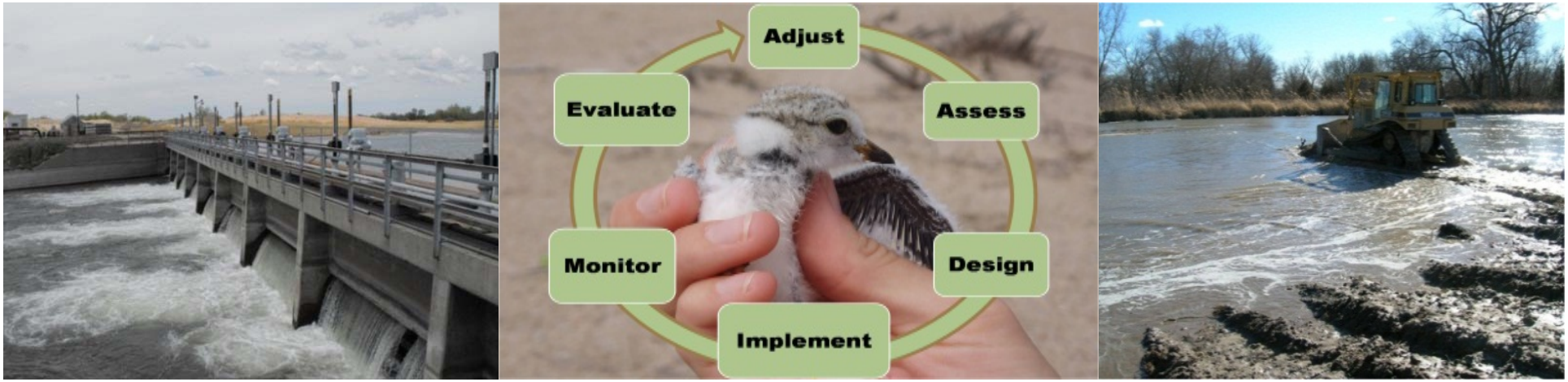


ADAPTIVE MANAGEMENT ON THE PLATTE RIVER

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

Target Flow Background

Governance Committee Meeting
December 4, 2012
Denver, CO

Target Flows

Release Date	Target Flow Wet (Normal)	Purpose	2012 Priority
Feb 15 – Mar 15	3,350 (3,350)	channel maintenance and wet meadow recharge	High
Mar 23 – May 10	2,400 (2,400)	whooping crane, others	Medium
May 11 – Sep 15	1,200 (1,200)	tern and plover	Medium/Low
May 20 – Jun 20	> 3,000	channel maintenance and pallid sturgeon	High
Oct 1 – Nov 15	2,400 (1,800)	whooping crane, waterfowl	Medium

- Lake McConaughy Environmental Account Annual Operating Plan for 2012 prioritized USFWS instream flow recommendations (no SDHF planned)
- Targets vs. releases – conveyance issues (choke point)
- Target flows vs. SDHF
- Evaluating success = did they work? – monitoring, research, analysis
- Rigorous AM framework for target flows = ISAC says “yes”

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

Target Flows - Objectives

- Defined by: *Bowman, D.B. 1994. Instream flow recommendations for the central Platte River, Nebraska. U.S. Fish and Wildlife Service.*

- Remain the same today

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

Target Flows – AMP

- No mention of USFWS target flows in AMP
- Flow management action in AMP:

<u>Broad Hypothesis PP-1:</u> Flows of 5,000-8,000 cfs magnitude in the habitat reach for duration of three days at Overton on an annual or near-annual basis…

<u>FSM Management Strategy:</u> *"Using the Environmental Account in Lake McConaughy and the Program's ability to deliver 5,000 cfs of Program water at Overton…**short-duration near-bankfull flows** will be generated in the habitat reach in the springtime or at other times outside of the main irrigation season. The intent is to achieve these flows, if possible, on an annual or near-annual basis. Testing will begin in the first year of the Program with a pulse flow target of up to 5,000 cfs for three days at Overton."*

- Priority hypotheses built around SDHF

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

Target Flows – AM Framework

- Do them until science points to something better
- Flow prioritization
- Rigorous AM framework:
  - Goals and objectives – what is success?
  - Uncertainties
  - Conceptual models
  - Hypotheses
  - Management actions – flow releases
  - Performance measures and benchmarks
  - Monitoring and research
  - Data analysis and synthesis
  - Reporting

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

Date	Flow Target	Duration	Hydrograph Component	Mean Volume	Beneficial Effects	05/21/12 Workgroup General Objectives	Detailed Objectives for 06/18/2012 Workgroup Discussion	Hypotheses
Pulse Flows								

Feb 15 – March 15	*Very Wet* 16,000 cfs	5 days	Local snowmelt & runoff	Natural peak event	• Bring the ground water levels in grasslands up near to the soil surface.
					• Cause and/or contribute to break up of ice and move ice for the effect of scouring vegetation.
					• Redistribute sediment in the active channel.
					• In years with little or no ice formation, pulse flows necessary for soil saturation in meadows.
						1) Increase water levels in wet meadow habitat.
						2) Maintain unvegetated channel width.
							Recreate (to extent feasible) historic early spring runoff hydrograph caused by high-plains snowmelt or early spring precipitation on frozen ground (investigate contributing factors) that occurred almost every year.
							• Duration – Roughly two weeks
							• Hydrograph Shape – Roughly Triangular
							  ○ Ascending limb – 1 week
							  ○ Descending limb – 1 week
							  ○ Duration at peak – 1 day
							• Hydrograph Peak – TBD
							
							Expected Target Species Habitat Benefits
							• Maintenance of unvegetated channel width via ice scour.
							• Possible surface water inputs into backwaters and wet meadows via ice jamming. Lateral groundwater flow into wet meadows likely minimal given Platte River stage-discharge relationship and length of event.
								Flow #3 – unvegetated channel width through scour
								
								WM-3 – wet meadow productivity

	Wet 12,000 cfs	5 days	Local snowmelt & runoff	Natural peak event				
	Normal 3,100-3,600 cfs	30 days	Local snowmelt & runoff	100,000 acre-feet				
	Dry 2,000-2,500 cfs	30 days	Local snowmelt & runoff	?				

Date	Flow Target	Duration	Hydrograph Component	Mean Volume	Beneficial Effects	05/21/12 Workgroup General Objectives	Detailed Objectives for 06/18/2012 Workgroup Discussion	Hypotheses
March 23-May 10	*Wet* 2,400 cfs *Normal* 2,400 cfs *Dry* 1,700 cfs	-	Fish guilds/life history components	?	• Whooping crane migration habitat, including wet meadows (primary production of invertebrates). • Sandhill crane habitat. • Eskimo curlew habitat. • Channel habitat for spawning fish, mussels, migratory waterfowl, wading birds, and shore birds. • Environmental education and ecotourism.	1) Optimize (wet and normal years) or prevent loss of (dry years) in-channel habitat availability for whooping cranes.		
May 11-September 15	*Wet* 1,200 cfs *Normal* 1,200 cfs *Dry* 800 cfs	-	Fish guilds/life history components	?	• Prevent shore birds from nesting at low elevations. • Barrier to terrestrial predators. • Prevent losses from native fish community.	1) Maintain tern (fish) forage abundance. 2) Moat nesting islands for terns and plovers. • Will revisit potential objective for pallid sturgeon after GC decision on "testing the assumption"		

Target Flows – Now what?

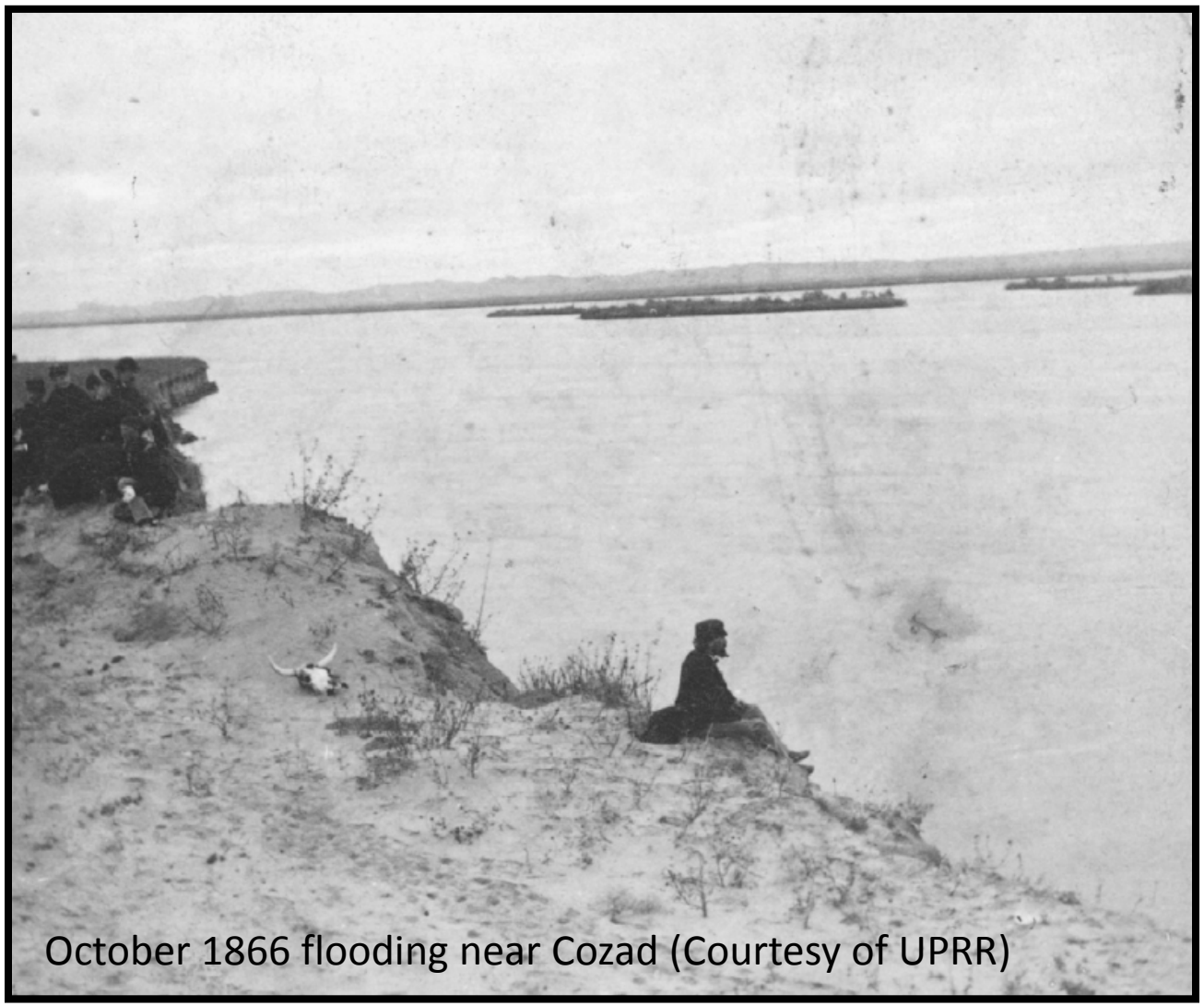
- What is the right volume of water?
- What have we learned?
- How do we maximize our learning?
- What are alternative flow actions?
- Program document (Page 4, First Increment Objective) says:

"DOI and the states agree that FWS' target flows will be examined through the Adaptive Management Plan and peer review and may be modified by FWS accordingly."

- Target flow assumptions and constraints

PLATTE RIVER
RECOVERY IMPLEMENTATION PROGRAM

Target Flows & Water Management



October 1866 flooding near Cozad (Courtesy of UPRR)

Target Flows

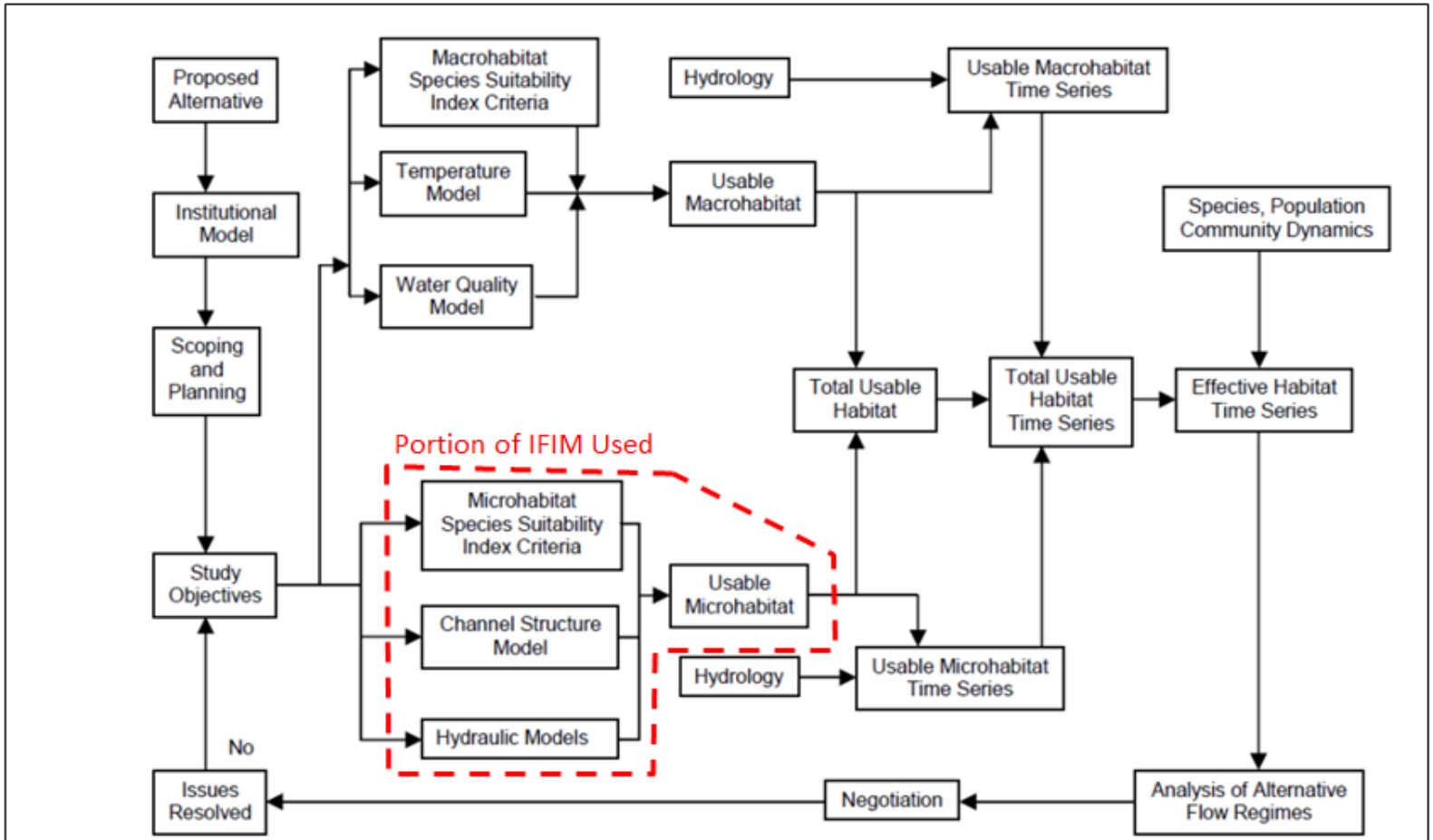
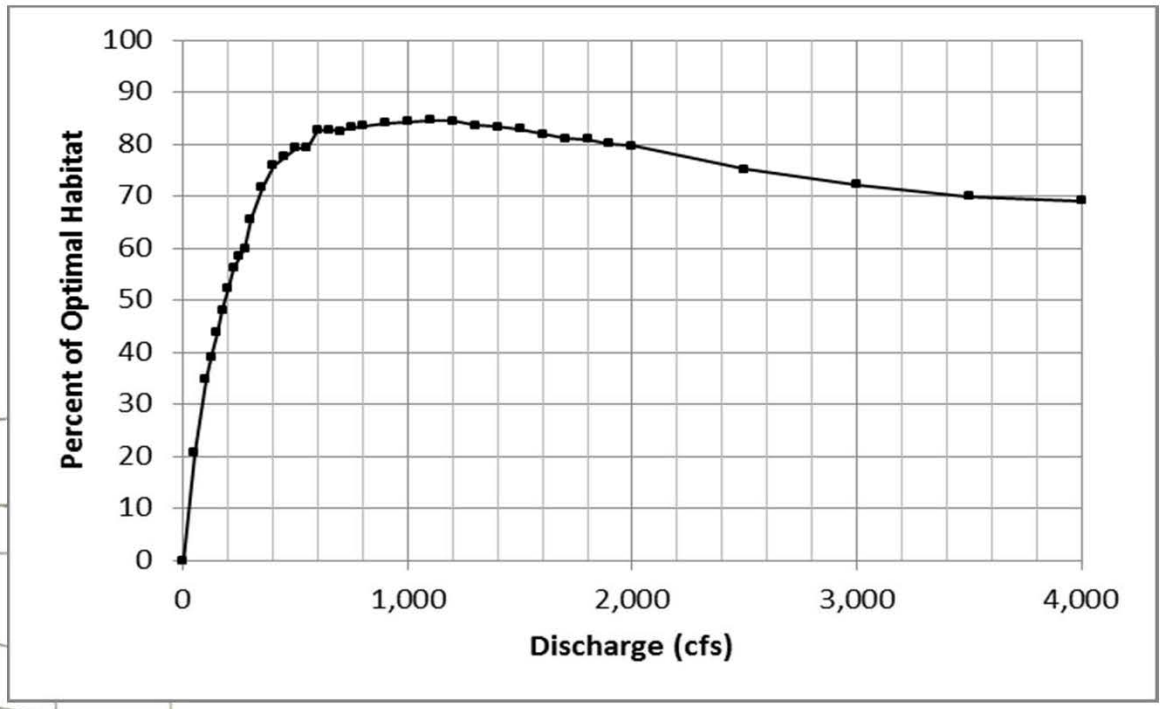


Figure 4-17 Basic operations of Instream Flow Incremental Method (IFIM) used by DOI agencies to define recommended flow magnitudes, frequency, duration, and timing. Source: Waddle 2001.

Figure 2. Reproduction of Figure 4-17 from NRC 2005. (Emphasis added to demonstrate portion of IFIM used)

Species Flows: Habitat Optimization



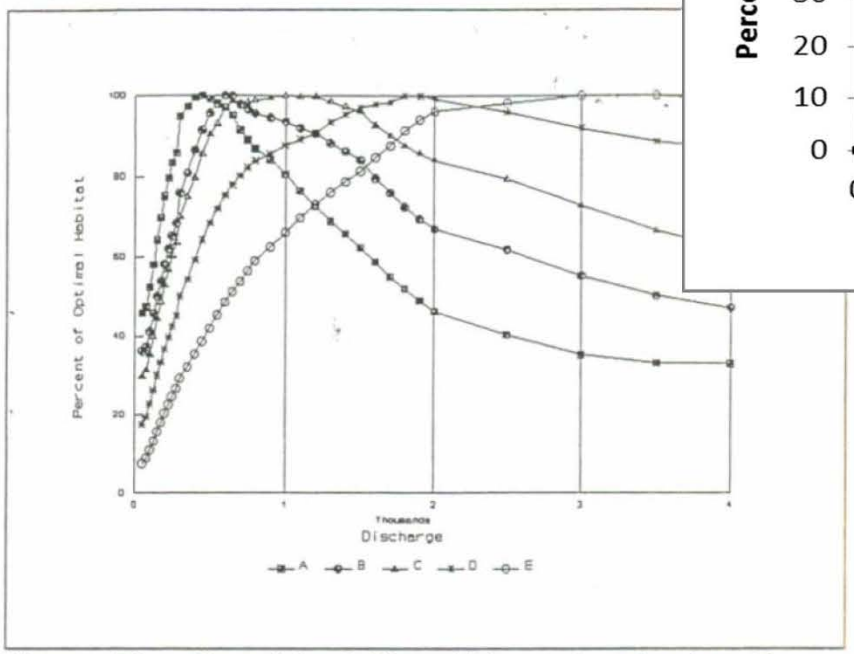


Figure B3. Normalized HA guild curves showing the percent of optimal habitat as a function of discharge for five guilds (A-E) during the fall BSP.

Pulse and Peak Flows: Workshop Testimony

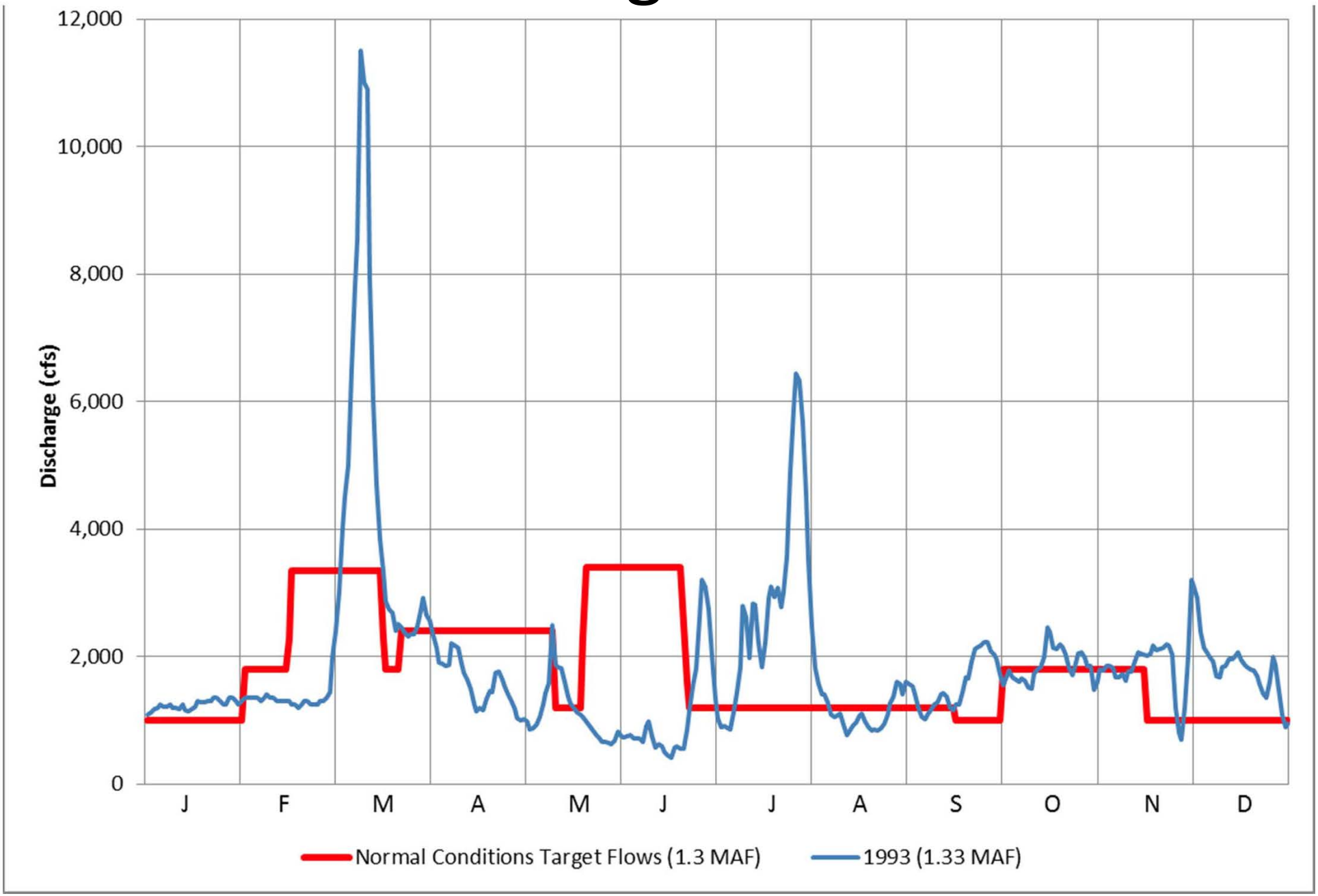
Yield Issues

North Platte River at North Platte - 1869

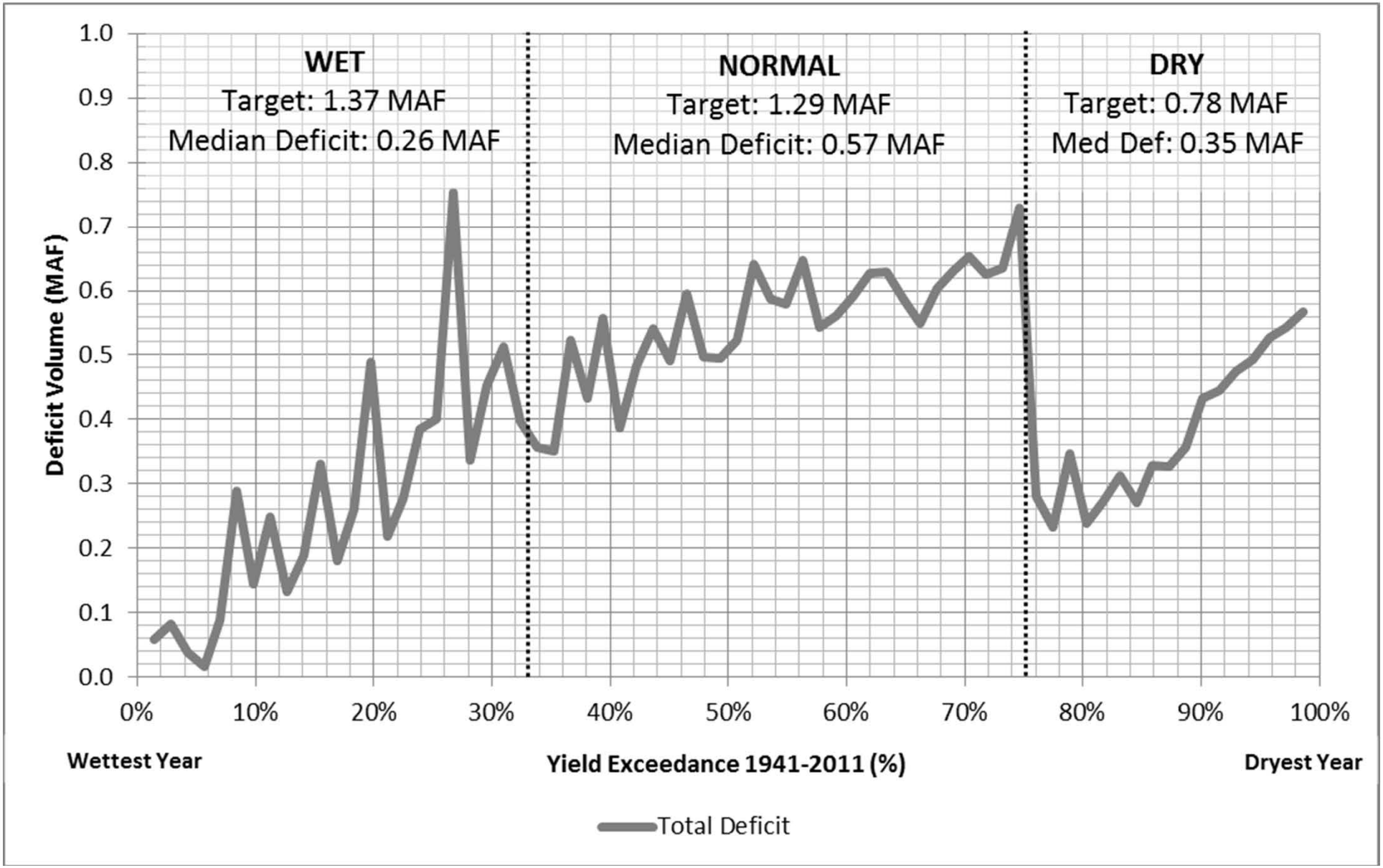
Maintain 20% of historic channel width with 46% of predevelopment yield

Timing Issues

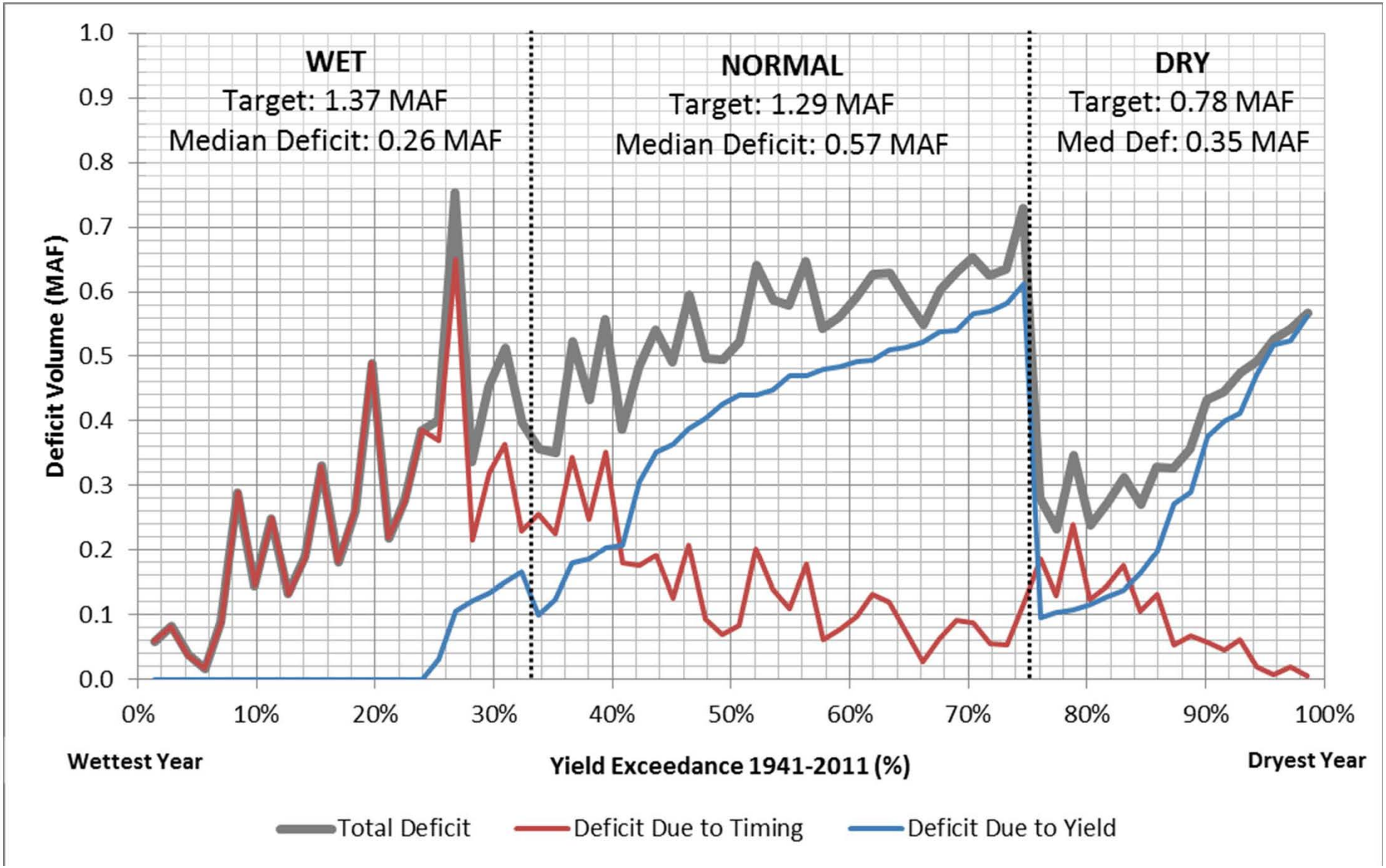
Deficit = 400 KAF



Species and Pulse Flow Deficits



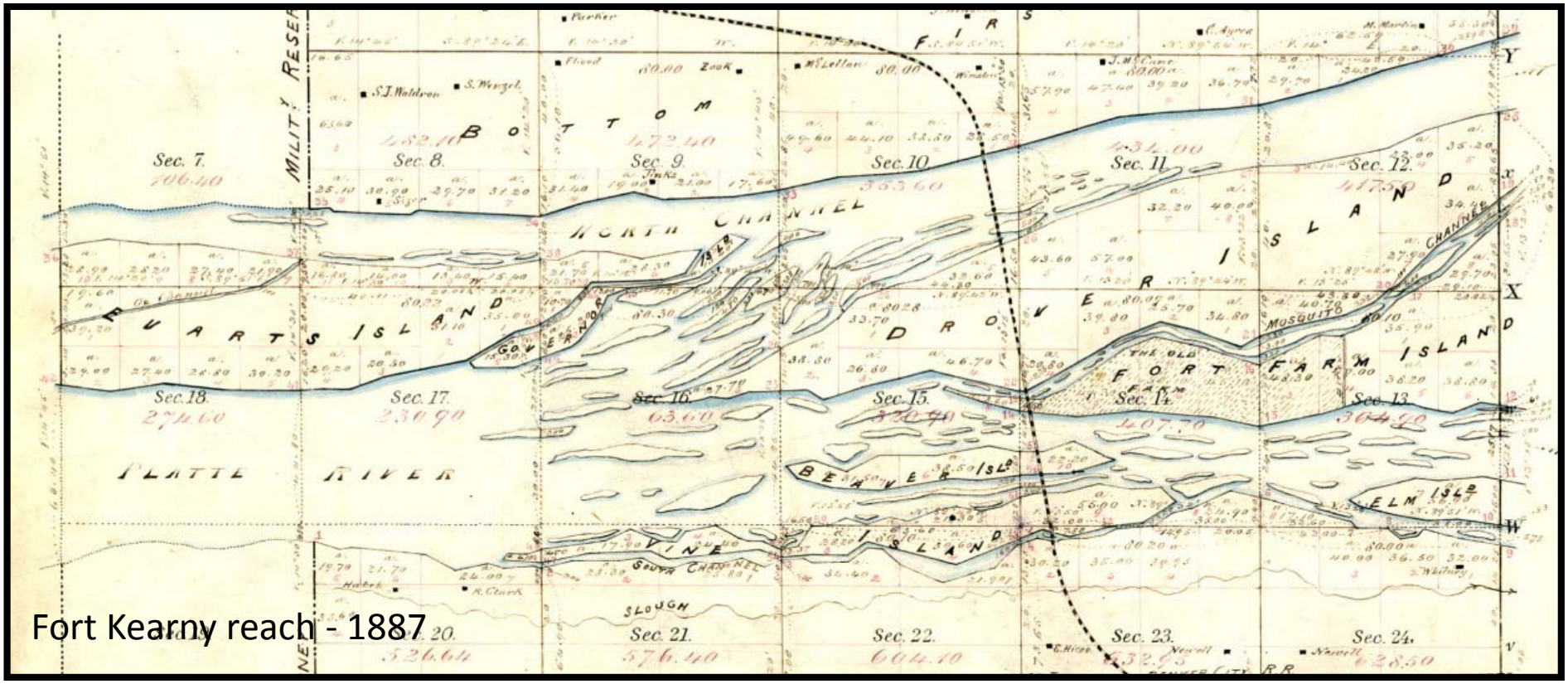
Species and Pulse Flow Deficits



Take-Home Points

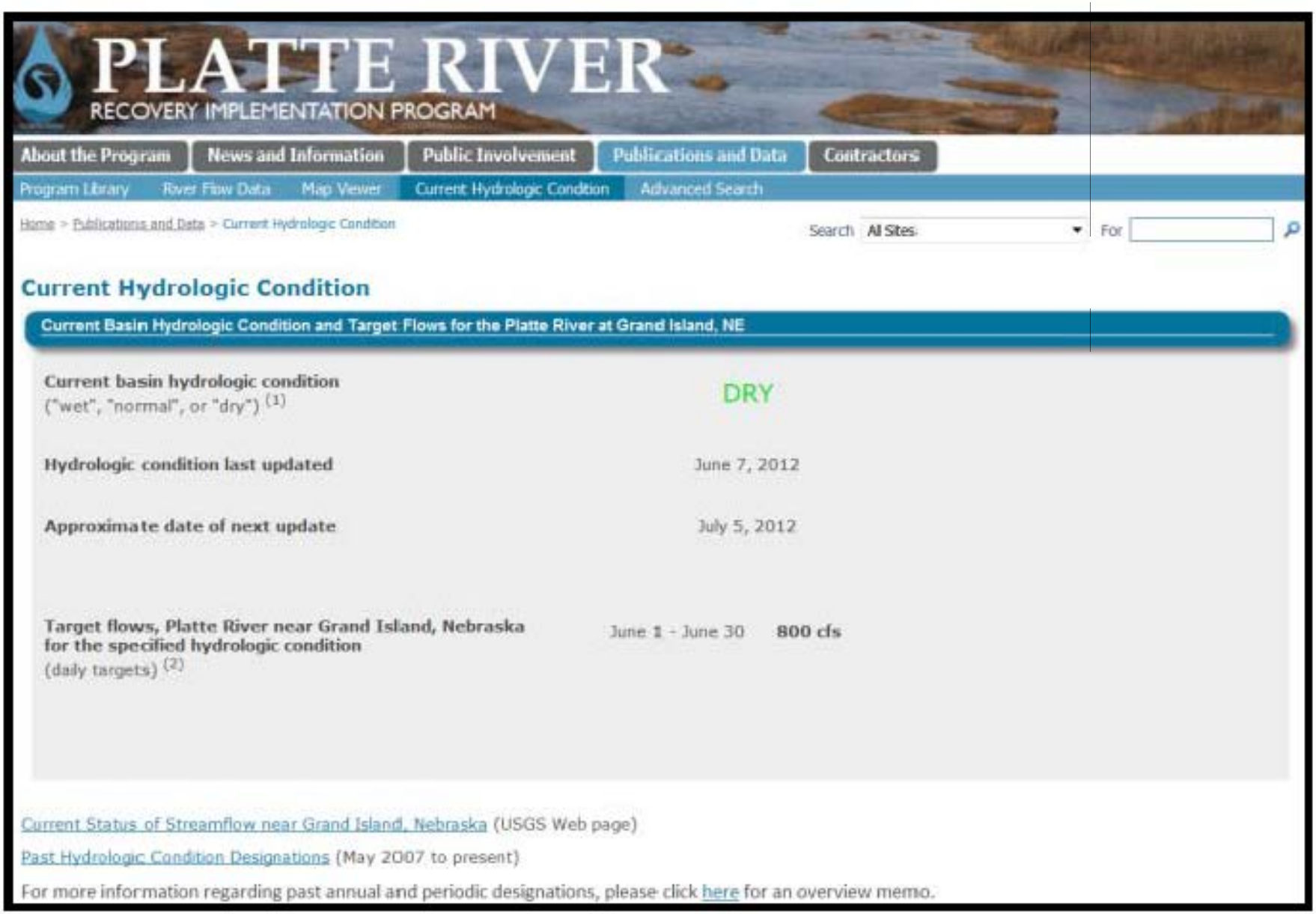
1. Species flows based on optimizing habitat suitability are difficult to defend but can be "tested"
2. Pulse and peak flow recommendations are not testable
3. Hydrologic condition designations are important but are not described
4. There are always deficits
    1. There appears to be a yield versus habitat disconnect
    2. No credit for natural flow if timing isn't perfect – must rely on storage and retiming

Program Flow Management



Fort Kearny reach - 1887

Real-Time Hydrologic Conditions



Program Water Volume Constraints

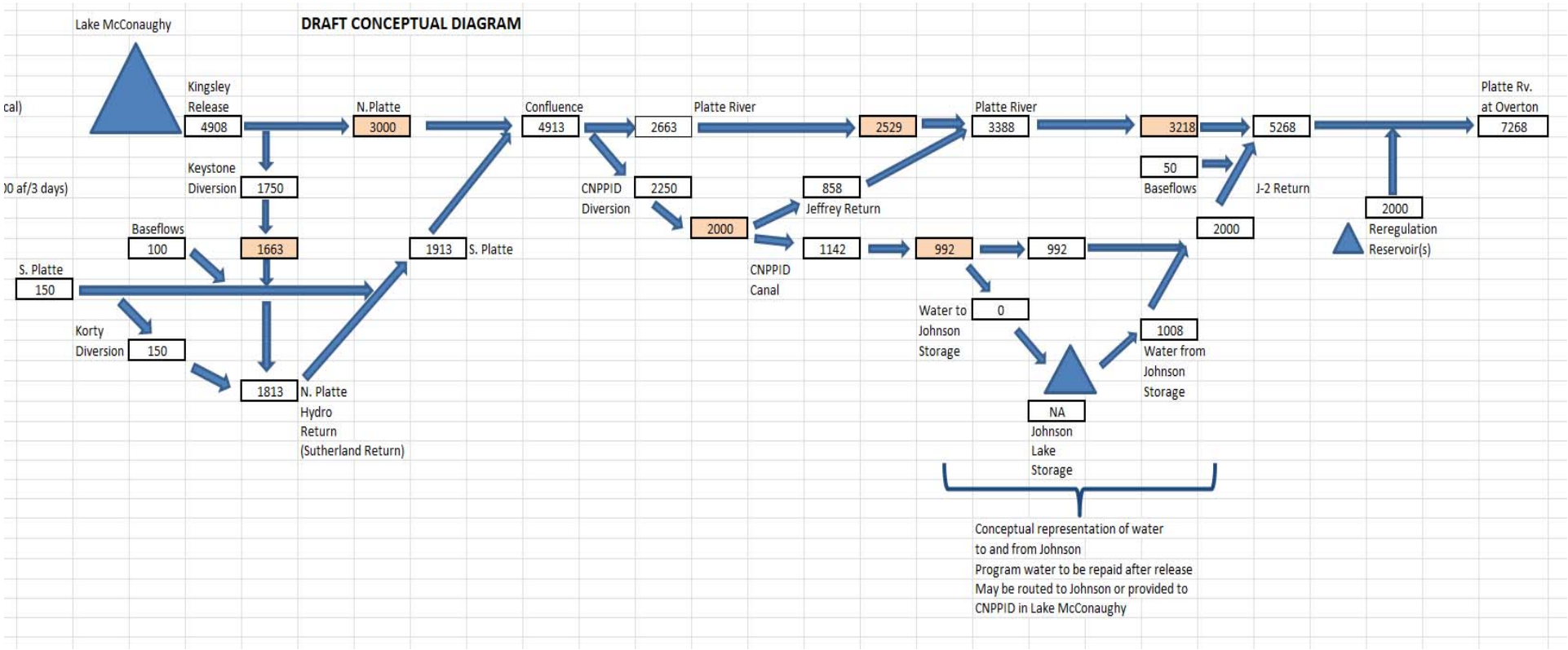
SIMPLIFIED MATRIX OF RELEASE VOLUMES IN ACRE-FEET BASED ON FLOW MAGNITUDE AND DURATION

Release Magnitude (cfs)	Release Duration												
	1 Day	3 Days	1 Week	2 Weeks	3 Weeks	4 Weeks	5 Weeks	6 Weeks	7 Weeks	8 Weeks	9 Weeks	10 Weeks	4 Months
200	397	1,190	2,777	5,554	8,331	11,107	13,884	16,661	19,438	22,215	24,992	27,769	47,603
400	793	2,380	5,554	11,107	16,661	22,215	27,769	33,322	38,876	44,430	49,983	55,537	95,207
600	1,190	3,570	8,331	16,661	24,992	33,322	41,653	49,983	58,314	66,645	74,975	83,306	142,810
800	1,587	4,760	11,107	22,215	33,322	44,430	55,537	66,645	77,752	88,860	99,967	111,074	190,413
1,000	1,983	5,950	13,884	27,769	41,653	55,537	69,421	83,306	97,190	111,074	124,959	138,843	238,017
1,200	2,380	7,140	16,661	33,322	49,983	66,645	83,306	99,967	116,628	133,289	149,950	166,612	285,620
1,400	2,777	8,331	19,438	38,876	58,314	77,752	97,190	116,628	136,066	155,504	174,942	194,380	333,223
1,600	3,174	9,521	22,215	44,430	66,645	88,860	111,074	133,289	155,504	177,719	199,934	222,149	380,826
1,800	3,570	10,711	24,992	49,983	74,975	99,967	124,959	149,950	174,942	199,934	224,926	249,917	428,430
2,000	3,967	11,901	27,769	55,537	83,306	111,074	138,843	166,612	194,380	222,149	249,917	277,686	476,033
2,400	4,760	14,281	33,322	66,645	99,967	133,289	166,612	199,934	233,256	266,579	299,901	333,223	571,240
2,800	5,554	16,661	38,876	77,752	116,628	155,504	194,380	233,256	272,132	311,008	349,884	388,760	666,446
3,200	6,347	19,041	44,430	88,860	133,289	177,719	222,149	266,579	311,008	355,438	399,868	444,298	761,653
3,600	7,140	21,421	49,983	99,967	149,950	199,934	249,917	299,901	349,884	399,868	449,851	499,835	856,860
4,000	7,934	23,802	55,537	111,074	166,612	222,149	277,686	333,223	388,760	444,298	499,835	555,372	952,066
5,000	9,917	29,752	69,421	138,843	208,264	277,686	347,107	416,529	485,950	555,372	624,793	694,215	1,190,083
6,000	11,901	35,702	83,306	166,612	249,917	333,223	416,529	499,835	583,140	666,446	749,752	833,058	1,428,099
7,000	13,884	41,653	97,190	194,380	291,570	388,760	485,950	583,140	680,331	777,521	874,711	971,901	1,666,116
8,000	15,868	47,603	111,074	222,149	333,223	444,298	555,372	666,446	777,521	888,595	999,669	1,110,744	1,904,132

<50KAF	Available Dry Years	*<120KAF*	Available Normal Years	*<200KAF*	Available Wet Years	*>200KAF*	Never Available

Assumptions: 1) EA & pathfinder modification yield varies from 40,000 to 80,000 AF; 2) J2 yield varies from 10,000 to 60,000 AF; 3) EA max = 200,000 AF

Conveyance & Capacity Constraints



Take-Home Points

1. Real-time hydrologic conditions reduce deficits and shift them to dry years
2. During drought periods, may have just enough water to implement SDHF… that's it
3. Achieving flow targets during the irrigation season is going to be almost impossible

Four pieces of not so gloomy news

1. Real-time hydrologic condition calculations significantly reduce operational deficits (90KAF)
2. Whooping crane migrations are outside of the irrigation season
3. The CNPPID and NPPD systems provide an efficient means to convey flows outside of the irrigation season
4. Existing summer baseflows during T&P nesting season are similar to or higher than prior to water development

Discussion

Independent Science Advisory Committee (ISAC) Response to Questions on Platte River Recovery Implementation Program (PRRIP) Target Flows

PRRIP Governance Committee Meeting

4 December 2012, Denver, CO

Drs. David Galat & Robb Jacobson representing ISAC

ISAC RESPONSE to Questions on Target Flows

1. **Do we push ahead with existing target flows using objective from May/June 2012 workshops?**

ISAC Response: ***NO***. Focus on Adaptive Management Plan (AMP) priority of implementing Short Duration High Flows (SDHF)

2. **Do we "peer review" target flows and consider revising /updating existing target flows?**

ISAC Response: **NOT AT THIS TIME**.

- Assumptions, methods used in 1994 are outdated
- Some aspects already reviewed
- ISAC proposes an alternative 'Target Flows Process'

ISAC RESPONSE to Questions on Target Flows

3. Do we consider a normative flow approach as suggested in the NRC report?

ISAC Response: **YES, POTENTIALLY AS PART OF A HYBRID APPROACH**. Species specific target flows AND normative approach for ecosystem processes that support species needs.

While the information used by the Service in formulating target flows is the best available, continual acquisition and analysis of scientific and habitat management information are necessary (Bowman, 1994; assumption #5)

…establish the sorts of conditions that we know from research in present environments favor the threatened and endangered birds and fish but are also consistent with our knowledge of presettlement conditions. (NRC 2005)

What is a ‘normative’ approach?

Origin: Stanford, J. A., et al. 1996. A general protocol for restoration of regulated rivers. Regulated Rivers: Research and Management **12**:391-413.

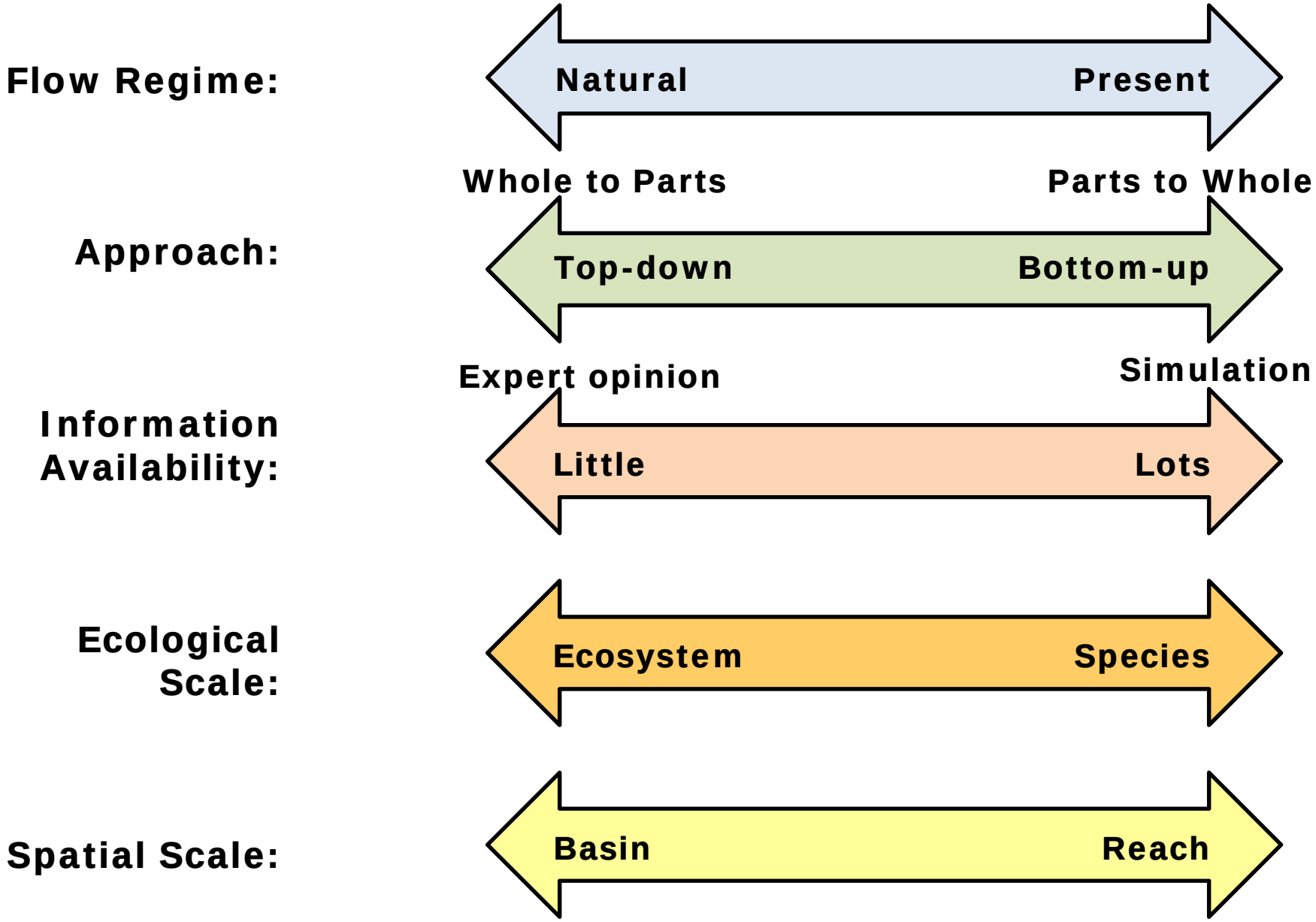
‘Owing to the importance of flow to habitat maintenance, and temperature to food-web energetics, highly significant restoration is possible simply by reregulation to allow more natural seasonality of flow and temperature. We call this restoration of ***normative*** *habitat conditions, where the norm or standard is established from what is possible in a natural-cultural context as opposed to striving for pristine conditions which are difficult, if not impossible, to define or achieve, at least for entire catchments.’*

What is a ‘normative’ approach?

Recommended by NRC Endangered & Threatened Species of the Platte River (2005) and characterized by:

- Focus on river as an ecosystem rather than individual species (pgs. 11, 249).
- Blend objectives to develop flow characteristics that benefit key wildlife species & attempt to mimic presettlement conditions to the extent possible (p. 111, Box 4.1).
- Flows that mimic natural characteristics, but recognize changed nature of the basin & water resource demands (p. 111, Box 4.1)

PPRIP Environmental Flow (E-flow) Assessment
Decision Space



Why Undertake a Target Flows Process?

1. Program says target flows will be evaluated through AM
2. More information & tools available than in 1994
3. Recent knowledge can lead to more creative & effective water-use decisions with increased flexibility
4. Re-examination is consistent with AM & existing collaborative involvement process
5. Can provide a firm scientific foundation, long-term stability & better certainty for the 2nd Increment
6. Scoring alternative projects & other existing 1st Increment target flows decisions not affected; application of revised Target Flows would affect scoring & other decisions, but *only* in the 2nd Increment.

Target Flows Process: Managing Expectations

1. Gain knowledge about alternative approaches (not necessarily getting THE answer)
2. ID strengths & weaknesses of different approaches
3. Evaluate & potentially revise existing PRRIP conceptual models for target species based on habitat needs, life histories, & important riverine process that create/maintain habitat & the target species recovery
4. Converge to small set of approaches that are worth applying to the Platte River

Target Flows Process: Draft Steps

1. EDO further evaluates target flows & distributes summary of relevant info to TAC
2. Select leading scientists & practitioners to participate
3. Pre-symposium webinars –
    a. educate presenters on constraints in Platte River to establish realistic context
    b. brief Program participants on scientific basis of dominant environmental flow (E-flow) approaches

Target Flows Process: Draft Steps

4. **Convene educational E-flows Symposium**
    a) **Comparison of E-flow approaches & methodologies**
    b) **Improve understanding of strengths & weaknesses relative to Platte River**
    c) **Report & recommendation of a way forward to GC**

Target Flows Process: Draft Steps

5. PRRIP workshops to revise/develop conceptual models & hypotheses using E-flow approaches
6. Converge on species-specific & normative flow targets, building support gradually with frequent GC updates
7. Technical report documenting results and rationale, with summary to GC
8. Peer review following OMB & USFWS guidelines
9. Provide support to negotiations on management actions and operating rules for the 2nd Increment