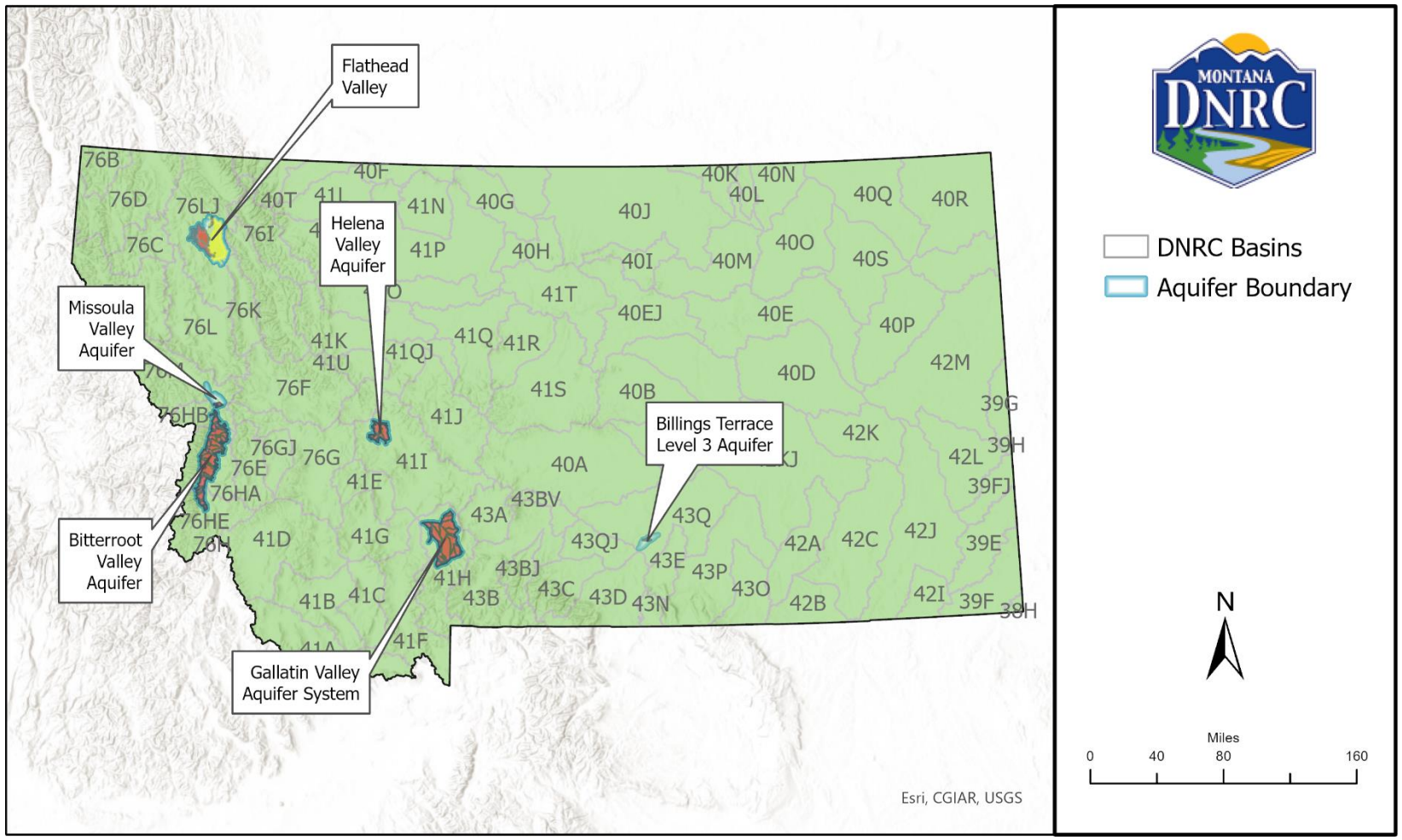
DNRC Criteria for Green, Yellow, Red Area Designation

Water Planning and Growth and Exempt Wells Stakeholder Working Group

Glasgow, MT

May 15, 2024

Red, yellow, green area

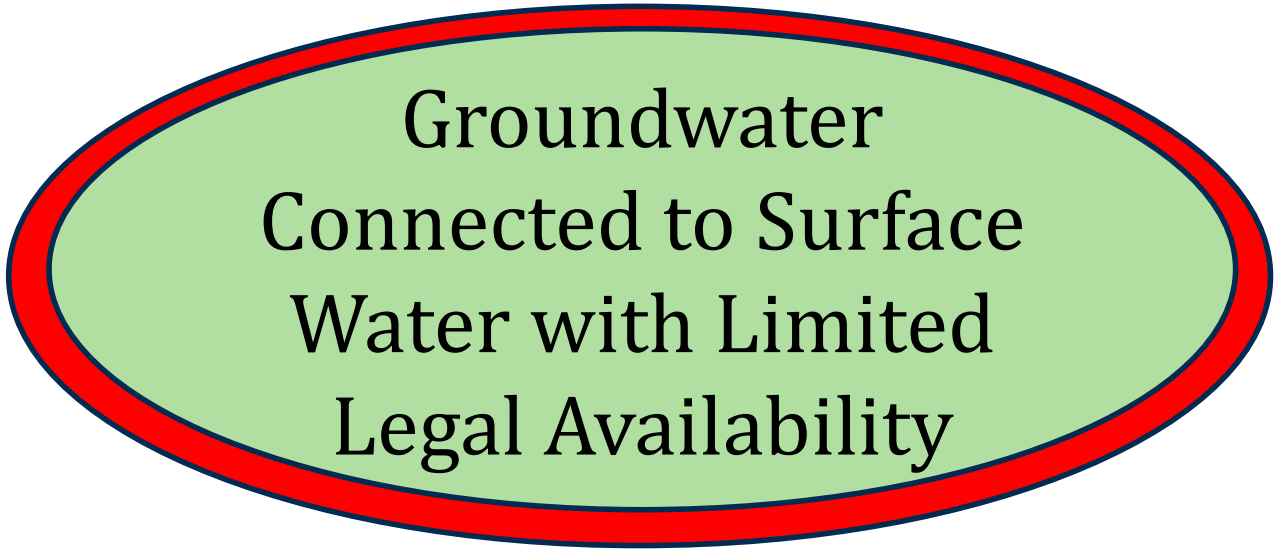


Goals of presentation and discussion

- Understand, discuss and reach agreement for yellow/red criteria
- Understand the confidence in date to make decisions
- Address vertical connection and separation of aquifers
- **Decision points:**
  1. Agreement on criteria
  2. Red and yellow CGWA boundaries

Metrics for Designating CGWA Yellow/Red Zones

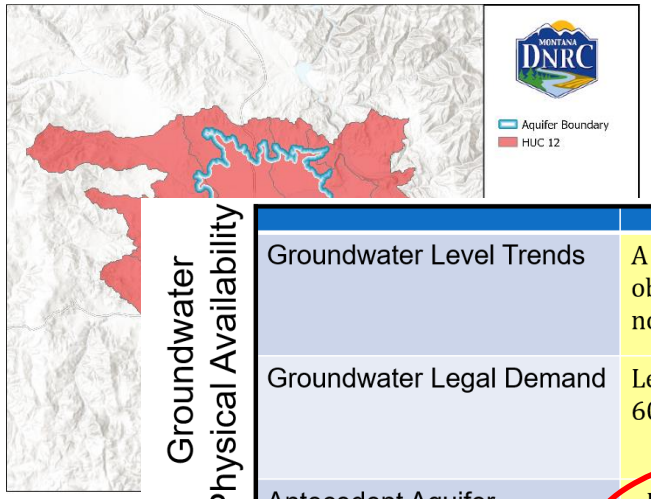
No immediate problems associated with groundwater physical availability

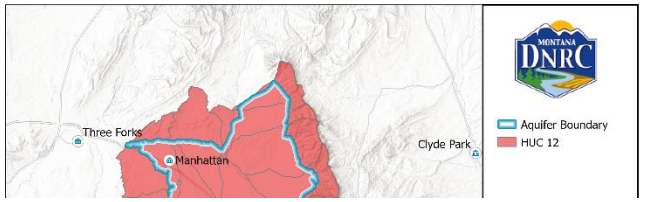


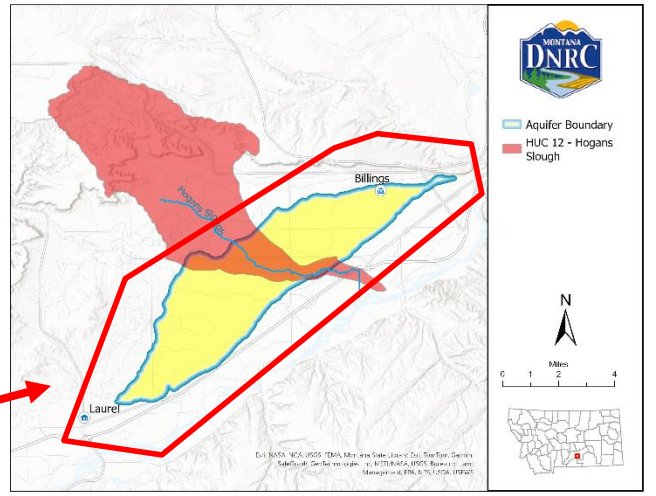
Metrics for Designating CGWA Yellow/Red Zones

	Metric	Yellow (temporary groundwater monitoring areas)	Red (Controlled Ground Water areas)	Confidence in data
Groundwater Physical Availability	Groundwater Level Trends	A decreasing groundwater level trend is observed but is projected to stabilize with no long-term aquifer impacts.	Groundwater level trend is decreasing and may cause long-term damage to the aquifer.	Low to Moderate
	Groundwater Legal Demand	Legal demand of groundwater is at least 60% of the aquifer physical availability.	Legal demand of groundwater is at least 75% of the aquifer physical availability.	Low to Moderate
	Antecedent Aquifer Conditions	- Recharge is reliant on induced infiltration - Formation has limited storage or potential for storage		High
GW Connected Surface Water	Groundwater **<u>Connected</u>** to Surface Water with Limited **Legal Availability**	**Legal demand of surface water** on connected sources is within 10% above or below the physical availability for **any** month	**Legal demand of surface water** on connected sources exceeds 10% of the physical availability for **any** month	High

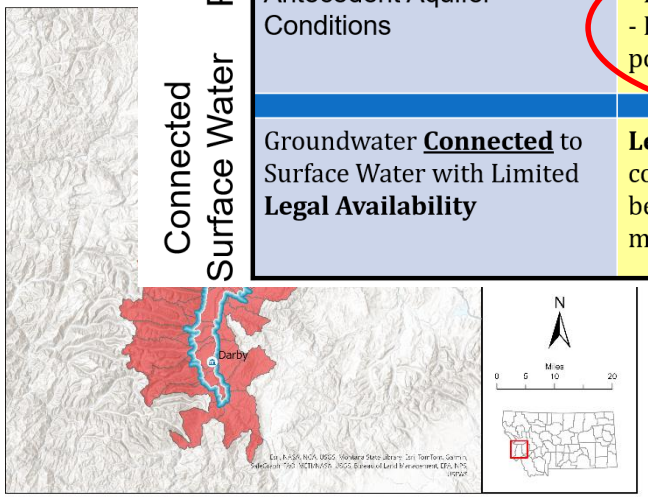
Statewide Map Recap

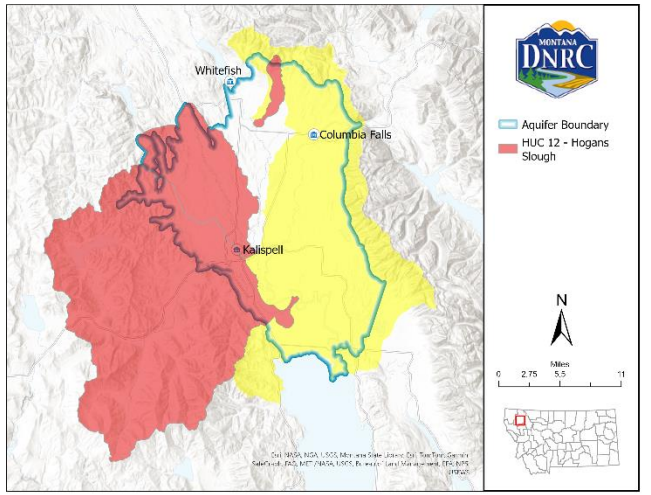






Groundwater Physical Availability		
Groundwater Level Trends	A decreasing groundwater level trend is observed but is projected to stabilize with no long-term aquifer impacts.	Groundwater level trend is decreasing and may cause long-term damage to the aquifer.
Groundwater Legal Demand	Legal demand of groundwater is at least 60% of the aquifer physical availability.	Legal demand of groundwater is at least 75% of the aquifer physical availability.
Antecedent Aquifer Conditions	- Recharge is reliant on induced infiltration - Formation has limited storage or potential for storage	
Connected Surface Water		
Groundwater **Connected** to Surface Water with Limited **Legal Availability**	**Legal demand of surface water** on connected sources is within 10% above or below the physical availability for **any** month	**Legal demand of surface water** on connected sources exceeds 10% of the physical availability for **any** month





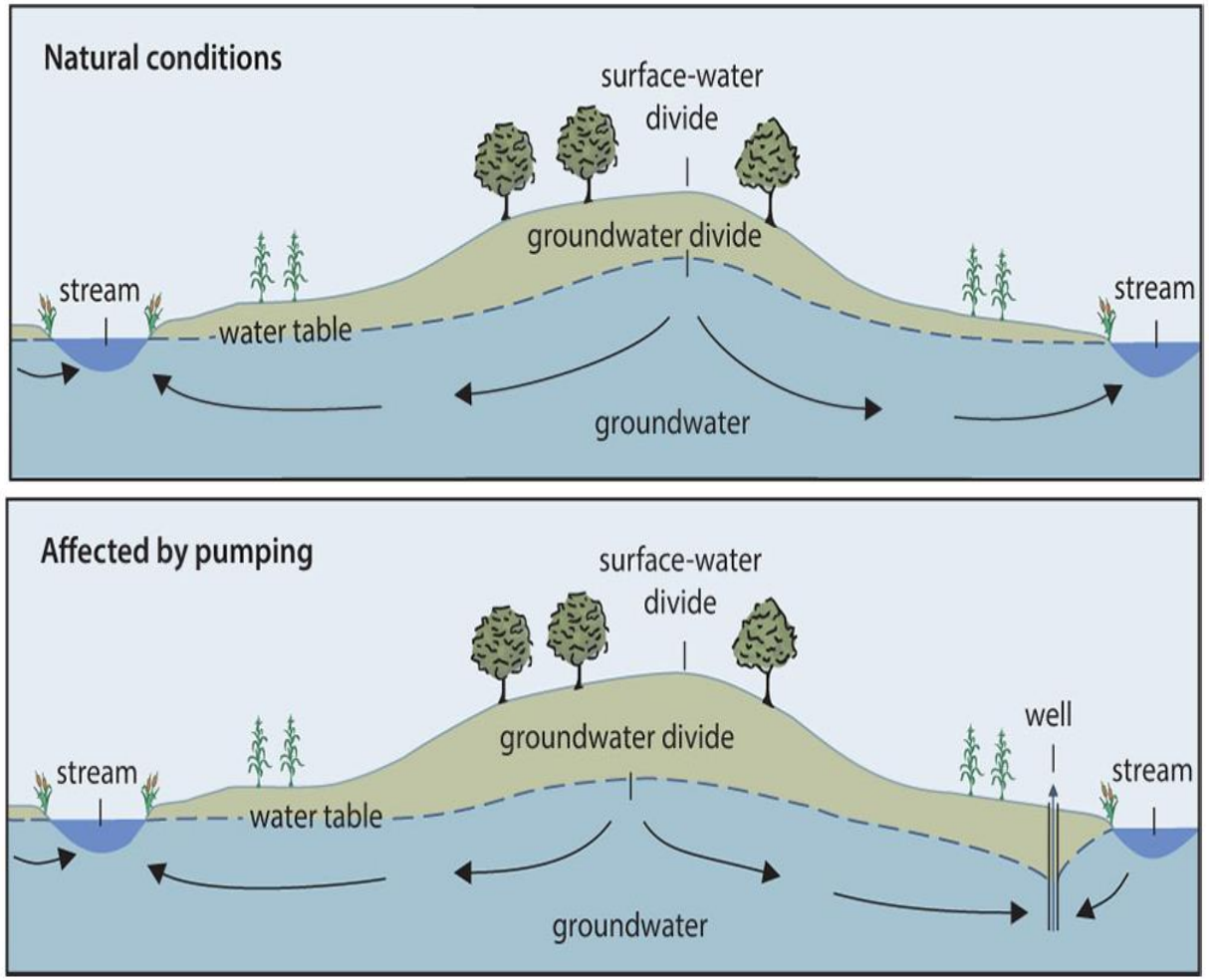
Policy Decision Groundwater-Surface Water Connection

- Stream Depletion Analysis (rate, timing, location of depletions) tells us the groundwater effect on surface water
- Red and yellow CGWA boundaries/size is a policy decision
- Location and timing of depletions are the foundation of this decision

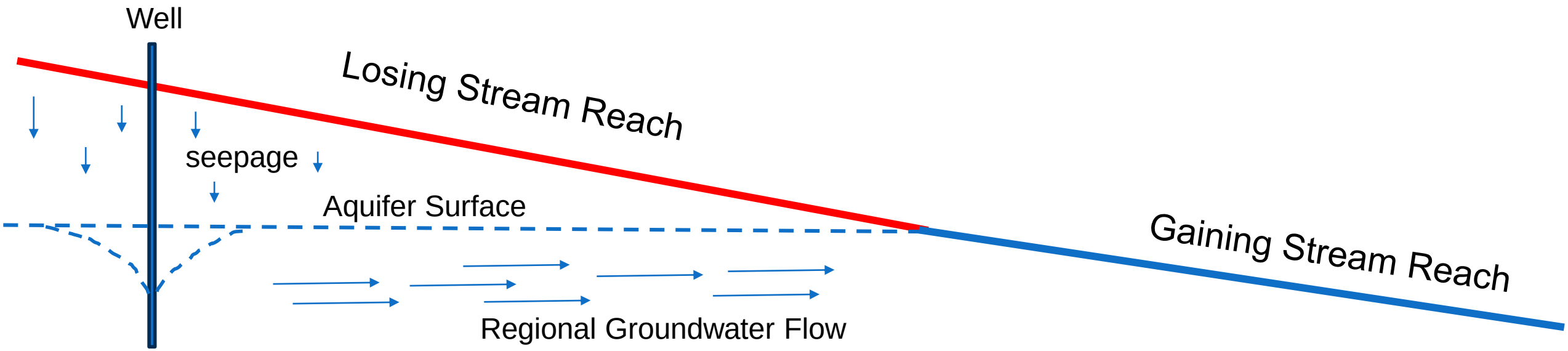
Groundwater-Surface water Connection – Stream Depletion

Stream Depletion Analysis
(rate, timing, location of depletions)

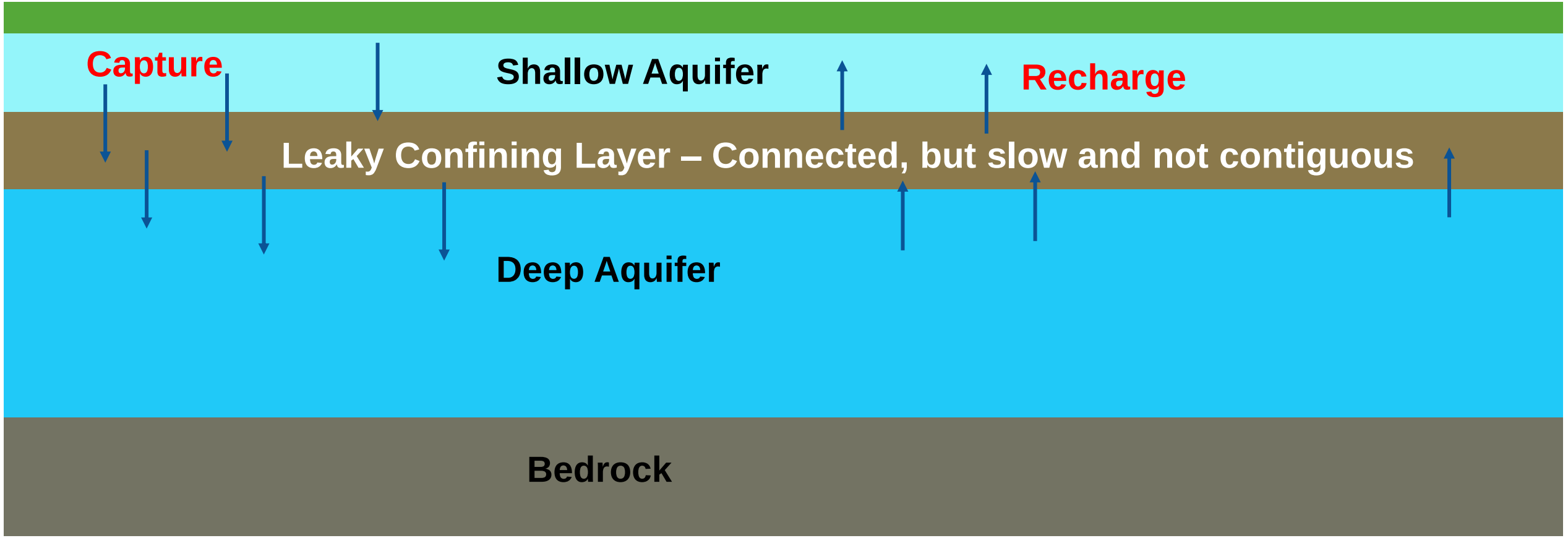
- DNRC analyses existing data: reports, well logs, elevation maps, stream measurements to determine location.
- DNRC models from pump tests to determine aquifer properties, rate and timing.



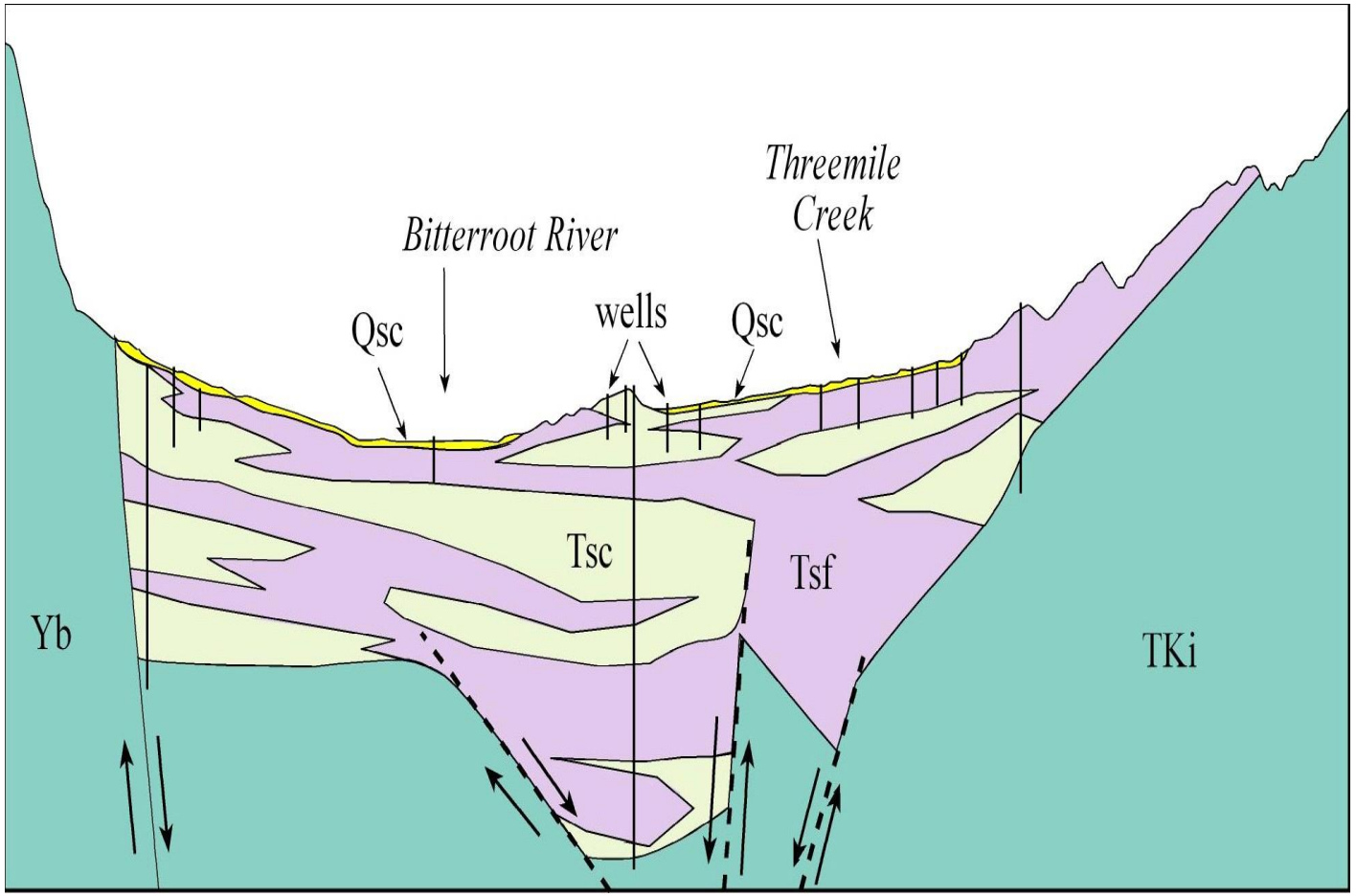
Groundwater – Surface Water Connection - Location

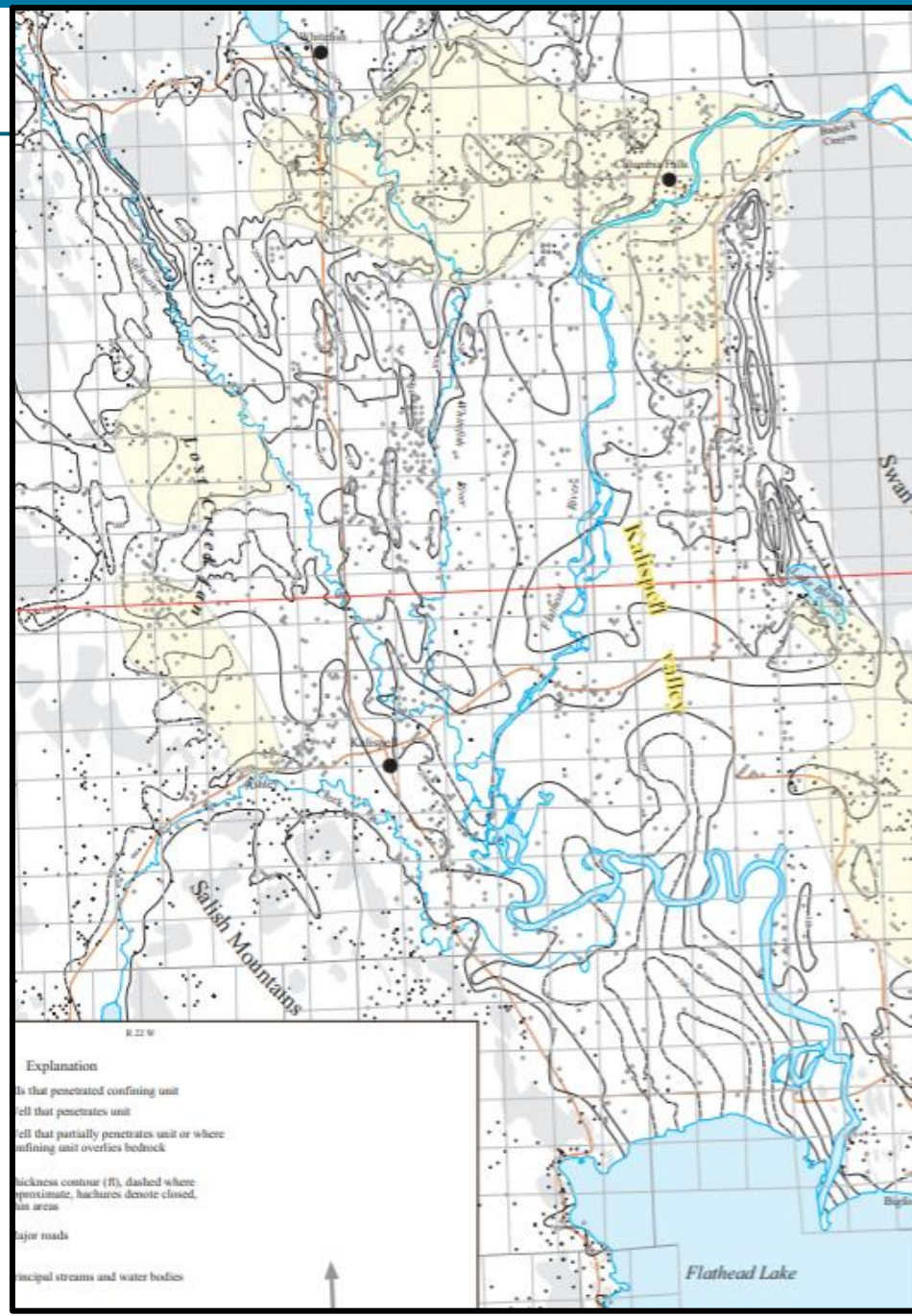


Groundwater-Surface Water Connection Vertical Connection



Bitterroot & Flathead Valley

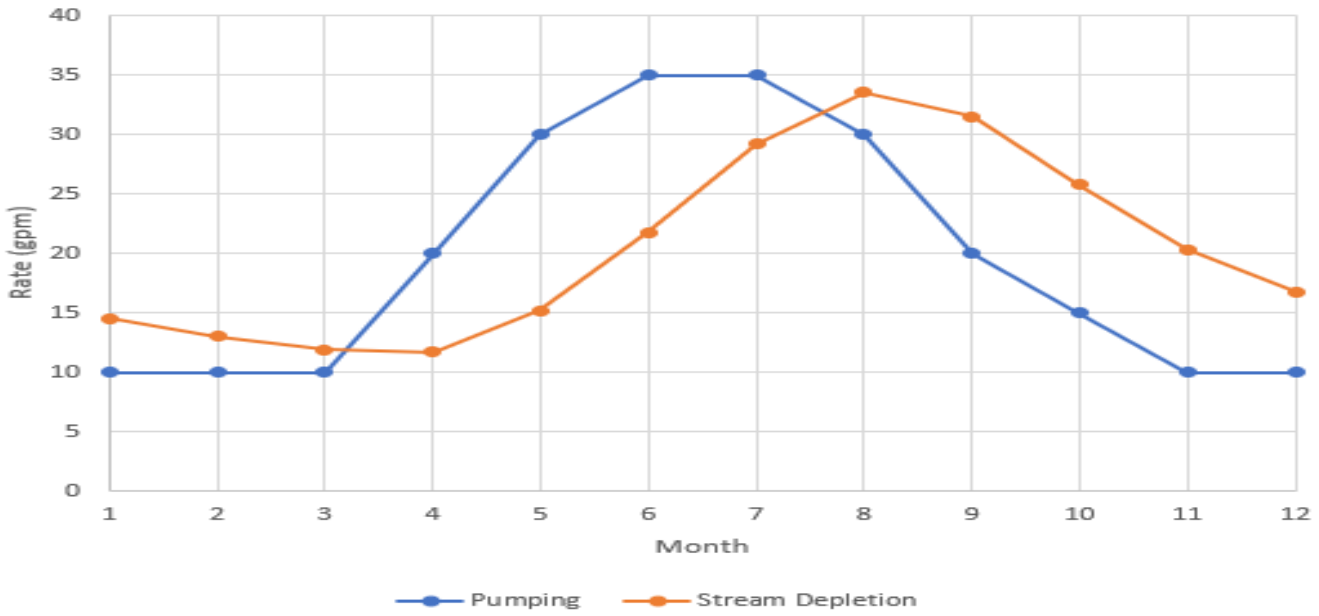


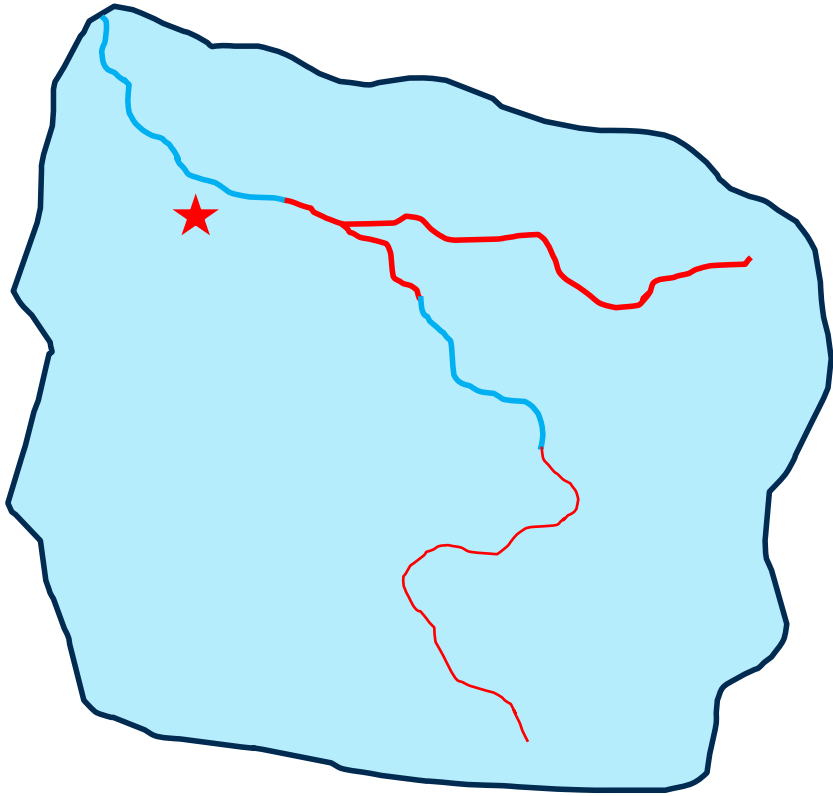


Groundwater-Surface Water Connection – Timing

Example 1

- New well is constructed near a connected stream in a shallow alluvial aquifer. Stream depletions slightly lag pumping consumptive use rate.

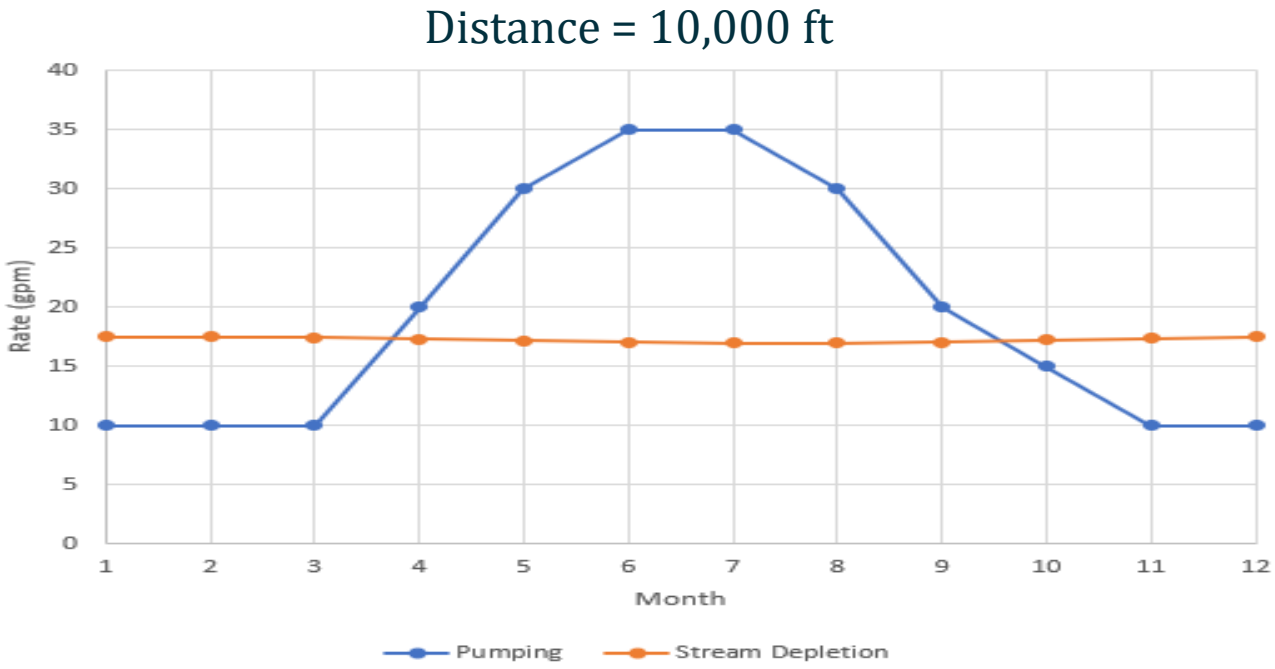


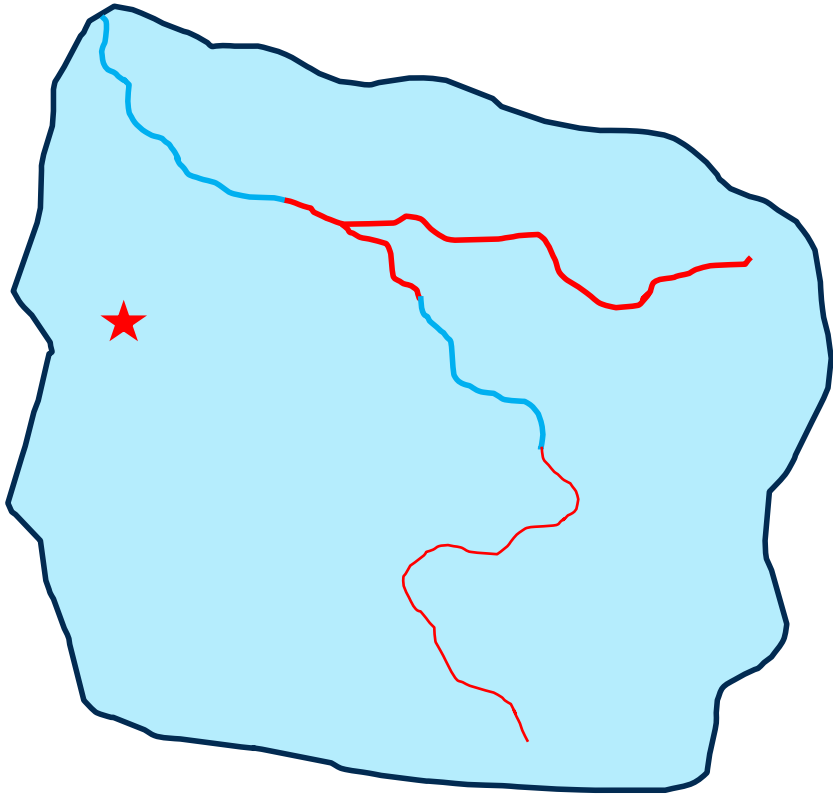


Groundwater-Surface Water Connection – Timing

Example 2

- New well is constructed far from a connected stream. Depletions take 3 months to start to show up, but then normalize to the "average" consumptive use rate.



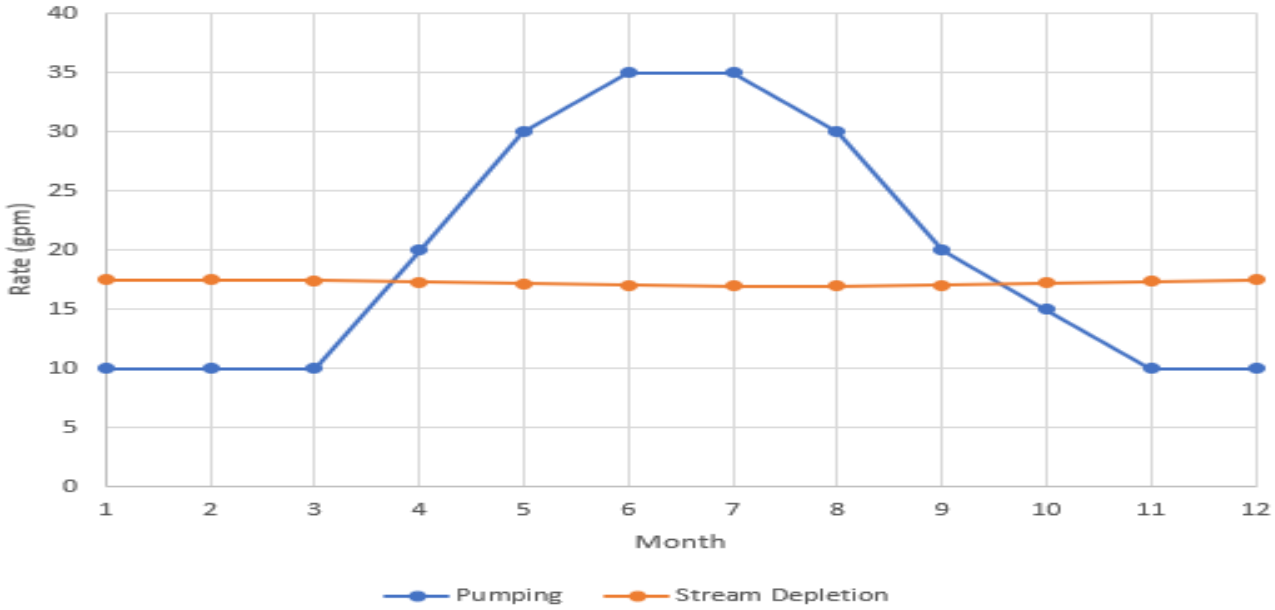


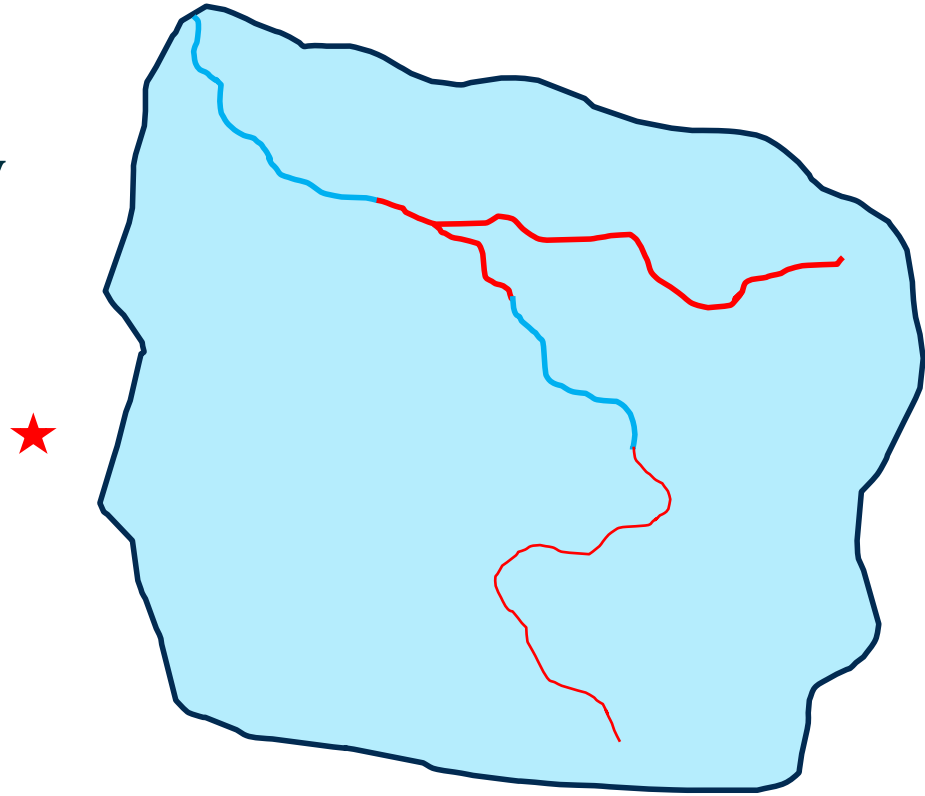
Groundwater-Surface Water Connection – Timing

Example 3

- New well is constructed far from a connected stream, in a different aquifer. Depletions take 1 year to start to show up, but then normalize to the "average" annual consumptive use rate.

Distance = 20,000 ft





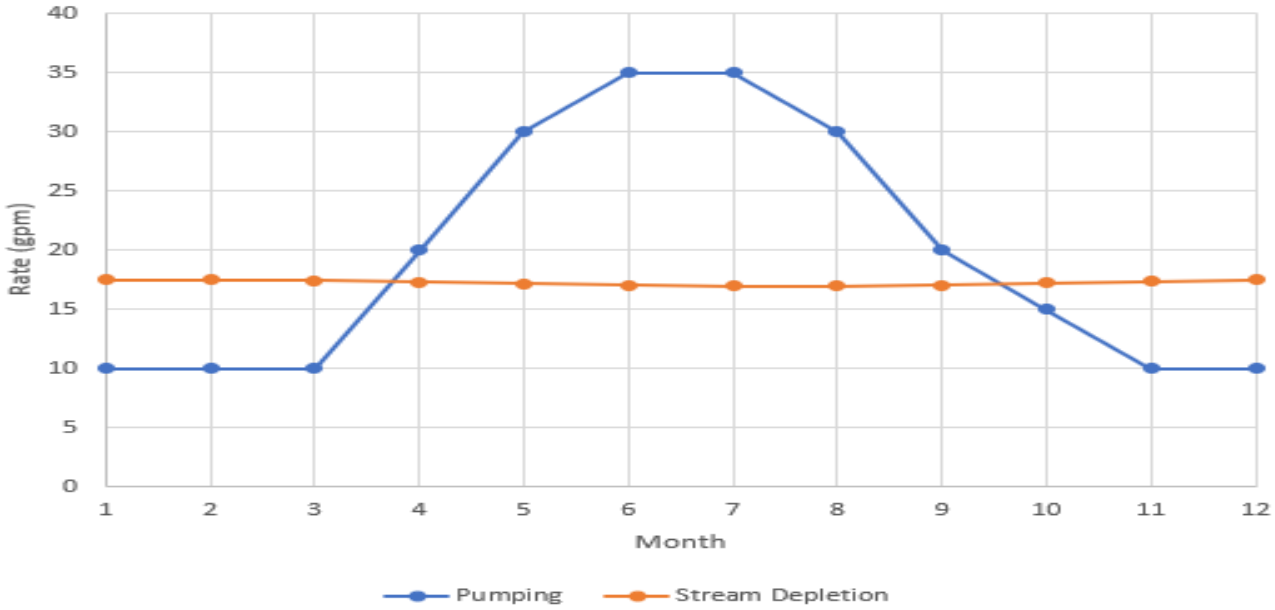
Groundwater-Surface Water Connection – Timing

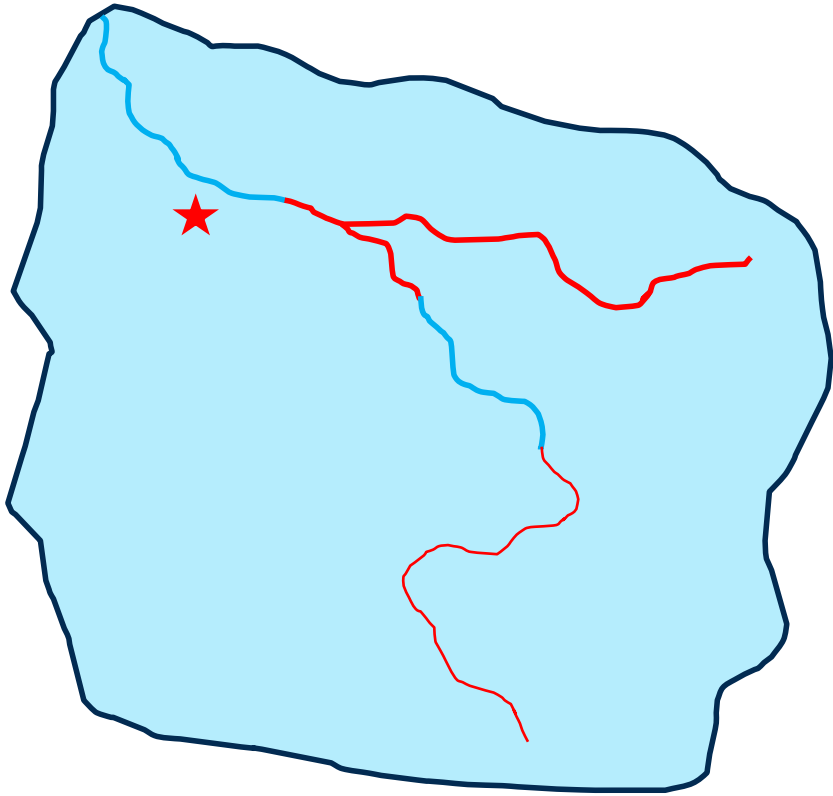
Example 4

Well in Deep Aquifer with variable or slow connection

Distance to surface water = 500 ft

Timing could take weeks to year(s?) to show up, but would likely normalize to annual consumptive use





Groundwater-Surface Water Connection

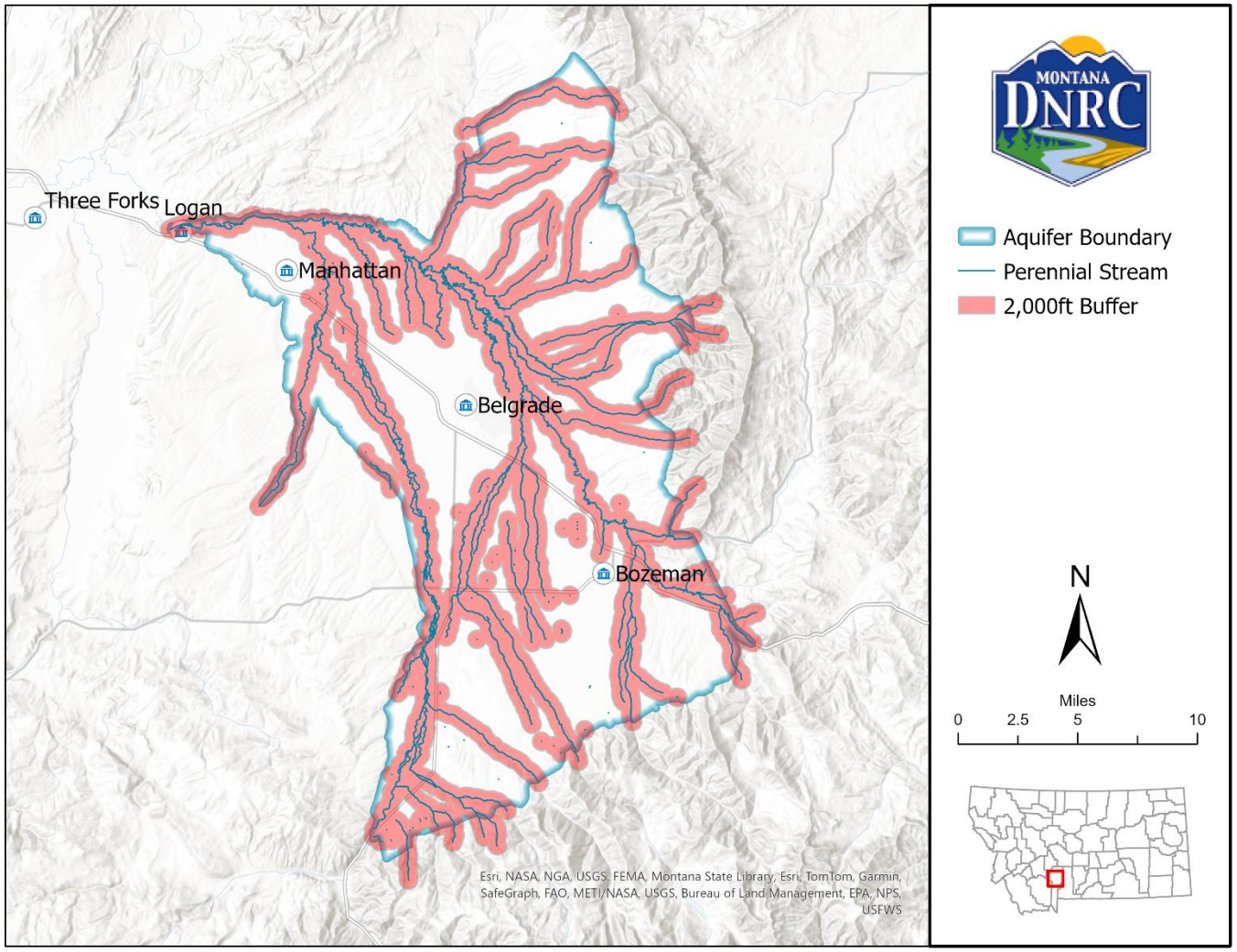
- Red and yellow CGWA boundaries/size is a policy decision
- Location and timing of depletions are the foundation of this decision
- Policy options for defining the CGWA boundaries
  - Stream buffer
  - Aquifer boundary
  - Watershed approach

Stream Buffer (e.g., Oregon)

Pro: recognizes depletions that occur in a short timeframe (days). Response to pumping is more immediate.

Con: does not recognize depletions that will occur from further wells that may still cause similar adverse effect.

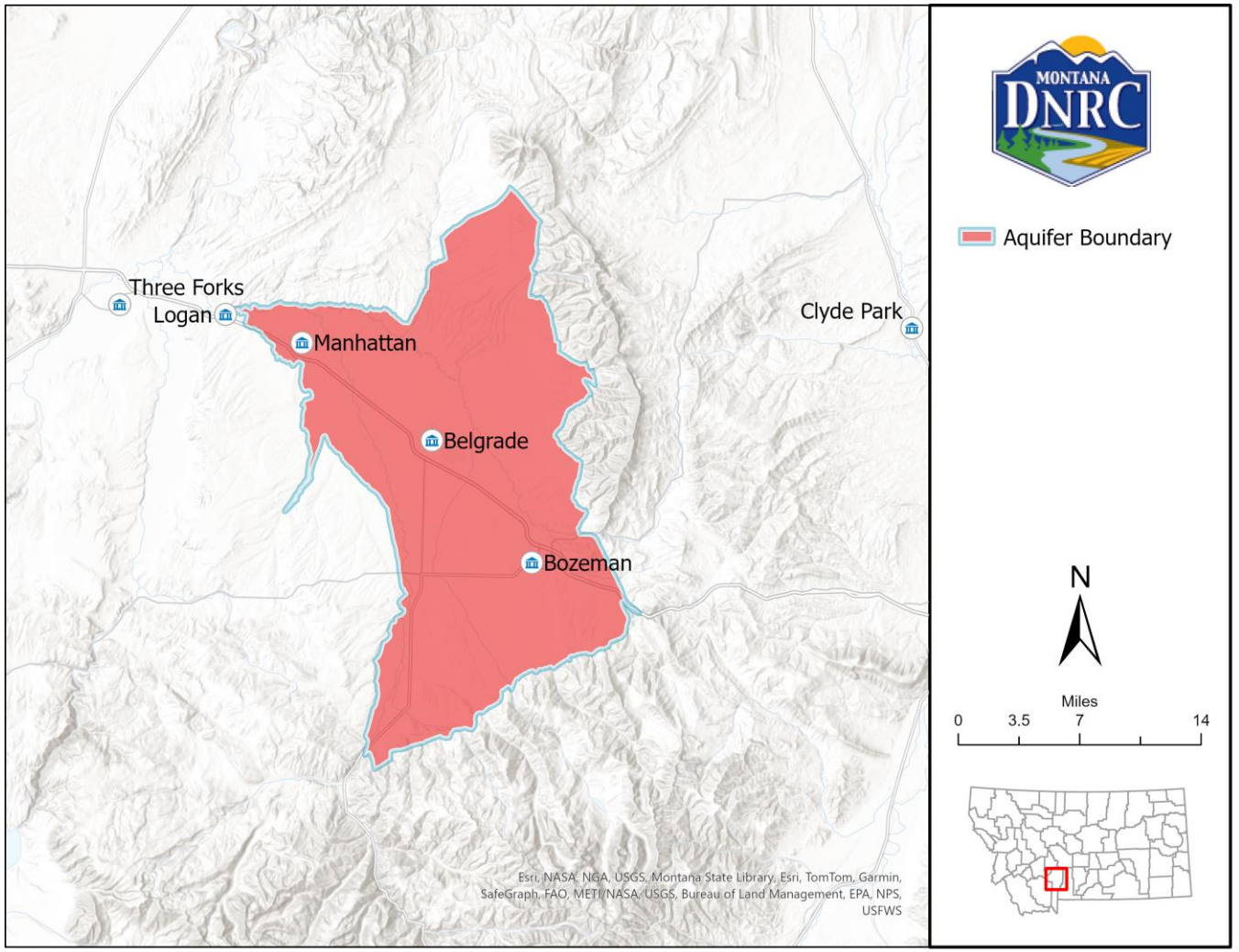
Question: "what distance" or "time" and as a buffer around how small of a stream?



Aquifer Boundary (e.g., Idaho)

Pro: recognizes depletions originating from only within the aquifer

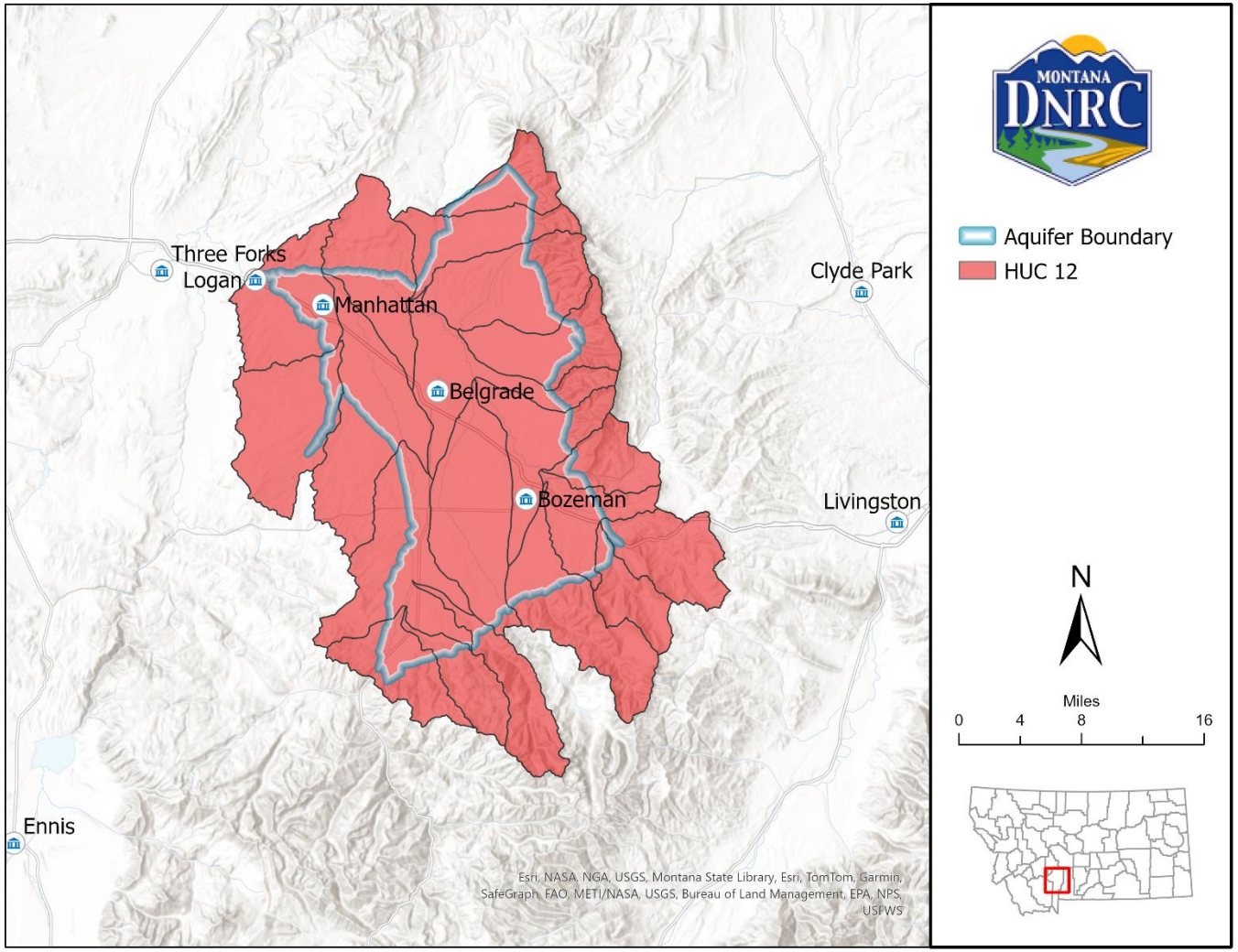
Con: does not recognize depletions originating from outside the aquifer that could cause similar adverse effect to the same surface water



Watershed Approach (HUC 12)

Pro: recognizes depletions from within the aquifer and immediately surrounding sub-watershed

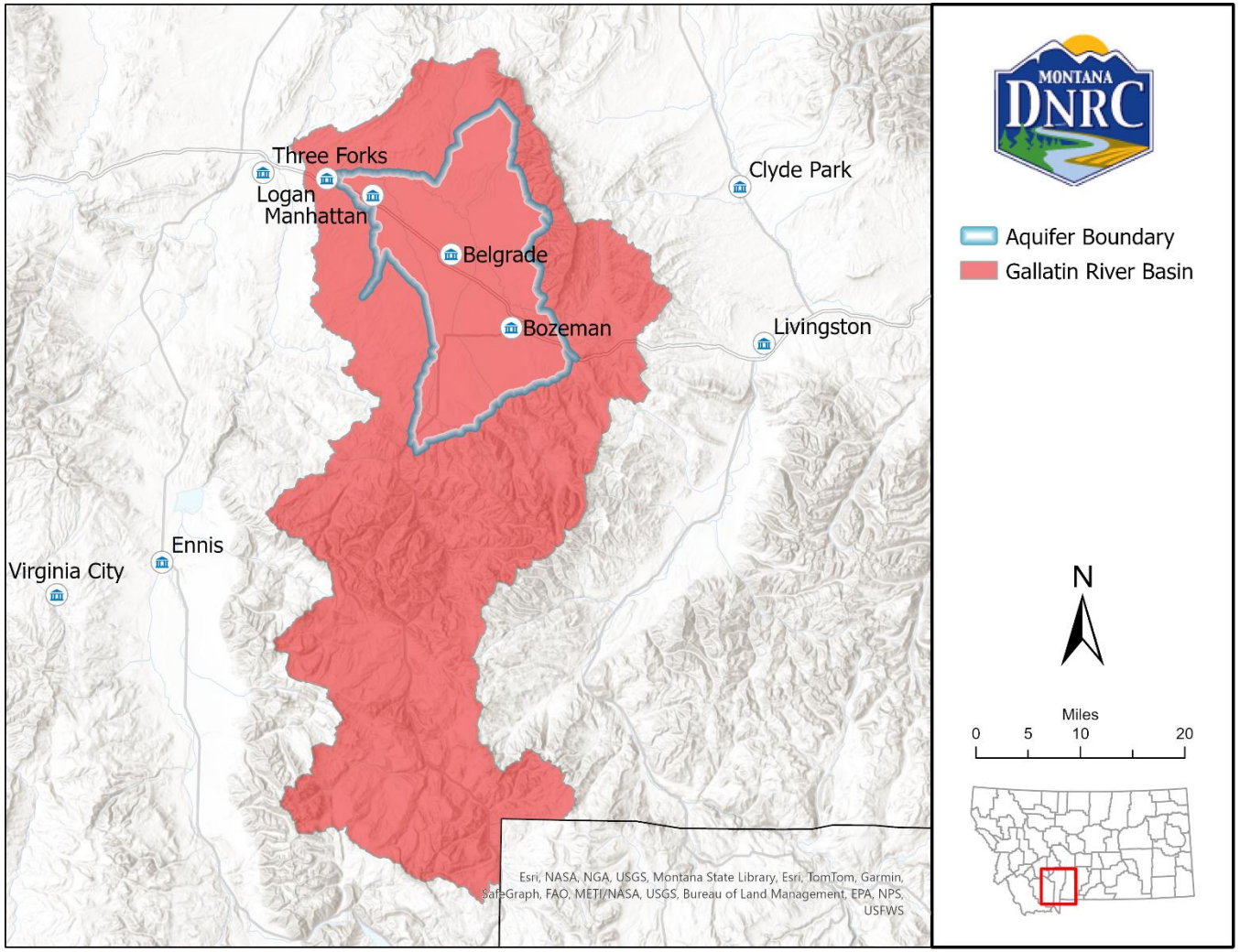
Con: does not recognize depletions that impact surface water directly upstream of sub-watershed that could still cause similar adverse effect



Watershed Approach- HUC 8 (e.g., Colorado)

Pro: recognizes depletions from within the aquifer and from anywhere within the full contributing watershed

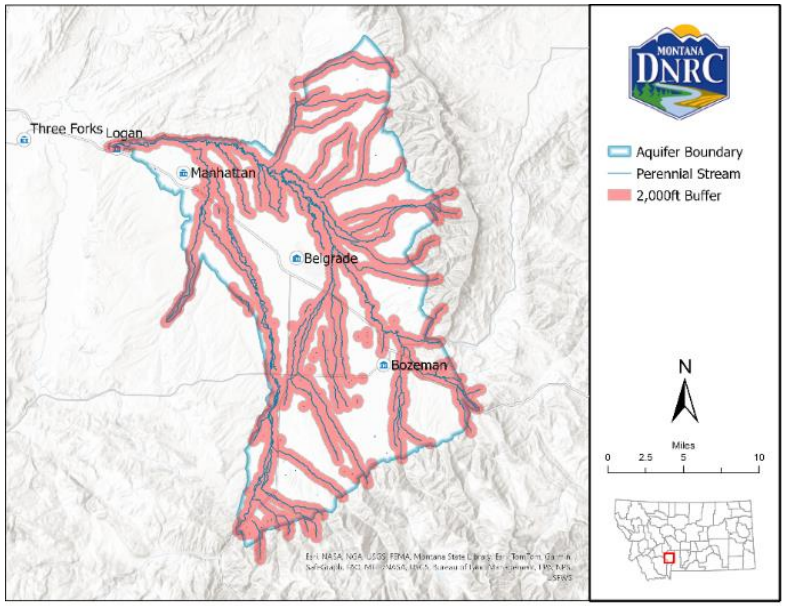
Con: Largest option for defining "Control Zone"



Recap and Decision Points

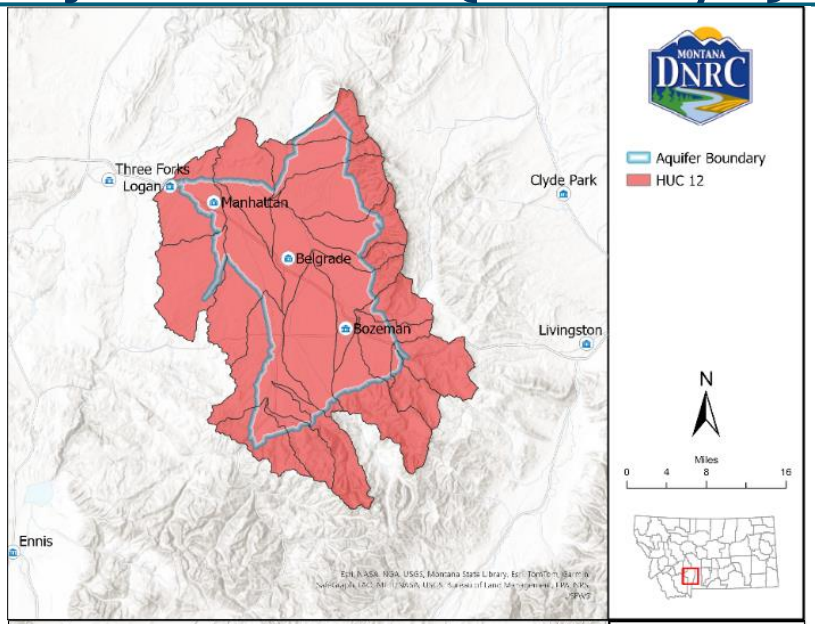
- All the “Red/Yellow” color (except Yellow at Billings) are due to Groundwater Connected to Surface Water with Limited Legal Availability, i.e., Adverse Effect
- Red and yellow CGWA boundaries/size is a policy decision
- Location and timing of depletions are the foundation of this decision
- Policy options for defining the CGWA boundaries:
  - Stream buffer
  - Aquifer boundary
  - Watershed approach

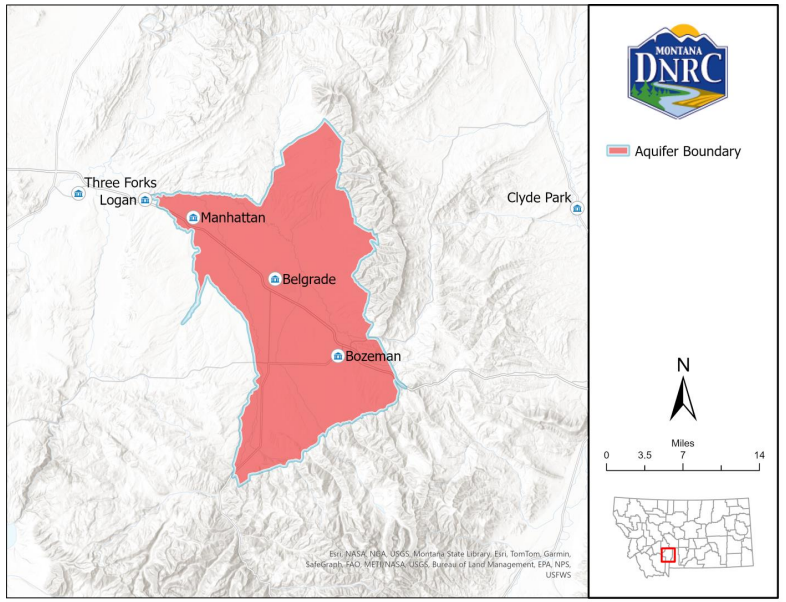
Summary Decision Point: Stream Buffer, Aquifer boundary, Watershed (HUC 12/8)?



Stream Buffer

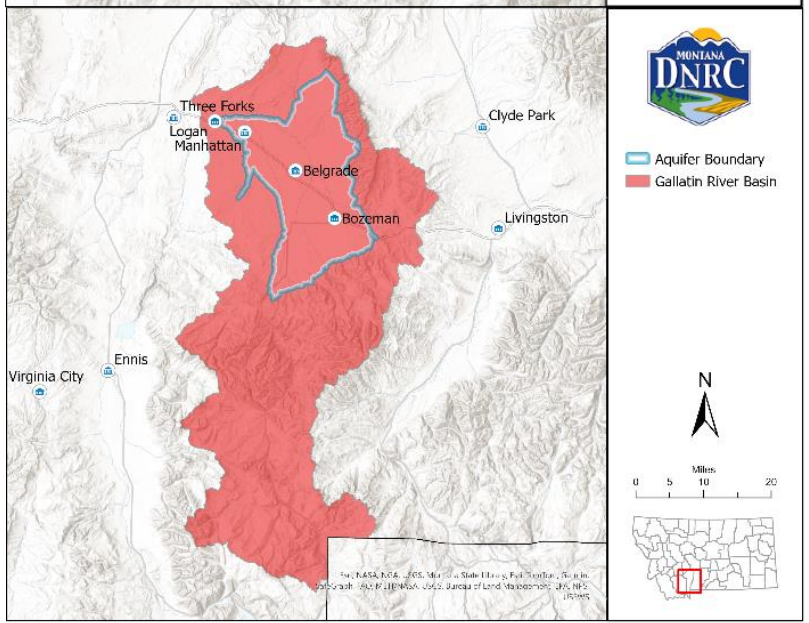
HUC 12 Sub-watershed





Aquifer Boundary

HUC 8 Sub-basin



Questions & Pause

Moving onto metering next

Metering & Reporting

- Who meters and reports their water use?
- What are the data used for?
- When should the data be reported, and how?
- How will the data be stored, and will it be made publicly available?

Who meters and reports data?

- The more data collected, the more powerful it becomes.
- With limited users reporting, data is still valuable, just requires more assumptions.
- Very small portion today meters and reports data.
- Red, Yellow, Green (?) metering and reporting would allow DNRC to integrate these data into decision-making.

What are the data used for?

- Metering and reporting informs water availability analysis. In lieu data, we are forced to make assumptions and estimations and are overly conservative.
- Metering and reporting data can support commissioner distribution.
- Metering and reporting data can be used for permit project completion verification, i.e., verifying maximum use.

When should the data be reported and how?

- Monthly would be nice; but impractical
- Annual would be sufficient
- Automated reporting is ideal (like a city water meter)
- User submitted would be sufficient
  - “In Colorado” users submit annual use data, and well meter inspectors are required to make periodic meter checks

How will the data be stored?

DNRC is beginning the process of creating a measurement database

- -Geolocated
- -Linked to water rights database
- -Surface and groundwater water use information
- -Discrete measurements not linked to water rights data
- -Could be made publicly available

Questions and Discussion

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