

# Water Supply and Planning for Non-Consumptive Water Demands

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# OUTLINE

1. Define Non-Consumptive Water Demand
2. History of Non-Consumptive Water Use
3. Statutory Authority for Non-Consumptive Water Demands
4. Socioeconomic Importance of Non-Consumptive Water Demands
5. Colorado Parks and Wildlife – Wildlife and Fishery Resource Stewards
- 6. Basin Roundtables and Non-Consumptive Needs Assessments:**
  - What the Statewide Non-consumptive Committee is Doing
  - What the Western Slope is Doing
  - What the CO BRT is doing

## WHAT IS A NON-CONSUMPTIVE WATER USE? WATER THAT SUPPORTS:

### FISH AND WILDLIFE RESOURCES

- Recreational Sport Fish (warm water and cold water)
- Conservation Species (Federally listed species and habitats; State Species of Special Concern)

### RECREATION

- Commercial Boats
- Canoes
- Kayaks
- Private Boaters
- Drift Boats
- Inner Tubes
- Rubber Ducks??

### RIPARIAN PROCESSES AND VALUES

- Floodplains (nutrient exchange, habitat, flood attenuation; floodplain storage)

## **AESTHETICS AND QUALITY OF LIFE**

- Scenery
- Watchable Wildlife
- Serenity

# WHAT IS A NON-CONSUMPTIVE WATER USE? WATER THAT SUPPORTS:

- FISH AND WILDLIFE RESOURCES
- RECREATION
- RIPARIAN PROCESSES AND FLOODPLAIN FUNCTIONS
- AESTHETICS AND QUALITY OF LIFE

## WITHOUT USING ANY OF IT

MISPERCEPTION: That non-consumptive uses are therefore incidental to other traditional uses of water, and therefore do not require a similar level of analysis as consumptive uses of water to assess demands.

*So . . . How do we assess 'non-consumptive' water demands?*

# Non-Consumptive Water Needs

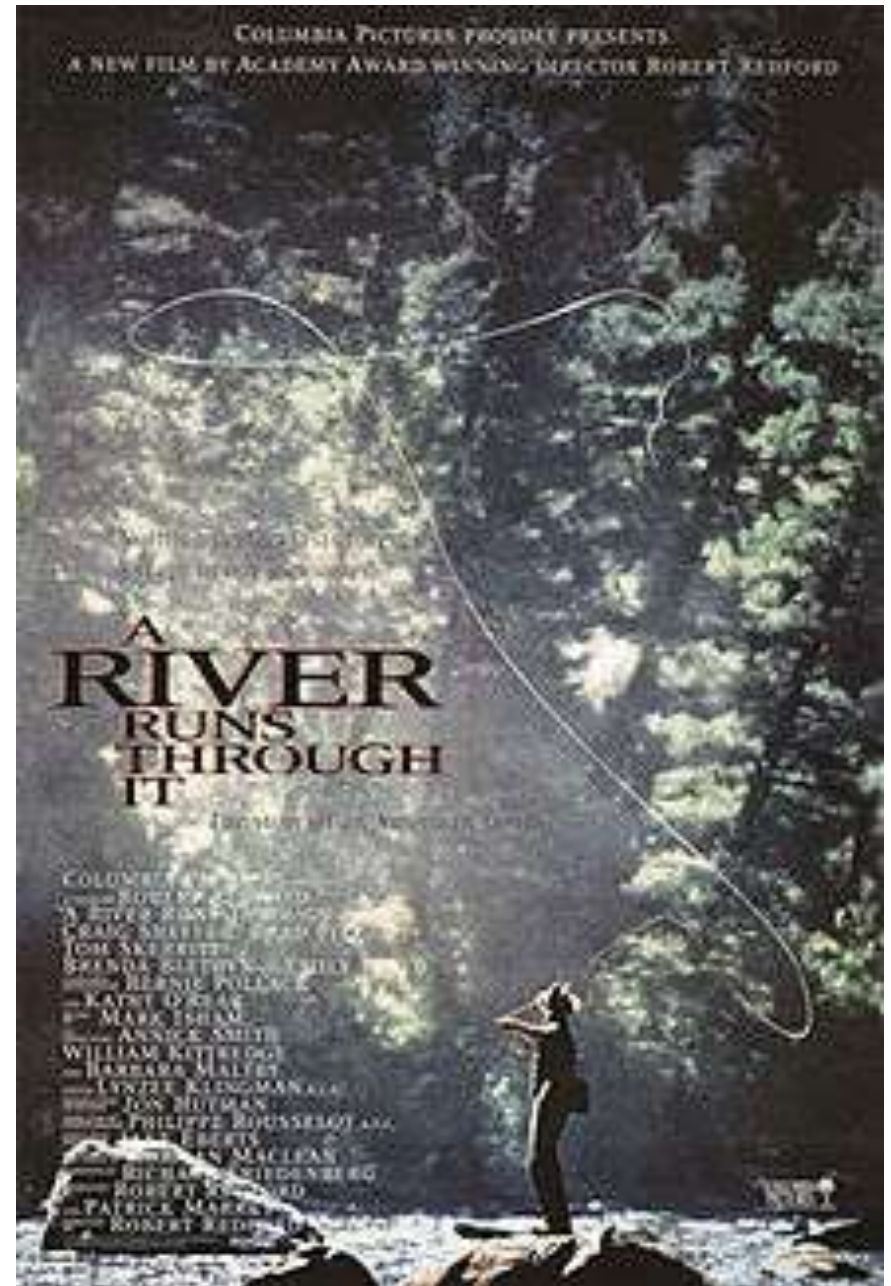
## HISTORY





1976 – Norman Maclean's  
Semi-autobiographical novel

1992 – Movie Starring Brad Pitt



# Socio-Economic Benefits of Non-Consumptive Water

- “Water-related activities, such as fishing, paddling, commercial rafting, wildlife viewing, camping, skiing and other snow sports, together infuse between \$7 and \$8 billion into the state’s economy and employ about 85,000 people across Colorado.”

<http://cwcb.state.co.us/environment/non-consumptive-needs/Pages/main.aspx> - CWCB Link to Non-Consumptive Reports and background information

- Angling and rafting bring direct expenditures of \$200-300 million; per AF ‘value’ of non-consumptive water in the Arkansas basin was estimated at ~\$350 / AF; values in the Poudre River were ~ \$150 / AF.
- Direct expenditures on angling and rafting are flow-elastic – up to 70% of bankfull flow for angling and to bankfull for rafting; ie, as flows increase, so does the money spent on non-consumptive recreation.

Loomis, John, 2010. EDR 08-02. THE ECONOMIC CONTRIBUTION OF INSTREAM FLOWS IN COLORADO: HOW ANGLING AND RAFTING USE INCREASE WITH INSTREAM FLOWS. Department of Agricultural and Resource Economics, Fort Collins, CO; <http://dare.colostate.edu/pubs>

## LEGAL DEFINITIONS OF NON-CONSUMPTIVE USES

Prior to 1973, there were included in some decrees statements that identified a certain beneficial use as 'non-consumptive'; e.g., piscatorial uses at hatcheries' hydropower,...

Within the Context of CO Water Law, 'non-consumptive' was a term that defined a water right's non-injurious nature; 'Consumptive' uses continued to deplete native streamflow; Storage and diversion further disrupted natural hydrologic patterns.

Some of these effects were GOOD for fish or rafters; some were BAD



Big fish in tailwater fishery

Dewatered 'Wild Trout Water'



## FEDERAL LEGISLATION ADDRESSING RIVERS

- Land and Water Conservation Fund Act (1965)
- Wild and Scenic Rivers Act (1968)
- National Environmental Policy Act (1969)
- Clean Water Act (1972)
- Endangered Species Act (1973)

## STATE RESPONSE TO “THE ENVIRONMENTAL MOVEMENT”

### **INSTREAM FLOW LEGISLATION (§37-92-102 (3) C.R.S.) - 1973**

Title 33 – “Parks and Wildlife” – *Protection of Fishing Streams* (§33-5-101 et seq.)

Title 33 – “Parks and Wildlife” – *Non-game and Endangered Species Conservation*

Title 33 – “Parks and Wildlife” – *Aquatic Nuisance Species*

Title 33 – “Parks and Wildlife” – *Arkansas River Recreational Act*

.....

Title 37 – “Water and Irrigation” – *Fish and Wildlife Resources* (§37-60-122.2)

“It is the intent of the general assembly that fish and wildlife resources that are affected by the construction, operation, or maintenance of water diversion, delivery, or storage facilities should be mitigated to the extent, and in a manner, that is economically reasonable and maintains a balance between the development of the state's water resources and the protection of the state's fish and wildlife resources.”

Title 37 – “Water and Irrigation” – *Recreational In-Channel Diversions* (§37-90-103)

CWCB as advocate, ‘fact finder’, or ‘gatekeeper’?

**HB1177 Required 'Needs Assessments' be done by each of the BRTs.  
Recall: *How do we assess 'non-consumptive' water demands?***

By Species (e.g., habitat suitability curves)

By Reach or River (e.g., surveyed cross section and longitudinal stream profiles, assessment of stability, sediment trends, habitat conditions, bankfull flows)

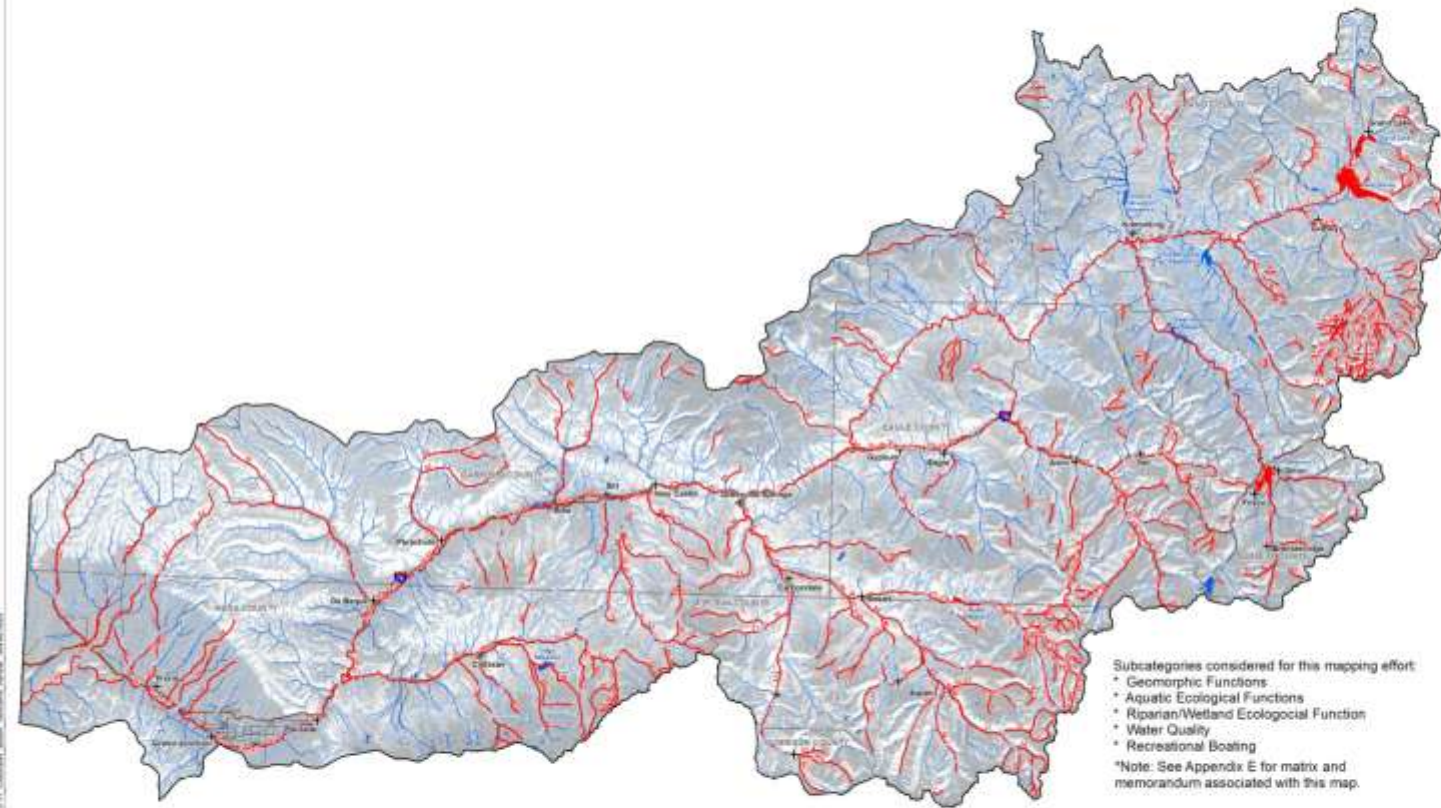
By Temporal Scales (How much? When? How often?)

By Budget - \$\$\$\$

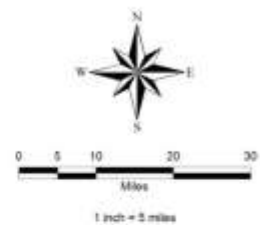
By Public Opinion – e.g., 'raftable days' analyses

By WFET\* – Watershed Flow Evaluation Tool





- Legend**
- Environmental and Recreational Features at Risk
  - Highways
  - Roads
  - Rivers and Streams
  - Lakes and Reservoirs
  - Cities and Towns
  - County Boundary



Subcategories considered for this mapping effort:

- Geomorphic Functions
- Aquatic Ecological Functions
- Riparian/Wetland Ecological Function
- Water Quality
- Recreational Boating

\*Note: See Appendix E for matrix and memorandum associated with this map.

**Figure 3-11**  
**Colorado Basin**  
**Nonconsumptive Needs Assessment**  
**Environmental and Recreational**  
**Features at Risk**

**DRAFT**

Refer to Appendix B of the NCNA Mapping Report for a complete list of data sources and Appendix D of the Mapping Report for other basin-specific mapping information.



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## NEXT STEP: NON-CONSUMPTIVE NEEDS ASSESSMENTS

*How Much? How often? Where? When?*

### WATERSHED FLOW EVALUATION TOOL (WFET)

Based on ELOHA – Ecological Indicators of Hydrologic Alteration: A new framework for developing regional flow standards; Poff et al., *Freshwater Biology* (2009)

WFET Flow Metrics at a 'node' on the model for:

- coldwater fisheries
- warmwater fisheries
- cottonwood abundance and recruitment potential
- raftable flows

## WFET Flow Metrics at a 'node' on the model for:

- coldwater fisheries
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Coldwater fishery metric: late-summer baseflow indicator as limiting factor on many trout streams in CO

Warmwater fishery metric: low-flow habitat relationships, translating a 30-d minimum flow period into expected biomass for bluehead, flannelmouth suckers

Cottonwood Abundance and Recruitment metric: both recruitment and abundance based on wet period, 90-day high flows. Applied selectively below 8700 ft in unconfined setting

Raftable Flow metric: based on multifaceted user surveys of sub-optimal to optimal flow conditions at feature. Multiple craft-types inventoried; development of boater 'flow curves' indicating general suitability for rafting.

# WFET Compares Hydrologies using STATEMOD and Hydrobase Inputs ‘turn on’ or ‘turn off’ major diversions

- Resulting differences between hydrology (e.g., ‘native flow’ vs ‘current diversion’ scenarios) were assessed for every metric at every node.
- For each metric, a Map was developed that indicated relative ‘threats to the resource’ based on the compared hydrologies (red, yellow, green, blue indicators)
- Mapping resulted in summary database of nodes, relative risks, and potential for improvement or protection of resource

Node	Location	Diversion	Flow	Temp	Salinity	Other	Overwintering fish habitat, macroinvertebrates, fishing, riparian habitat	Sediment transport, embankment, cottonwood regeneration, overwintering fish habitat, macroinvertebrate habitat	E, USFS	CBT, ag, local	Waterway flow ecology risk at high levels. Warm water fish (WFET results does not apply at this location).	Yes	No	Not Applicable	Considered for cottonwood (magnitude of flows likely preclude flow solution).	Current - 100,000 AF - May to July increase 1 in 3 years (150% increase over current flows)
7	Upper Colorado	Windy Gap Reservoir to Windy Gap	X							Windy Gap	Did not examine reservoir levels as part of WFET study.	No			Not Applicable	Not Applicable
8	Upper Colorado	Windy Gap Reservoir	X		X		Fishing	Ideal whitening disease conditions, sediment transport and deposition, fish/spatial life needs				No			Not Applicable	Not Applicable
9	Upper Colorado	Windy Gap Reservoir to Williams Fork	X	X			Gold Medal fishery, riparian habitat, recreational boating (present)	Whitening disease, temperature, water quality, algae, fish/spatial life needs, channel maintenance (sediment transport and deposition)	E	RAM (Windy Gap), ag	WFET results indicate trout and cottonwood flow ecology risk at high levels. Warm water fish (WFET results does not apply at this location).	Yes	No	X	For trout - flows could be considered; for cottonwood, (magnitude of flows likely preclude flow solution).	Trout - 200 AF August/September annual average current; cottonwood - 100,000 AF - May to July increase 1 in 3 years (150% increase over current flows)
10	Upper Colorado	Williams Fork to Blue River	X	X	X		Fish, sediments	Temperature, sediment embankment, cottonwood vegetation related to upstream reservoir management, fish/spatial life needs.	E	RAM, ag	WFET results indicate trout flow ecology risk at low (seasonal) levels and cottonwood flow ecology risk at high levels. Warm water fish (WFET results does not apply at this location).	Yes		X	For trout, if RAM not protected identify mechanisms to protect (year); for cottonwood, (magnitude of flows would likely preclude flow solution).	Cottonwood - 150,000 AF - May to July increase 1 in 3 years (150% increase over current flows)
11	Upper Colorado	Blue River to Mile Gauge		X		X	Private boating until October 1st, commercial boating until later Day (?)	White clad recreational boating (private and commercial), fishing, sediment siltation, macroinvertebrate services, boating and fish habitat affected by reservoir operations	E		WFET results indicate trout flow ecology risk at low (seasonal) levels and cottonwood flow ecology risk at high levels. Warm water fish (WFET results does not apply at this location).	Yes		X	For trout, if results not protected identify mechanisms to protect (year); for cottonwood, (magnitude of flows would likely preclude flow solution).	Cottonwood - 200,000 AF - May to July increase 1 in 3 years (150% increase over current flows)

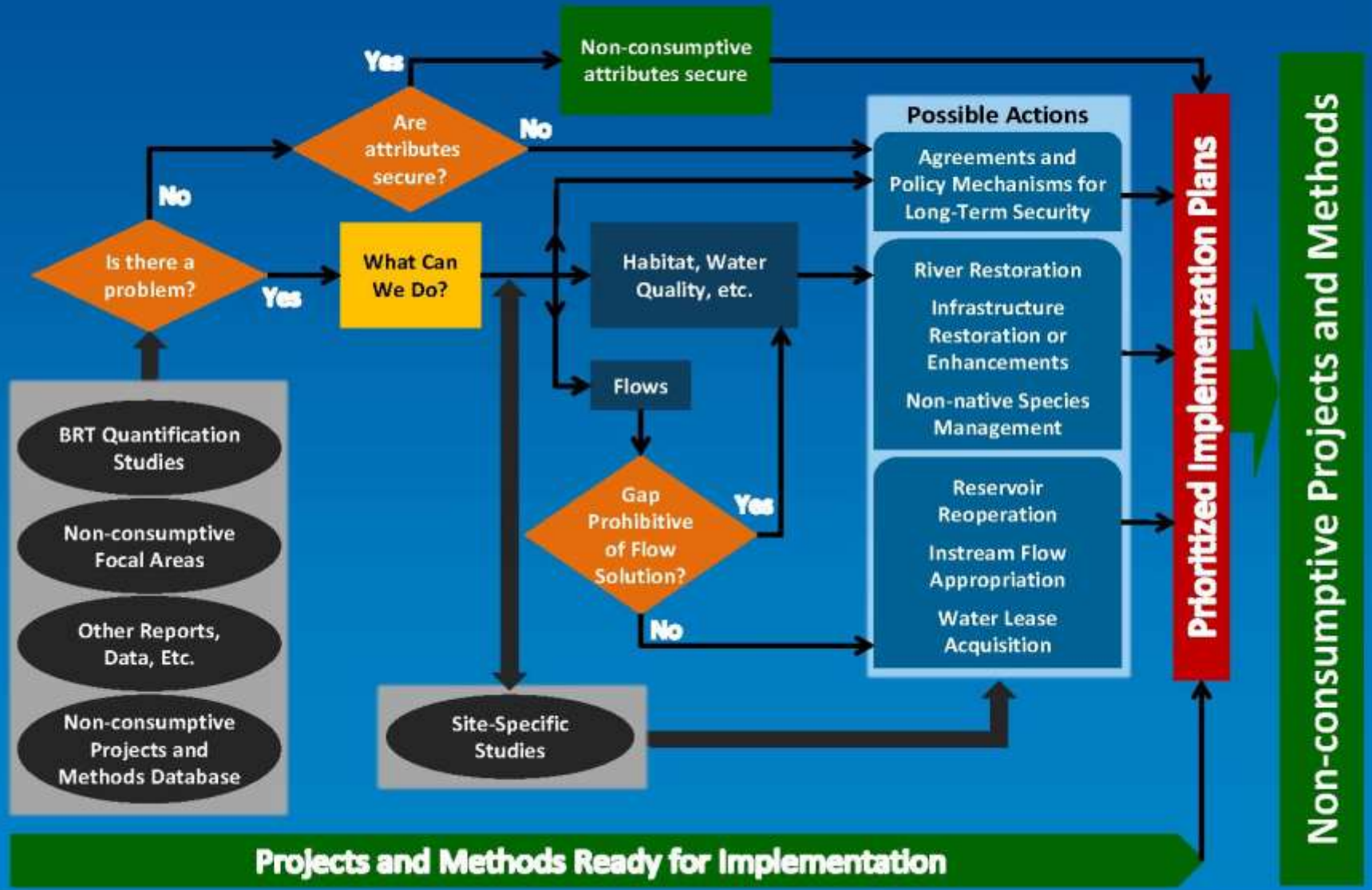
## **Statewide Non-Consumptive Committee Meeting Purpose (10/2011)**

1. Address how to plan and implement methods and projects that will help protect identified non-consumptive values; . . . and outline strategies and resources (from the IBCC and CWCB) needed to help basin roundtables advance non-consumptive efforts and projects.
2. Discuss how to integrate the protection of non-consumptive needs with meeting identified consumptive needs . . . in order to develop a balanced approach to addressing Colorado's water future.

### IMPLEMENTATION AND INTEGRATION

NOTE: Language of 'quantifying non-consumptive needs' is tempered to reflect the more important question of HOW to protect identified non-consumptive values

# Nonconsumptive Projects and Methods Implementation



# Non-Consumptive Projects and Methods Implementation

Non-Consumptive Attribute – Threats?

NO – Protection Strategy

NO – explore non-water quantity solution; ‘do no harm’ flow-wise.

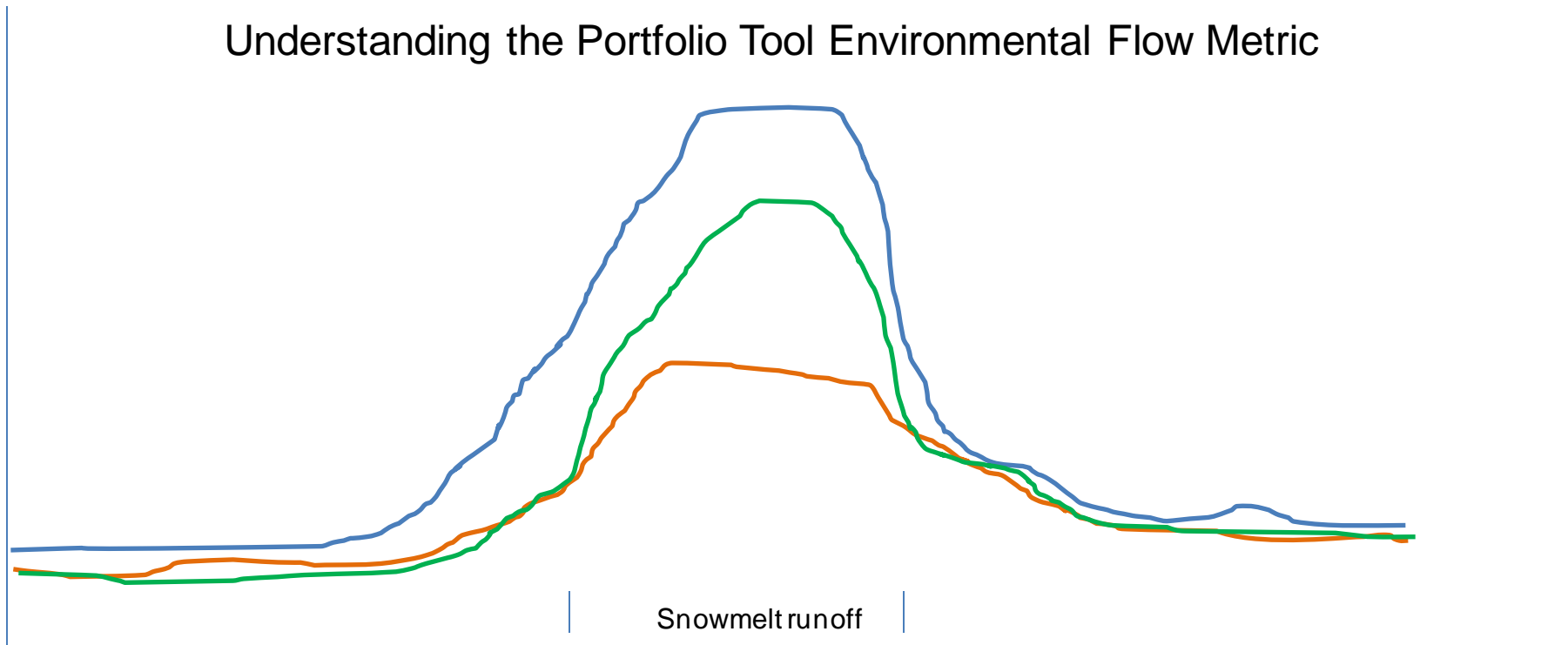
MAYBE – more study needed to rule out other factors

Yes – is threat related to flows?

**YES** – follow up for protective measures:

- Can flows be secured via operations agreement, appropriation, purchase of additional water?
- In-channel structural solution (e.g., river restoration? diversion structure fix?)
- Out-of-channel infrastructure / policy shift (e.g., new storage, regional conservation, water transfers; new statutes?)

## Understanding the Portfolio Tool Environmental Flow Metric



— 20:20 – Take 20% of Baseflow; 20% of Peaks

— 20:50 – Take 20% of Baseflow; 50% of Peaks

— 'Daily Mean' hydrograph

Compare resulting out-of-basin diversions against PBOs in Colorado, Gunnison, Yampa, San Juan River basins

## Back to our Future – *How do we provide an appropriate water supply for non-consumptive needs?*

BRT / IBCC effort extremely helpful to bring everyone's understanding of non-consumptive flow needs, and how integral they are to the social, economic, and cultural fabric of communities

CPW (CO Parks and Wildlife) engaged in process and hoping to work cooperatively with water users and conservation advocates to maintain viable populations of fish and to highlight the state's hydrologic blessings!