Characterization of the unsaturated zone beneath a bank filtration facility

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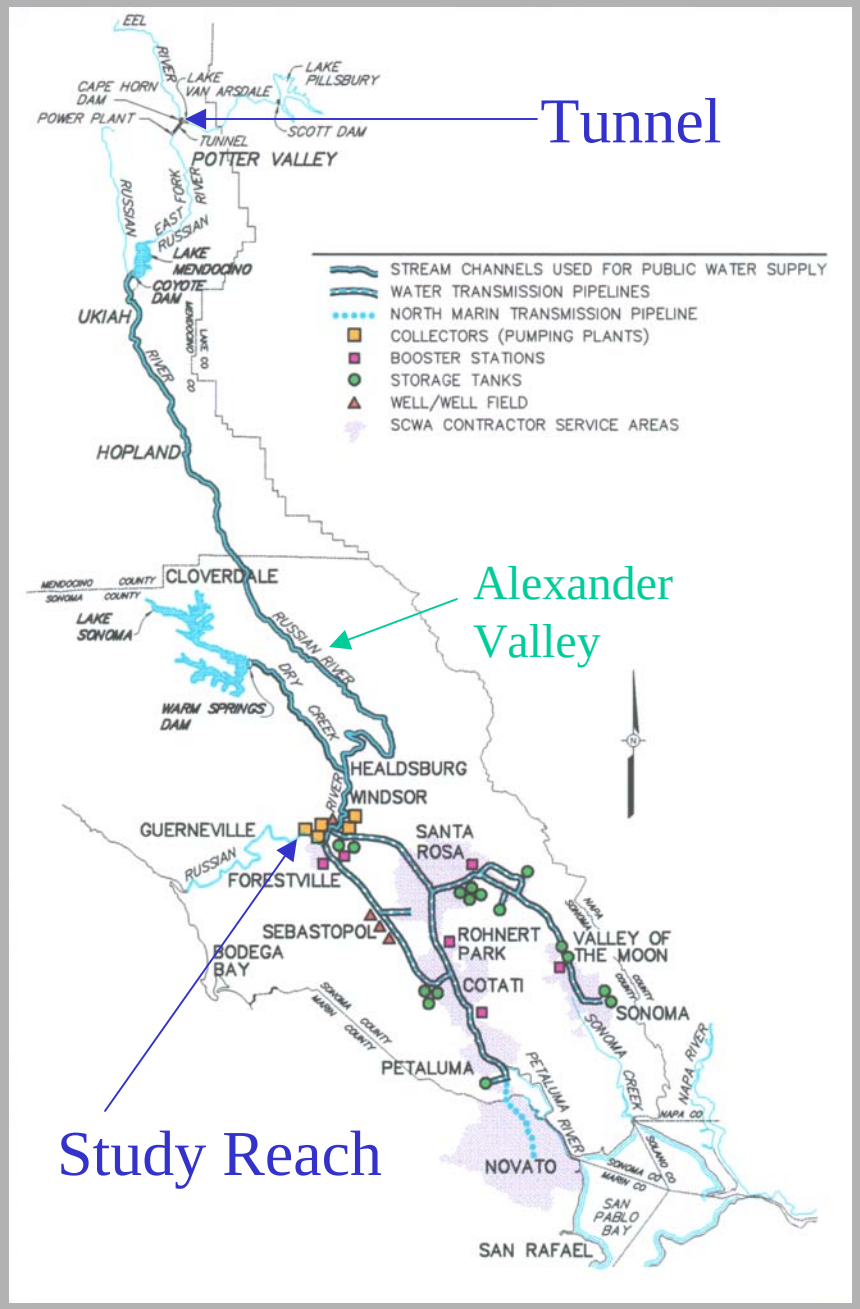
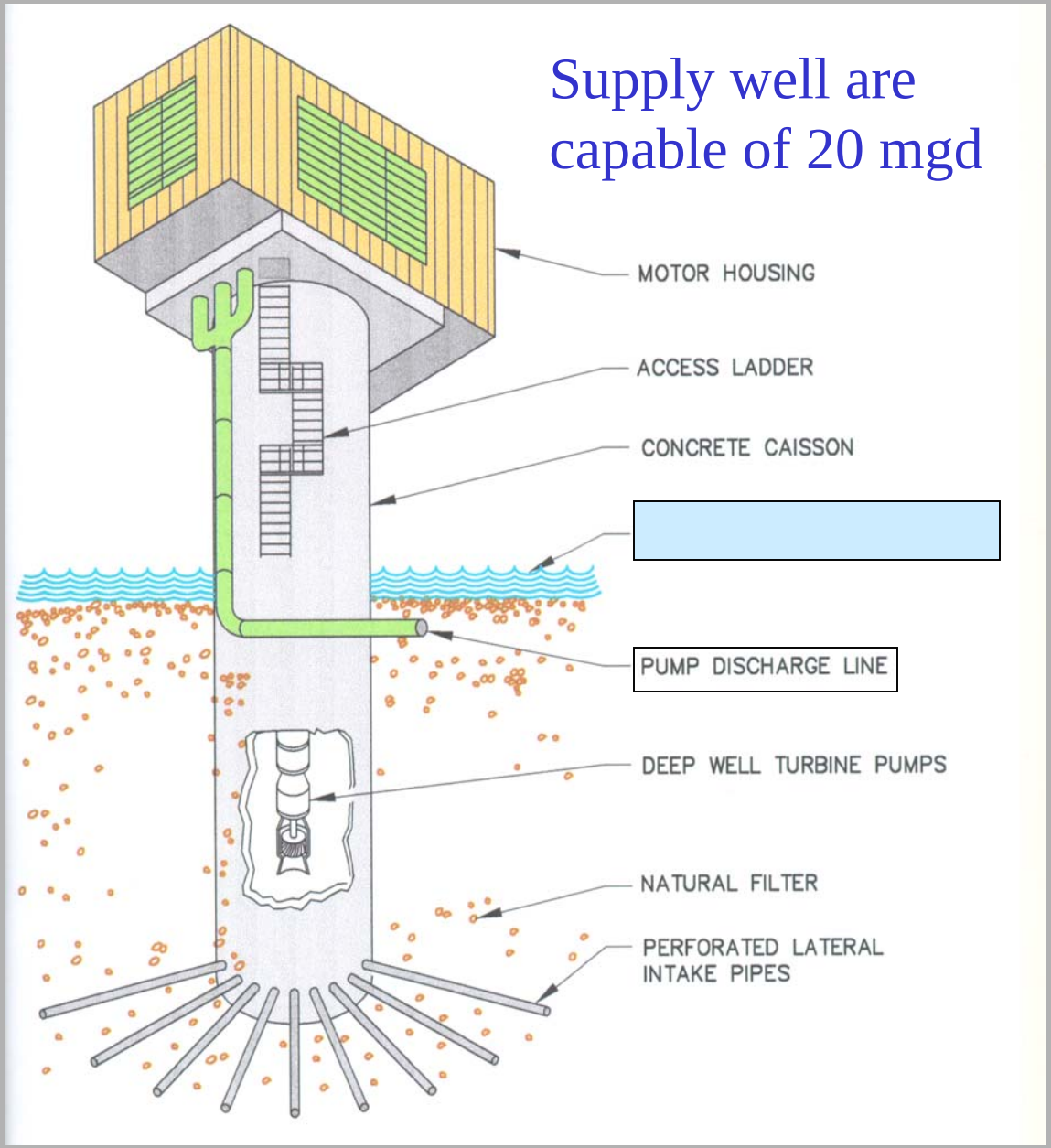
U.S. Geological Survey

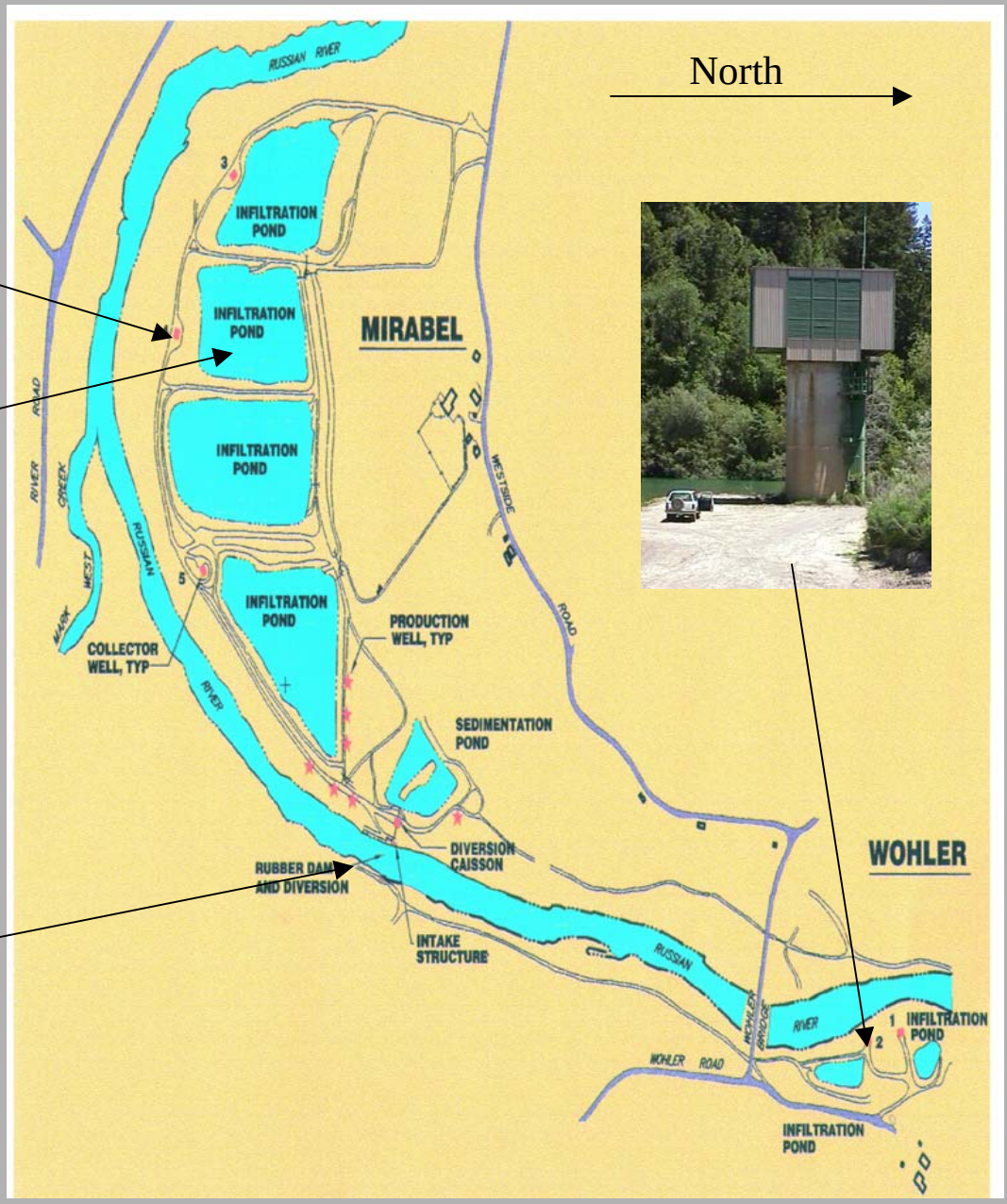

OREGON
IDAHO
NEVADA
UTAH
ARIZONA
CALIFORNIA
MEXICO
VICINITY MAP
RUSSIAN RIVER WATERSHED
POTTER VALLEY
UKIAH
HOPLAND
CLOVERDALE
HEALDSBURG
WINDSOR
GUERNEVILLE
FORESTVILLE
SANTA ROSA
JENNER
SEBASTOPOL
ROHNERT PARK
COTATI
SONOMA
PETALUMA
NOVATO
SAN RAFAEL
SAN FRANCISCO
LAKE MENDOCINO
LAKE SONOMA
LAKE PILLSBURY
LAKE VAN ARSDALE
COYOTE DAM
WARM SPRINGS DAM
PACIFIC OCEAN
LEGEND
RUSSIAN RIVER WATERSHED


Tunnel
Alexander Valley
Study Reach
CAPE HORN DAM
POWER PLANT
TUNNEL
SCOTT DAM
LAKE PILLSBURY
LAKE VAN ARSDALE
POTTER VALLEY
LAKE MENDOCINO
COYOTE DAM
UKIAH
HOPLAND
CLOVERDALE
LAKE SONOMA
WARM SPRINGS DAM
HEALDSBURG
WINDSOR
GUERNEVILLE
FORESTVILLE
SANTA ROSA
SEBASTOPOL
BODEGA BAY
ROHNERT PARK
COTATI
VALLEY OF THE MOON
SONOMA
PETALUMA
NOVATO
SAN RAFAEL
STREAM CHANNELS USED FOR PUBLIC WATER SUPPLY
WATER TRANSMISSION PIPELINES
NORTH MARIN TRANSMISSION PIPELINE
COLLECTORS (PUMPING PLANTS)
BOOSTER STATIONS
STORAGE TANKS
WELL/WELL FIELD
SCWA CONTRACTOR SERVICE AREAS

Sonoma County Water Agency operates the largest natural filtration system in the world. The streambed of the Russian River reduces the cost of water treatment by filtering out suspended sediment and colloidal materials.

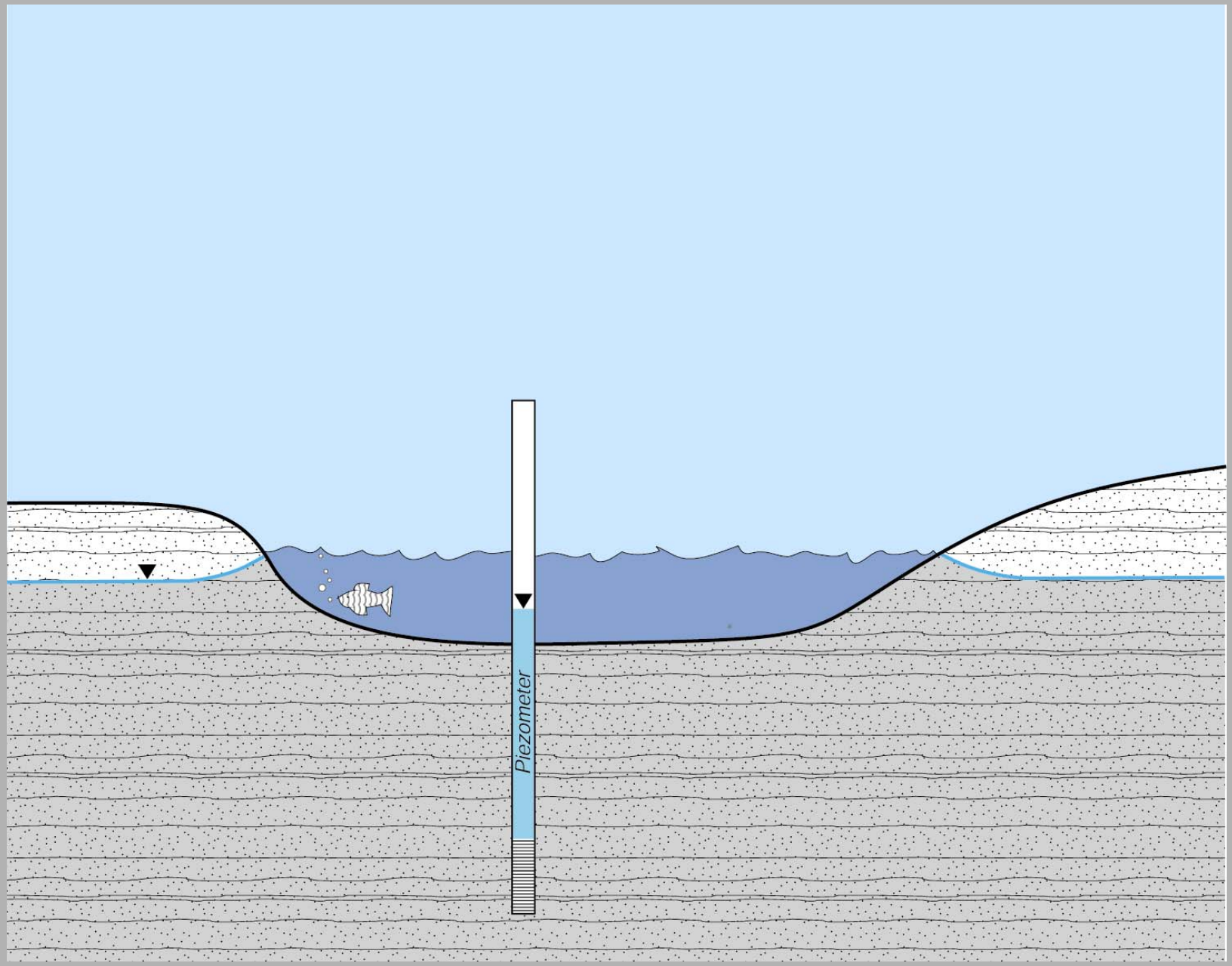


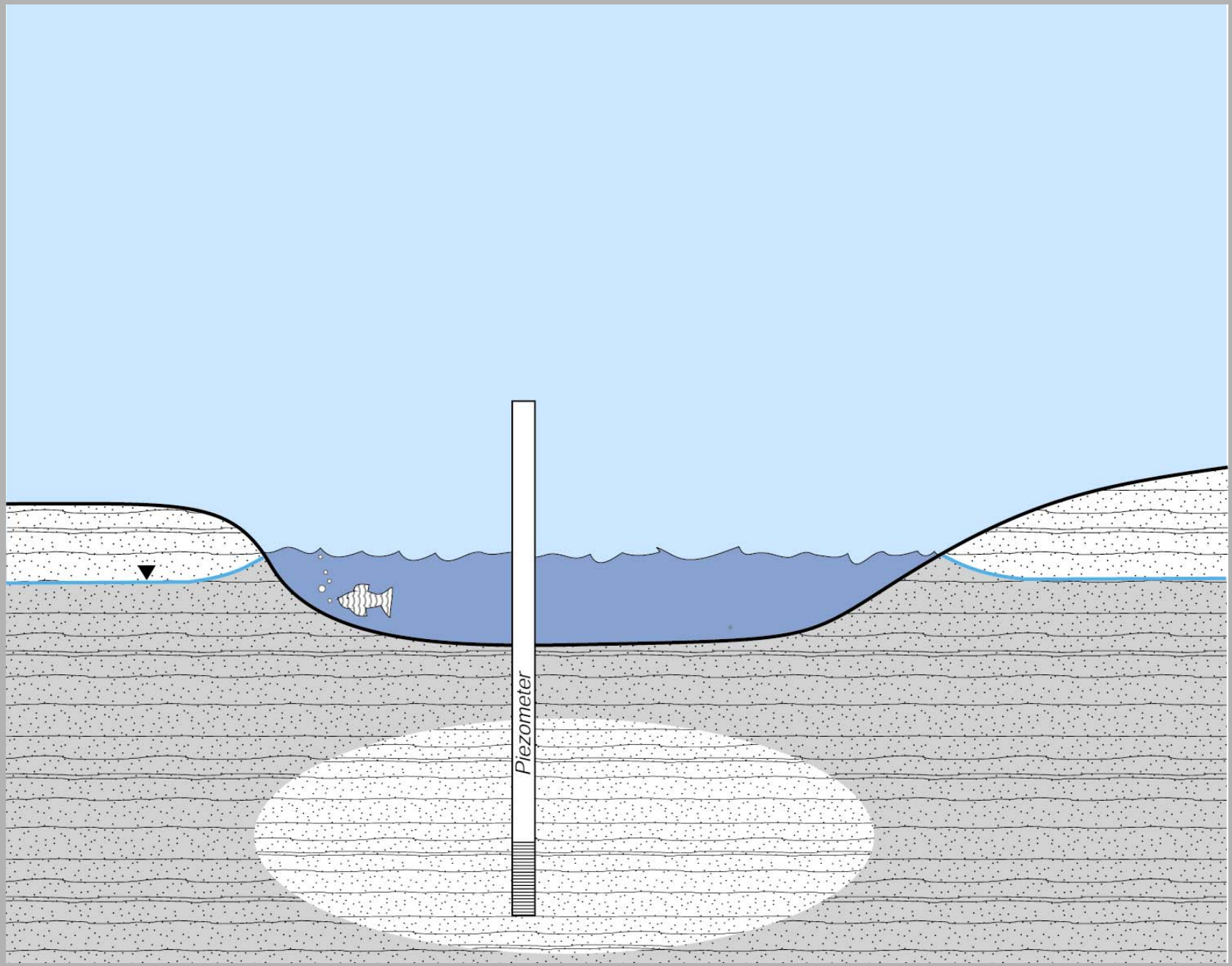
The inflatable dam is erected, May – Nov.

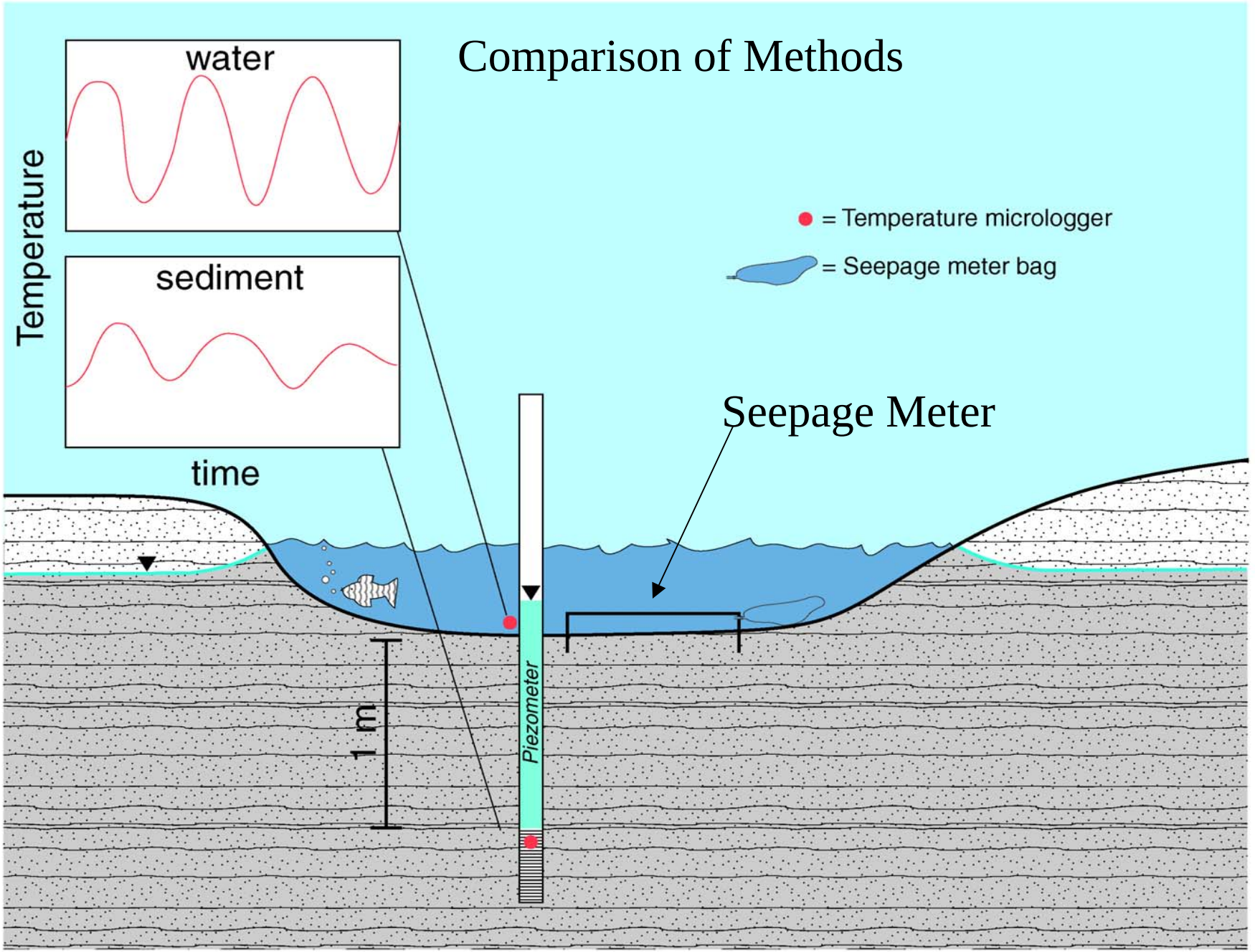



3 meter inflatable dam
Fish ladder

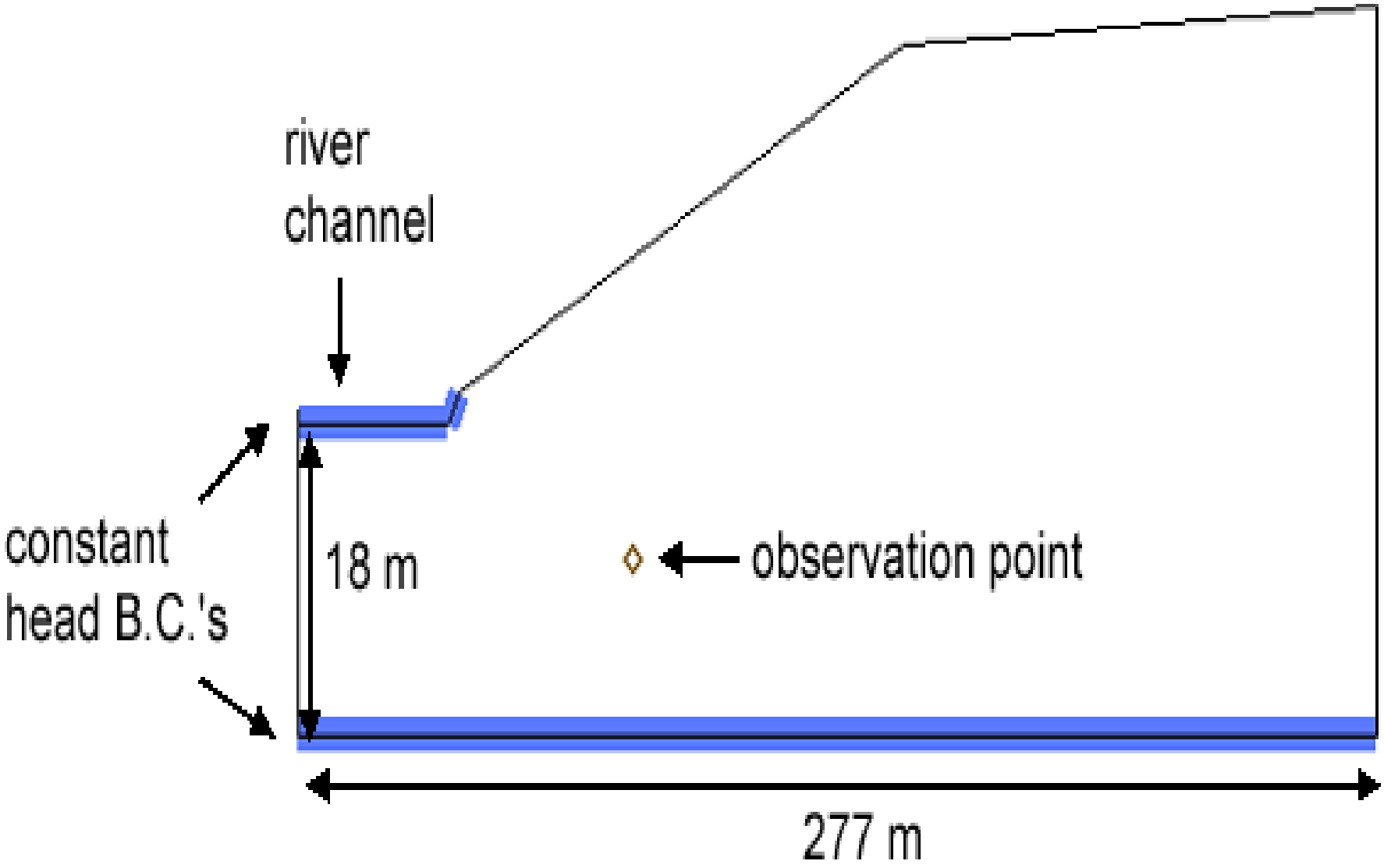

In-stream sediment monitoring
for determining seepage rates


Piezometer

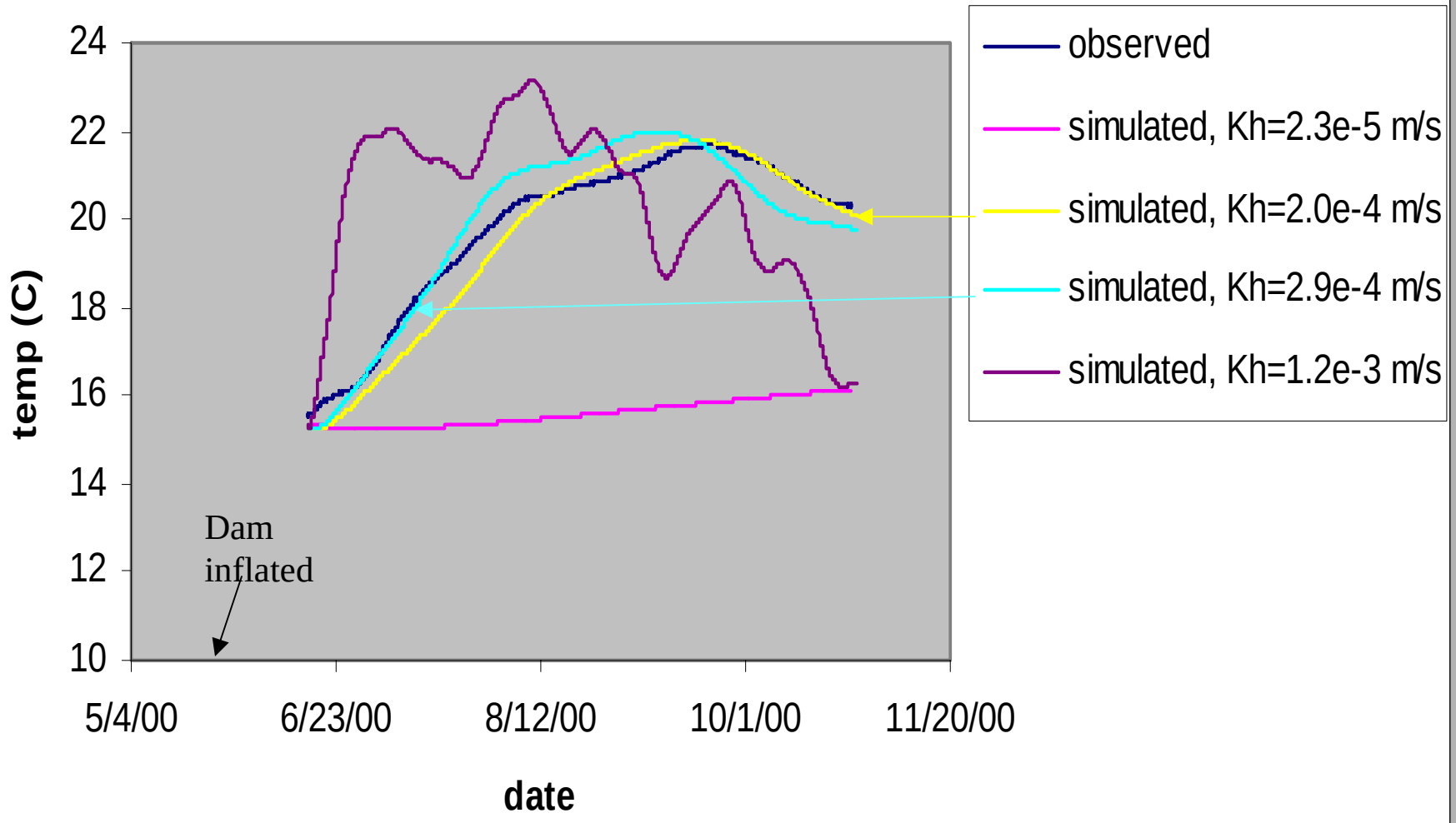

Piezometer


Comparison of Methods
water
sediment
Temperature
time
= Temperature micrologger
= Seepage meter bag
Seepage Meter
Piezometer
1 m

Deeper ground-water monitoring



Wholer TW-01: Kh/Kv=1

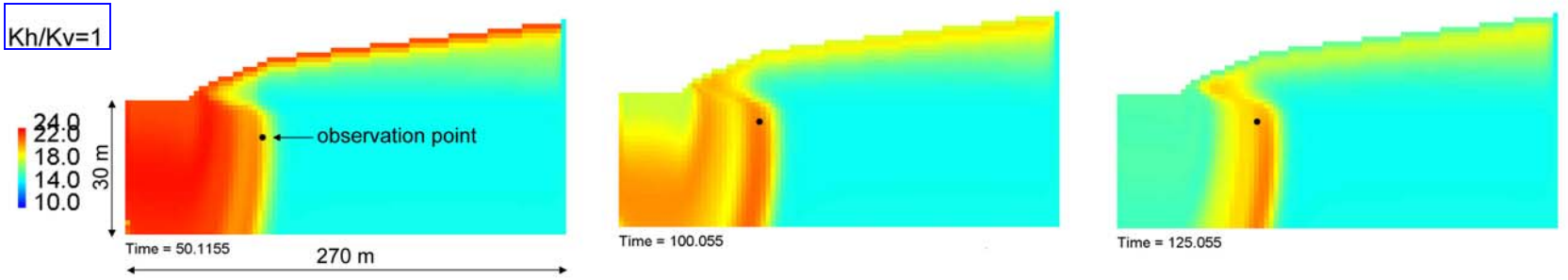


Wholer Well TW-01

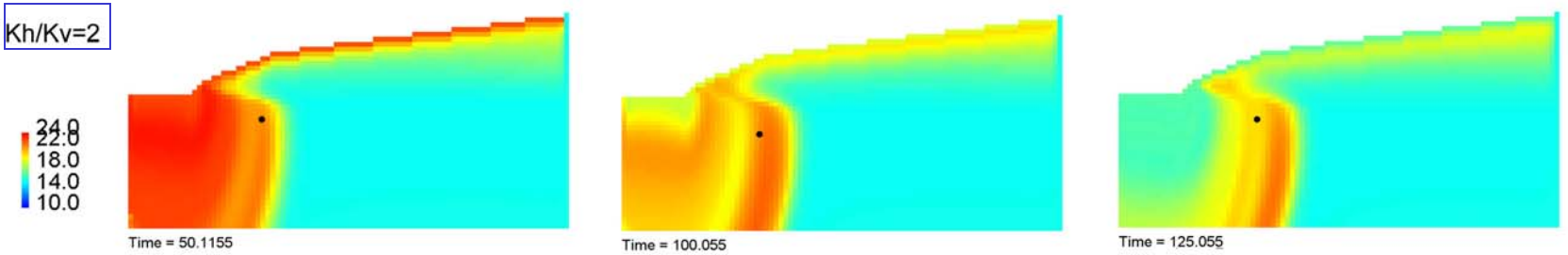
Kh=2.0E-4 m/s

50 days → 100 days → 125 days

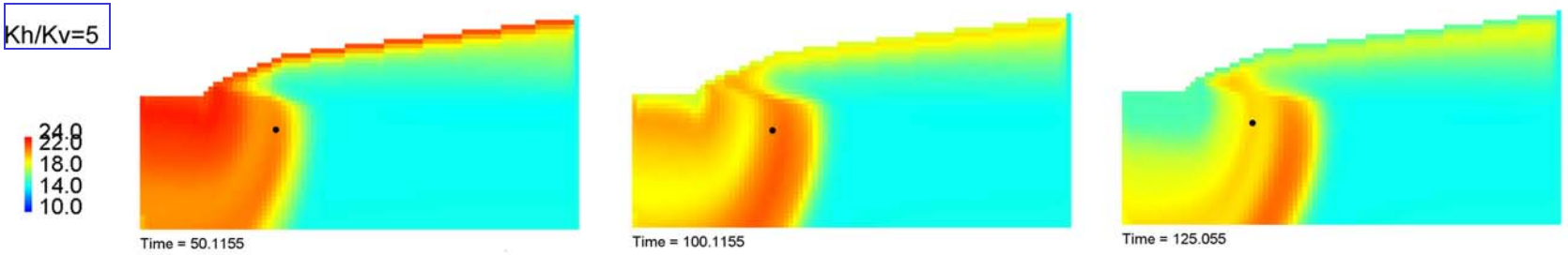
Kh/Kv=1

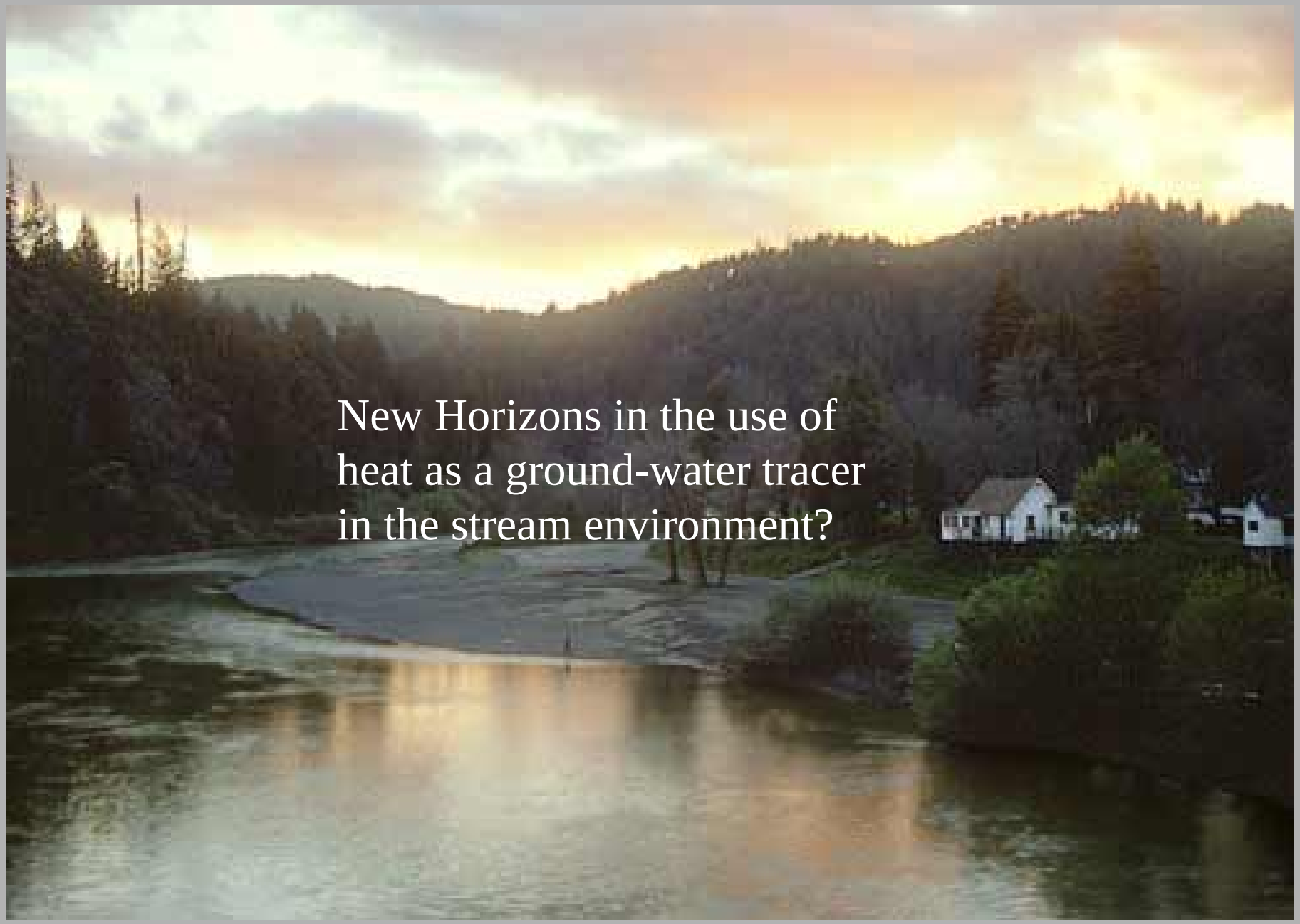


Kh/Kv=2



Kh/Kv=5



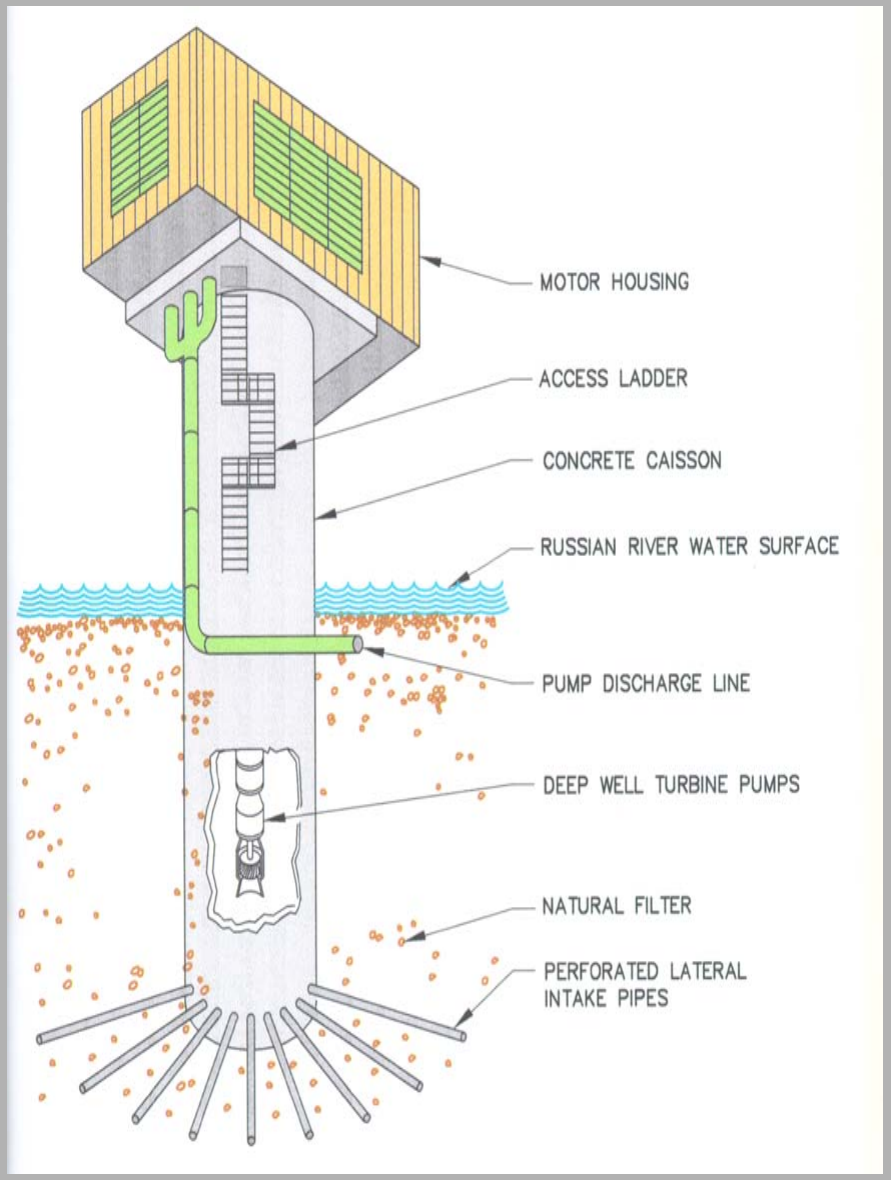

New Horizons in the use of
heat as a ground-water tracer
in the stream environment?

The use of temperature measurements to calibrate 3-D heat, solute, and water transport models

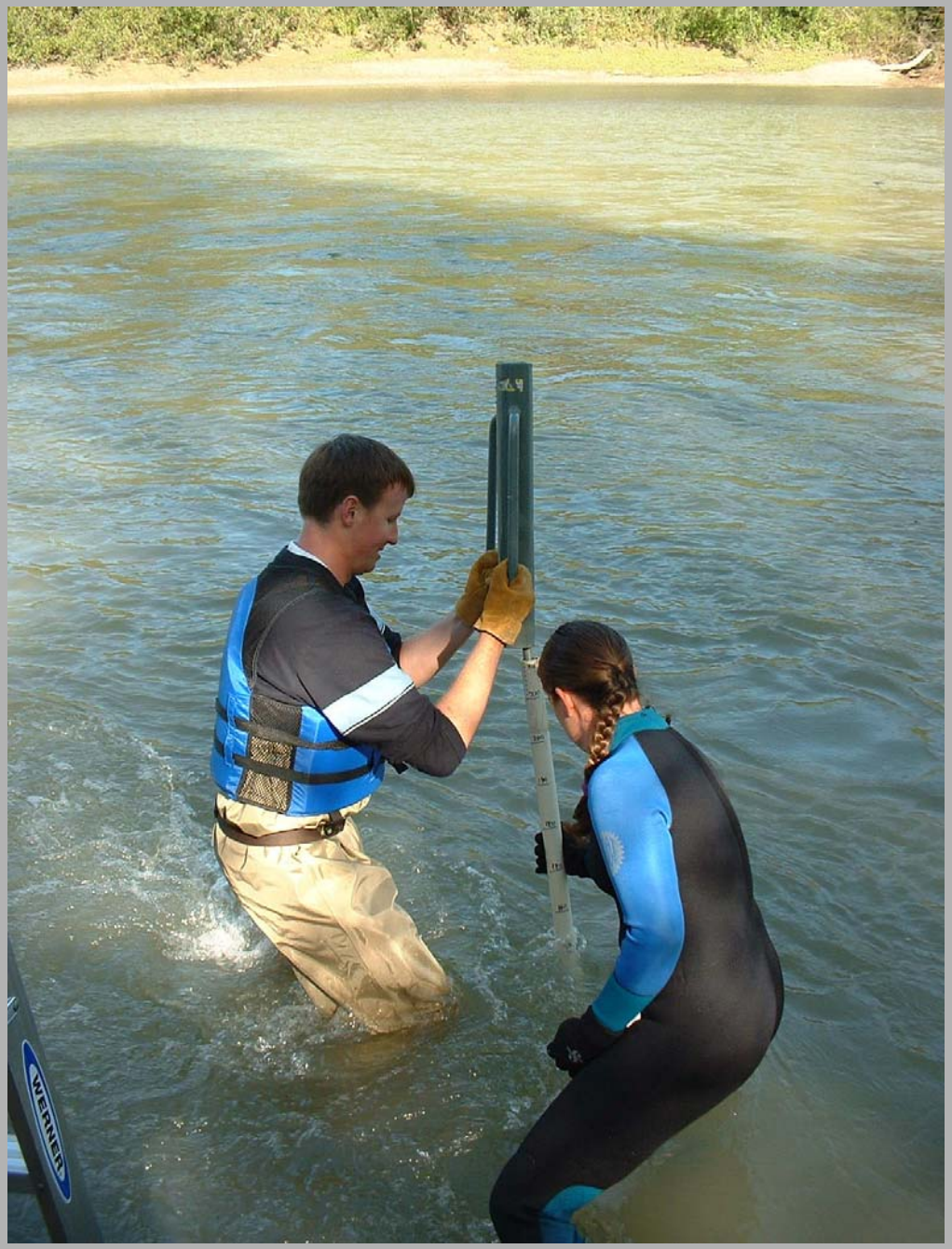
SUTRA

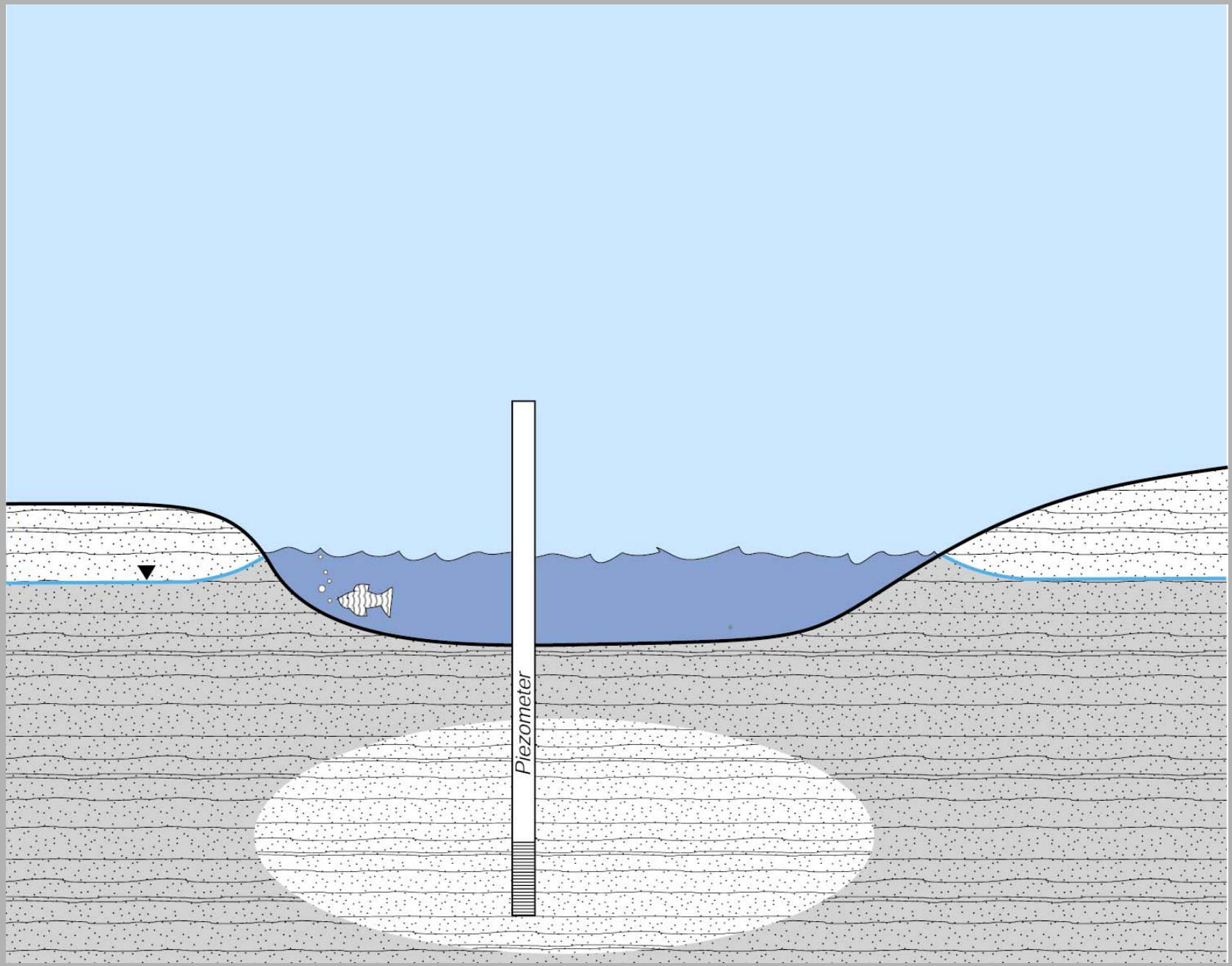
TOUGH2

Supply wells cause the streambed to desaturate in the summer



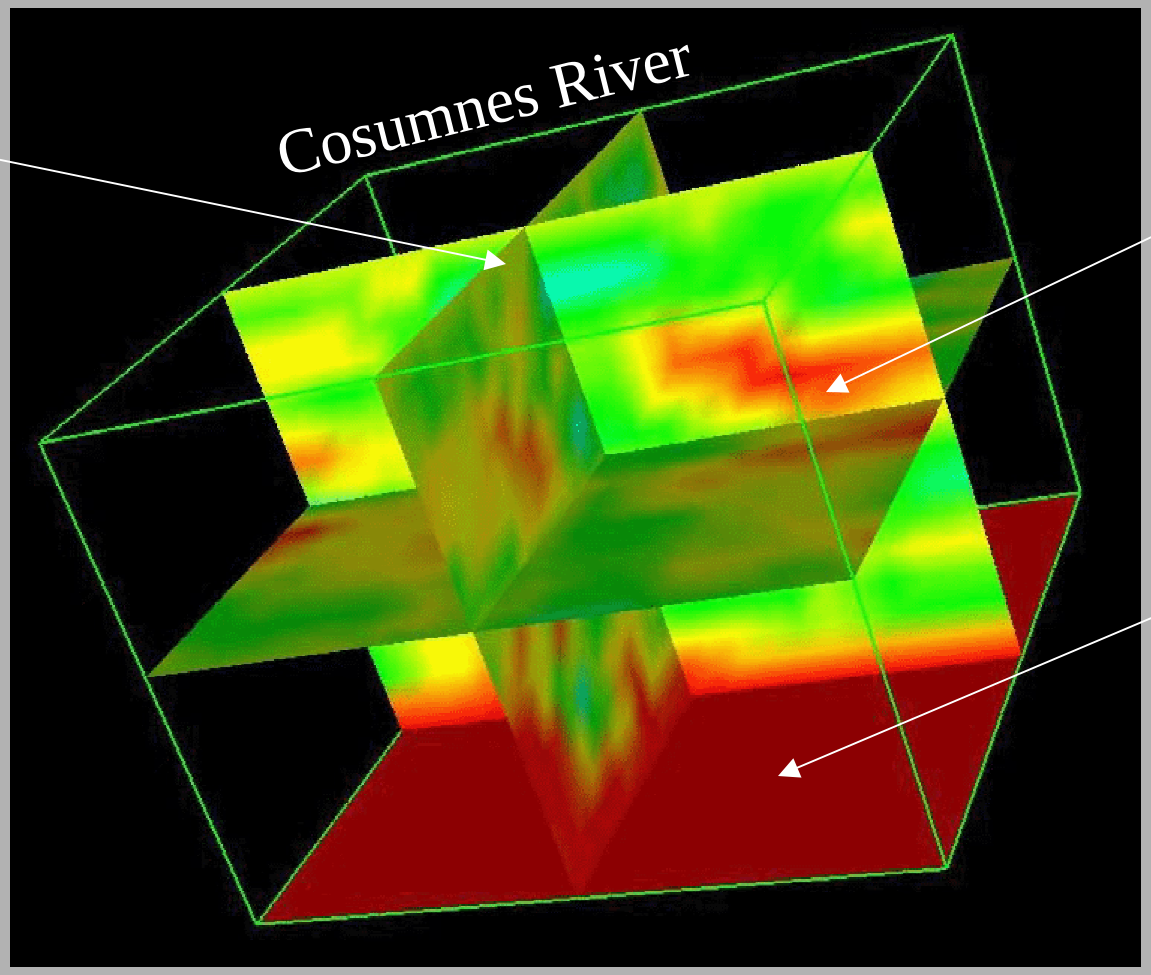

Supply wells


WERNER


Piezometer

3-D GW modeling using TOUGH2 and SUTRA

Observed sediment temperature used to calibrate the model



TOUGH2 contour plot of sediment water content below the river three months after flow ceased. Red color represents saturated sediments and blue is driest sediments. Horizontal plane spans 100 m in both directions.