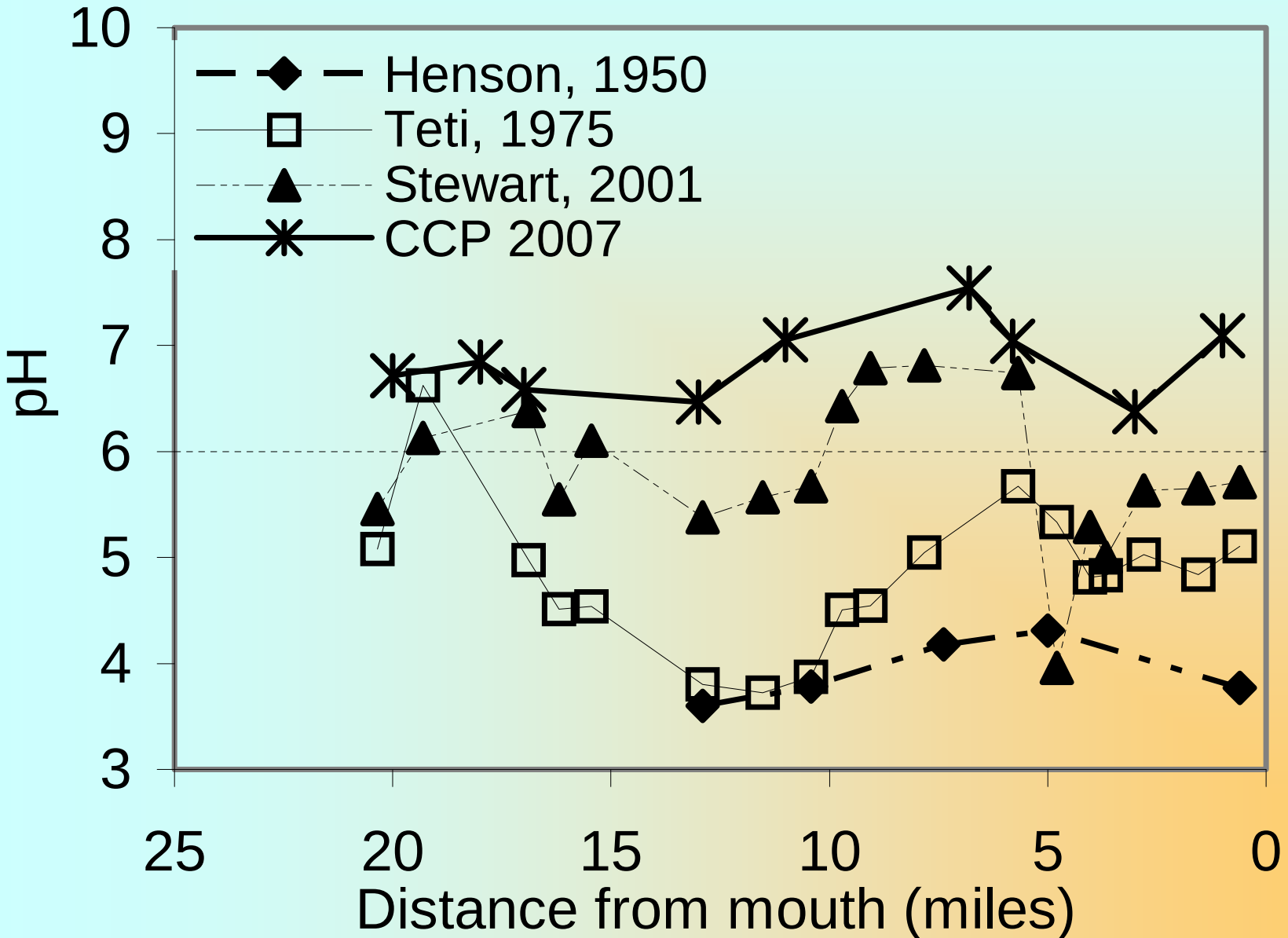


Water quality

pH near the mouth



Water quality: along the stream



Current conditions starting from headwaters:

Segment	Location	Setting	Condition
1	Headwaters to Reedsville Farm Pond	Rocky, surrounded by rhododendron	Mildly acidic, Preston PSD 1 water supply
2	Below Reedsville Farm Pond to mouth of Kanes Creek	Low gradient, channelized	Nutrient and alkalinity inputs


Cabela's
FODC

Segment 3

Segment	Location	Setting	Condition
3	Kanes Creek to Masontown	Flat, mostly channelized, several tribs with mining	Improved from acidic to neutral in last five years

Segment 4 & 5

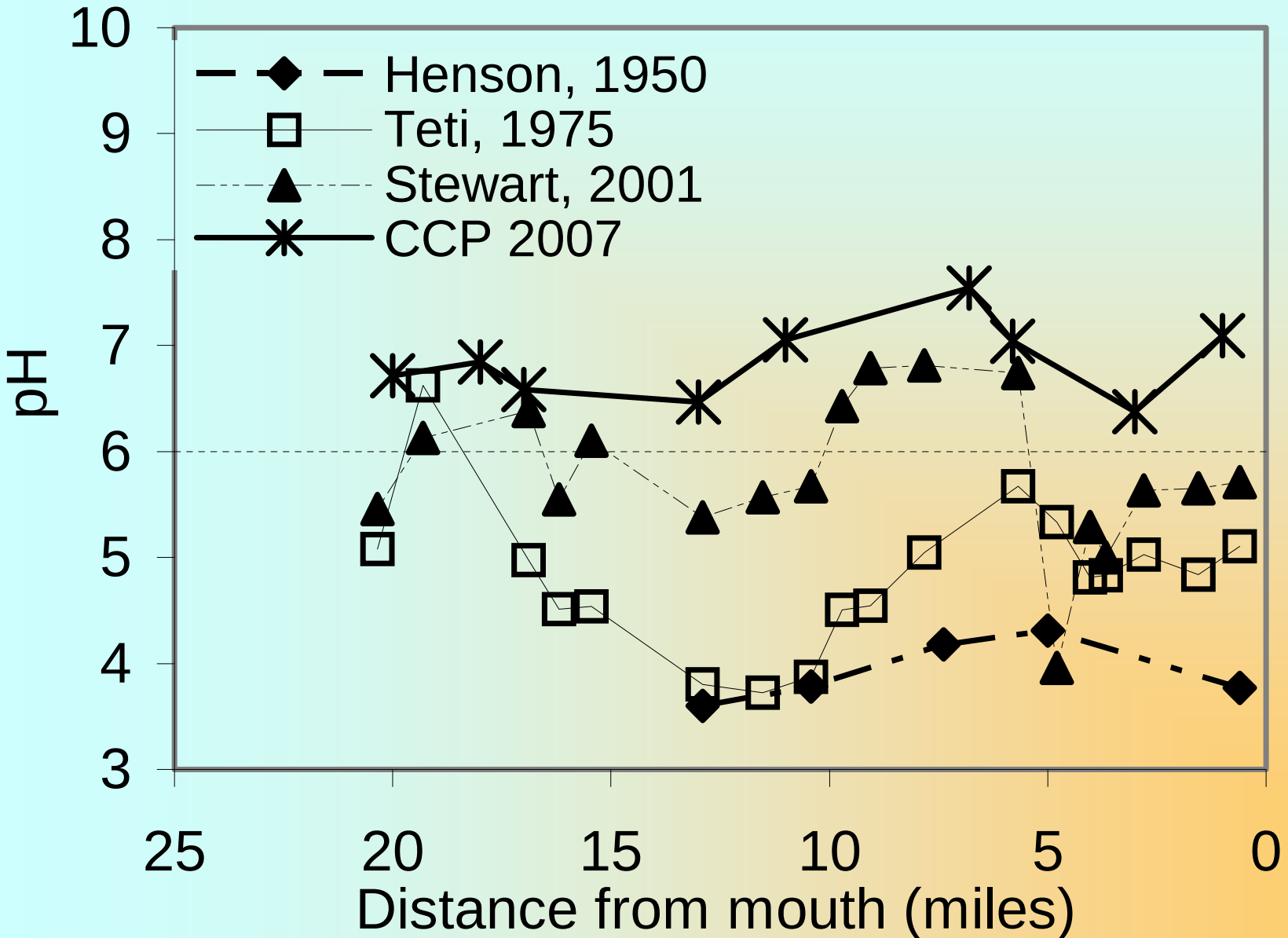
Segment	Location	Setting	Condition
4	Masontown to Greer	Steep	Masontown sewage treatment plant drastically reduced bacteria pollution
5	Greer to Dellslow	Steep, well-known whitewater kayaking destination	Water quality is currently excellent


EPCAMR

Segment 6 & 7

Segment	Location	Setting	Condition
6	Richard mine to mouth of Aarons Creek	Swift, well defined channel	Water always turbid, often red from Richard mine Discharge
7	Aarons Creek to mouth	Swift, reinforced banks	Red streambed, but fish often present

Water quality: along the stream



Water quality improvement

1950-1975: pH rises to 5 or above in lower part of the gorge and Morgantown

1975-2000: pH between 5 and 7 for entire creek except immediately below the Richard mine

2000-2008: average pH rises above 6 in all nine mainstem sites (metals continue to impede fish recovery below Richard)

What accounts for improvement in water quality in recent years?

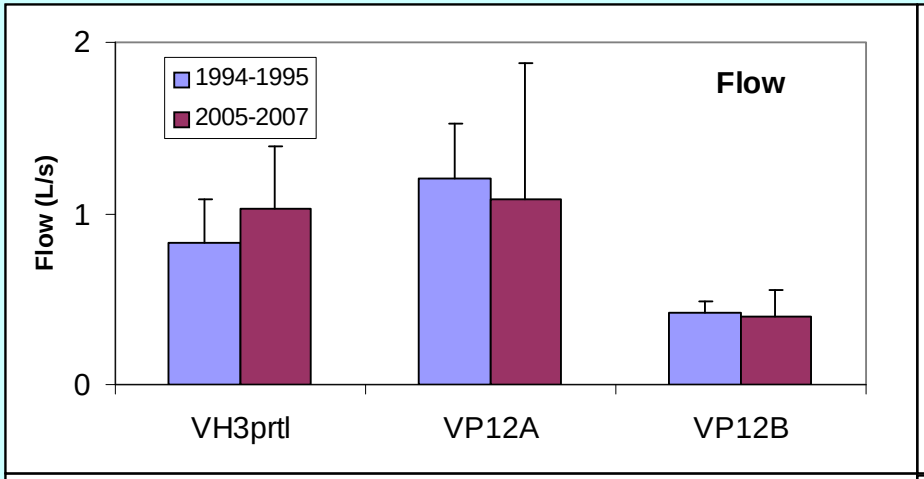
- Decrease in pyrite oxidation
- Abandoned mineland reclamation
- Behavior of NPDES permittees
- Dry periods

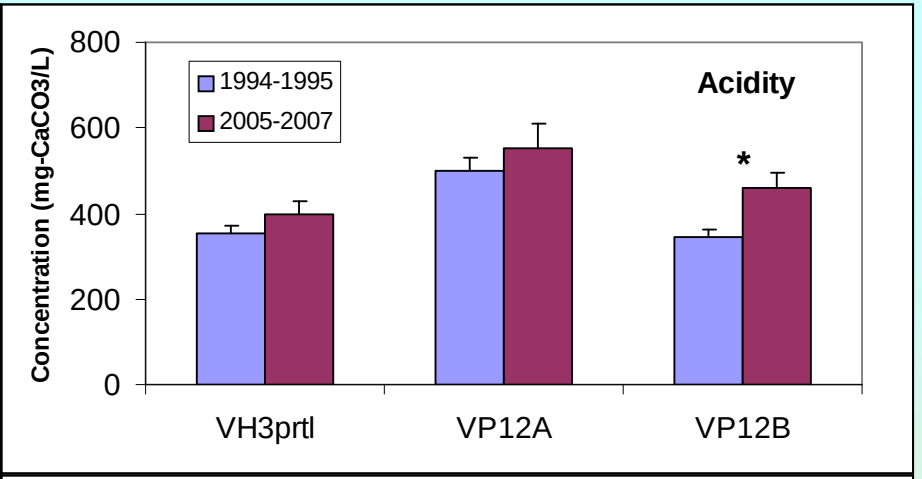
FODC: Active but not that active

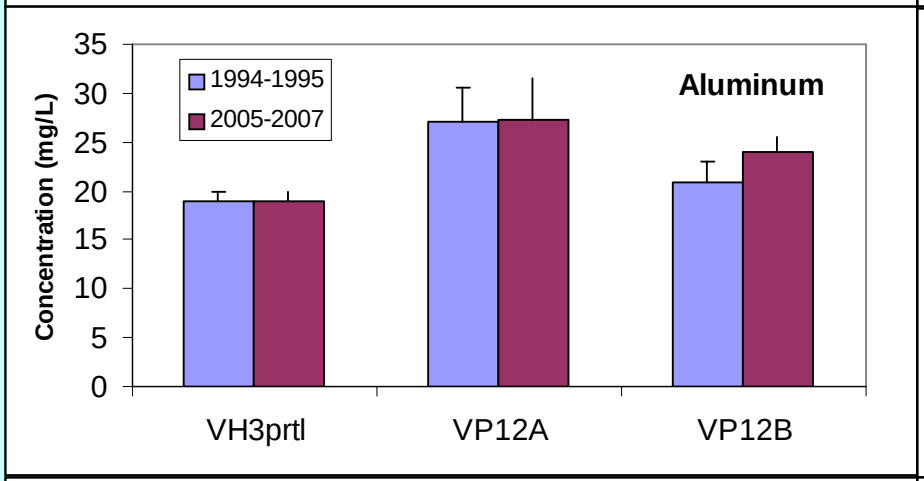
- Partnered with OSM and WVDEP-OAMLR to fund Kanes Creek South project
- Partnered with OSM, OAMLR, WVDEP-DWWM to fund Slabcamp project
- Worked with same partners to design and build Slabcamp ancillary project
- Currently constructing Valley Point #12 project (Skelly & Loy's design).
- Two more projects in design (Dietz-Gourley Consulting)
- Developing additional projects with funding from WVDEP-DWWM

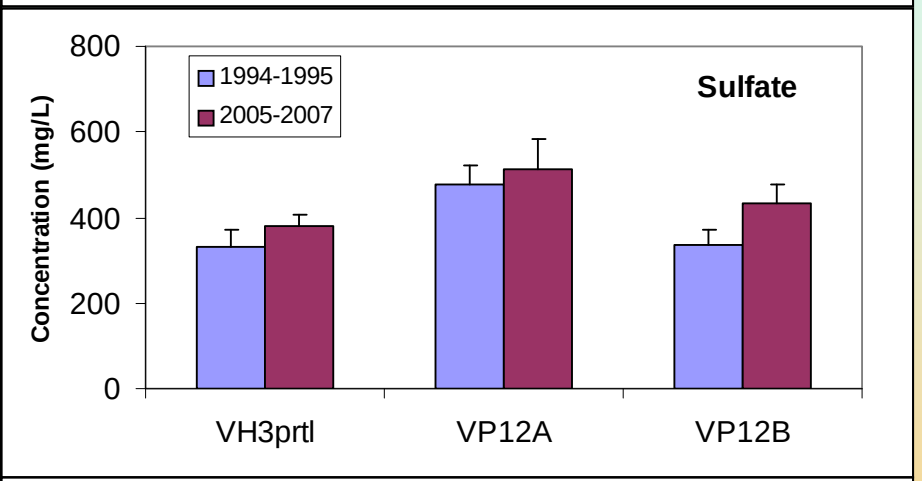
Pyrite dissolution

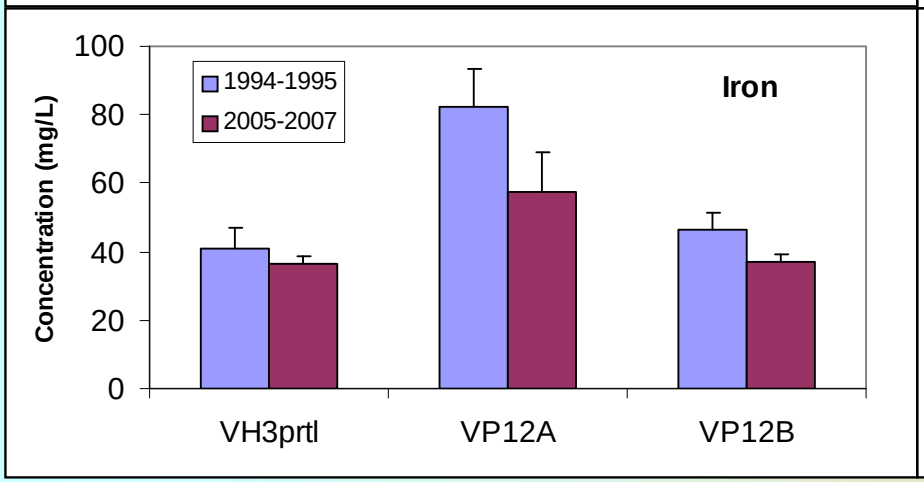
- We compared water quality results at three sites where NRCS had monitored in 1994 and 1995, and where FODC monitored in 2005 to 2007.
- Sites are at the extreme eastern edge of the watershed, on the Preston anticline.
- NRCS installed wooden weirs in 1994. We monitor at the same sites: no reclamation, no wet seals.

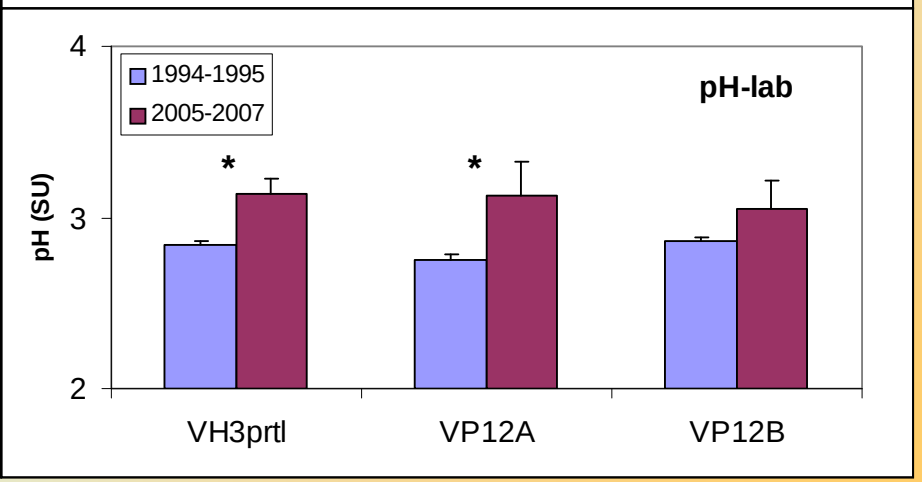

Flow
1994-1995
2005-2007
Flow (L/s)
2
1
0
VH3prtl
VP12A
VP12B


Acidity
1994-1995
2005-2007
Concentration (mg-CaCO3/L)
800
600
400
200
0
*
VH3prtl
VP12A
VP12B


Aluminum
1994-1995
2005-2007
Concentration (mg/L)
35
30
25
20
15
10
5
0
VH3prtl
VP12A
VP12B

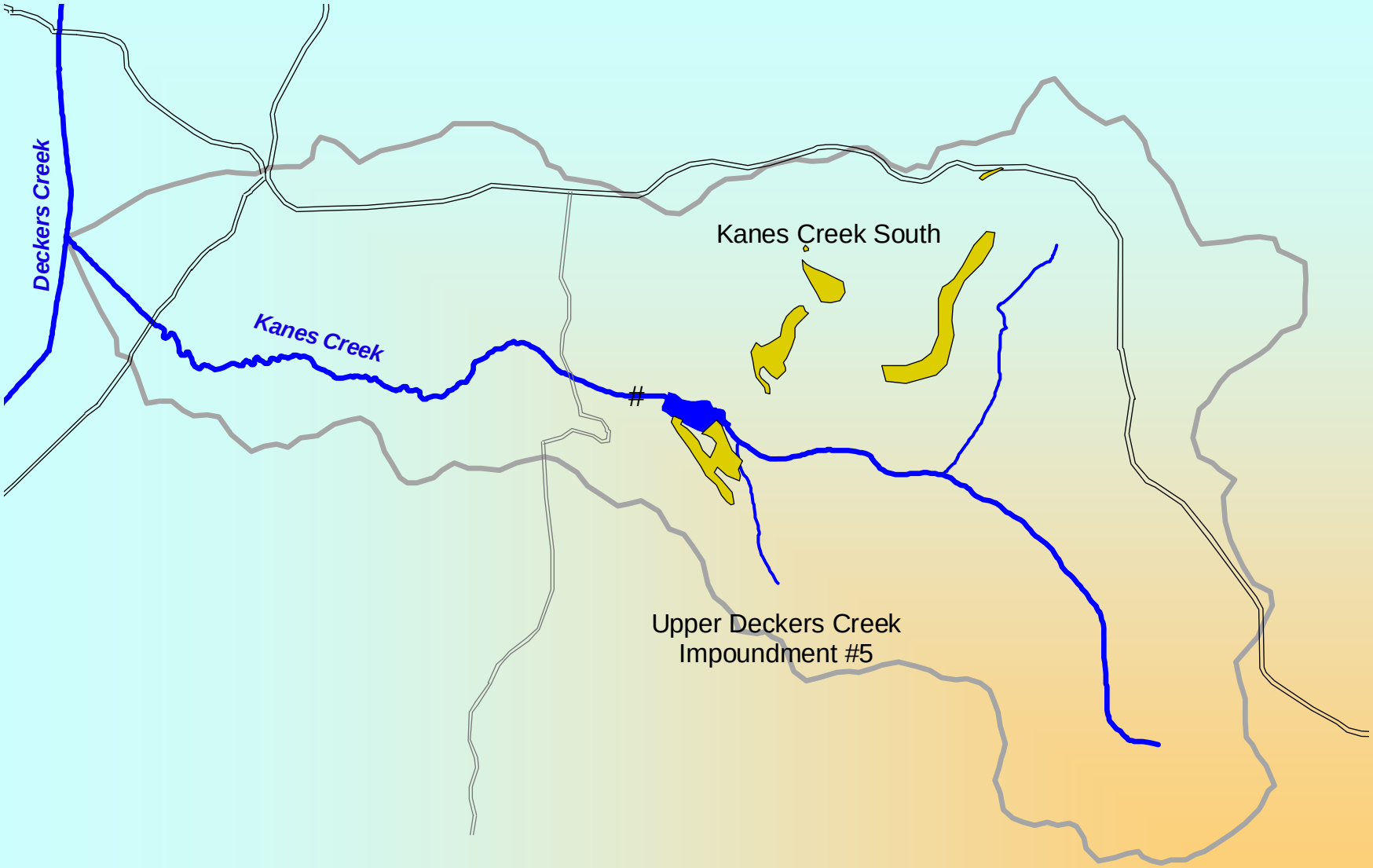

Sulfate
1994-1995
2005-2007
Concentration (mg/L)
800
600
400
200
0
VH3prtl
VP12A
VP12B

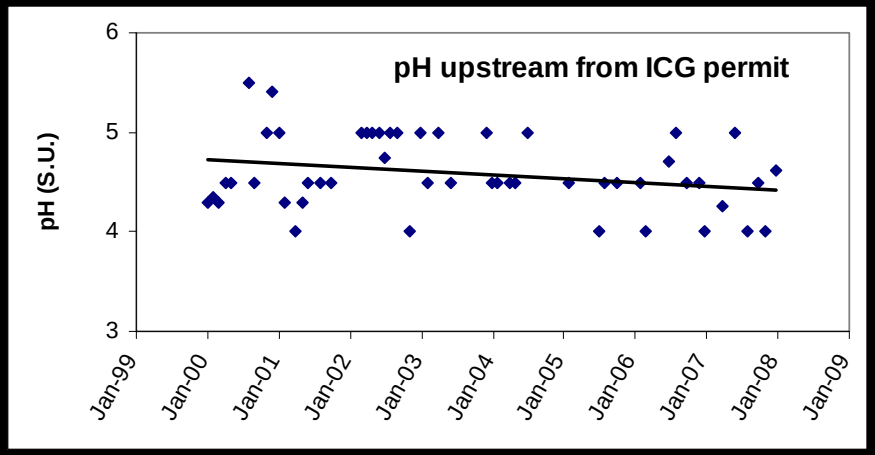

Iron
1994-1995
2005-2007
Concentration (mg/L)
100
80
60
40
20
0
VH3prtl
VP12A
VP12B

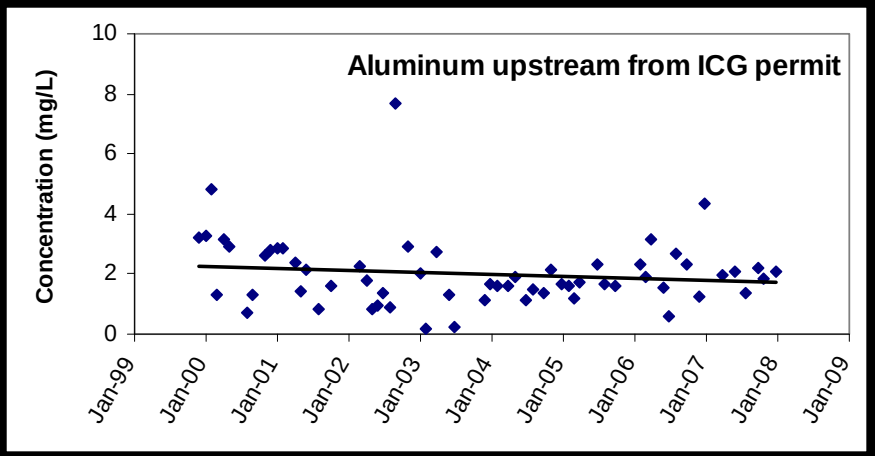

pH-lab
1994-1995
2005-2007
pH (SU)
4
3
2
*
*
VH3prtl
VP12A
VP12B

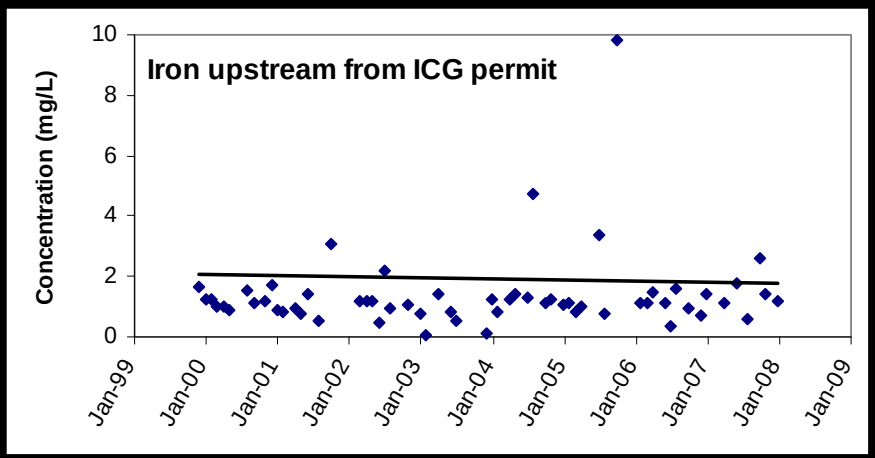
Abandoned Mine Land reclamation

- OAMLR has reclaimed two large areas in the Kanes Creek watershed:
  - 1996: Upper Deckers Creek Impoundment #5, reclaimed approximately 12 acres and built a SAPS
  - 2002: Kanes Creek South, reclaimed approximately 32 acres, wet-sealed portals, built open limestone channels, eliminated impoundments


Deckers Creek
Kanes Creek
Kanes Creek South
#
Upper Deckers Creek
Impoundment #5


pH upstream from ICG permit
pH (S.U.)
6
5
4
3
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09


Aluminum upstream from ICG permit
Concentration (mg/L)
10
8
6
4
2
0
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09


Iron upstream from ICG permit
Concentration (mg/L)
10
8
6
4
2
0
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09

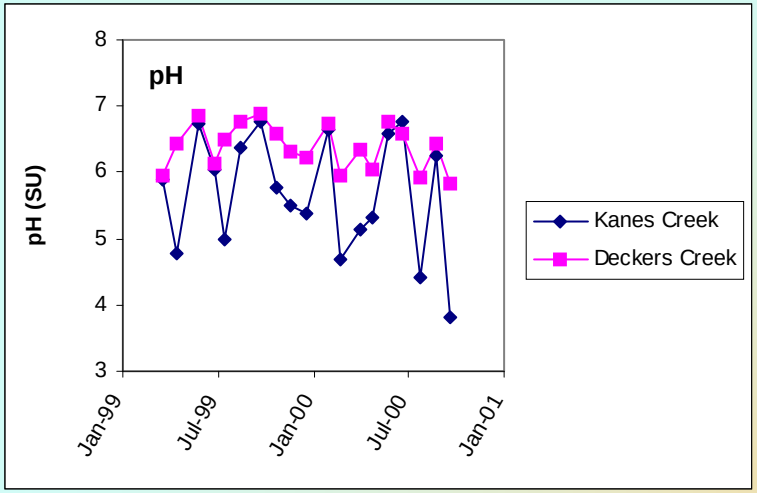
Permittees

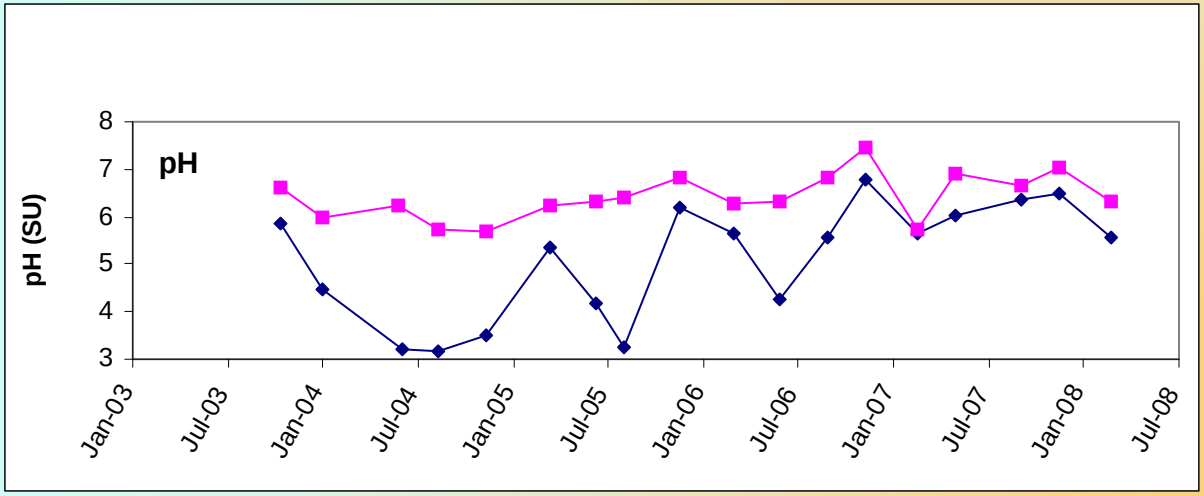
- ICG, Coaltrain, DeCondor, and Greer all have discharges to Deckers Creek or its tributaries
- None have recently discharged any acid water to the creek, that we know of
- **ICG pumps and treats water from two large mines, discharging to Kanes Creek**
- DeCondor treats AMD with anhydrous ammonia in a tributary to Kanes Creek
- Coaltrain has obtained release on its permits in watershed. They discharged high alkalinity water from Bakerstown jobs.
- Greer maintains a refuse dump and limestone mines in the watershed.

Kanes Creek and Deckers Creek

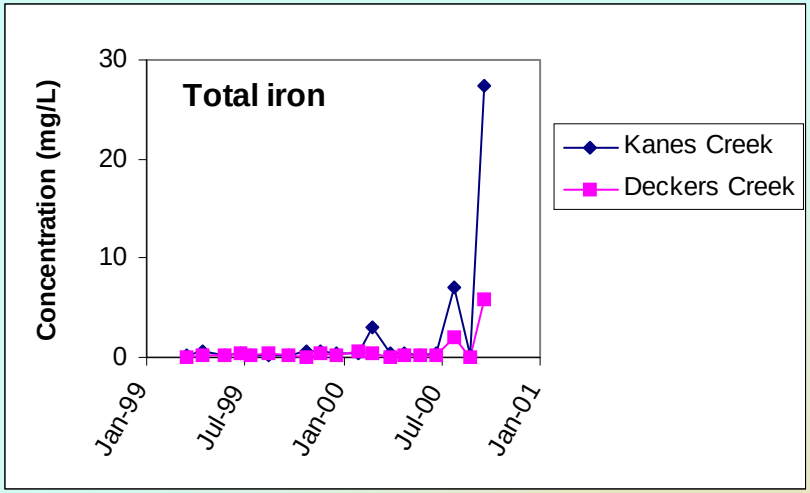
- Deckers Creek pH values follow those in Kanes Creek
- “Hits” on iron in Deckers Creek occur on those days with higher iron concentrations in Kanes Creek
- Low pH values and high iron concentrations are missing after the end of 2006
- Some change in Kanes Creek is having a beneficial effect on Deckers Creek

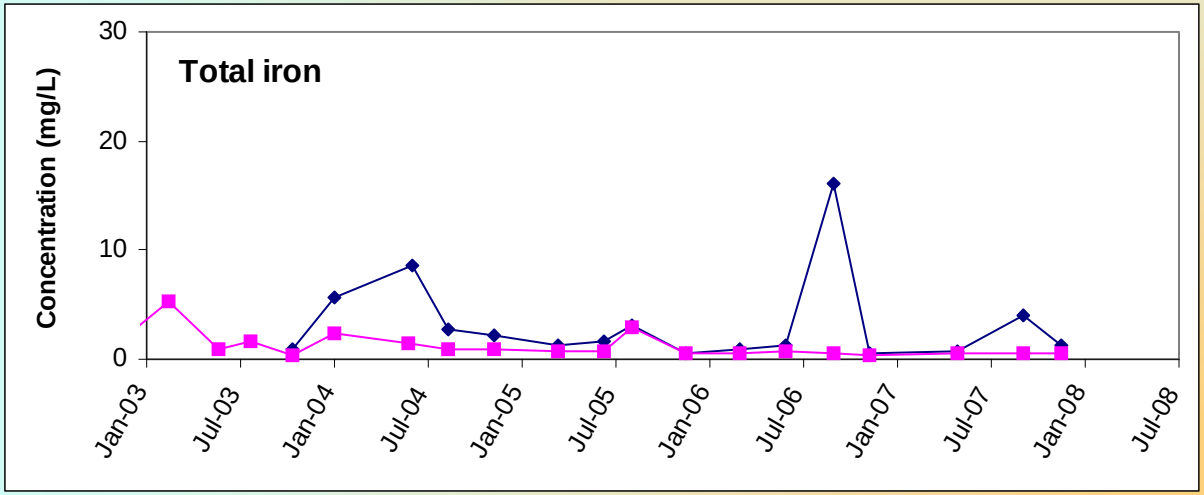
pH in Kanes Creek and in Deckers Creek just below Kanes

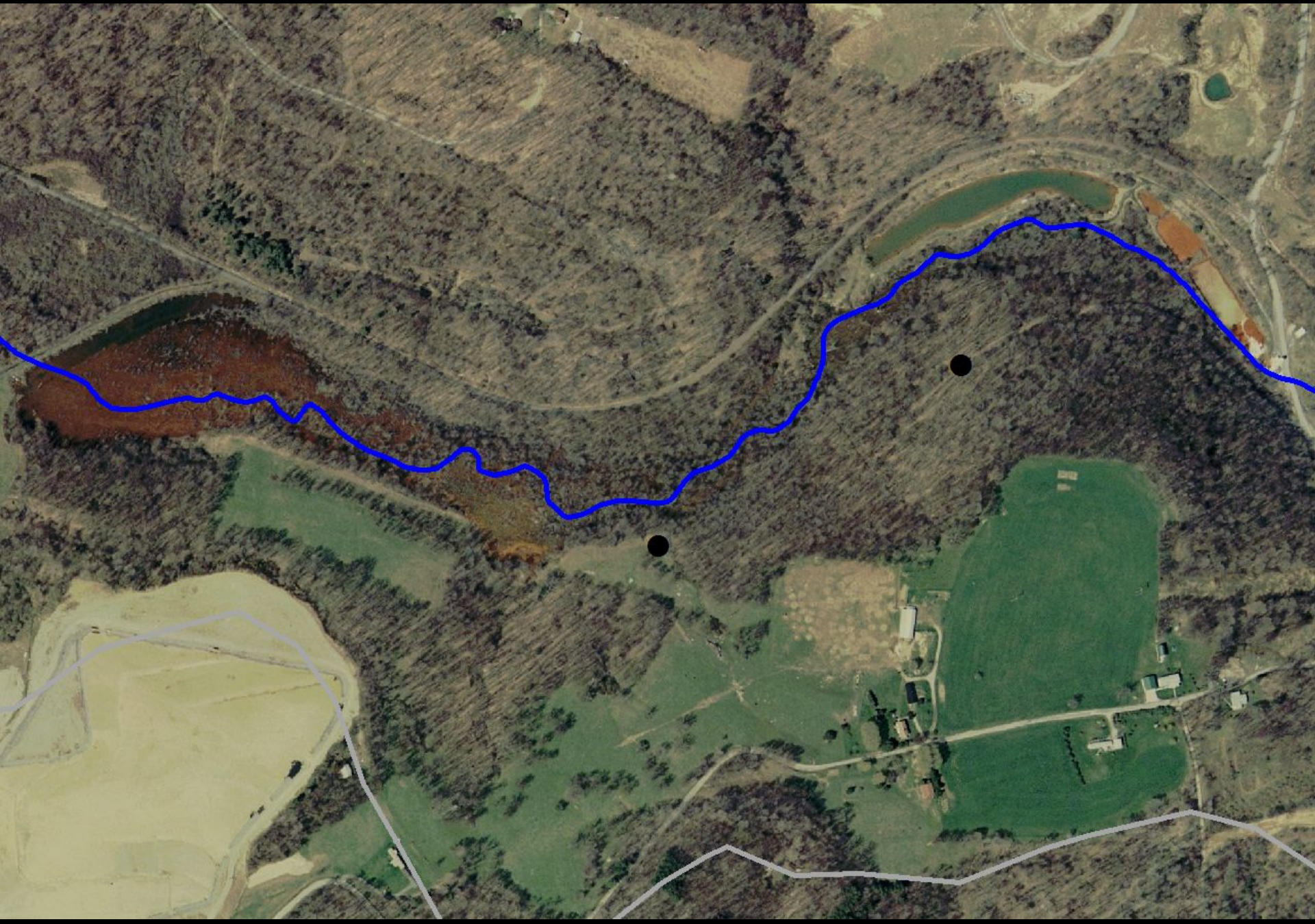




Iron in Kanes Creek and Deckers Creek

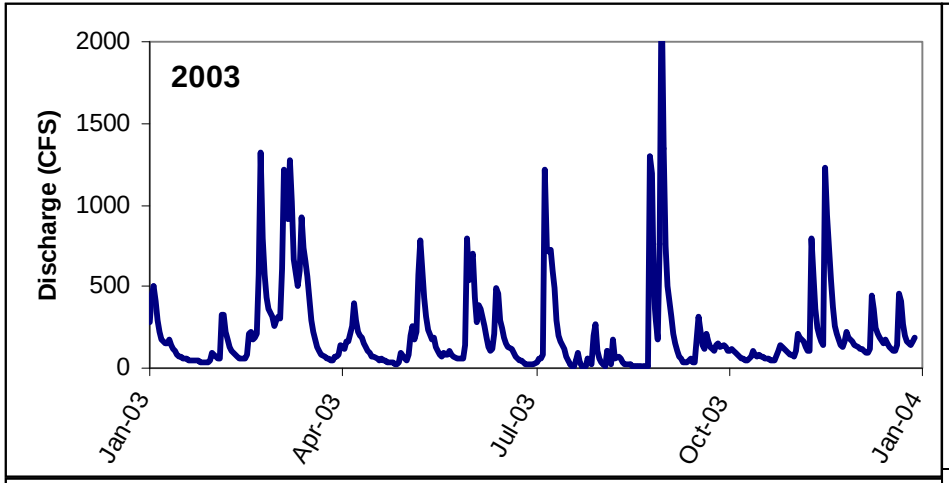


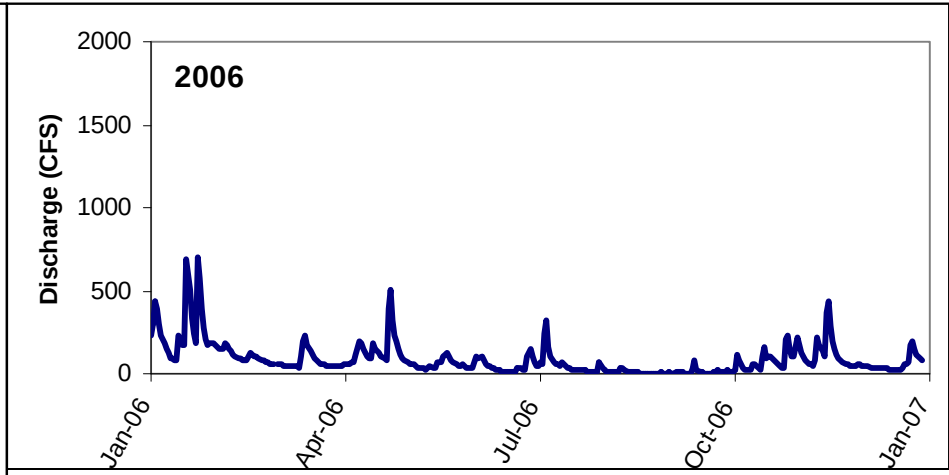


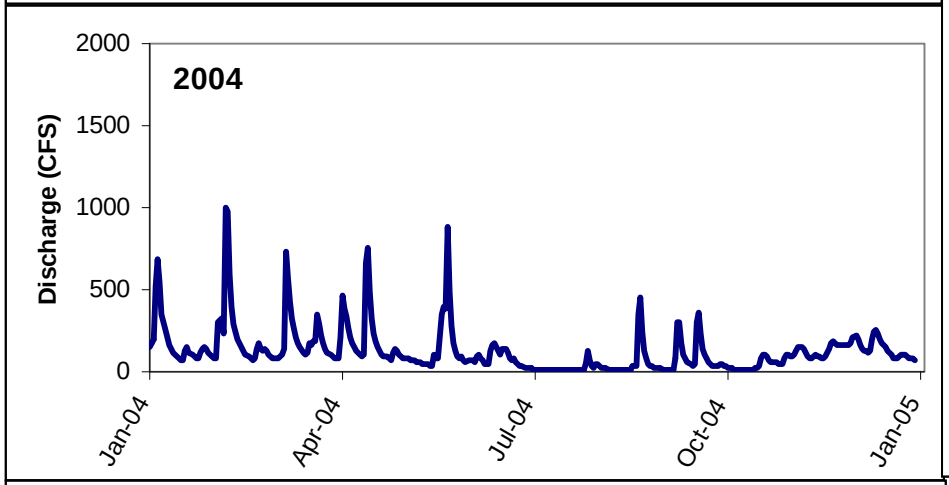


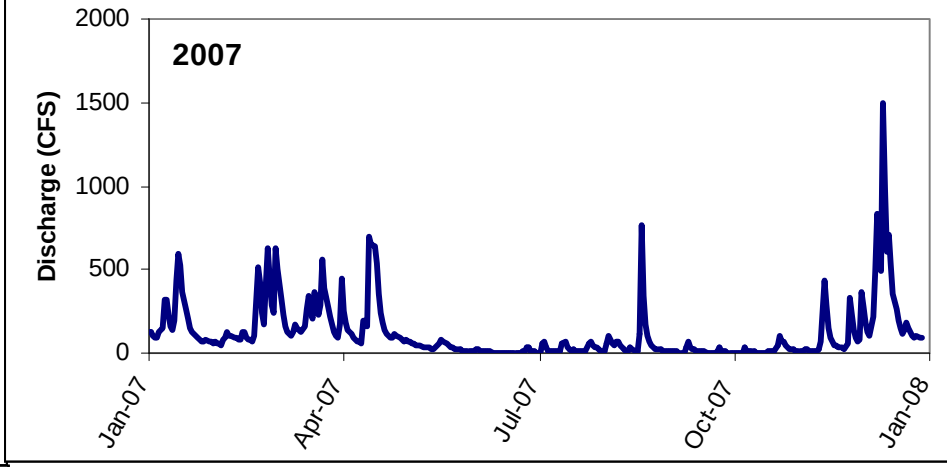
Weather

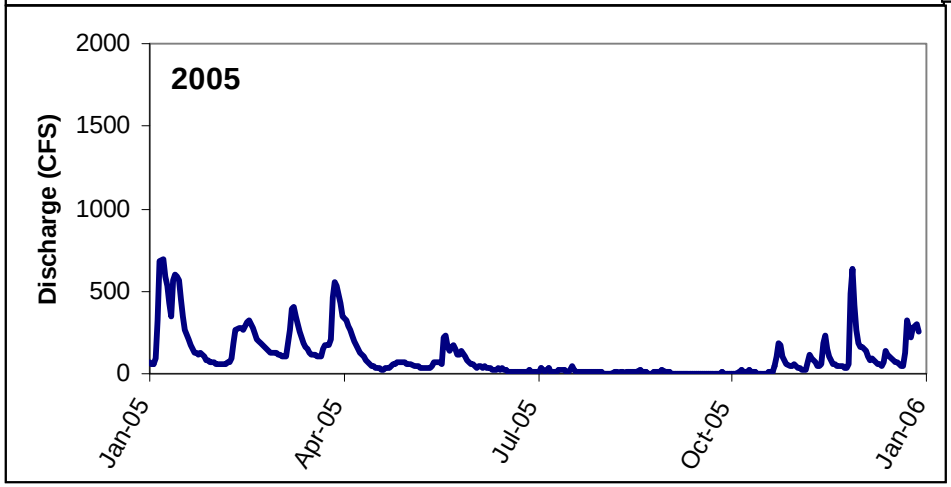
- USGS maintains a stream gauge on Deckers Creek in Morgantown
- It operated from 1946 to 1969, and again since 2002
- Data are available via the Internet or by contacting USGS


2003
Discharge (CFS)
2000
1500
1000
500
0
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04


2006
Discharge (CFS)
2000
1500
1000
500
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07


2004
Discharge (CFS)
2000
1500
1000
500
0
Jan-04
Apr-04
Jul-04
Oct-04
Jan-05


2007
Discharge (CFS)
2000
1500
1000
500
0
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08


2005
Discharge (CFS)
2000
1500
1000
500
0
Jan-05
Apr-05
Jul-05
Oct-05
Jan-06

Observed pattern of rainfall and fish communities

Fish results at Dellslow (September)	Hydrological year
2001: many small creek chub, a few large suckers	
	2002: Relatively dry year
2002: multiple size classes of creek chub, large carp	
	2003: Wet year, some low pH and high metal values measured
2003: decrease by ~90% in fish community	
	2004: Relatively dry year
2004: multiple size classes present again	
	2005: Relatively dry year
2005-2007: increasing quality of fishery (sauger, smallmouth bass)	
	2006-2007: Relatively dry years
	2008:???

Conclusions

- Water monitoring data since 1950 demonstrate improvement in water quality
- Current water quality is good, and there is some good fishing
- In the past 50 years, changes in mining practices and probably pyrite depletion has improved Deckers Creek
- In the past eight to ten years
  - Depletion of pyrite and abandoned mine land reclamation have not played a strong role in recovery
  - Changes in the behavior of permitted dischargers and the lack of really wet years may have aided recovery
  - ICG's change of their pumping station may be having a very positive effect on Deckers Creek
- More AMD remediation projects should increase fishable areas
- Stream restoration requires vigilance and effort by agencies, the permitted community, and interested citizens.