



University of
Massachusetts
Amherst

Hydraulic analysis and risk assessment of a proposed fish barrier for Johnson Creek, Utah.

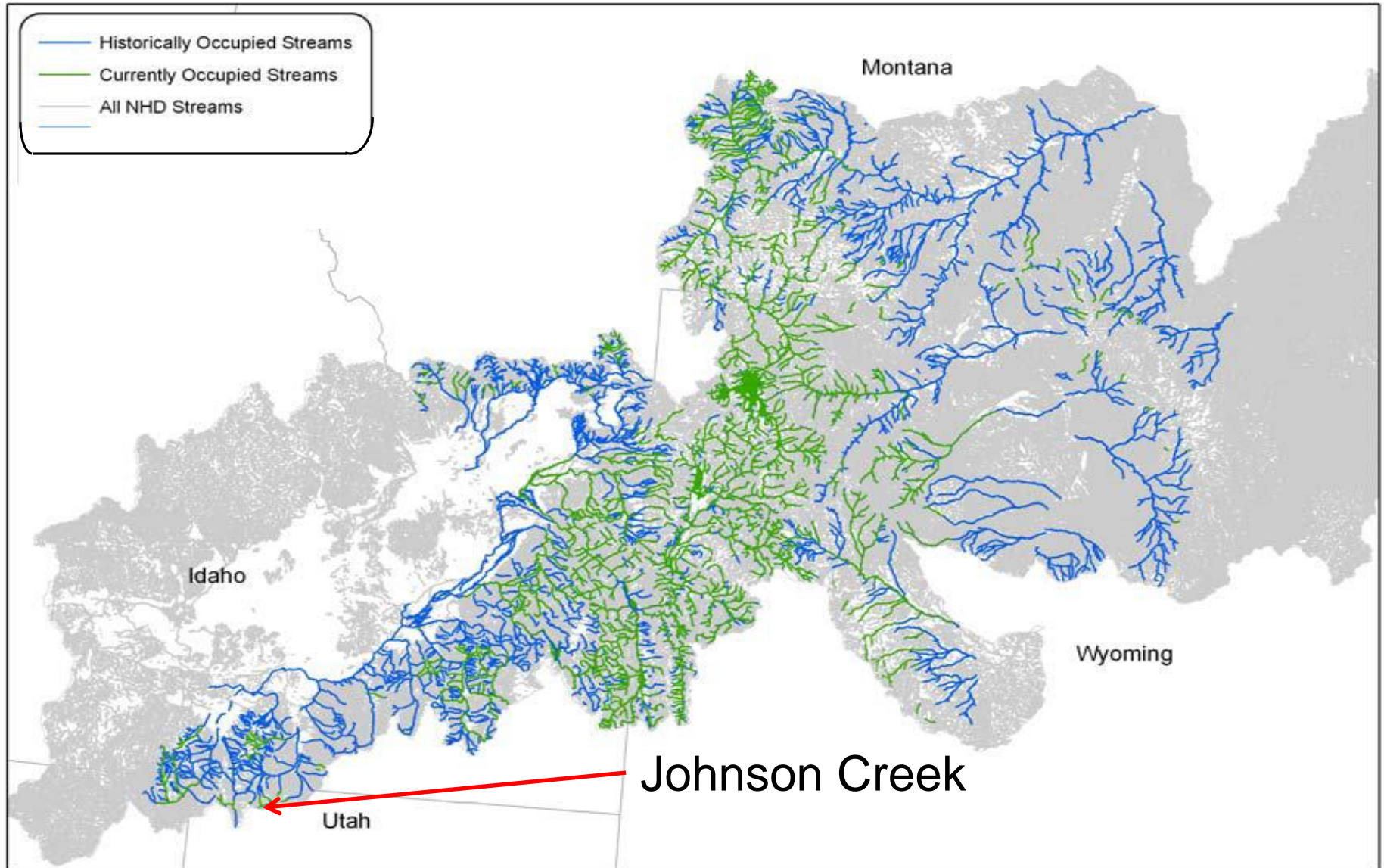
Item Type	event;event
Authors	Hunter, S.
Download date	2026-05-19 15:05:26
Link to Item	https://hdl.handle.net/20.500.14394/24753

Hydraulic & Risk Assessment of Fish Barrier Alternatives on Johnson Creek, Utah

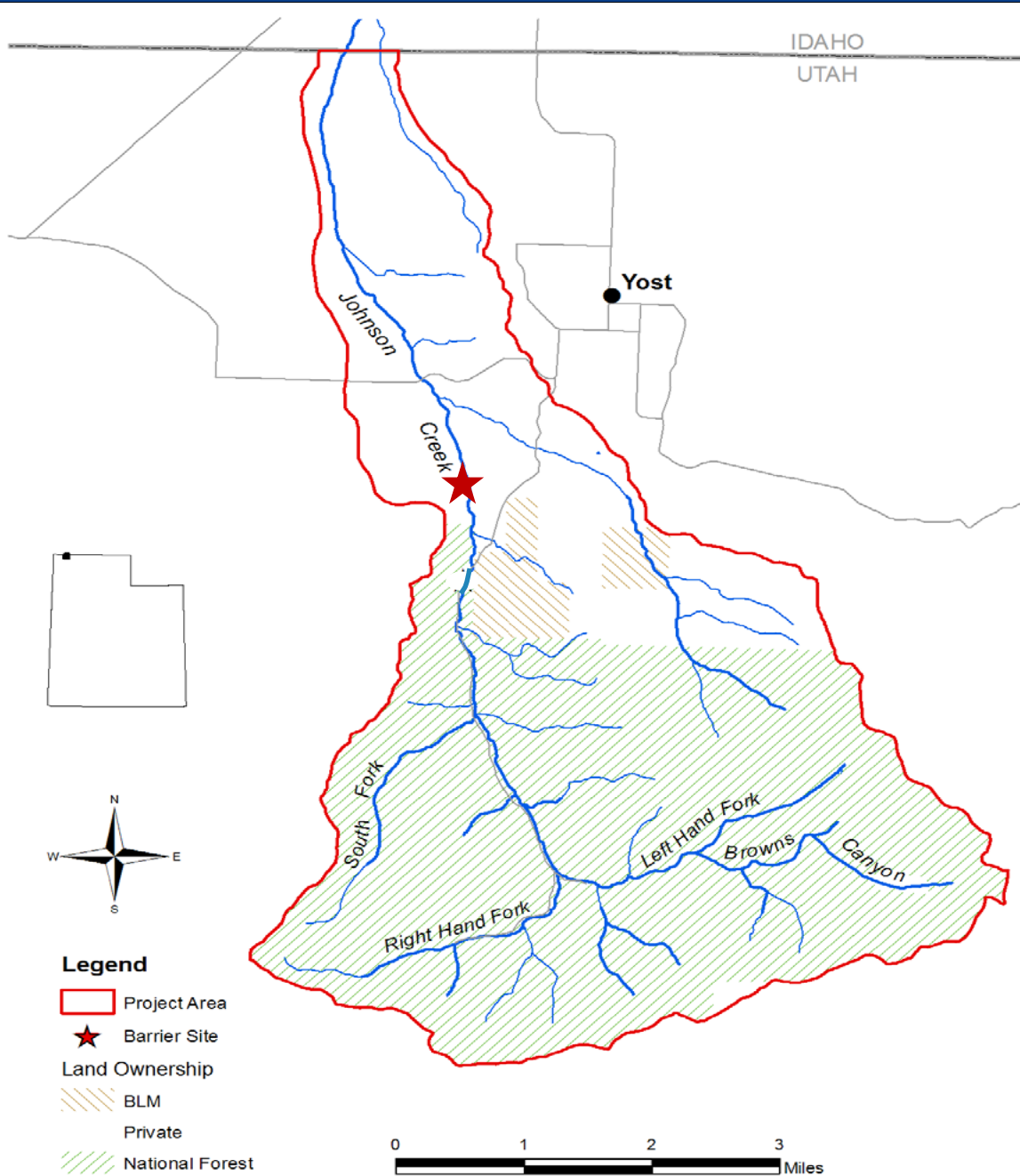




Johnson Creek



Yellowstone Cutthroat Distribution





K. Morita image

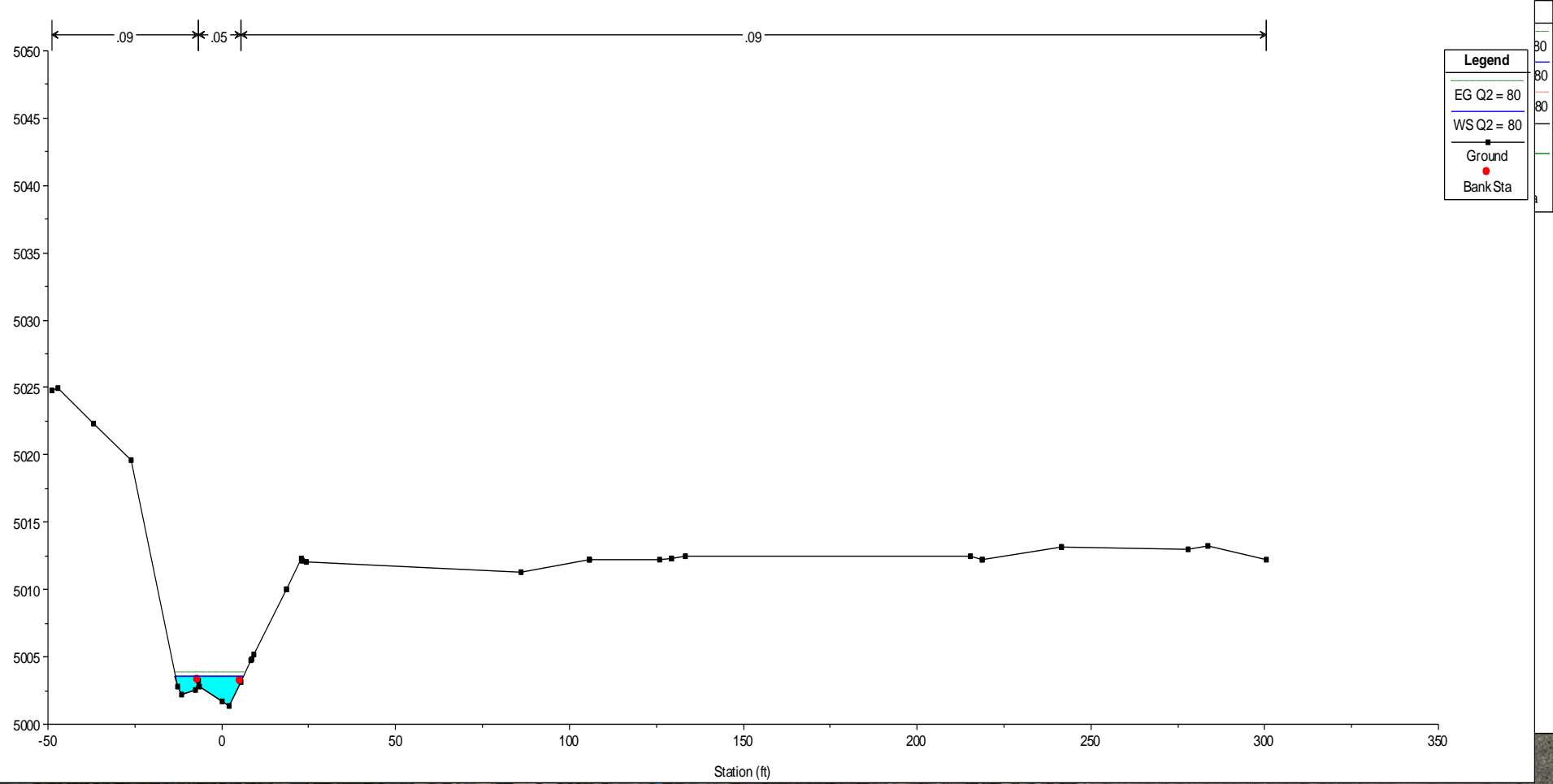
Stop Brook Trout
100 year flood =
326 cfs





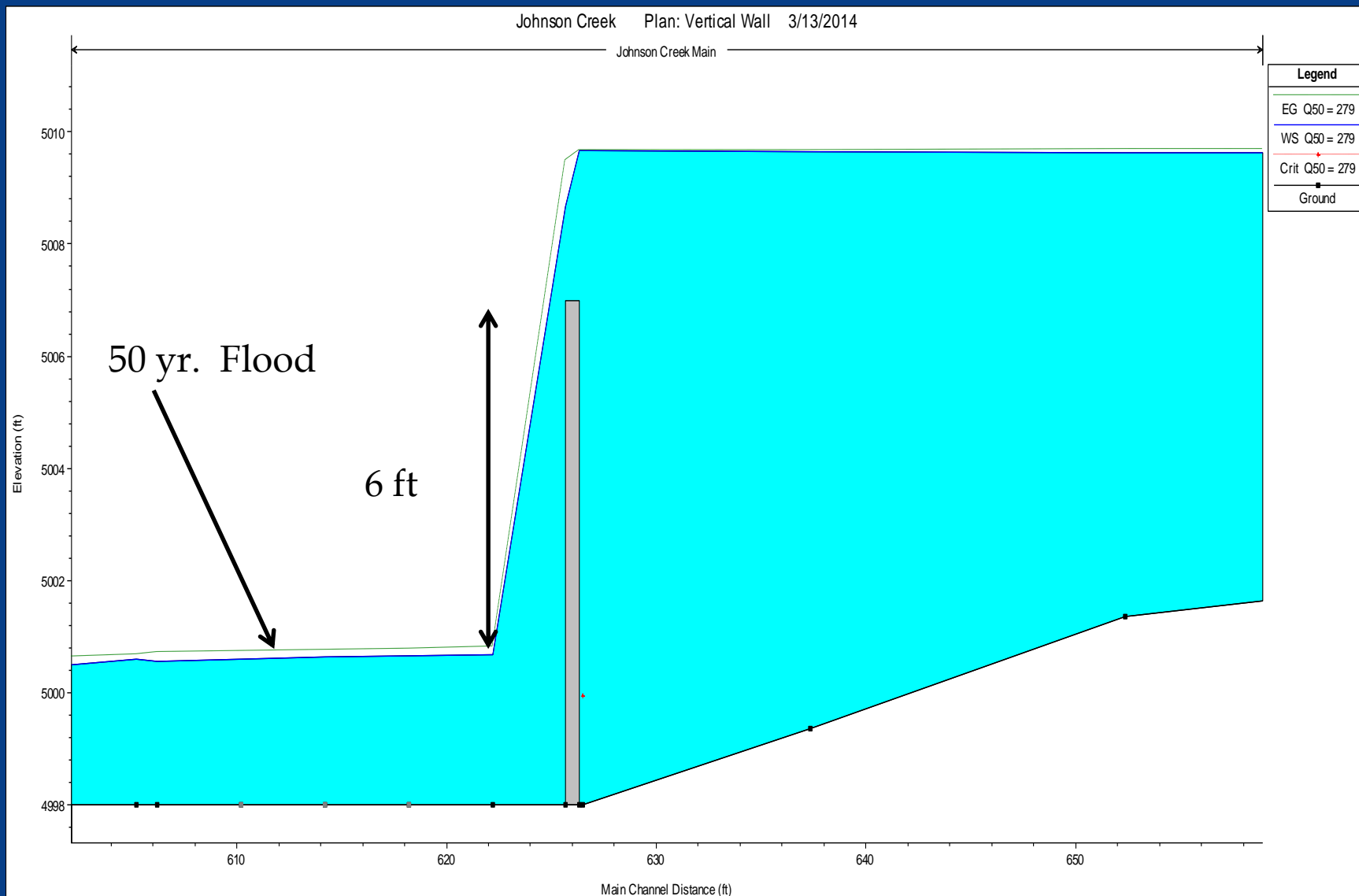
Johnson Creek Plan: Vertical Wall 3/26/2014

Johnson Creek Plan: Vertical Wall 3/26/2014

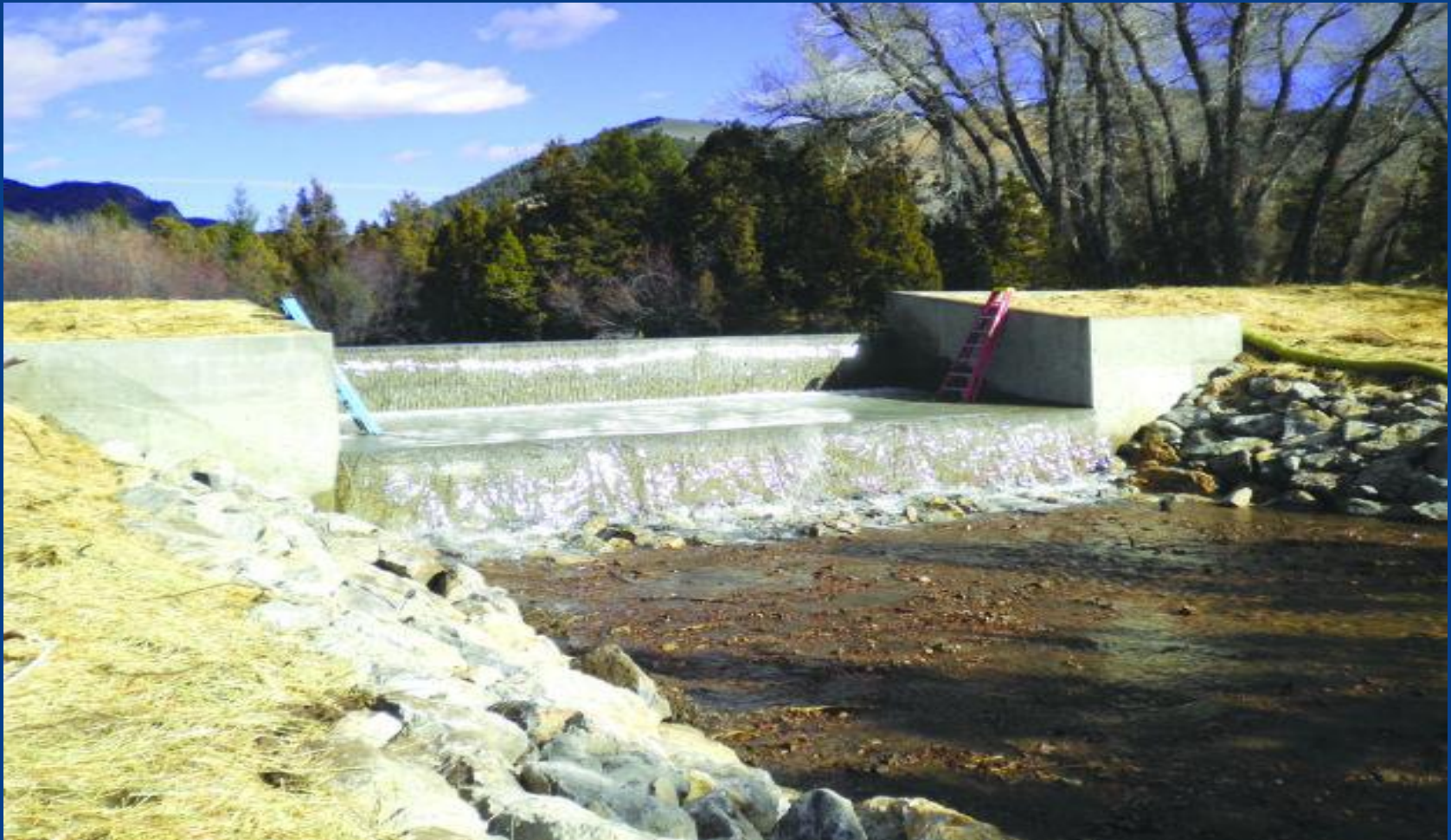




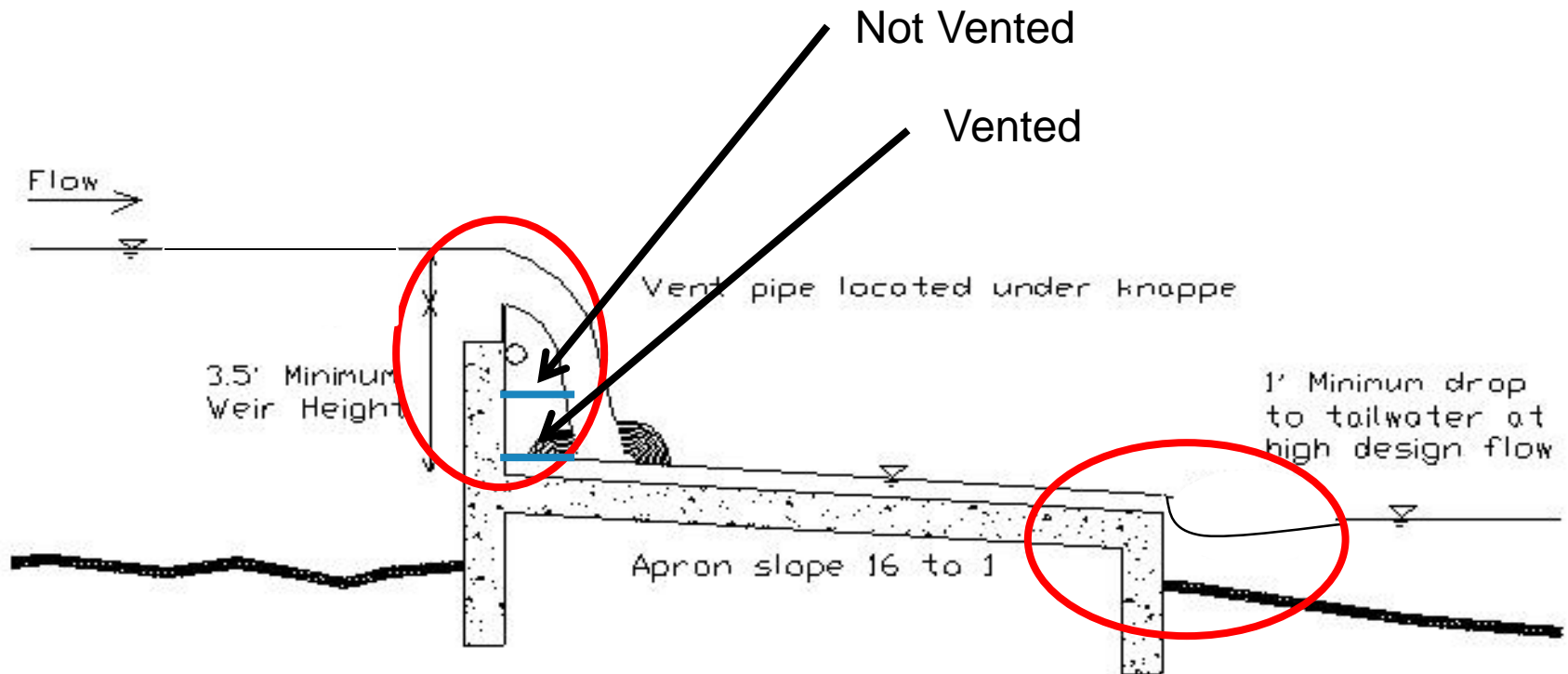








Greenhorn Creek Fish Barrier, Montana



Velocity Barrier



Relative Performance Index

- 1.) EFFECTIVENESS = 4 COMPONENTS
- 2.) STABILITY = 2 COMPONENTS

Relative Performance Index

1.) EFFECTIVENESS

- Free Overfall (Weir Height)
- Burst Speed
- Prolonged Speed
- Apron Elevation

Less
Effective

< 1



> 1

More
Effective



Relative Performance Index

1.) STABILITY

- Water Impounded
- Dam Freeboard

Least
Stable

< 1



> 1

Most
Stable



Relative Performance Index

$$RPC = \frac{(Weir + Burst + Prolonged + Apron + Impounded + FB)}{6}$$

Least Effective &
Stable



Most Effective &
Stable

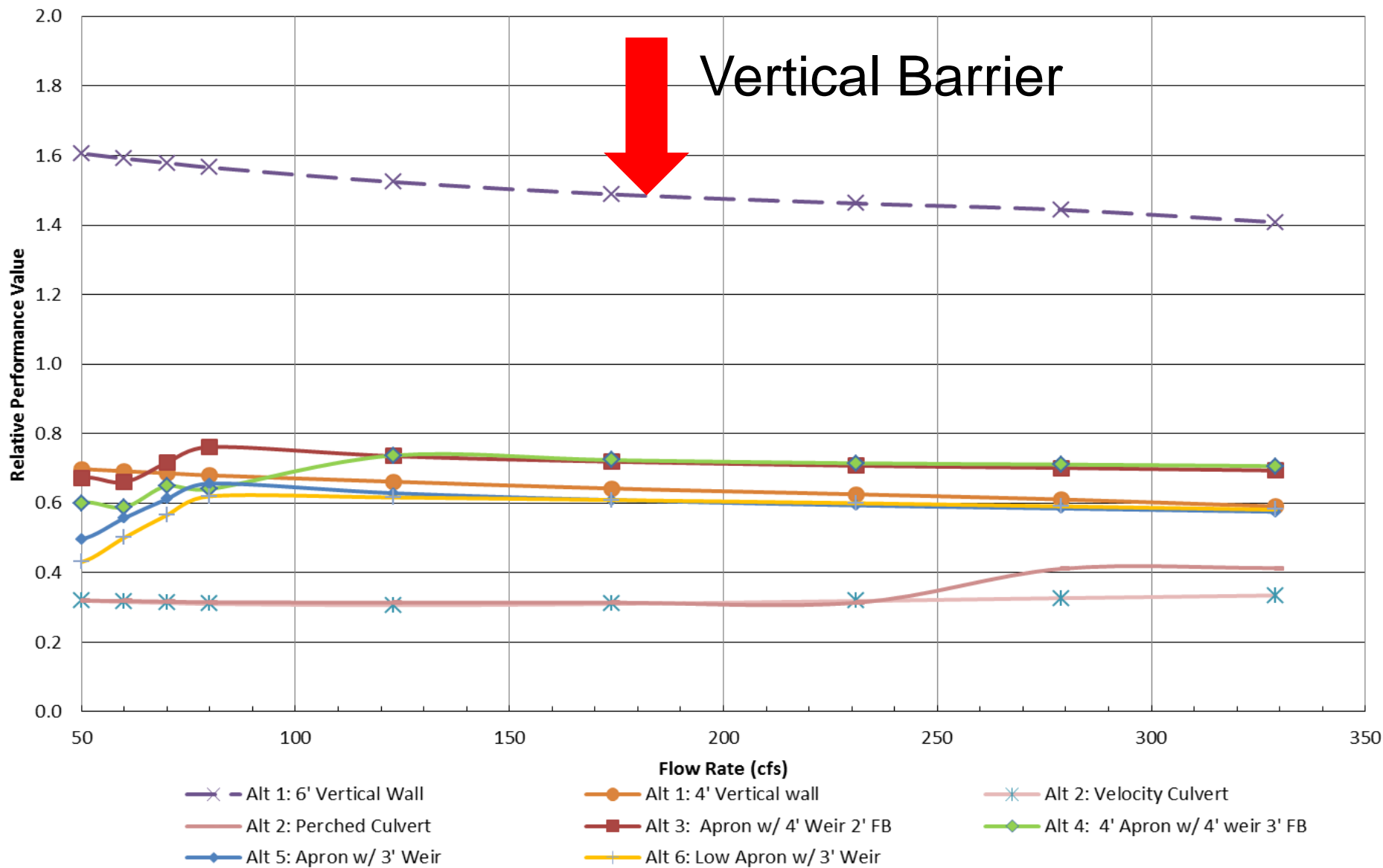


Additional Considerations

Cost vs. Risk of Reinvasion

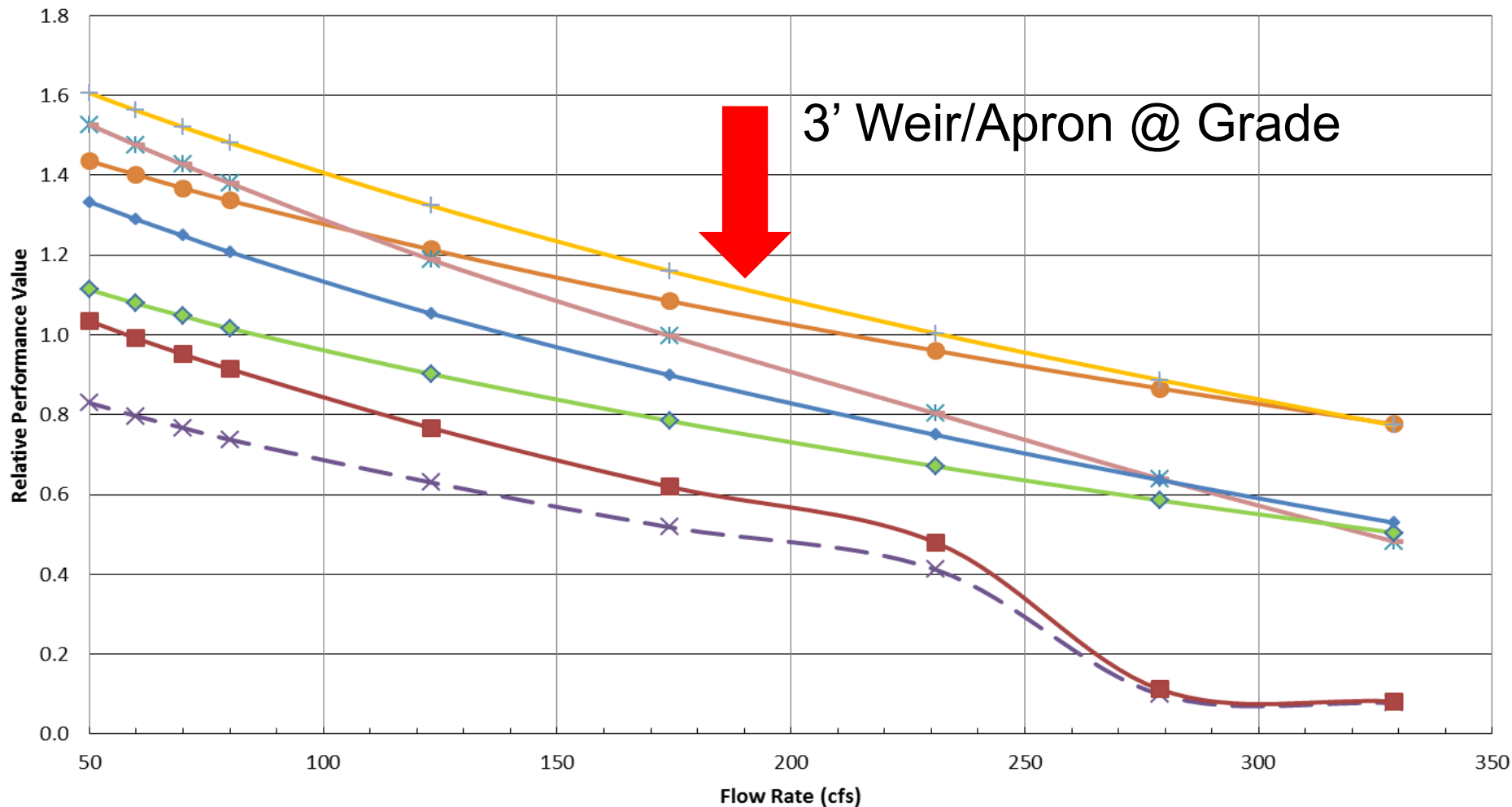
Is this Cost Effective / Prohibitive ?

Johnson Creek, UT Barrier Alternatives Hydraulic Effectiveness Comparison





Johnson Creek, UT Barrier Alternatives Structure Stability Comparison



Alt 1 Vertical Wall

ALT 1 Lowered 2 FEET

Alt 2 Perched culvert

Alt 2 Velocity Culvert

Alt 3 USBR Apron 2' freeboard

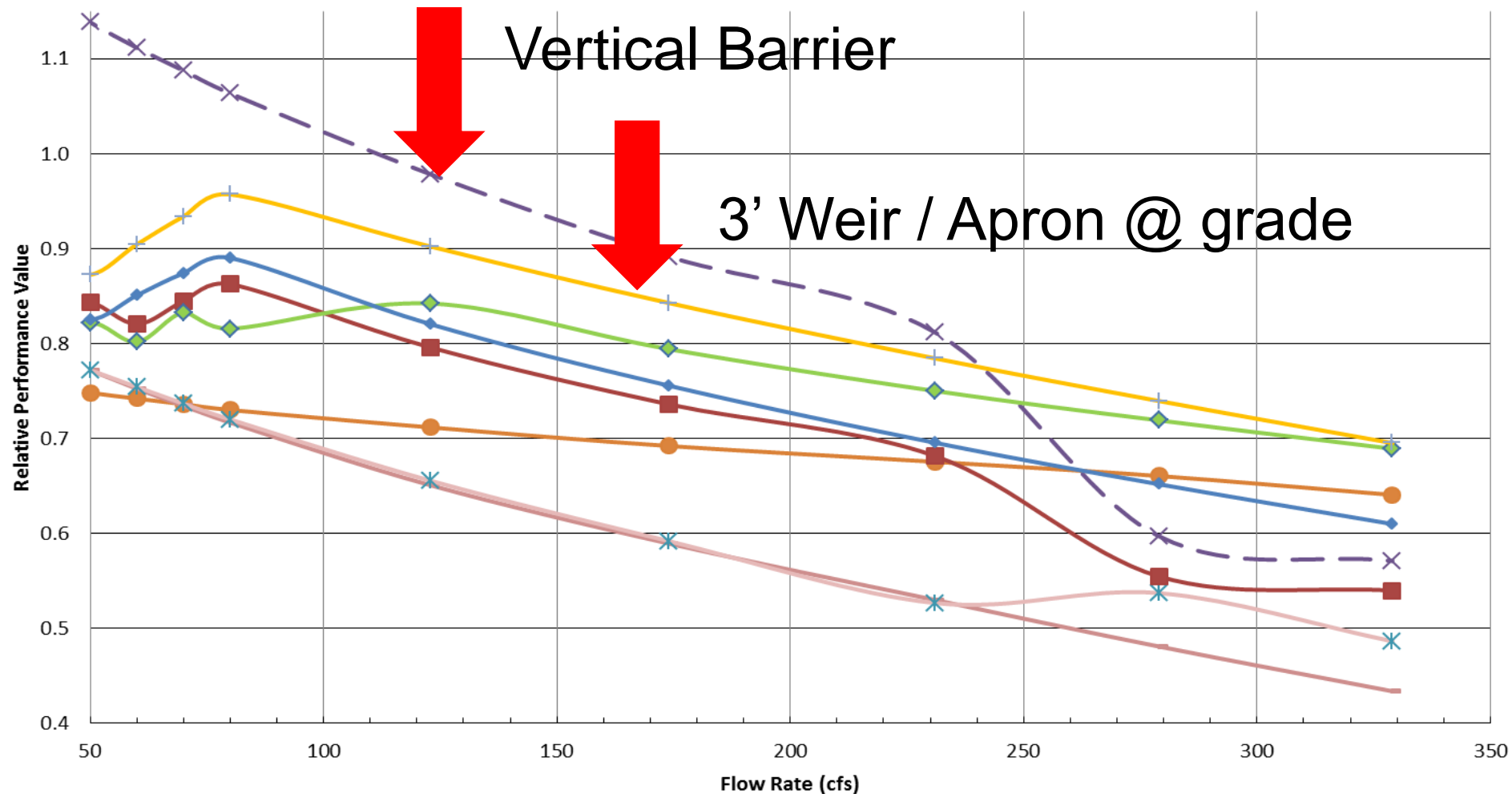
Alt 4 USBR Apron 3' freeboard

Alt 5 Apron w/ 3' Weir

Alt 6 Low Apron w/ 3' Weir



Johnson Creek, UT Barrier Alternatives Hydraulic Performance and Risk Comparison



Alt 1 6' Vertical Wall

ALT 1 4' Vertical Wall

Alt 2 Velocity Culvert

ALT 2 Perched Culvert

Alt 3 USBR Apron w/ 4' Weir 2' FB

Alt 4 USBR Apron w/ 4' Weir 3' FB"

Alt 5 Apron w/ 3' Weir

Alt 6 Low Apron w/ 3' Weir



The Goal

Design an effective & stable barrier
in an appropriate location that has
minimal effects on the stream system

What is Needed for Successful Barriers?

- Comprehensive barrier design manual
- Better understanding of target species
- More precise hydrology predictions
- Site Location & stream type (geomorphically stable & effects of barrier on stream)
- Consistent long-term monitoring & maintenance
- Better hydraulic data at proposed barrier (3-D)
- Learn from our successes & mistakes

Additional Considerations

- Understand the risks of installing a barrier
- Understand that barriers are not a long-term solution to control non native species
- Invasion vs. isolation

All things considered, an artificial barrier should be regarded as a stopgap measure; ultimately, the only permanent method for securing populations of Colorado River cutthroat trout will be removal of nearby nonnative trout populations and reestablishment of connectivity to larger stream networks (Hepworth et al. 2002).

Thanks

- Dale White: Forest Hydrologist, Gallatin N.F. Montana
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- Jason Carey: Engineer, River Restoration
- Matt McKell: Aquatic Biologist, Utah DNR
- Mark Lacy: Fish Biologist, White River N.F. Colorado
- Mark Weinhold: Forest Hydrologist, White River N.F. Colorado

Questions

