

“The Original Proposed Approach of 2002, with Five Treatments”

IMPLEMENT TREATMENT

DO NOT IMPLEMENT TREATMENT

The Design Did Not Build on History of Previous Work . . .

Though Useful as Starting Point, It Was Not Fully Adopted . . .

	Increased Fluctuations In Daily Flows	Mechanical Removal of Rainbow Trout in GC	Stable-Low Flows in Fall	TCD (Future)	Beach Habitat Building Flow
WY2002-03					
WY2003-04					
WY2004-05					
WY2005-06					
WY2006-07					
WY2007-08					
WY2008-09					
WY2009-10					
WY2010-11					
WY2011-12					
WY2012-13					
WY2013-14					
WY2014-15					
WY2015-16					
WY2016-17					
WY2017-18					

The 2002 Revised Design with Two Controlled and Two Randomized Treatments [May 2004]

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Evolution in Design on Basis of Progress & Historical Perspective Continued

Water Year	MLFF + Designer Flow Treatments in Winter and Summer/Fall	Mechanical Removal of Rainbow Trout in GC (non-optimized)	Naturally Warmed owing to Low Reservoir	Beach Habitat Building Flow (Paria Trigger)
WY2003	MLFF + ExpFF	Remove Fish	Warming Event	Non-Trigger
WY2004	MLFF + ExpFF	Remove Fish	Warming Event	Non-Trigger
WY2005	Plus, Stable Fall	Remove Fish	Warming Event	Fall BHBF Test
WY2006	Plus, Stable Fall	Remove Fish	Warming Event	No Testing
WY2007	MLFF + ExpFF	Do Not Remove Fish	Warming Event	Event ???
WY2008	MLFF + ExpFF	Do Not Remove Fish	Random ???	Event ???
WY2009	Plus, Stable Fall	Do Not Remove Fish	Random ???	Event ???
WY2010	Plus, Stable Fall	Do Not Remove Fish	Random ???	Event ???
WY2011	MLFF + ExpFF	Remove Fish	Random ???	Event ???
WY2012	MLFF + ExpFF	Remove Fish	Random ???	Event ???
WY2013	Plus, Stable Fall	Remove Fish	Random ???	Event ???
WY2014	Plus, Stable Fall	Remove Fish	Random ???	Event ???
WY2015	MLFF + ExpFF	Do Not Remove Fish	Random ???	Event ???
WY2016	MLFF + ExpFF	Do Not Remove Fish	Random ???	Event ???
WY2017	Plus, Stable Fall	Do Not Remove Fish	Random ???	Event ???
WY2018	Plus, Stable Fall	Do Not Remove Fish	Random ???	Event ???

Update on Lake Powell

- **Reservoir Level**

- Current Elevation - 3602.0 ft (98 ft from full)
 - low for 2005 – 3555.1 ft on 4/8/2005
 - lowest elevation since May 1969
- Current Live Storage 12.0 MAF (49%)
- Projected Low (March 2006) – 3593.0 ft
- Projected High (July 2006) – 3625.7 ft

- **Warmer GCD Releases**

- Maximum observed temperatures
 - 11/14/2003 – 13.2°C (56°F)
 - 10/5/2004 – 15.5°C (60°F)
 - 10/11/2005 – 15.8°C (61°F)
 - WY 2006 est. 12-13°C depending on hydrology



Historical Perspective on EXP

- Let's Step Back and Look
 - MLFF+BHBF is the approved Management Action (baseline)
 - EXP treatments include: reducing coldwater exotics, plus EXP trout suppression flows, and Fall BHBF test
 - Nature decided to add thermal element
 - Managers decided to add LCR Translocation (conservation)
- Comparing Policies: Stable Shoreline Habitat vs. Warmer River
 - “Fluctuating Flows” we decide???
 - “Temperature Control” nature’s own device?

Warming was added to the MLFF operation after a decade of not being implemented!

Now What?



Status of Evolved Design on Basis of Historical Perspective

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Water Year, w/ HBC & RBT Recruitment Success [+ or -]	Dominant Dam Operation (with Seasonal Variants Toward “Designer Flows,” but All Within ROD)	Mechanical Removal of Rainbow Trout in GC (with Progressive Optimization)	Naturally Varied Temperature (Relative to August Average at GCD, RM61) [+, 0, -]	Beach/Habitat Building Flow (Paria, LCR River Sand Inputs Relative to Historic Mean) [+, 0, -]
WY1991, [0,0]	EXP Flows	No Exotic Control	[0,nd]	[-,-](No BHBF)
WY1992, [-,+]	Interim only	No Exotic Control	[-,-]	[+,-](No BHBF)
WY1993, [-,+]	Interim only	No Exotic Control	[0,-]	[+,+](No BHBF)
WY1994, [-,+]	Interim only	No Exotic Control	[-,-]	[-,-](No BHBF)
WY1995, [-,+]	Interim only	No Exotic Control	[0,0]	[0,0](No BHBF)
WY1996, [0,+]	Interim+BHBF	No Exotic Control	[0,0]	[-,-](W/ BHBF)
WY1997, [0,+]	MLFF only	No Exotic Control	[0,0]	[+,-](No BHBF)
WY1998, [+,+]	MLFF+HMF	No Exotic Control	[0,0]	[+,-](No BHBF)
WY1999, [+,+]	MLFF only	No Exotic Control	[0,0]	[+,- (No BHBF)
WY2000, [+,+]	MLFF+LSSF+HMF	No Exotic Control	[0,+]	[-,-](No BHBF)
WY2001, [?,+]	MLFF only	No Exotic Control	[0,0]	[+,-](No BHBF)
WY2002, [?,-]	MLFF only	No Exotic Control	[0,0]	[-,-](No BHBF)
WY2003, [?,-]	MLFF+EXP FF	Experimental Fish Removal	[+,+]	[-,-](No BHBF)
WY2004, [?,0]	MLFF+EXP FF	Experimental Fish Removal	[+,+]	[-,-](No BHBF)
WY2005, [?,?]	MLFF+EXP FF+Fall Testing	Experimental Fish Removal	[++,++]	[+,+](W/ BHBF)
*WY2006, decision [?,?]	MLFF+Fall Testing	Experimental Fish Removal	???	???(No BHBF)

Considering Historical Perspective and Recent Results?

Let's Consider the Continued MLFF Options – Option #1

Forward Titration that Could Evolve to a Factorial Design In fact, we have 15 years of a Forward Titration design already behind us with pretty solid data for both sediment and fisheries! The MLFF (and its precursor, Interim operation) was implemented from 1991 through 2001 with no Mechanical Removal or persistent thermal warming event. **Then, we continued mostly MLFF operations and implemented MR along with Nature's Own version of the Selective Withdrawal Structure since 2002! Hence, after an 11-year long “block” of MLFF with cold water and unconstrained RBT recruitment, we are now heading into the 4th year of a block of MR coupled with a warm main-channel “event.”** What to do?

Selective Withdrawal Structure might be a handy tool to have in our experimental kit right now. Pursue Mechanical Removal of Warm & Cold fish species?

MLFF Under the Range of Upper Basin Hydrologic Cycle If we continue monitoring the MLFF under the paired implementation of MR and warming, we have no way of ensuring that warming will continue. **Perhaps we continue MR and let nature decide the end of the warm event, or try to manage the system to prolong warming (while building the SWS)?**

Managers might choose to enhance the probability of a HBC recruitment signal by recommending stable Fall flows, but that could confound ability to discern MR & Temp from Habitat Stability?

Remember, Carl said “...it ain't just about learning . . . It's about comparing policies that managers are willing to commit to in order to benefit the resources!”

Considering Historical Perspective and Recent Results?

What About Option #2 (add Stable Fall Flows)

Evaluating Stable Flows vs. Mechanical Removal and Warming

What to do in the next 5-year phase (Phase V)?

MLFF Under the Range of Upper Basin Hydrologic Cycle There is some chance that the Native Fishes response below GCD is dominated by Upper Basin Hydrology (cycles of wet/cold & dry/warm) once interactions with exotics are limited (through use of MR or other factors limiting their success). Perhaps flow stability should only be added to the Forward Titration (our most costly treatment) after a sustained monitoring period under MLFF+MR+Warm Event? If no recruitment occurs by 2011, then a combination of stable flows, MR and warming (with operation of a SWS) could be the next step in the Forward Titration turned Factorial.

We Should Recognize that In 5 More Years, Our Experiment will be 20-years old!

SWS Could Allow Factorial Design w/ Decade Scale Blocks

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WY1998, [+,+]	MLFF+HMF	No Exotic Control	[0,0]	[+,-] (No BHBF)
WY1999, [+,+]	MLFF only	No Exotic Control	[0,0]	[+,-] No BHBF)
WY2000, [+,+]	MLFF+LSSF+HMF	No Exotic Control	[0,+]	[-,-] (No BHBF)
WY2001, [?,+]	MLFF only	No Exotic Control	[0,0]	[+,-] (No BHBF)
WY2002, [?,-]	MLFF only	No Exotic Control	[0,0]	[-,-] (No BHBF)
WY2003, [?,-]	MLFF+EXP FF	Experimental Fish Removal	[+,+]	[-,-] (No BHBF)
WY2004, [?,0]	MLFF+EXP FF	Experimental Fish Removal	[+,+]	[-,-] (No BHBF)
WY2005, [?,?]	MLFF+EXP FF+Fall Testing	Experimental Fish Removal	[++,++]	[+,+] (W/ BHBF)
*WY2006, decision [?,?]	MLFF+Fall Testing	Experimental Fish Removal	[++,++]	??? (No BHBF)
WY2007, [?,?]	MLFF only (Ramping	Experimental Fish Removal	SWS Built? [++,++]	???
WY2008, [?,?]	MLFF only Tests for	Experimental Fish Removal	Warm Thermal [++,++]	???
WY2009, [?,?]	MLFF only Sand Bars	Experimental Fish Removal	Regime [++,++]	???
WY2010, [?,?]	MLFF only Might be	Experimental Fish Removal	Extended [++,++]	???
*WY2011, decision [?,?]	MLFF ? Added)	Experimental Fish Removal	Through [++,++]	???
WY2012, [?,?]	Amended MLFF?	Experimental Fish Removal	Management [++,++]	???
WY2013, [?,?]	Amended MLFF?	Perhaps Stop EXP MR?	Action [++,++]	???

Other Options for Experimental Flows 2007-2011?

**What About Stakeholder Suggested Modifications of the
GCMRC's Recommended Options (#1 or #2)
(add Relaxed Winter Fluctuating Flows, Stranding Flows,
Altered Ramping Rates, etc.)**

MINI EXPERIMENTS FOR CONSIDERATION –

Ramping & Daily Range versus Beach Stability, etc.

Alternative Operations for “Trout Suppression”

**Influence of Expanded Daily Variability on Food Base and
Associated Aquatic Resources, etc.**

**All Options are Being Discussed/Considered in SPG and
Ongoing Conversations with SA's and Cooperating Scientists**