Restoring Flow to Cook Creek, a Class I Brook Trout Stream De-watered by a Nearby High Capacity Well

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WISCONSIN DEPT. OF NATURAL RESOURCES

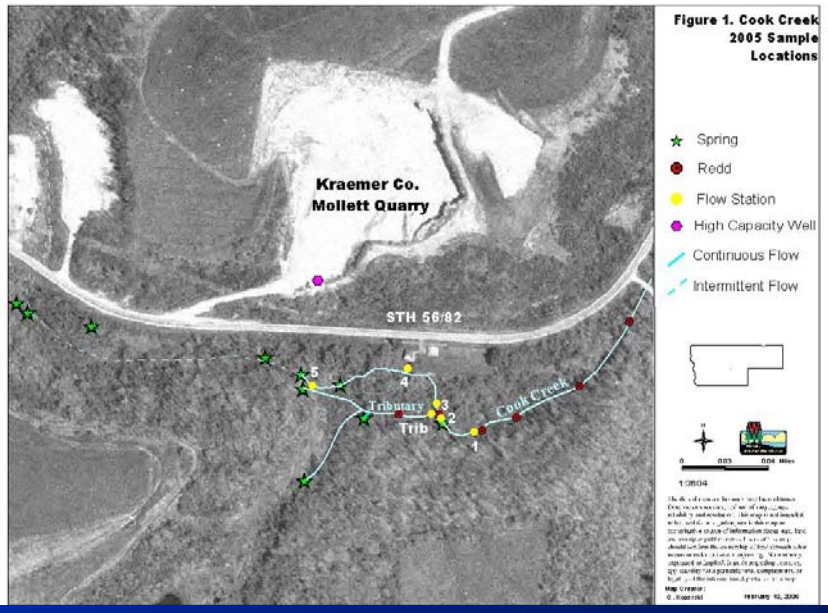
UW Extension
Wisconsin Geological and Natural History Survey

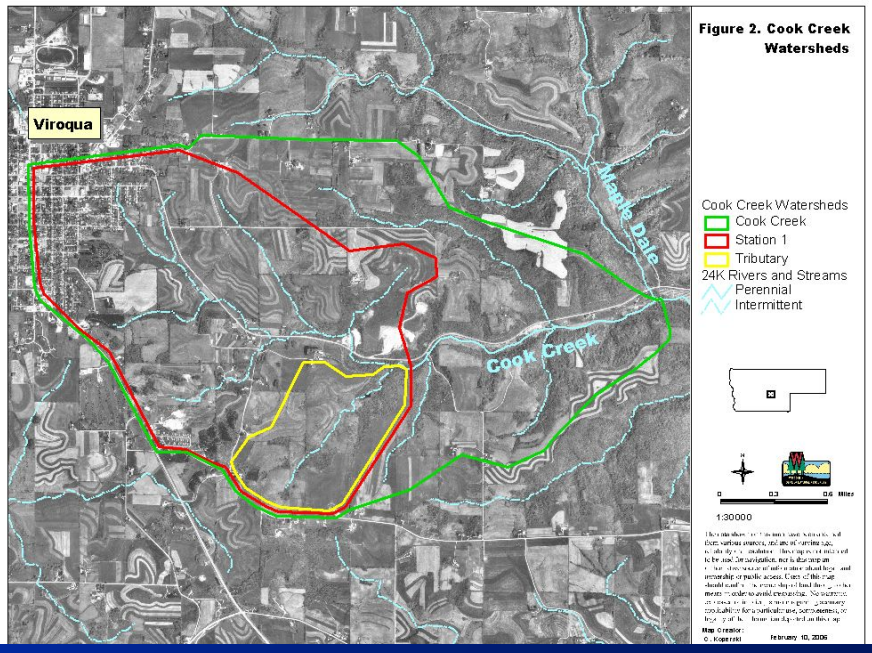
High capacity well <u>not</u> in operation

High capacity well in operation

Any Questions?

Cook Creek - Class I brook trout





Documented De-watering Events

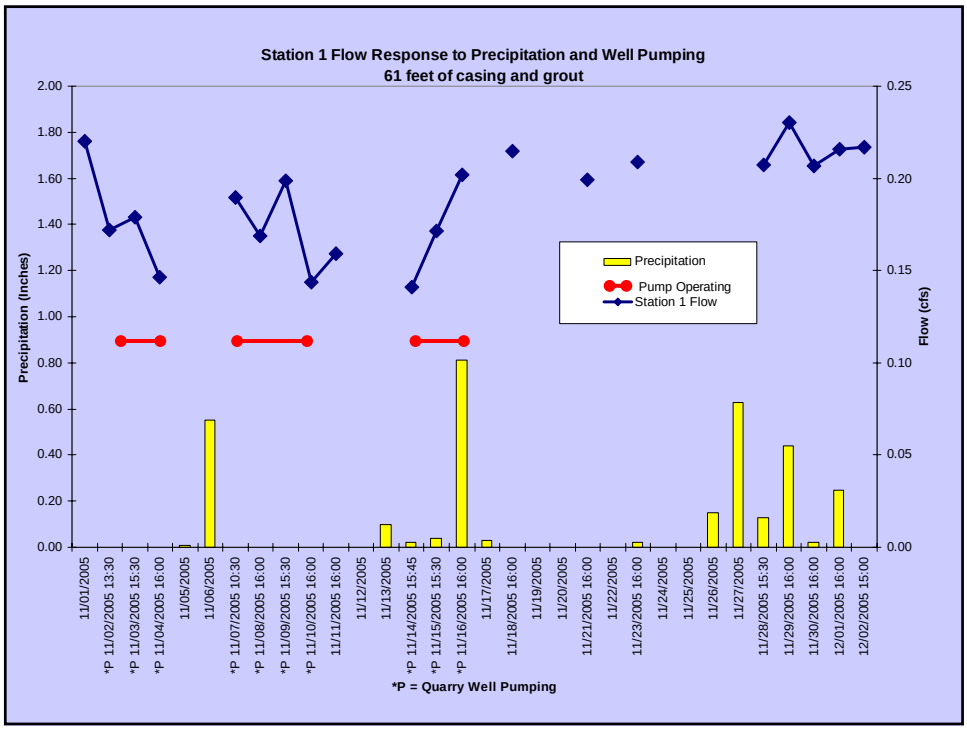
- April, 2004
- September, 2004
- July, 2005
- November, 2005

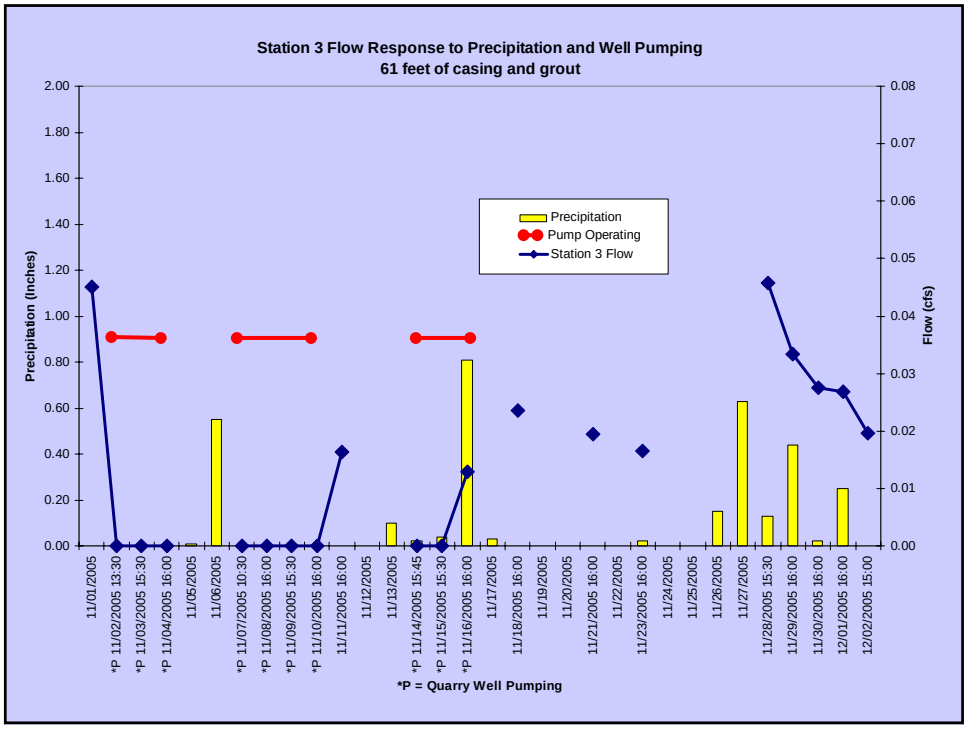
4 hours after pumping began:

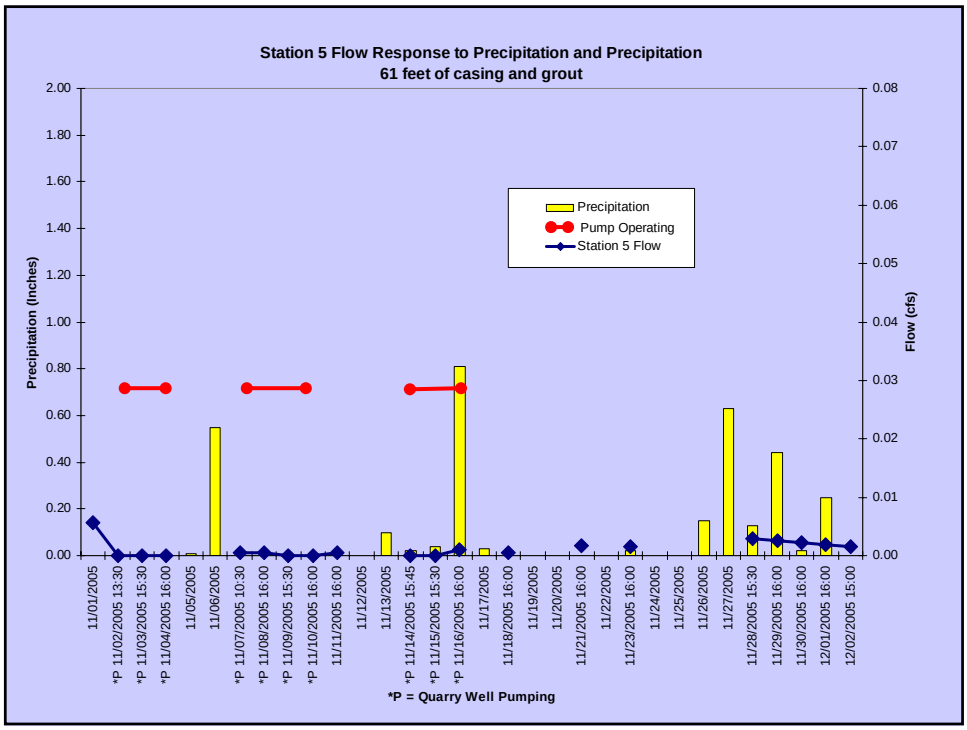
areas of discontinuous flow between Stations 3 & 5

8 hours after pumping began:

no flow between Stations 3 & 5




Station 3 Flow Response to Precipitation and Well Pumping
61 feet of casing and grout
Precipitation (Inches)
Flow (cfs)
Precipitation
Pump Operating
Station 3 Flow
*P = Quarry Well Pumping


Station 5 Flow Response to Precipitation and Precipitation
61 feet of casing and grout
Precipitation (Inches)
Flow (cfs)
Precipitation
Pump Operating
Station 5 Flow
*P = Quarry Well Pumping

Macroinvertebrates moved to any small pool of water to survive

Quickly receding waters stranded and killed sculpin, adult and young of the year brook trout

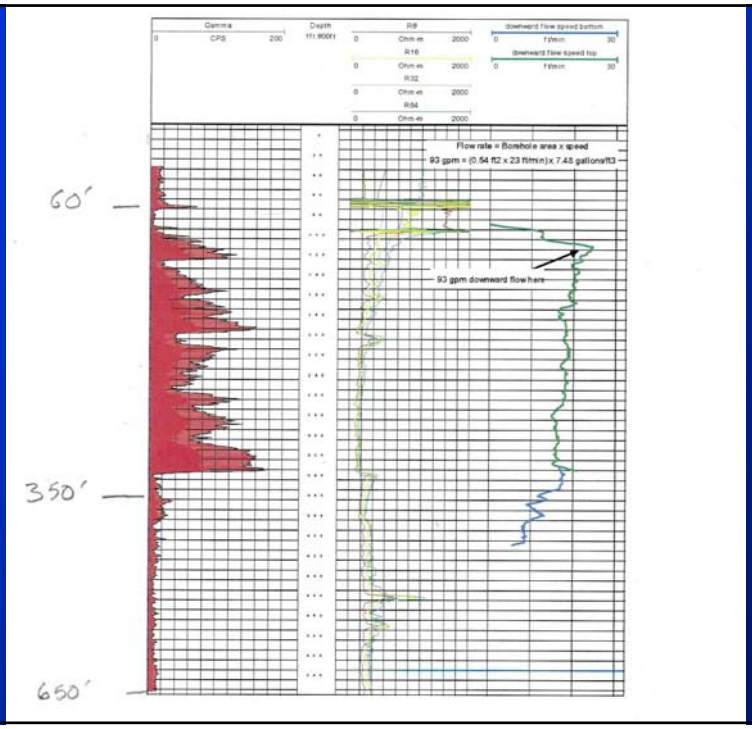
Quarry pumped 128,000 gallons on first day (8 hr work day)

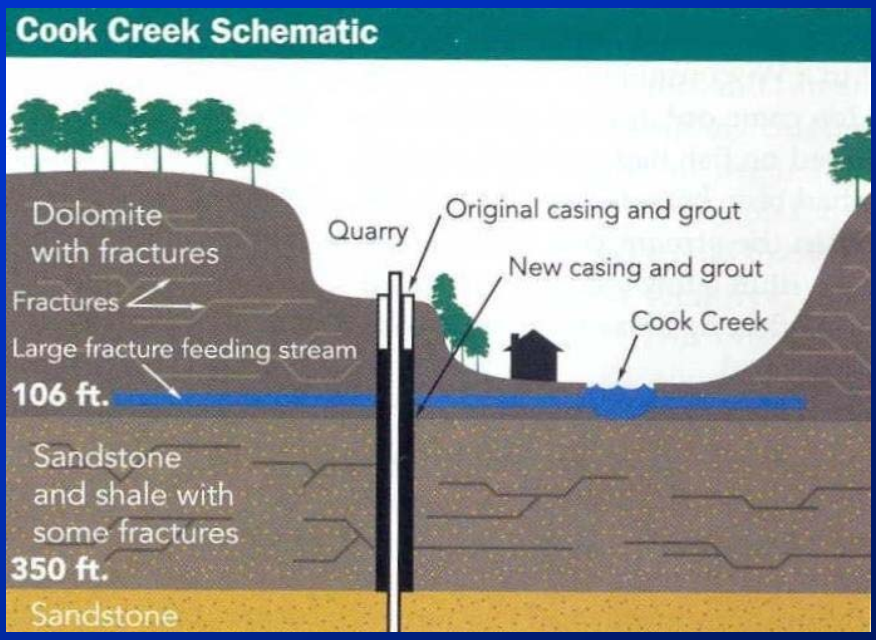
Quarry pumped 843,600 gallons over 10 days

Volume of Cook Cr at Station 1: 47,000 gallons in 8 hours

WGNHS Survey of Well

- December 16, 2005
- Geophysical Logging conducted
- Mapped a confining rock layer from 90-340'
- Indicated a large fracture at 96'
- Suggested the well allowed groundwater to flow across a confining rock layer continuously since it was deepened in 1999


Gamma
CPS
Depth
R8
R16
R32
R64
downward flow speed bottom
downward flow speed top
Flow rate = Borehole area x speed
93 gpm = (0.54 ft2 x 23 ft/min) x 7.48 gallons/ft3
93 gpm downward flow here
60'
350'
650'

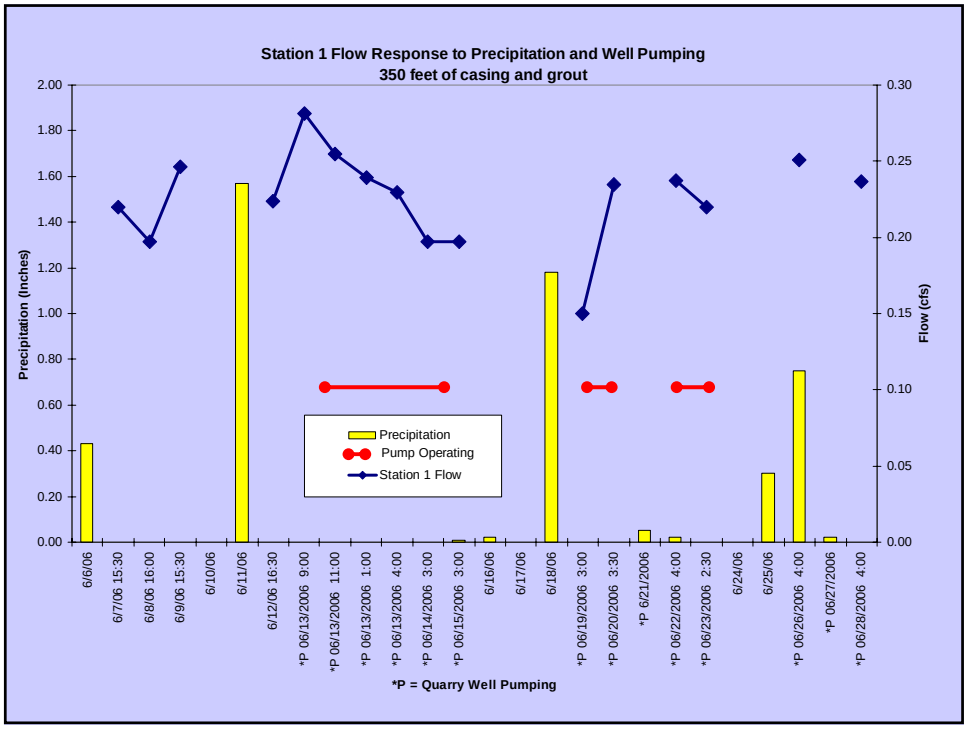

Cook Creek Schematic
Dolomite with fractures
Fractures
Large fracture feeding stream
106 ft.
Sandstone and shale with some fractures
350 ft.
Sandstone
Quarry
Original casing and grout
New casing and grout
Cook Creek

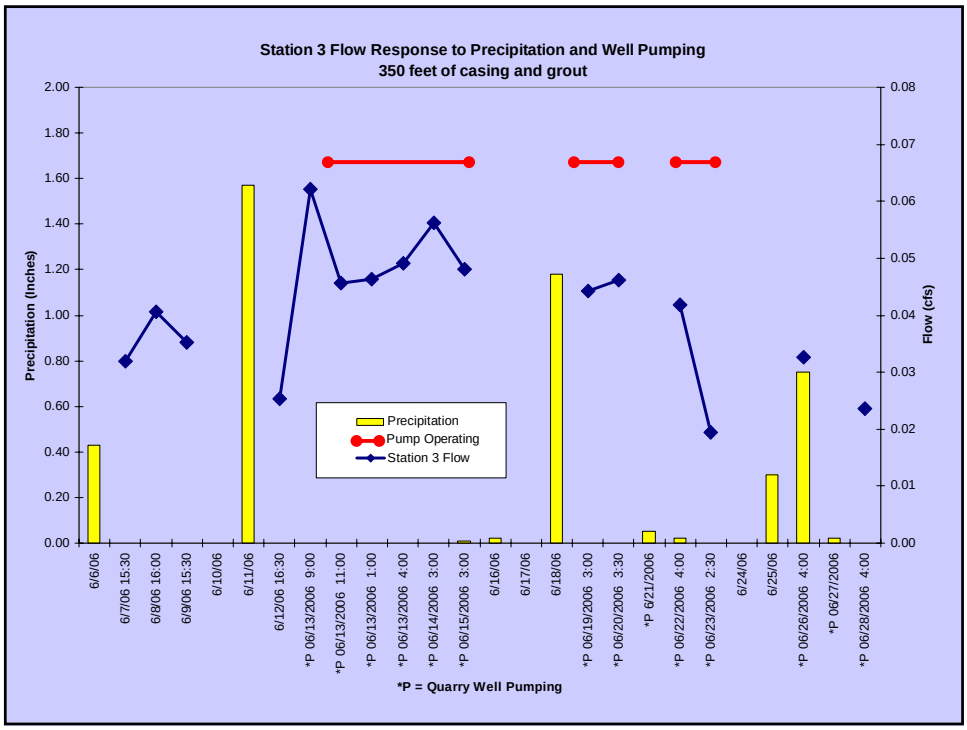
History of Mollett Quarry Well

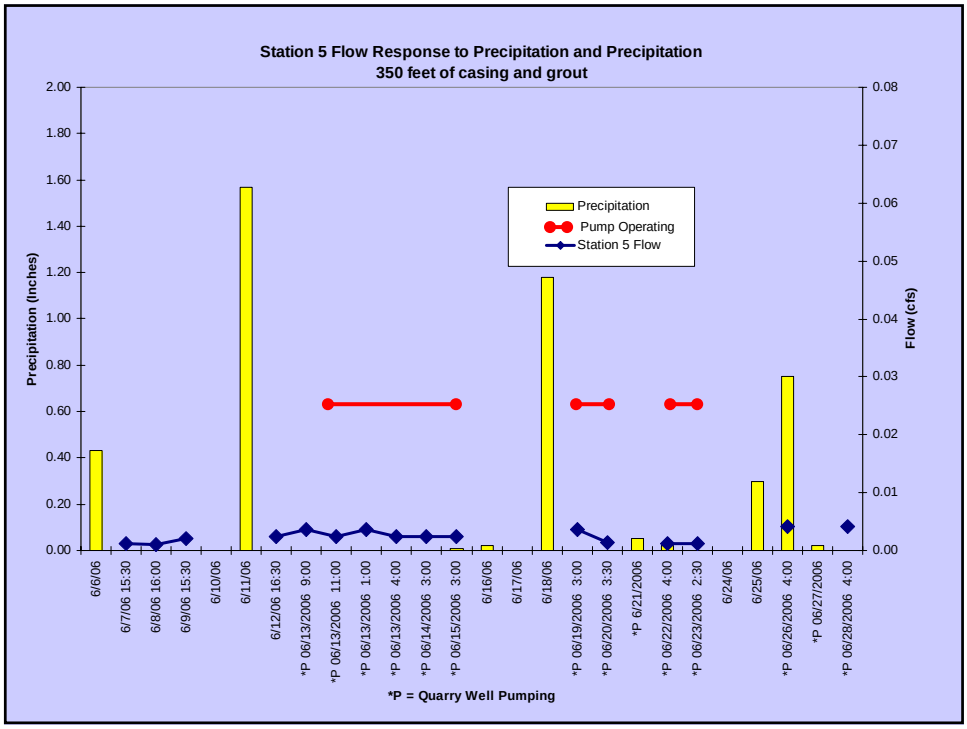
- Drilled in 1994 to 350’ and cased to 61’
- Deepened in 1999 to 550’ with no additional casing
- Documented stream de-watering in 2004 & 2005
- April 2006 well cased and grouted down to 350’

June 2006

- Stream flows measured prior to and during quarry wash and well operation
- Stream flows varied, but Cook Creek flowed at all stations on all days

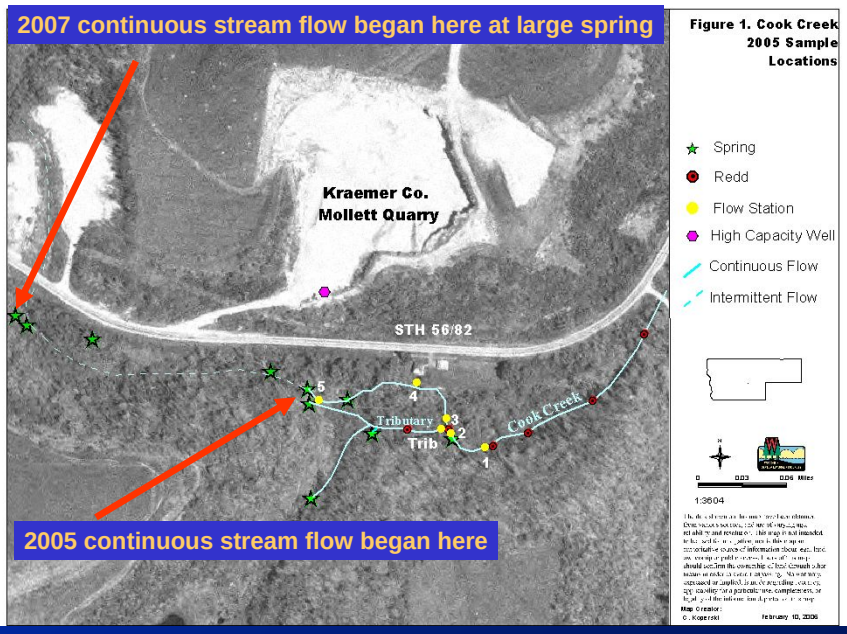

Station 1 Flow Response to Precipitation and Well Pumping
350 feet of casing and grout
Precipitation (Inches)
Flow (cfs)
Precipitation
Pump Operating
Station 1 Flow
*P = Quarry Well Pumping


Station 3 Flow Response to Precipitation and Well Pumping
350 feet of casing and grout
Precipitation (Inches)
Flow (cfs)
Precipitation
Pump Operating
Station 3 Flow
*P = Quarry Well Pumping

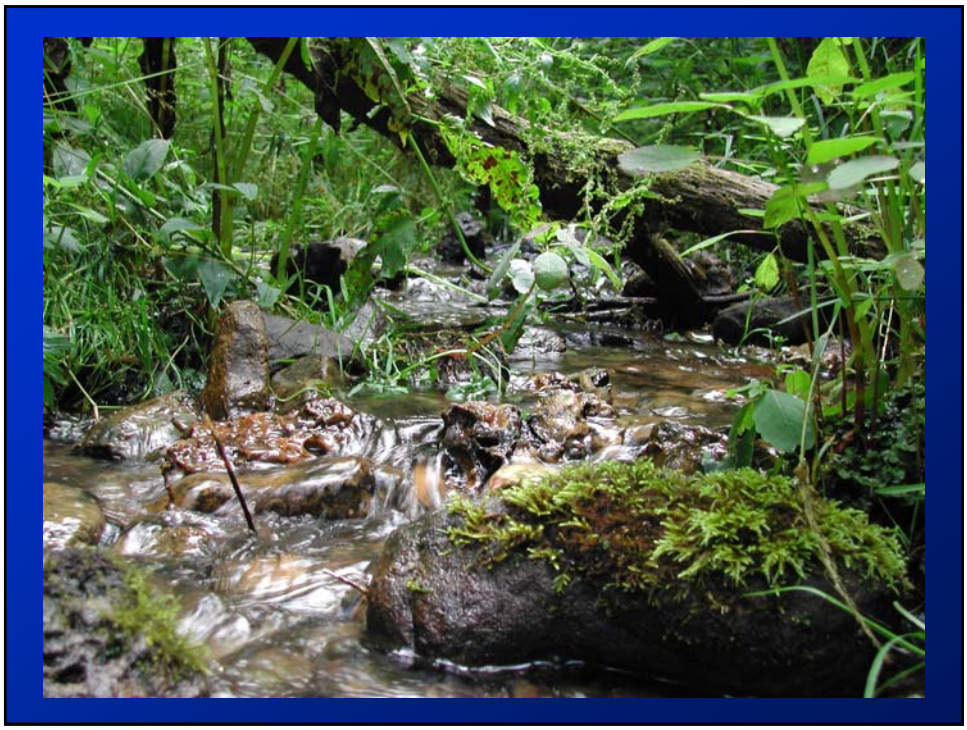


October 2007

- Robust flow observed at all stations
- "New" start of stream location 0.25 miles upstream from 2005 location
- Profuse spring flow from hillside at "new" start of stream



October 2007

Previously dry headwater spring

Expanded area now available for adult brook trout to spawn and for young brook trout to grow.
parr marks
John Lyons