Meeting The Mitigation Requirement For The Bonneville Unit Central Utah Project

Mark Holden

Utah Reclamation Mitigation and Conservation Commission

Utah Reclamation Mitigation and Conservation Commission

A presidential Commission established in July 1994 under the

Central Utah Project Completion Act of 1992 (CUPCA)

www.mitigationcommission.gov

Common Issues Facing GCDAMP and CUPCA

- Water supply and delivery
- Ecosystem needs
- Hydropower generation
- Endangered Species
- Funding

Colorado River Basin Water Development

- Colorado River Compact of 1948 allotted Utah 23% of Colorado River water in the Upper Basin (up to 1,715,000 AF)
- Colorado River Storage Project Act (CRSPA) of 1956 authorized numerous “participating projects”, of which CUP is the largest

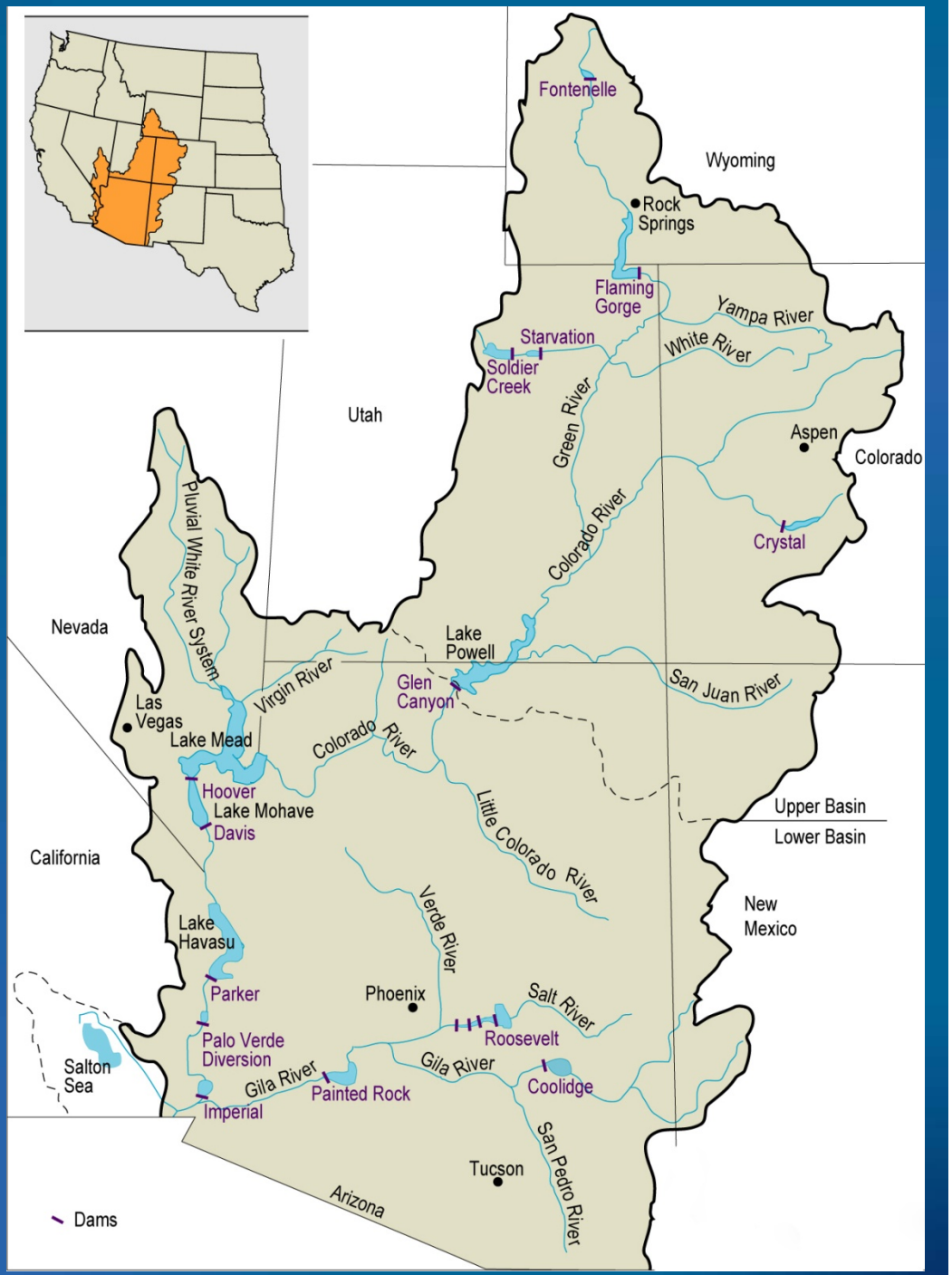
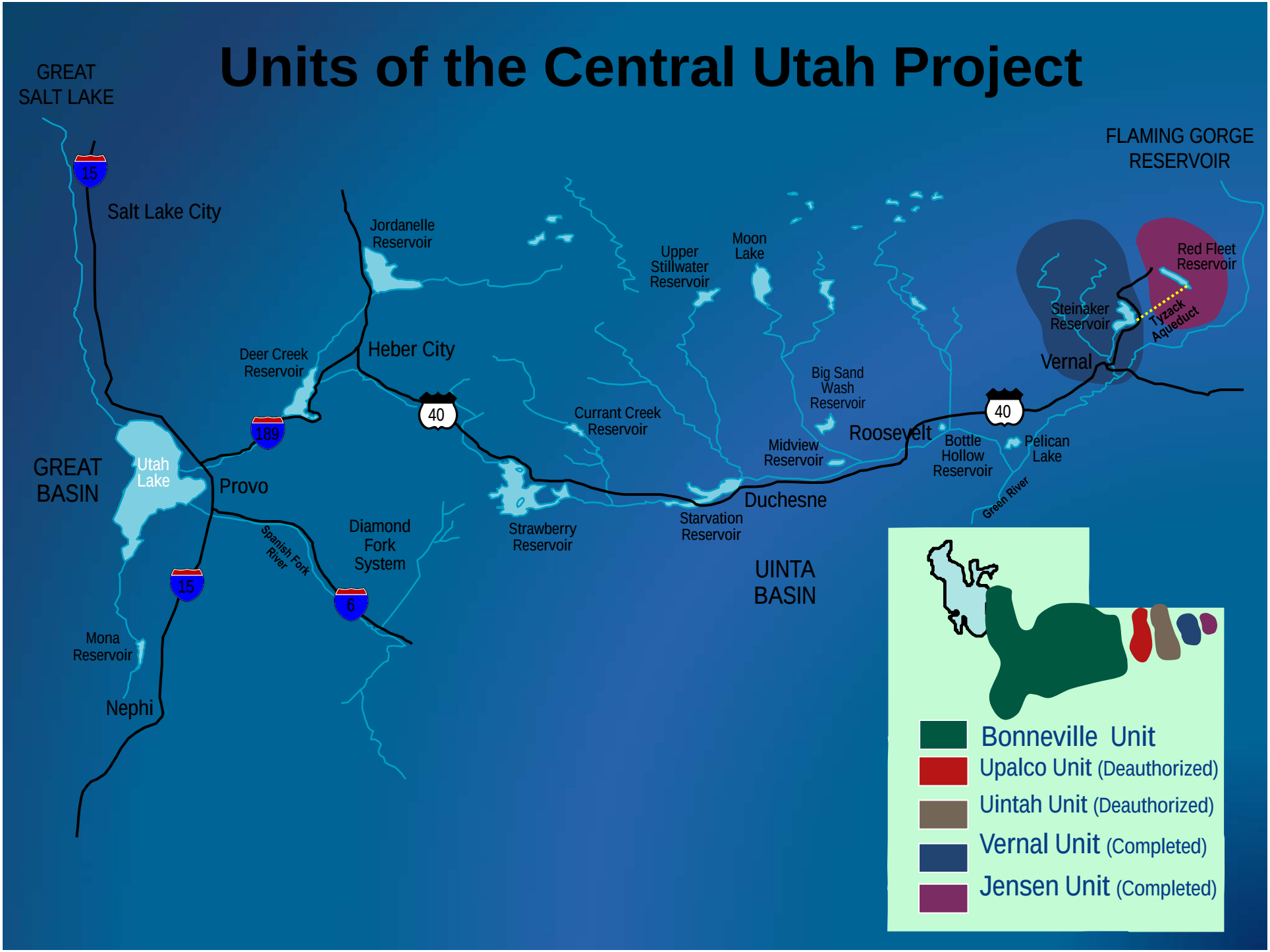
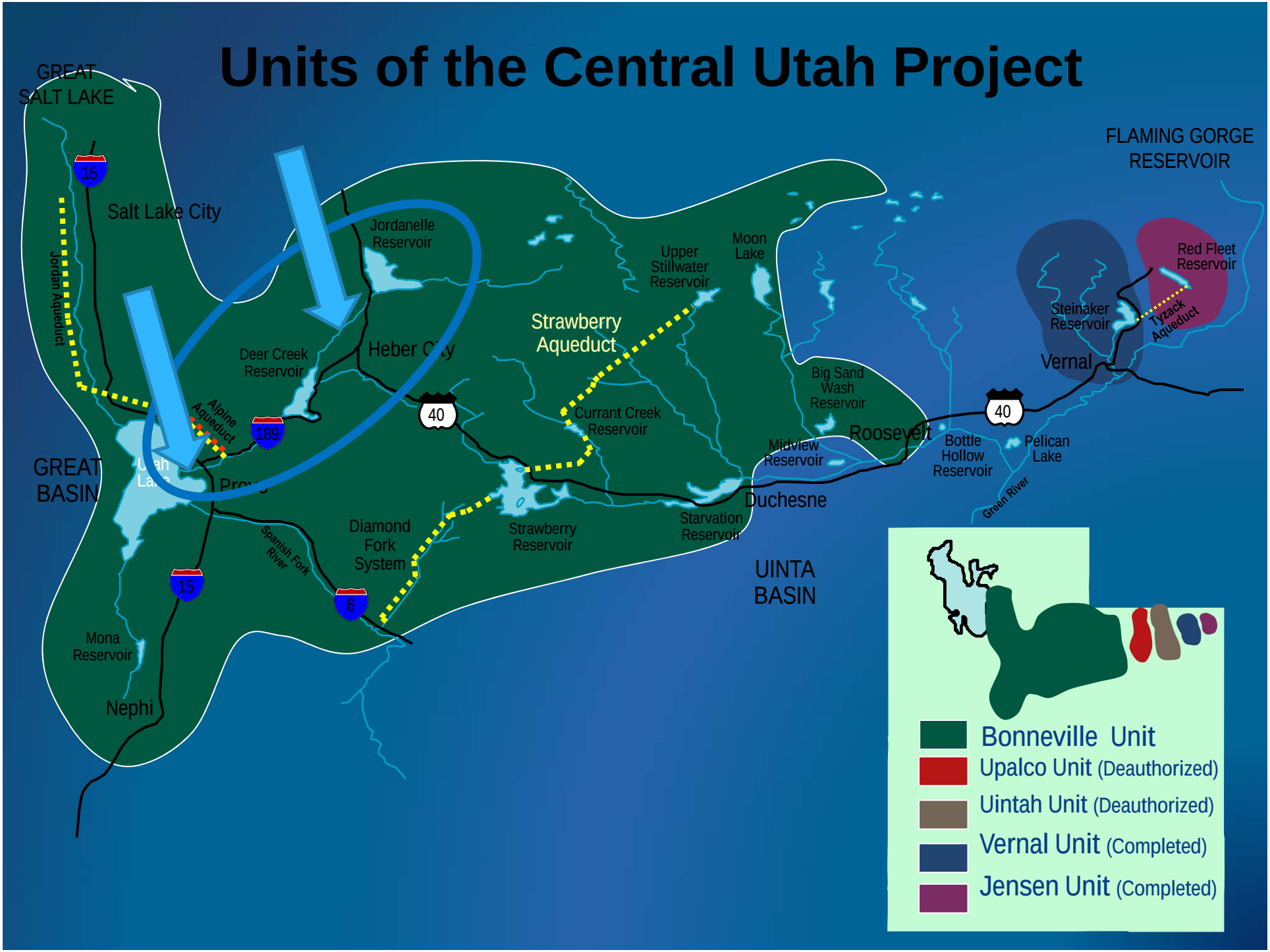


Figure Source: David L. Alles
Western Washington University

Units of the Central Utah Project



Units of the Central Utah Project



Importance of Streamflows in Managing Restored Rivers

Middle Provo River, 1990s

Provo River Restoration Project 2003

Importance of Streamflows in Managing Restored Rivers

- Restoration of ***conditions*** without restoration of ***processes*** is not really restoration

- Information on relationships between flow levels and instream aquatic habitats and geomorphic and riparian processes is vital to managing the Provo River Restoration Project.

Regulation of Flow Regime

- Typical reservoir operations truncate or eliminate peak flows
- Reduction of peak flows eliminates inundation and physical disturbance
  - Lack of geomorphic processes
  - Rivers are naturally very dynamic systems
  - Decline of disturbance-dependent communities (cottonwood)
- Lowering of water table/lack of seasonal recharge
  - Narrowing of riparian zone
  - Drier understory composition

Regulation of Flow Regime
continued

- Encroachment of riparian zone by mid- and late-successional upland species (e.g. box elder, conifers)
- Altered sediment transport/balance
  - Bed armoring
  - Tributaries increasingly important
- Seasonal shifts in peak flows
- Functional shift of stream type

Idealized General Approach to Instream Flow Recommendations

- Instream Flow Council Policy Statements (2004)
  - Riverine Components
  - Riverine Resource Stewardship: maintain/restore ecological functions and processes similar to those exhibited in their natural state
  - Flow Variability: provide inter- and intra-annual variable flow patterns that mimic the natural hydrograph

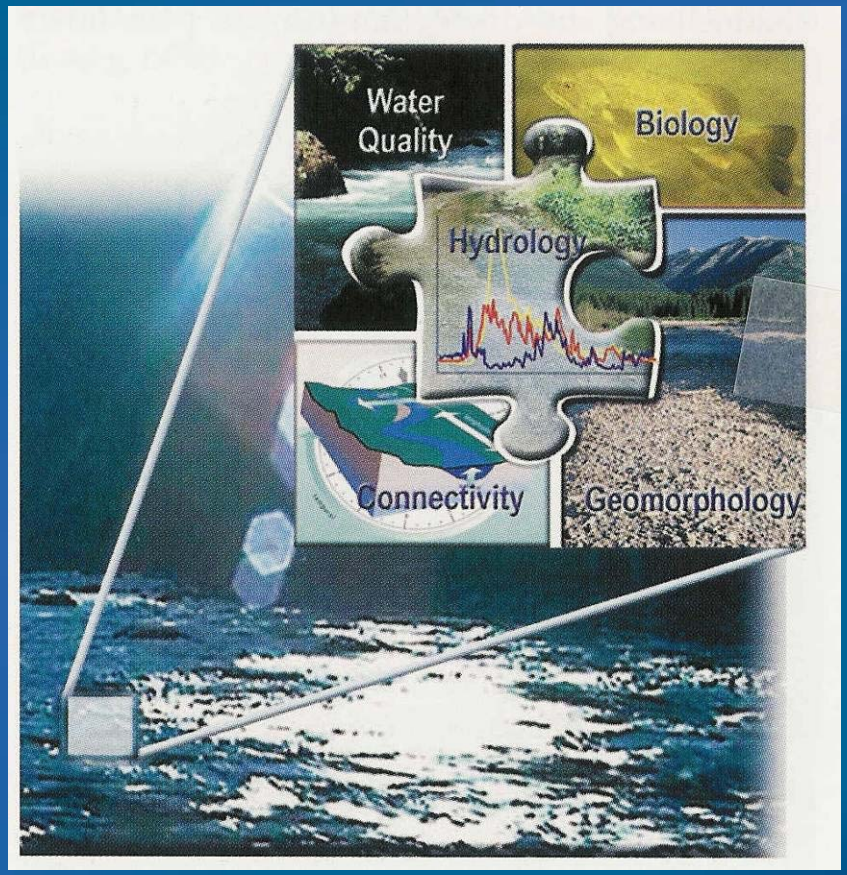


figure from Annear et al. 2004

Idealized General Approach to Instream Flow Recommendations

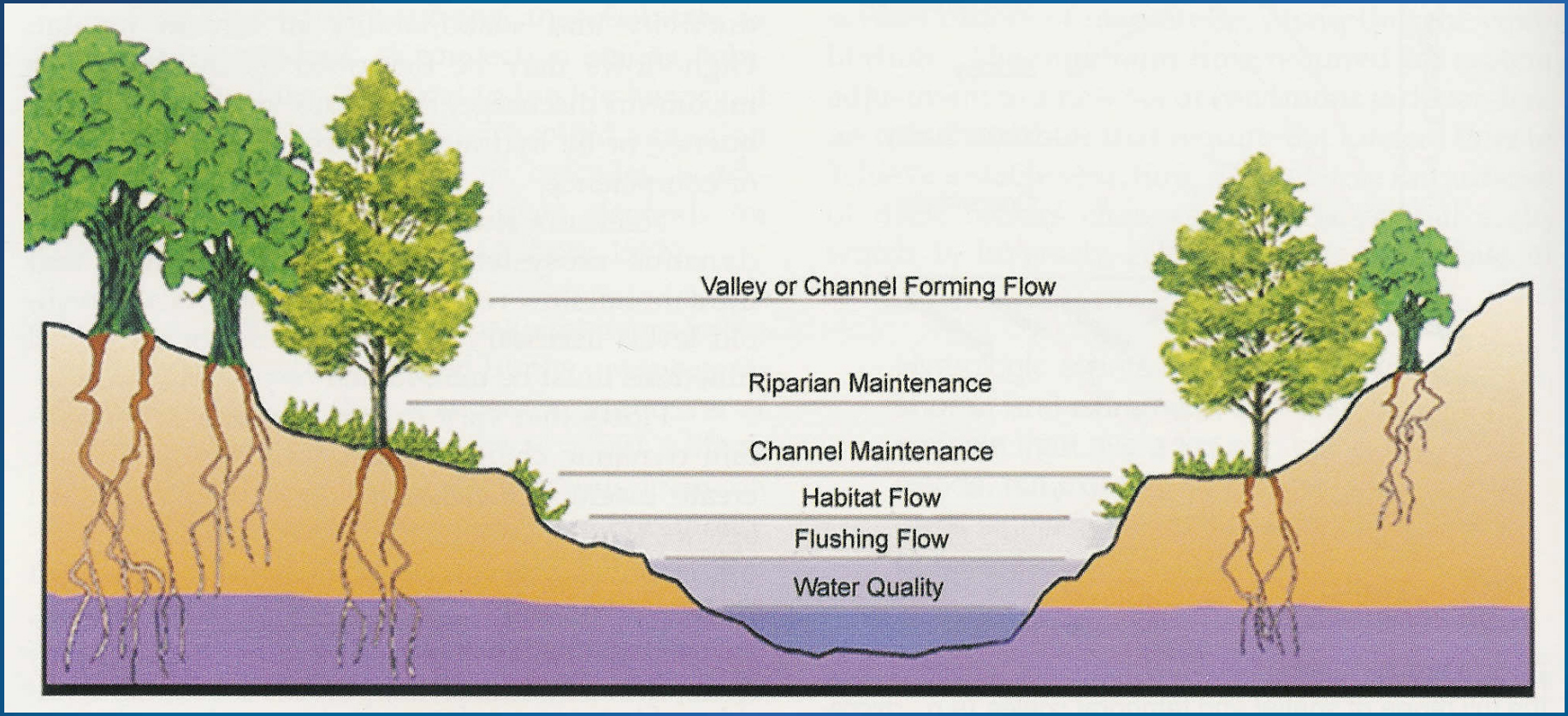


figure from Annear et al. 2004

We Developed a Model of Cottonwood Recruitment in the Middle Provo River

- To assess alternative flow regimes
- To predict effects of restoration designs
- To develop flow recommendations for riparian recruitment

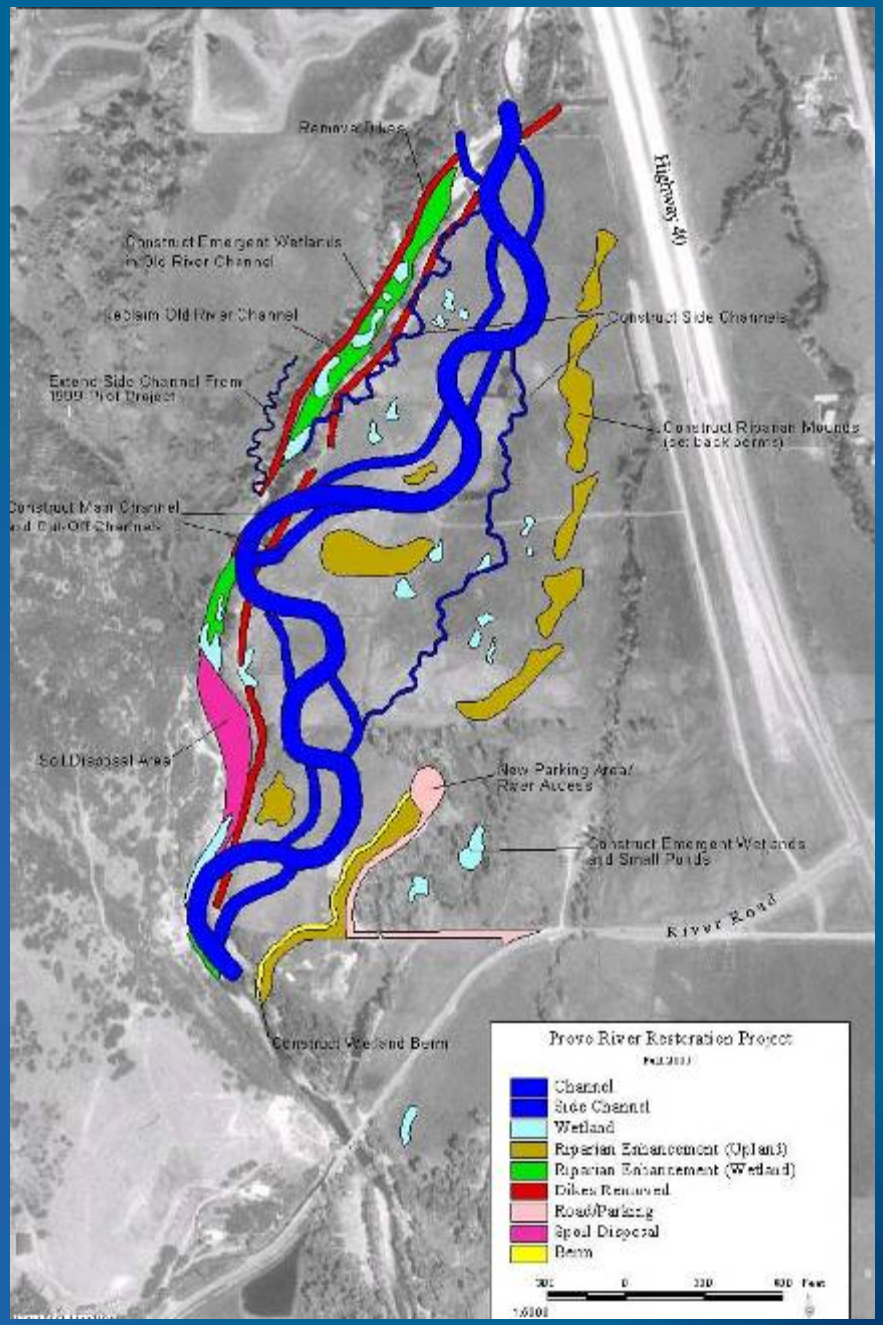
Importance of Riparian Vegetation to Aquatic Habitat

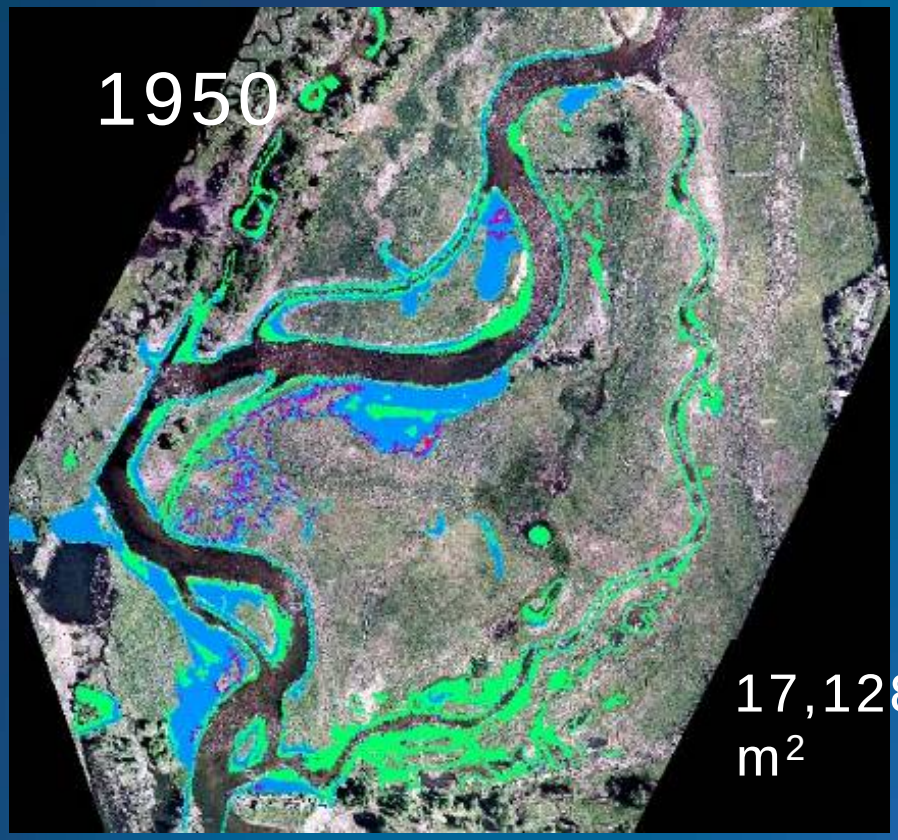
- instream cover
  - woody debris
  - roots/overhanging banks
- habitat complexity
  - velocity refuges
  - scour holes at log jams
- size of bed material

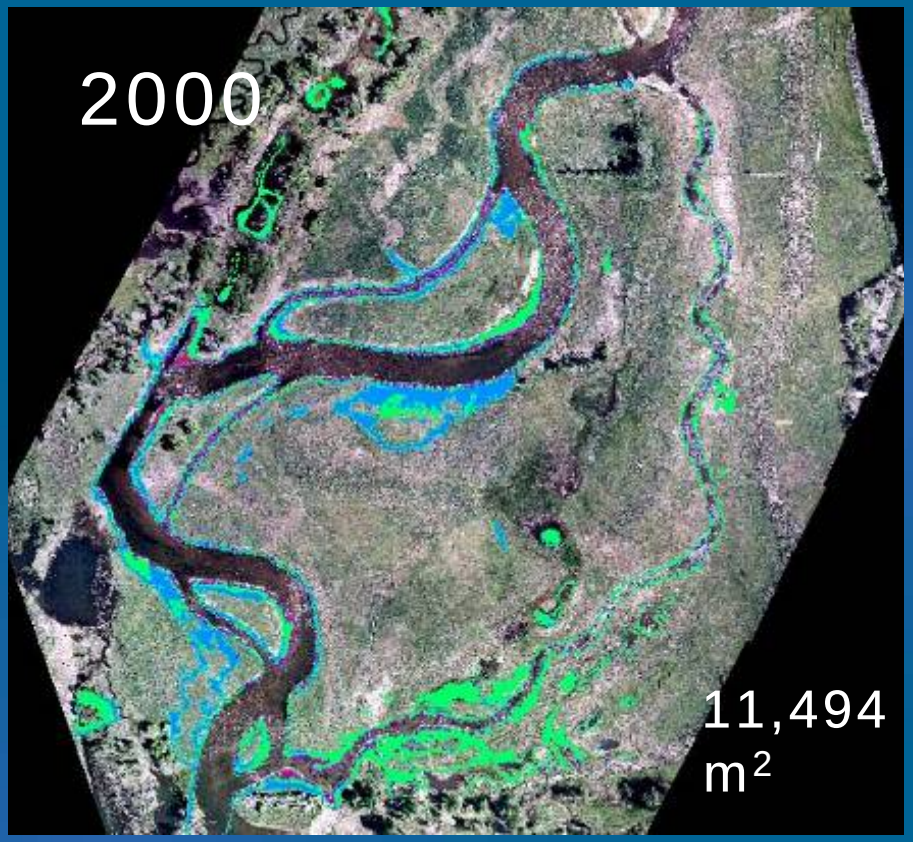
Importance of Riparian Vegetation

- water quality
  - temperature
  - DO
  - nutrients
- channel morphology
  - bar deposits
  - bank strength

Reach 8 was restored in 2000

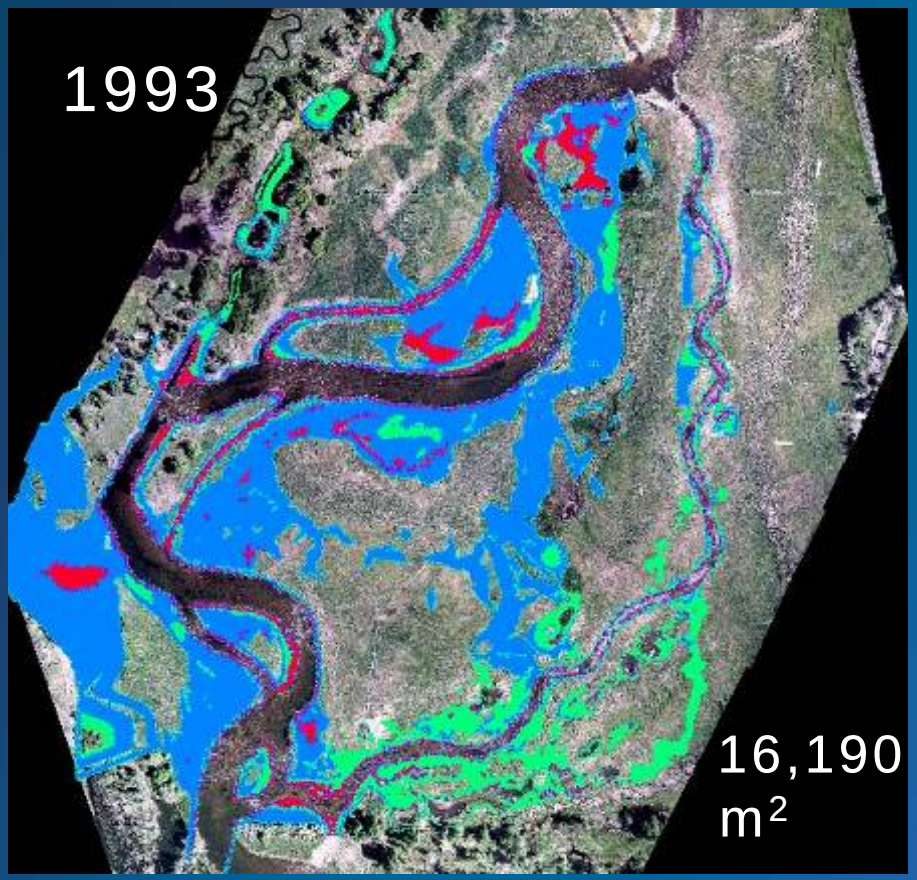


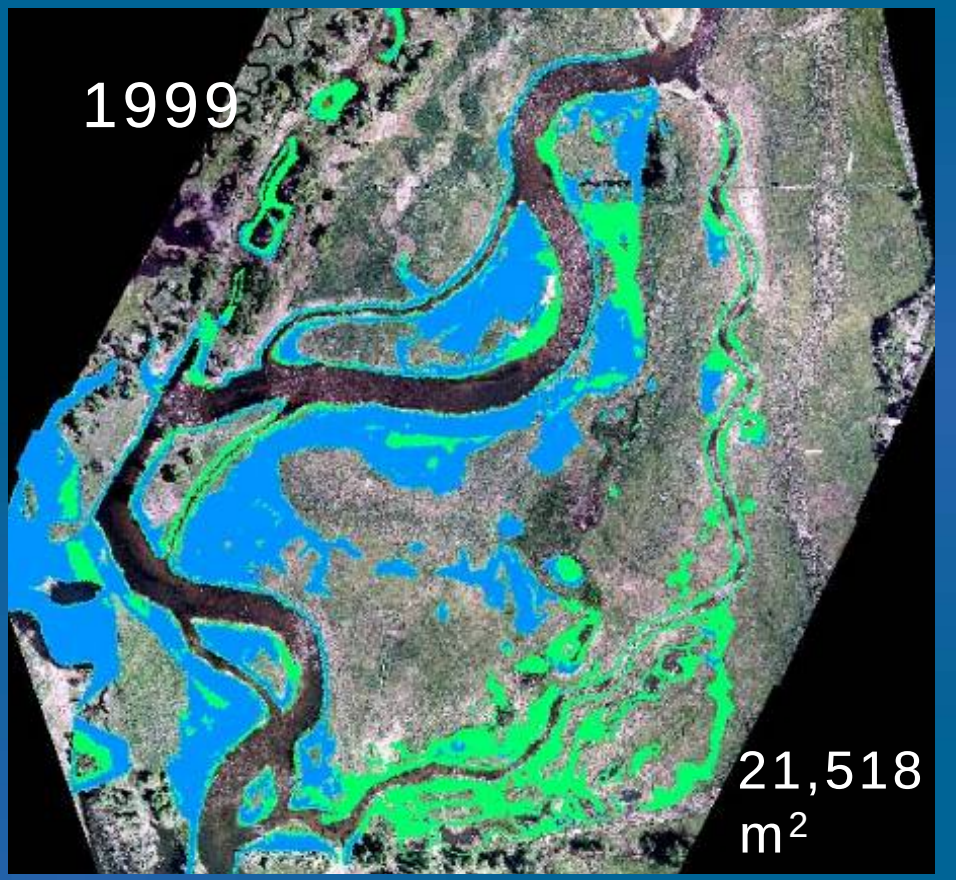




- peak flow = 1570 cfs
- slow receding limb rate
- total AF_{ANN} =171,632
- 49% more recruitment with 7% more flow

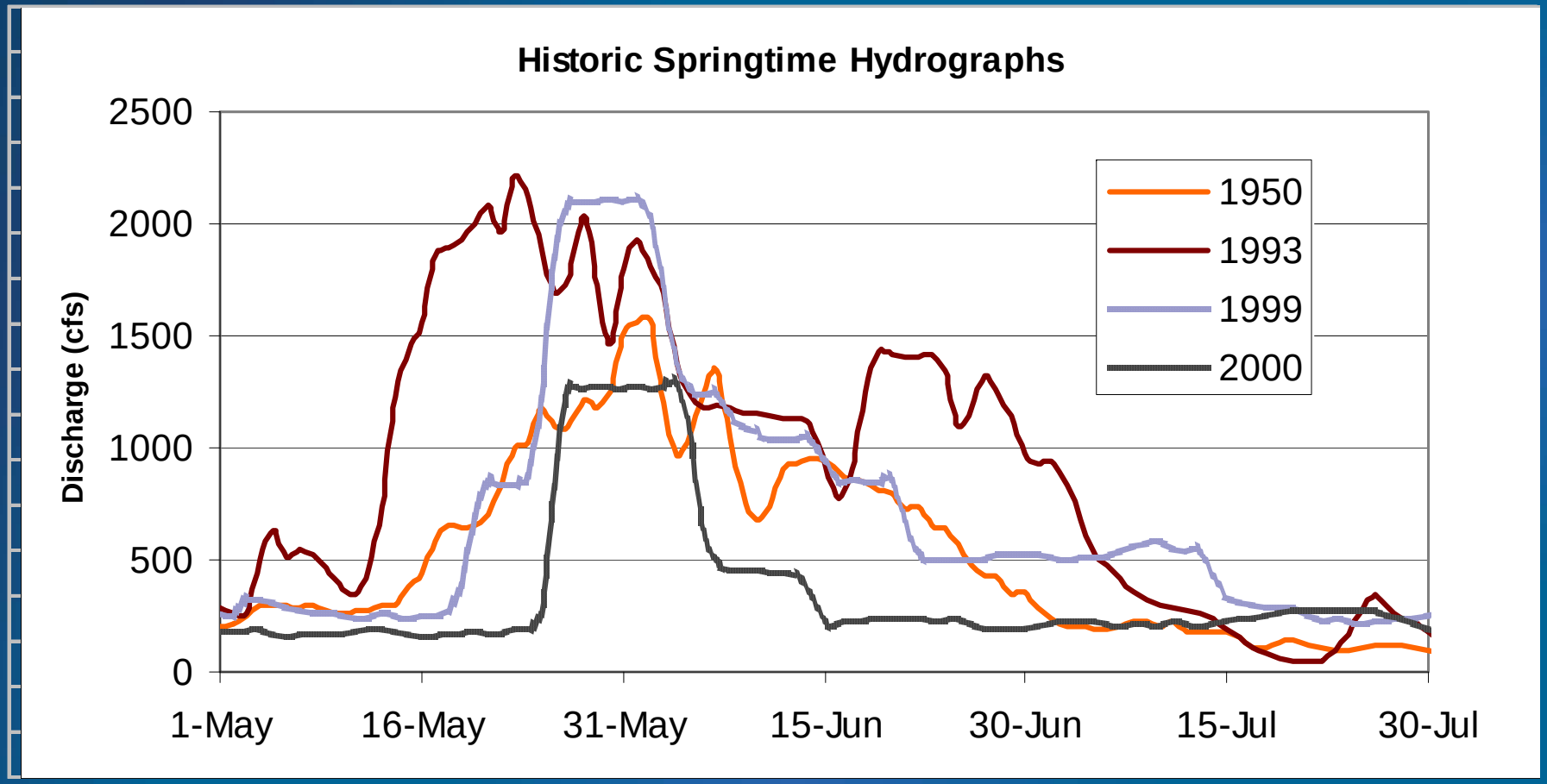
- peak flow = 1280 cfs
- faster receding limb rate
- total AF_{ANN} =159,675





- peak flow = 2,210 cfs (1,930 cfs)
- peaks before seeding window
- August re-wetting (red death)
- total AF_{ANN} =237,818

- peak flow = 2,110 cfs
- faster receding limb rate
- higher baseflow
- total AF_{ANN} =248,747
- 33% more recruitment with 4% more water



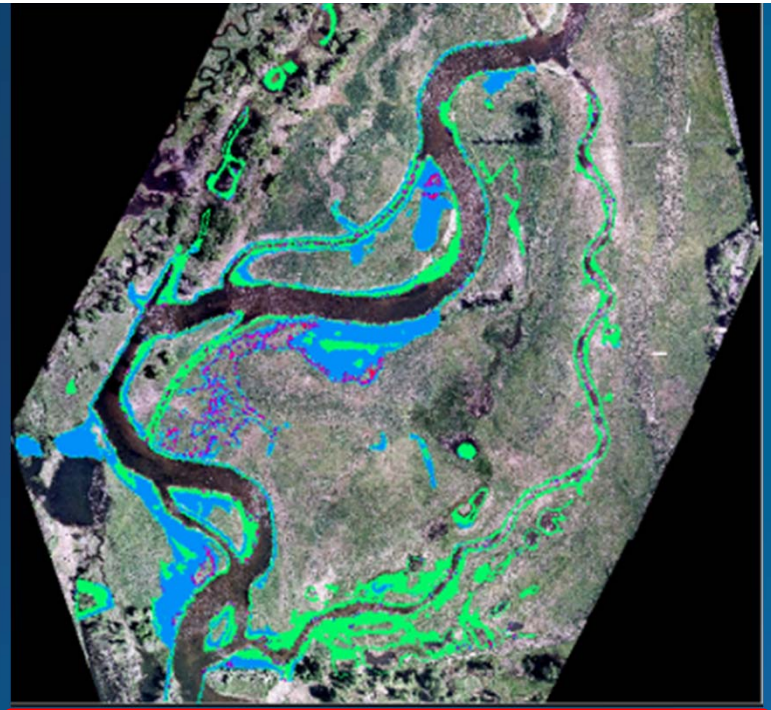
1950 = 171,632 AF

1993 = 237,818 AF

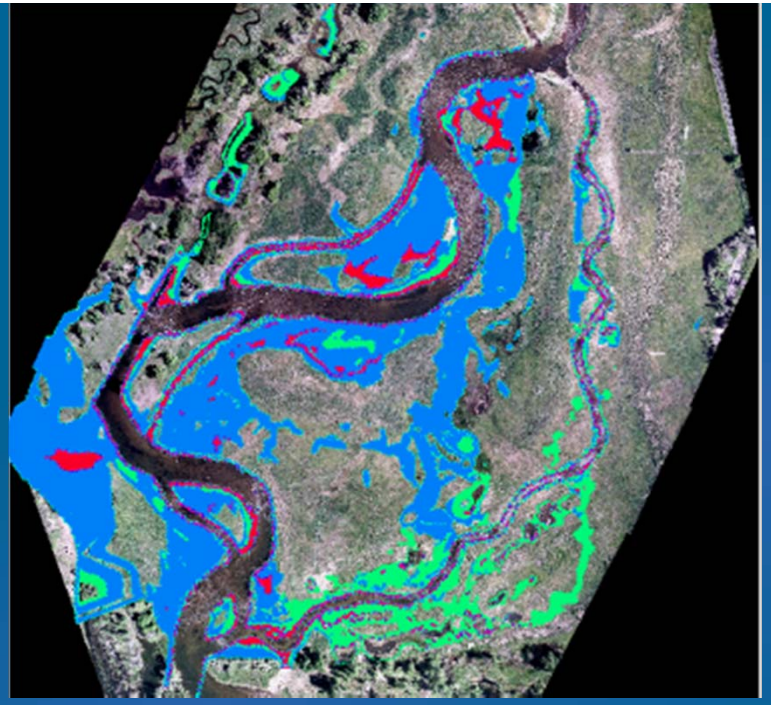
1999 = 248,740 AF

2000 = 159,675 AF

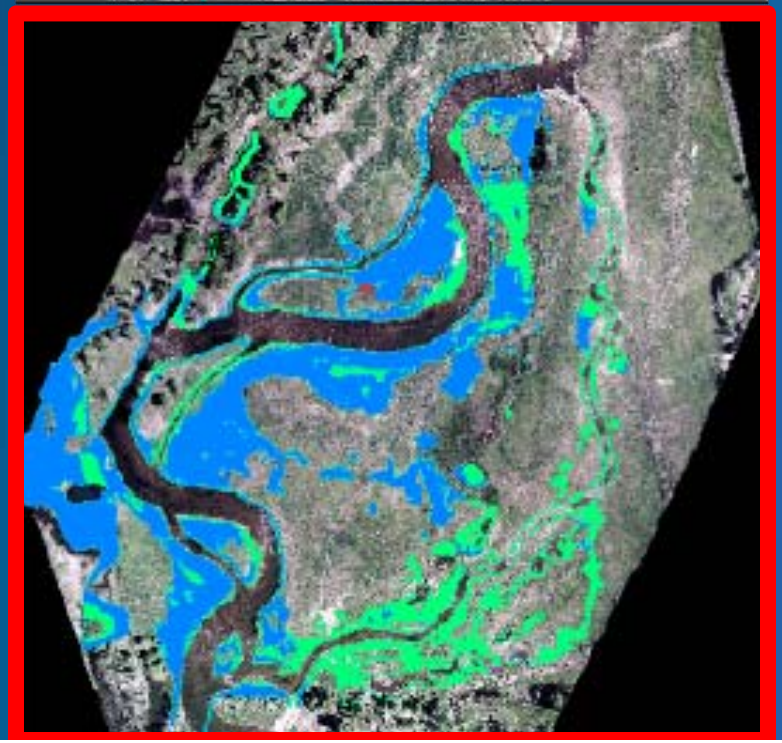
1950



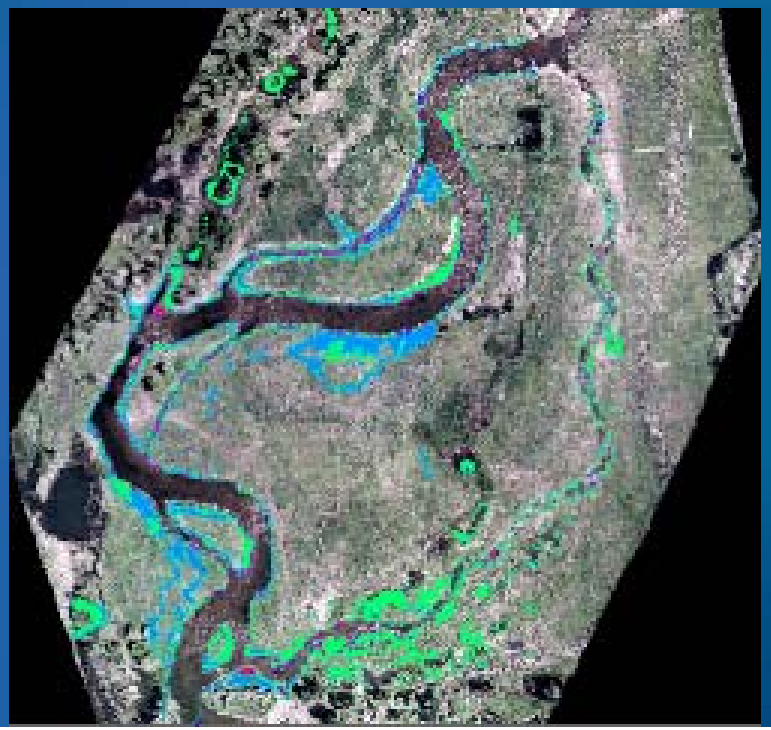
1993



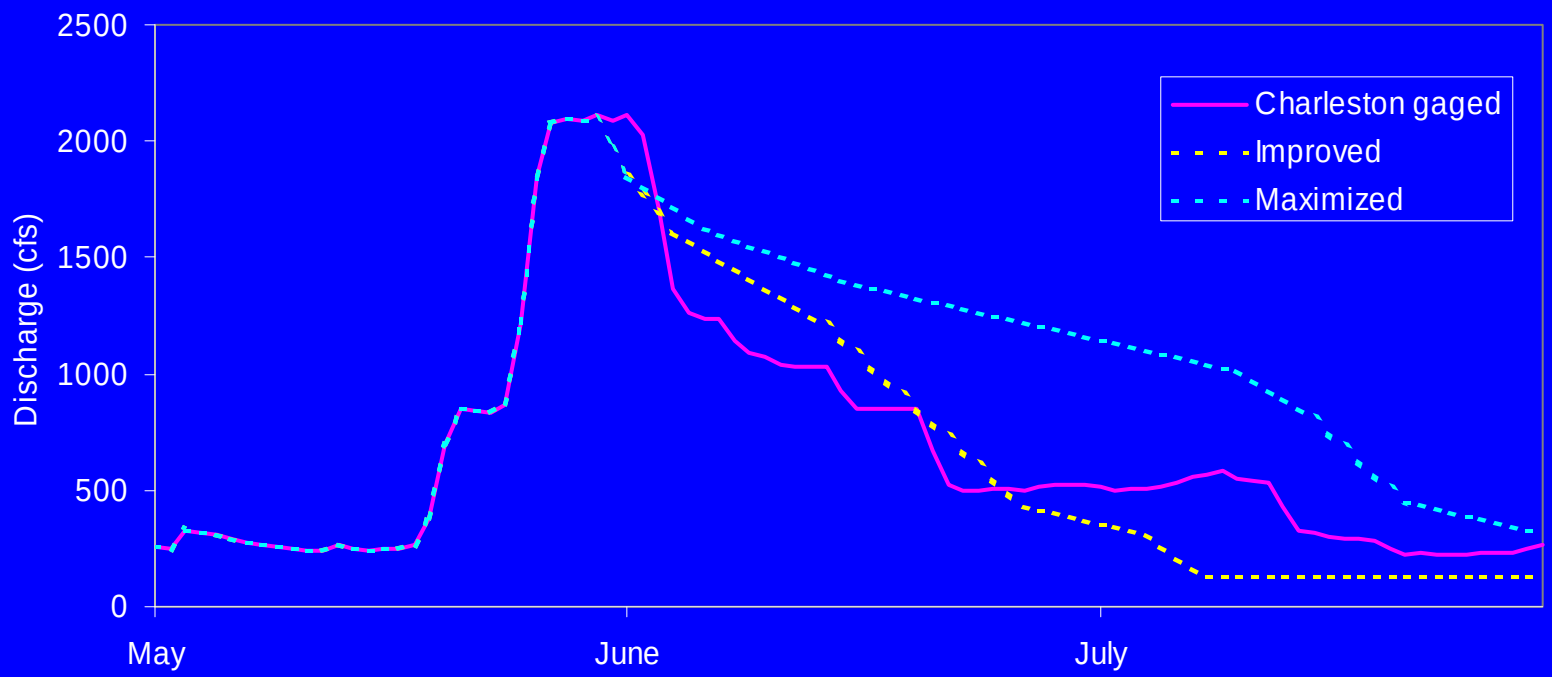
1999



2000



Cottonwood Recruitment Flow Recommendations
1999 Hydrographs



1999 Hydrograph	Historic	"Improved Flows"	"Maximized Flows"
Annual ac-ft	248,747	242,336 (-3%)	299,837 (+21%)
May 1 - July 31 ac-ft	125,780	119,369	176,870
Percentage May-July	50.6	54.6	63.6
Recruitment Success	21,518 m^2	26,495 m^2 (+23%)	26,628 m^2 (+24%)

We now have more detailed information on proposed operations

- Riparian recruitment flows are often the most difficult to satisfy under controlled conditions
- Deer Creek – Jordanelle Operating Agreement allows flexibility needed to achieve riparian recruitment flows ***in some years***

Hydropower Generation & Delivery

GENERATION:

Water flows from the reservoir through a penstock, into the turbine, and then out through the tailrace.

The water turns the turbine, and the spinning turbine creates electricity which travels to a step-up-transformer and then onto the transmission system.

TRANSMISSION:

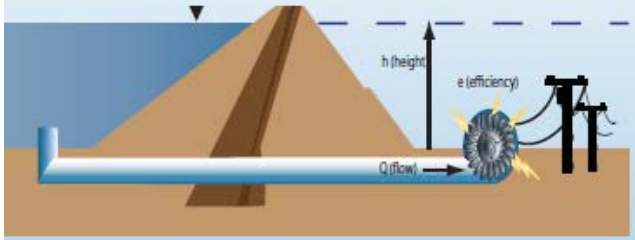
When the electricity reaches the transmission line, it is transferred across long distances and then delivered to a neighborhood substation transformer.

This transformer steps down the voltage and delivers the electricity to the local distribution system.

DISTRIBUTION:

The electricity then travels through the distribution system to a transformer that steps down the voltage once again. The power is now ready to be delivered to homes.

The Power Equation



$$\text{Power (kilowatts)} = \frac{\text{Height (feet)} \times \text{Flow (cubic feet per second)} \times \text{Efficiency (hydraulic, mechanical, and electrical)}}{11.8}$$

Project Timeline

2008
- July 2008 Commercial Operation
- June 2008 Power Plant Start-up

2007
- August 2006 Construction Contract Award to W.W. Clyde
- September 2006 Begin Construction

2006
- December 2005 Equipment Supply Contract with VA Tech
- June 2006 Power Plant Design by CH2MHill

2005
- July 2005 Project Contract Negotiations

2004
- June 2004 Design Update & Environmental Assessment

2000
- January 2000 Preliminary Design & NEPA Analysis

1993
- 1993 Jordanelle Dam Completed

JORDANELLE DAM HYDROPOWER PROJECT

Central Utah Water Conservancy District

Heber Light & Power

U.S. Department of the Interior — March 3, 1849

U.S. Department of the Interior — Bureau of Reclamation

- The July, 2005 Final Environmental Assessment for Jordanelle Dam Hydroelectric Project states that one of the project purposes is to:

  "***Generate hydroelectric power as an incidental use to the delivery of water for CUP purposes, which include*** municipal and industrial water supply, irrigation supply, flood control, and ***fish and wildlife***."

Provo River Delta Restoration Project (PRDRP)

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

U.S. DEPARTMENT OF THE INTERIOR · MARCH 3, 1849 ·

CENTRAL UTAH WATER CONSERVANCY DISTRICT

JUNE SUCKER RECOVERY IMPLEMENTATION PROGRAM

June Sucker Recovery

Listed as Endangered in 1986

Photo by K. Wilson, Utah Division of Wildlife Resources

Need for the PRDRP

- The proposed action is needed to facilitate recovery of June sucker in Utah Lake by **restoring habitat conditions essential for spawning, hatching, larval transport, survival, rearing, and recruitment of June sucker on a self-sustaining basis**

Purposes of the PRDRP

- Purposes of the proposed action are to:
  - provide **recreational improvements** and opportunities compatible with restoration needs; and
  - **adopt flow regime targets** for the lower Provo River and provide **delivery of supplemental water to the lower Provo River**, including additional conserved water.


Viewing Tower
Trail at Grade (Uplands)
UTAH LAKE
Viewing Tower
Trail on Berm
Private Property Access
New Parking
River Access (Easement)
Skipper Bay Dike Trail
Provo Lakeview Parkway and Trail - Preferred Alignment
Utah Lake State Park
Boat Harbor Drive
Realign Boat Harbor Drive
Trail Connection
Provo River Parkway Trail
Provo River
See Close-Up Map

LOWER PROVO RIVER ECOSYSTEM FLOW RECOMMENDATIONS FINAL REPORT

September 2008

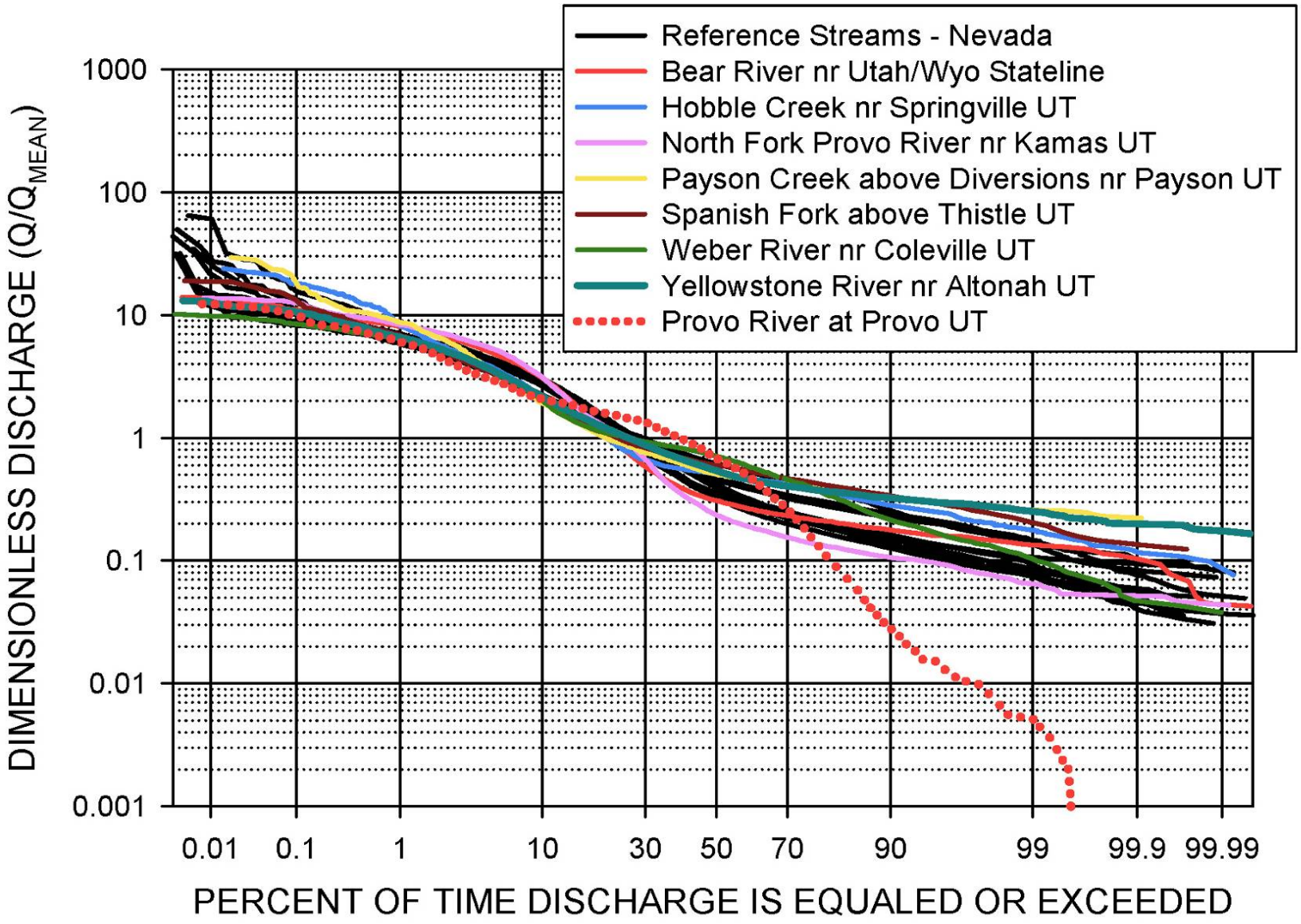


Figure A6. Plot of dimensionless discharge for reference streams in Nevada with Utah streams added including the Provo River at Provo UT gage.

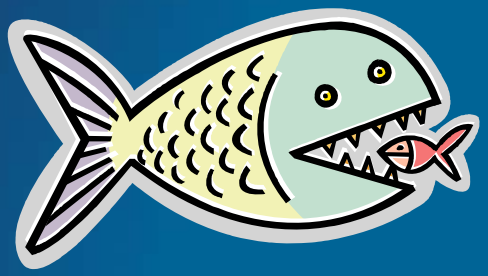
Flow Management Objectives

- Lower Provo River
  - goal of minimum year-round flow of 75 cfs (CUPCA) being pursued but not yet in place

Ecological Functions: Aquatic Biology

- June Sucker Spawning
  - snowmelt runoff conditions may trigger spawning
  - flows patterned/ timed to coincide with natural snowmelt runoff
  - flows that flush accumulated fines and maintain clean, loose gravels

Ecological Functions: Aquatic Biology



- Larval Drift (June sucker)
  - flows adequate to transport larval June sucker from spawning to rearing habitat
- Rearing Habitat (June sucker)

Lower Provo River Flow Guidelines

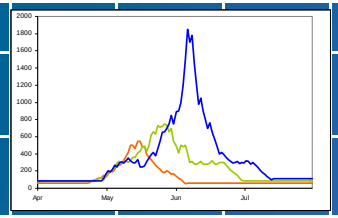
WINTER BASE FLOWS
aquatic habitat
mimicry of natural hydrology

SPRING FLOWS
follow recommended hydrographs
spawning
channel maintenance
gravel flushing
larval drift

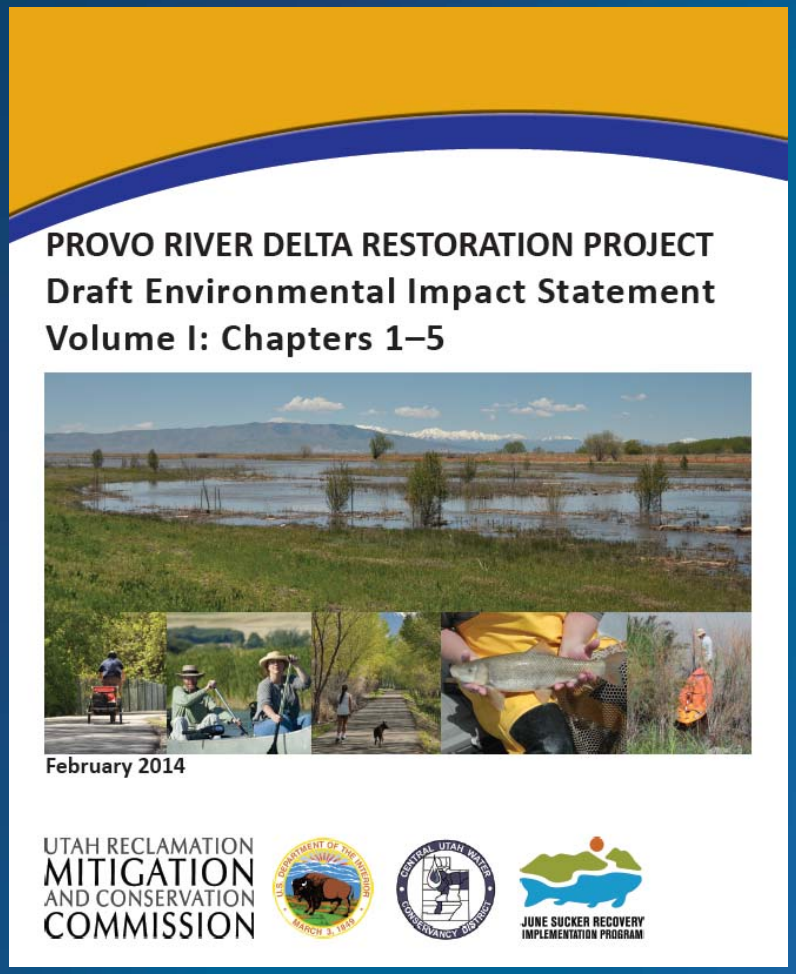
SUMMER BASE FLOWS
aquatic habitat
water quality
vegetation encroachment prevention
mimicry of natural hydrology

AUTUMN BASE FLOWS
aquatic habitat
mimicry of natural hydrology

provide year-to-year variability

DRY YEAR	59 cfs						57 cfs			67 cfs		
MODERATE YEAR	78 cfs						86 cfs			86 cfs		
WET YEAR	83 cfs						113 cfs			100 cfs		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

provide seasonal variability



Draft EIS released February 2014

Final EIS scheduled to be released April 2015

Record of Decision May 2015

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

U.S. DEPARTMENT OF THE INTERIOR MARCH 3, 1849

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