

Hydro-ecology and Poudre River Futures

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Outline

Address three questions:

- How does the river work (ecologically)?
 - River health
 - Hydro-ecology 101
 - What kind of river do we have today, and what might we be most concerned about in the future (ecologically)?
 - What can we do?
- Take home messages and a question for you

Geographic Focus

- Canyon mouth to Greeley
 - integrates the 1000+ square miles upstream
 - hardest working segment of the river
 - most vulnerable segment of the river
 - a focal point of the relationship between people and the river

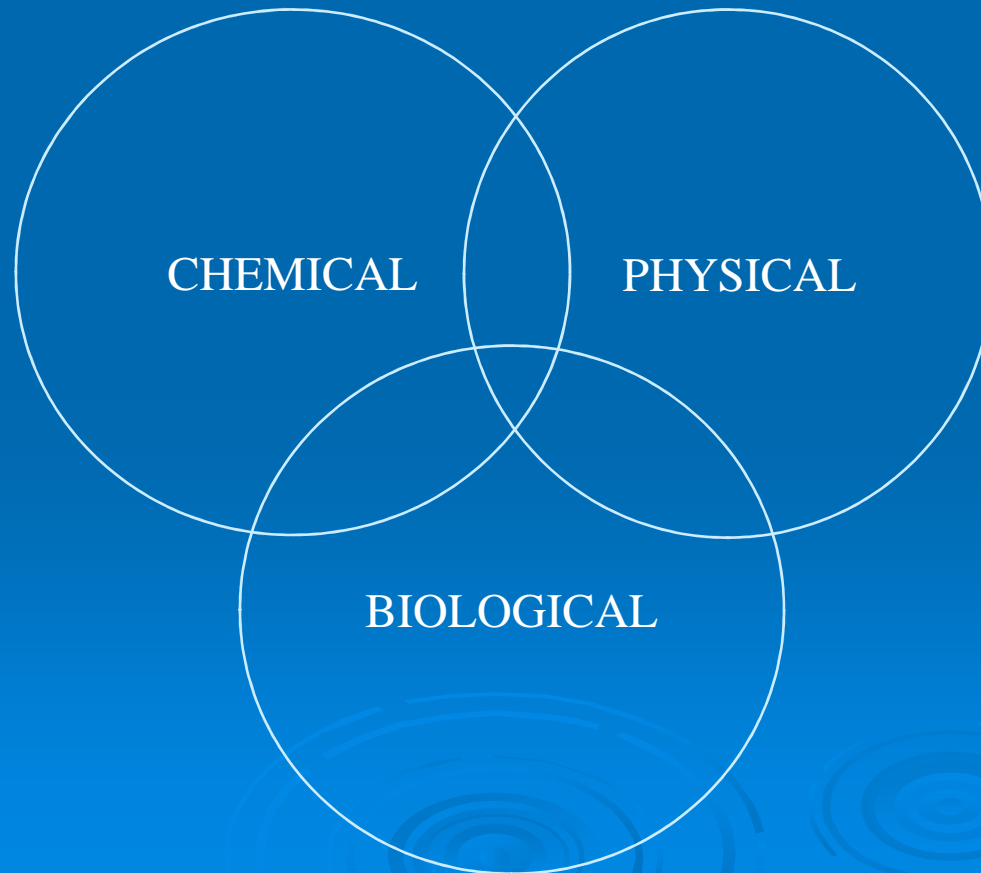


How does the river work (ecologically)?

What is river health?



“To restore and maintain the
chemical, physical, and biological
integrity of the Nation’s waters”








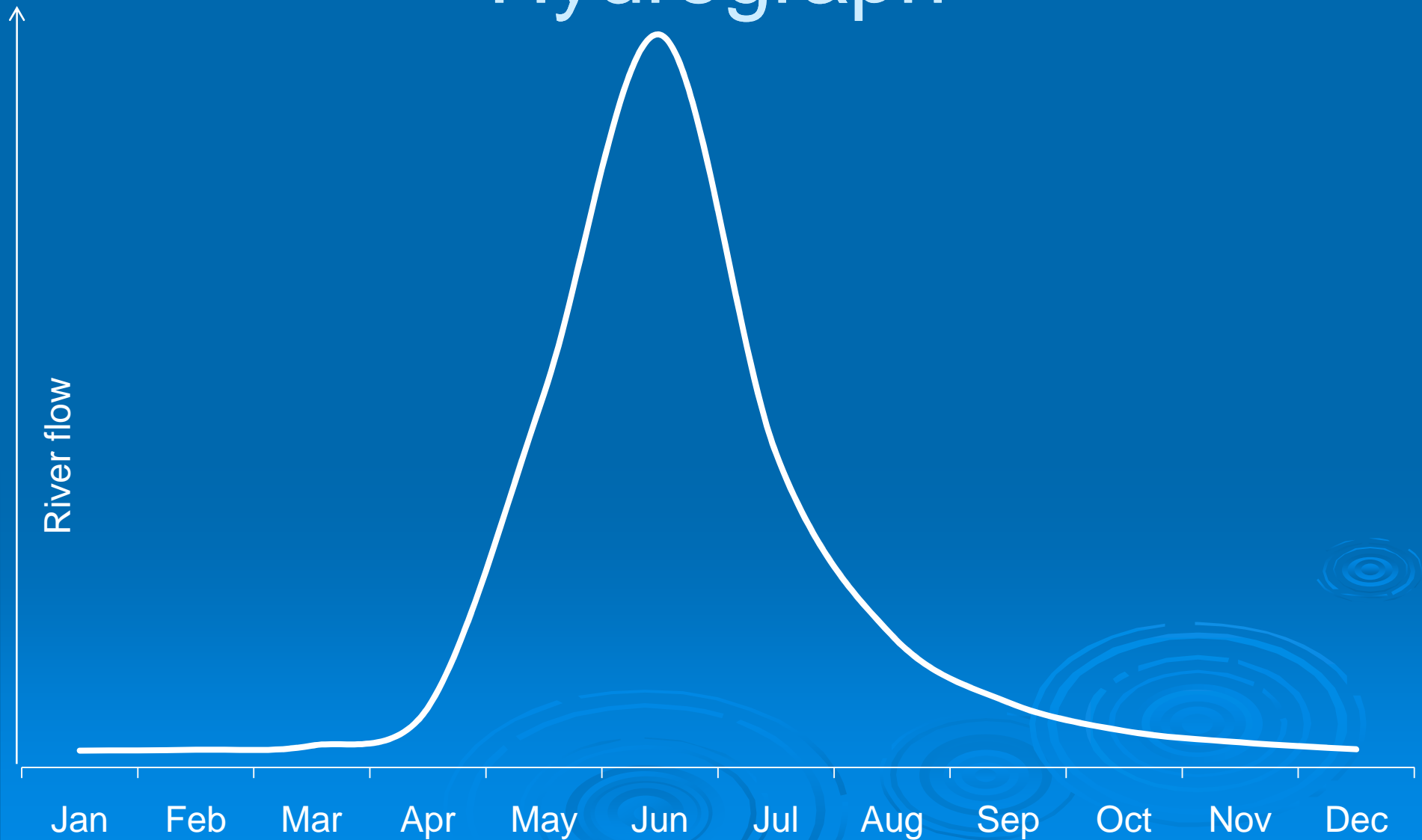
NABS (www.benthos.org)

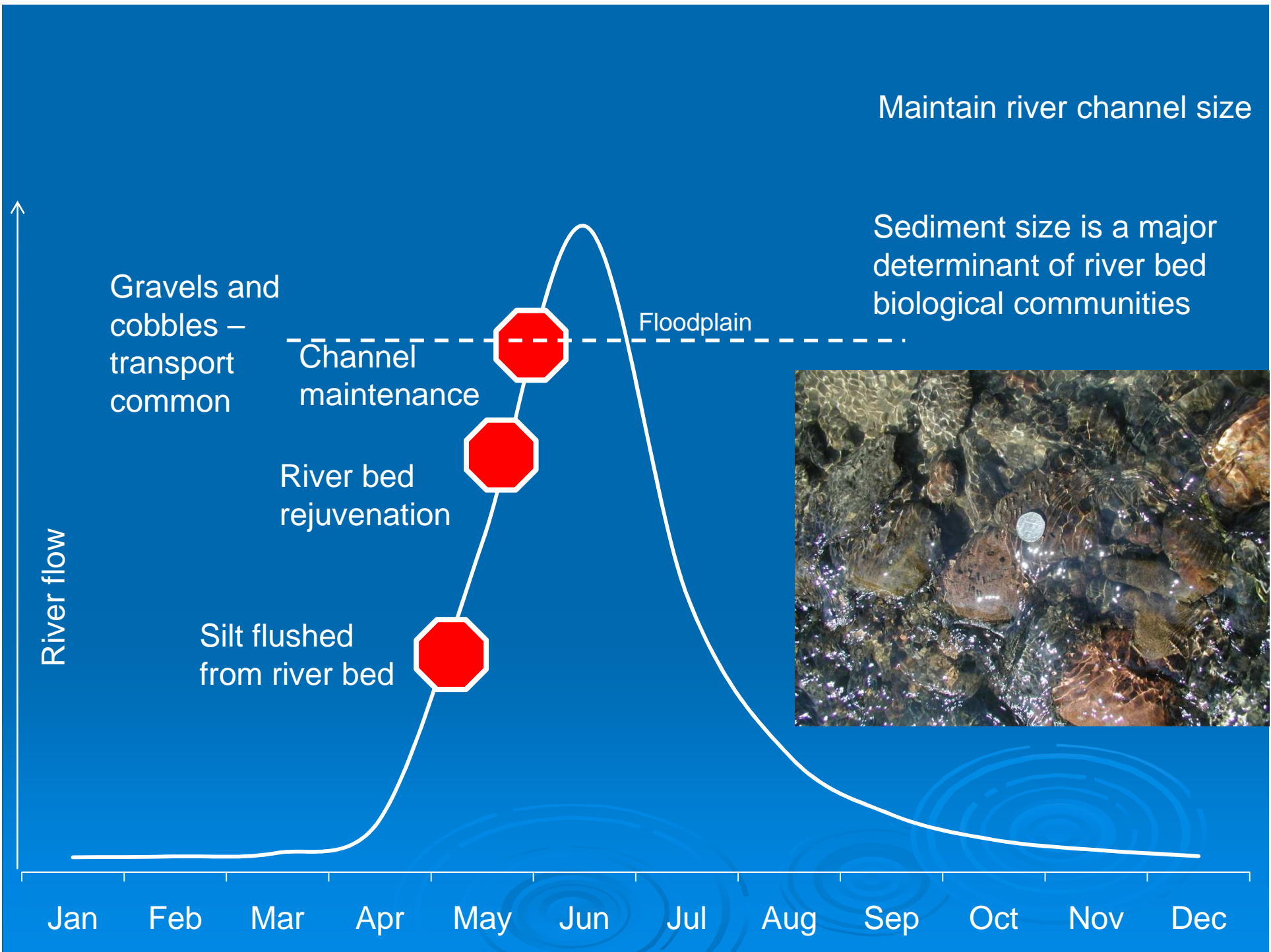


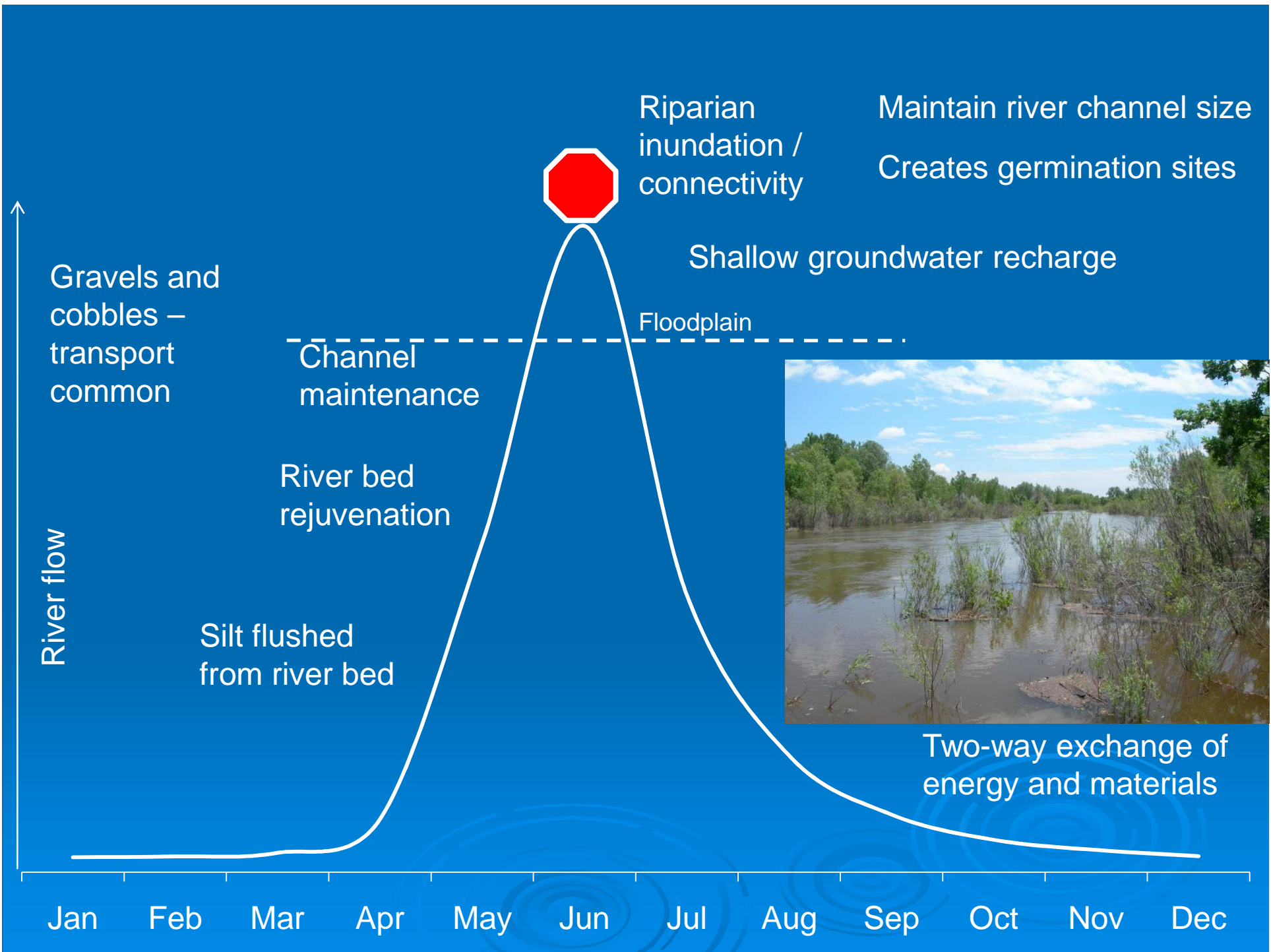
River Flow Patterns

- The “conductor” or master variable of the river ecosystem
 - 5 key characteristics:
 - Magnitude
 - Frequency
 - Duration
 - Timing
 - Rate of Change
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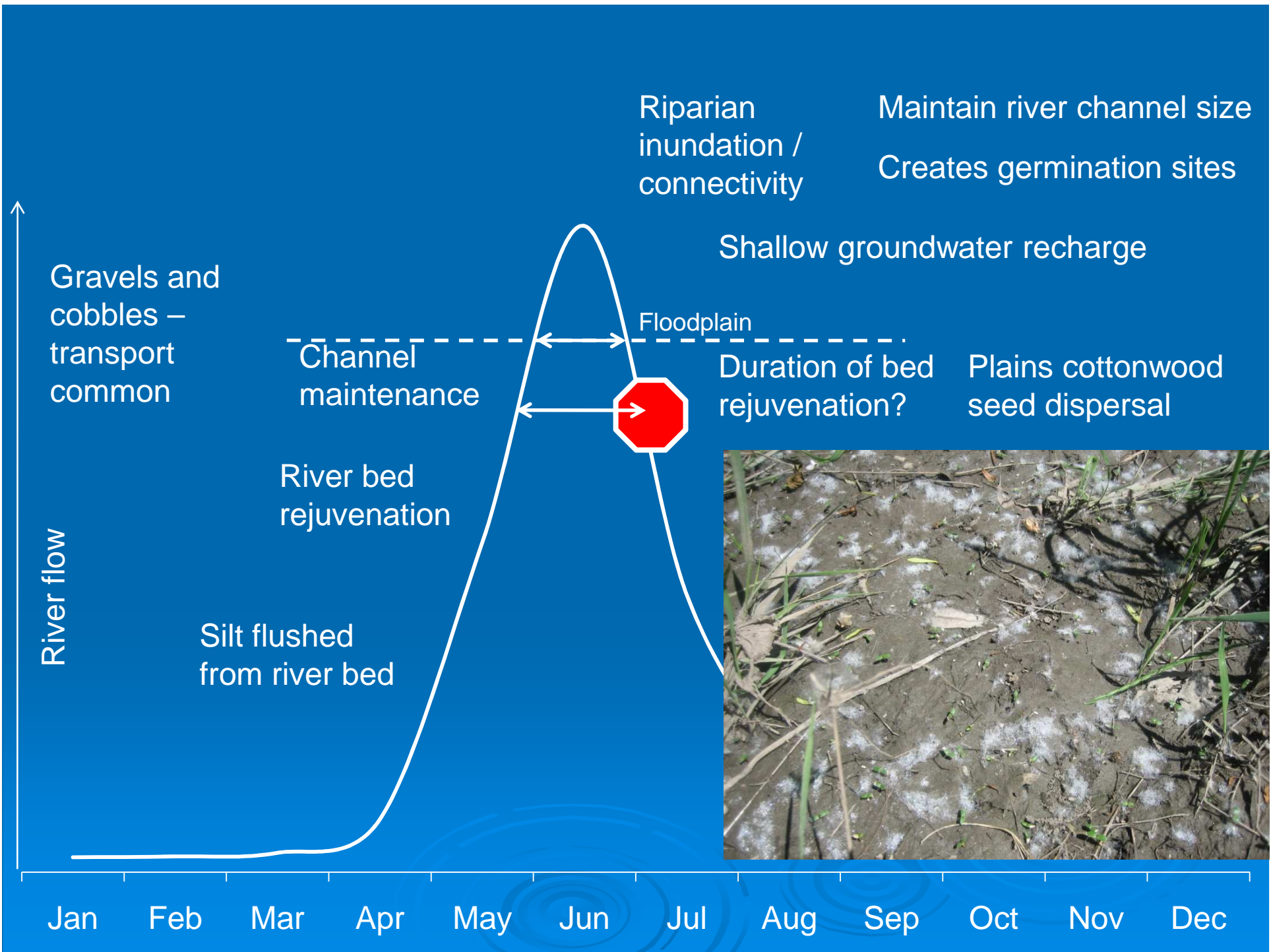
A Brief Tour of a Poudre River Hydrograph











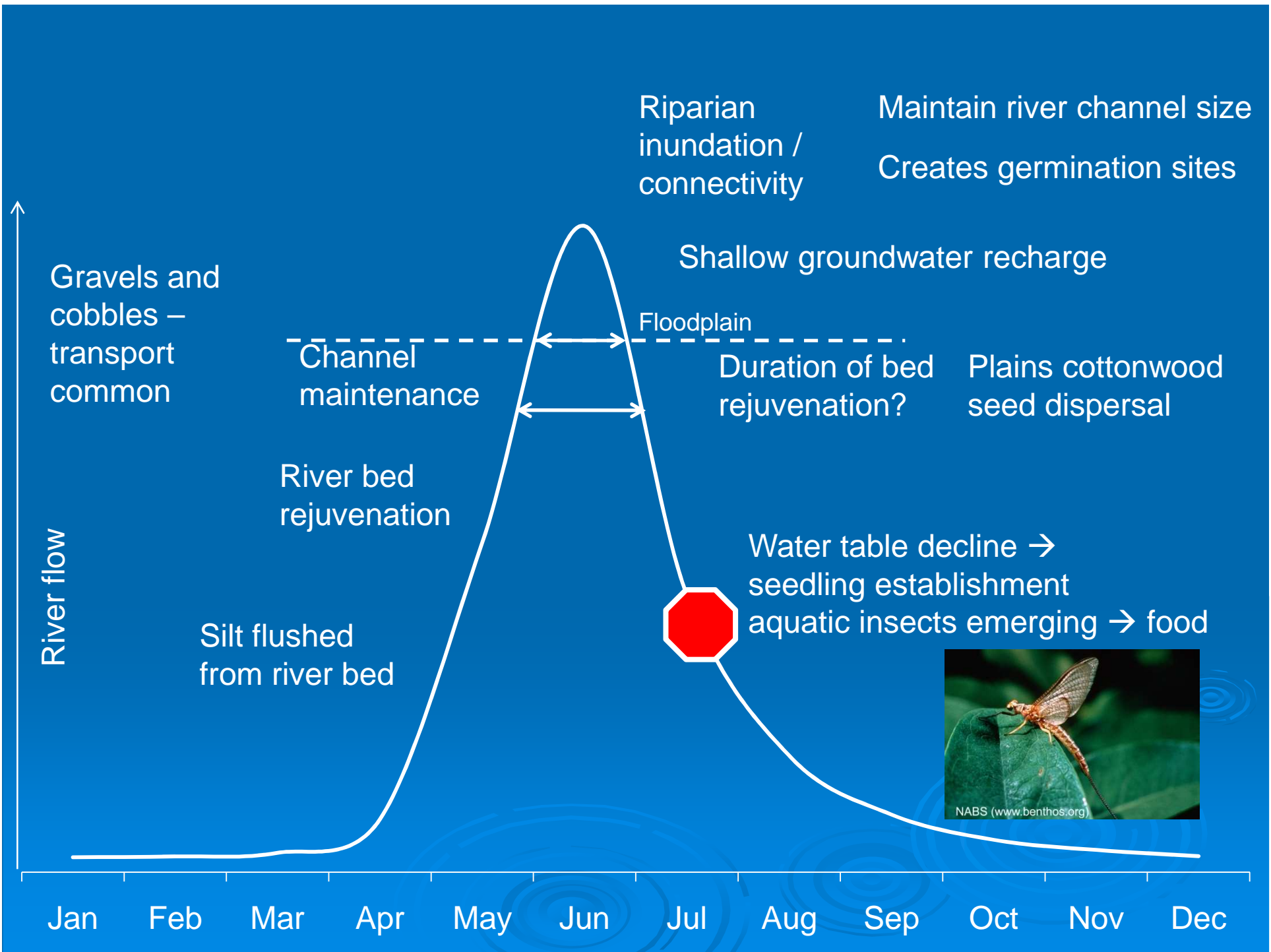
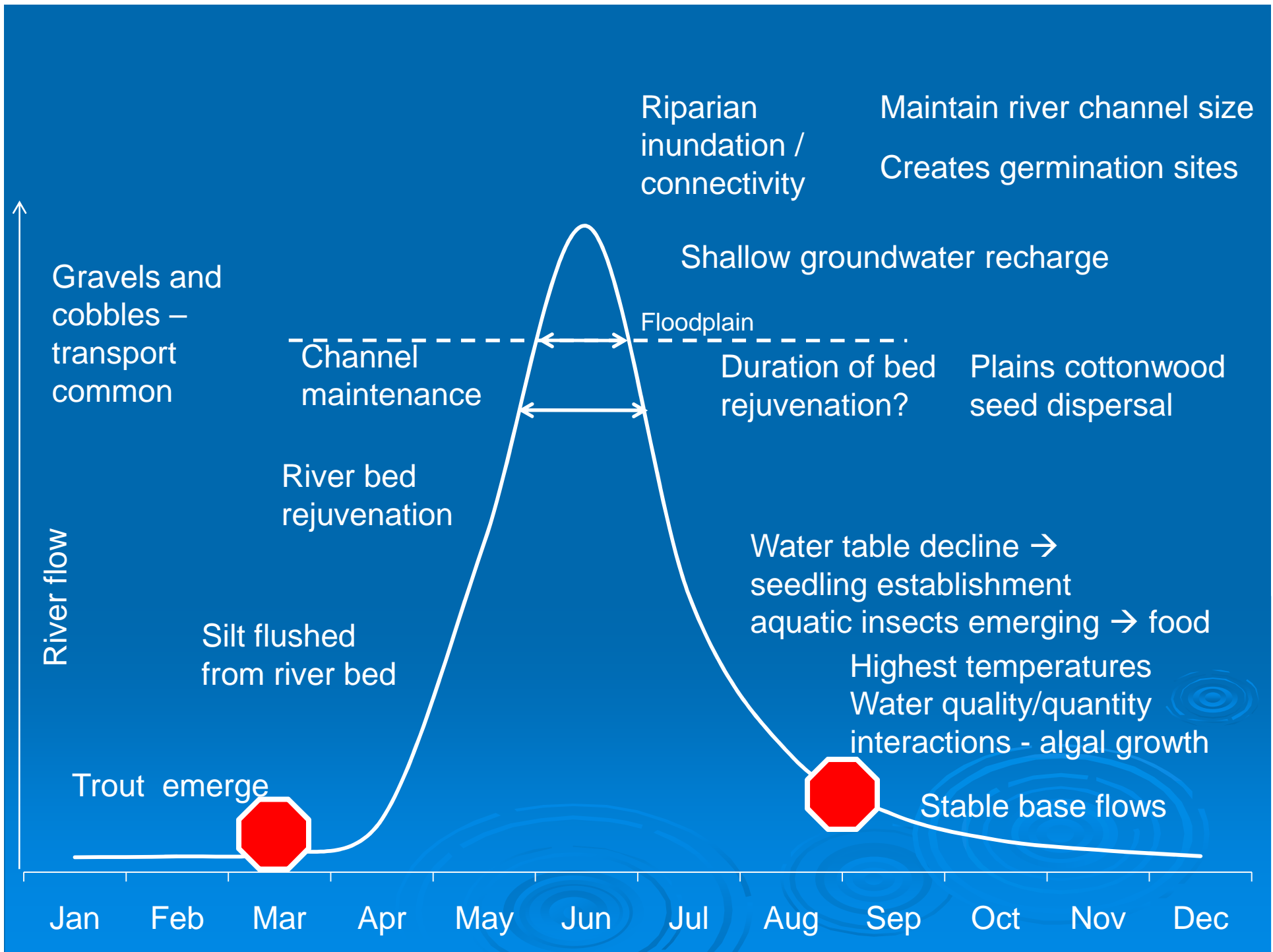




Photo courtesy of
David Merritt USFS





Brown trout

Late summer / fall temps < ~74 °F
Fall spawning

Spring emergence

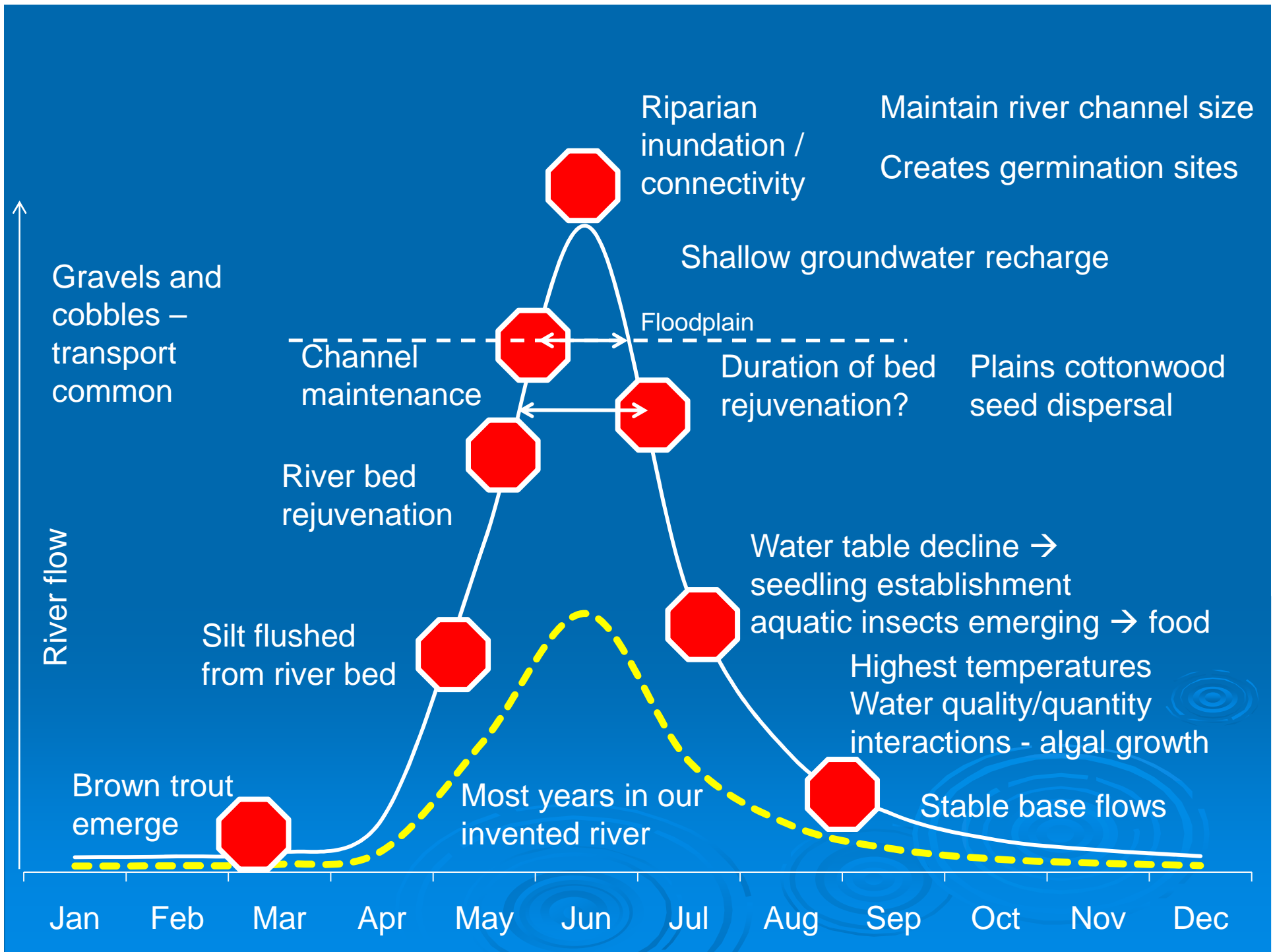


Photo Credit: Dave (Gio) Giordano


What kind of river do we have today (ecologically)?

What might we be most concerned about?





Some Key Concerns

- Degraded water quality
 - River bed clogged with sediment
 - More filamentous algae
 - Maintain fisheries (trout and native)
 - Maintain flood conveyance
 - Maintain recreation and aesthetic appeal
 - Maintain valued biota
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Reduced Summer Low Flows

- Loads of N and P result in higher concentrations in less water
- Higher temperatures
- Water quality / quantity interactions

MORE PRODUCTION OF ALGAE

WITH SHIFTS TO FILAMENTOUS FORMS

– reduced aesthetic appeal for fishing and recreation, also food web effects



Summer / Fall Base Flows



Stable base flows

Temperatures cool enough
to maintain trout

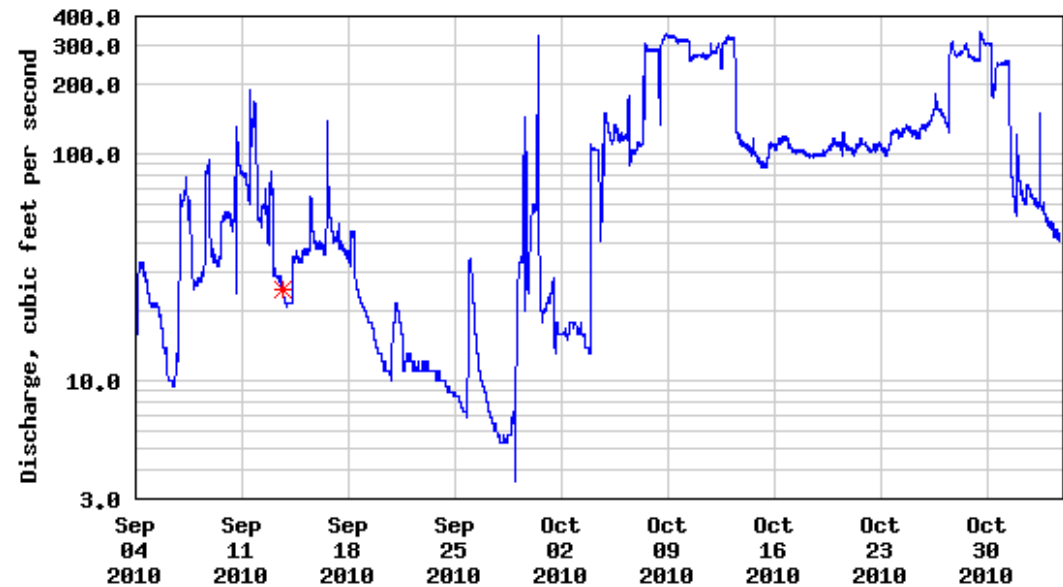
Jul

Aug

Sep



USGS 06752260 CACHE LA POUDE RIVER AT FORT COLLINS, CO



----- Provisional Data Subject to Revision -----

— Discharge

* Measured discharge

Unstable base flows

Too warm for trout survival

Jul

Aug

Sep

What if very low flows extend into winter?



Spring emergence or frozen?

Flood Conveyance





Looking upstream
from Shields Ave. in
Fort Collins - 2004

Same location 2010







Fort Collins 1904

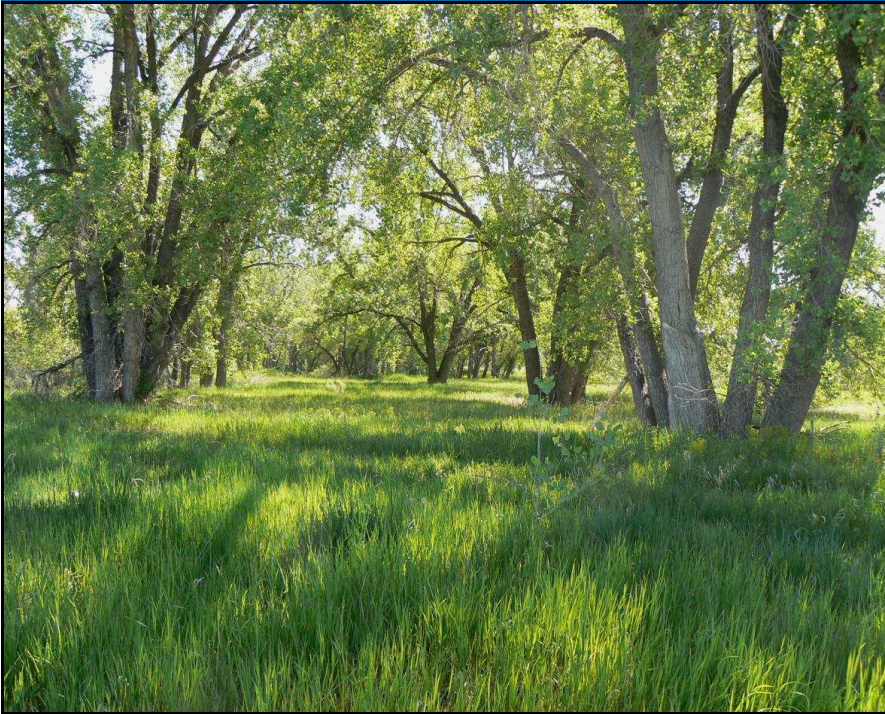


1999

Valued biota



Plains cottonwood



Trout and Native Fish Habitat



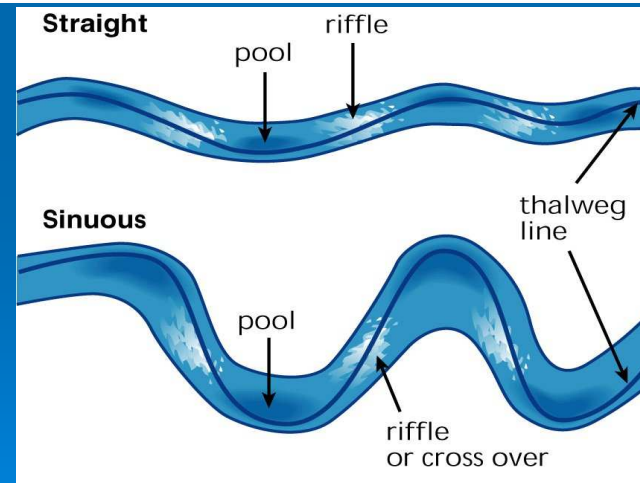
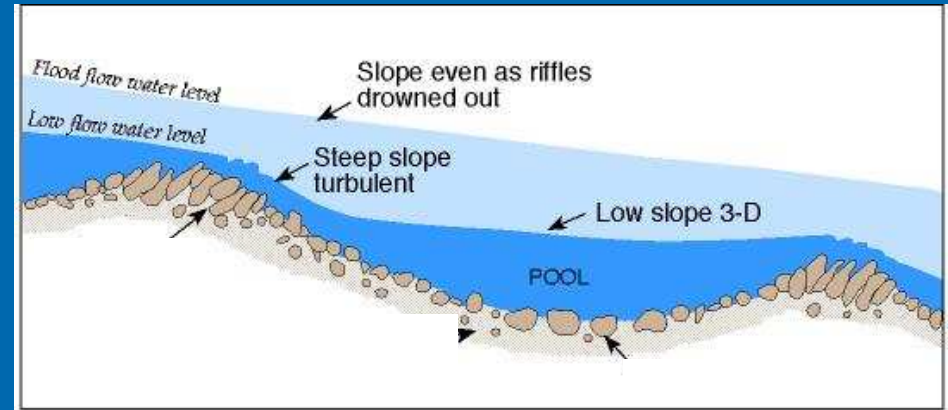


Photo Courtesy of Greg Wilkerson

Cinderella's castle - Disneyland

A meandering river...

But does it have diverse habitat for fishes?



Many combinations of depth, flow velocity, and gravel sizes?

What can we do?

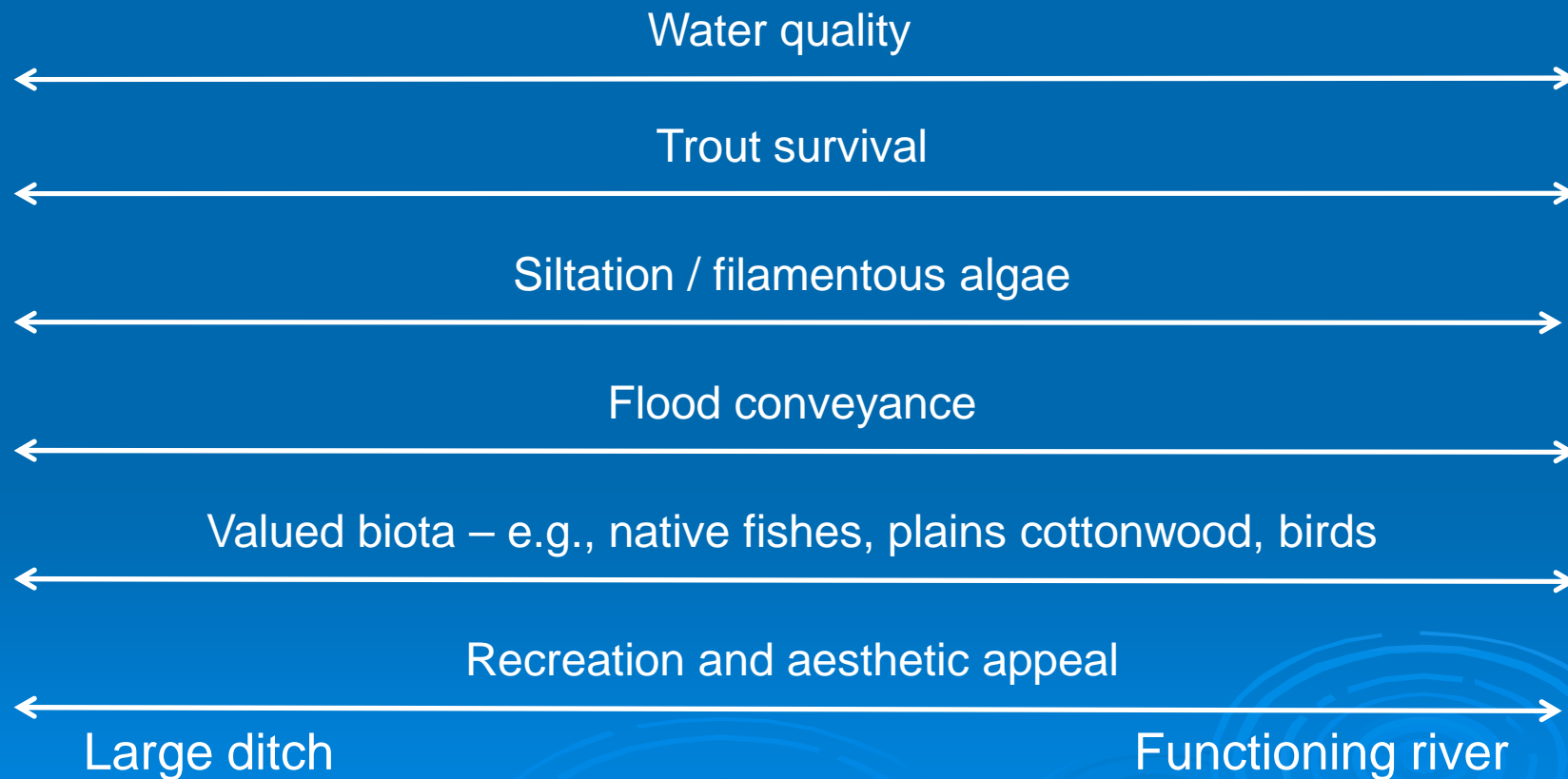
- Work towards environmental flows that conserve river amenities and functions
 - Some aspects easier than others
 - Engineers need numbers
 - Incremental approach based on measured successes
- Reduce waste and inefficiency
 - Cooperation, conservation, reuse
- Economic valuation of and payments for ecosystem services

Restoration?

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.



A Spectrum of Poudre River Futures



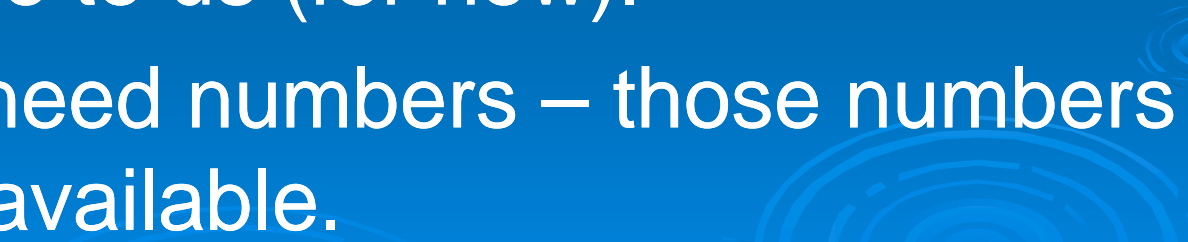
More Risk

Less Risk

Take Home Messages

- The Poudre River is not going back to pre-development conditions – irreversible change has occurred – now an invented river ecosystem
- Restoration is not returning the river to an undeveloped historical condition. It is assisting the recovery and sustainability of an ecosystem that has been damaged.

Take Home Messages

- The current trend of deteriorating river integrity and amenities can be reversed with environmental flows and sound long-term stewardship that balances human demands with ecosystem needs.
 - A wide range of alternative river futures is still available to us (for now).
 - Engineers need numbers – those numbers are mostly available.
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Take Home Messages

- Focus on river services / amenities that we value the most:
 - Clean water
 - Trout and native fishes
 - Valued flora and fauna
 - Flood conveyance
 - Recreation and aesthetic appeal...
 - Healthy farms and cities are compatible with sustaining these river amenities
 - **WE MUST HAVE A VISION!**
- 

Planning an alternative future for the river

What's your vision?



“The significant problems we face cannot be solved at the same level of thinking we were at when we created them.”

-Albert Einstein

Einstein also studied rivers:

Einstein, A., 1926. [The cause of the formation of meanders in the courses of rivers and of the so-called Baer's Law.](#) Read before the Prussian Academy, January 7, 1926. Published in *Die Naturwissenschaften*, Vol. 14. [English translation in "Ideas and Opinions," by Albert Einstein, Modern Library, 1994].