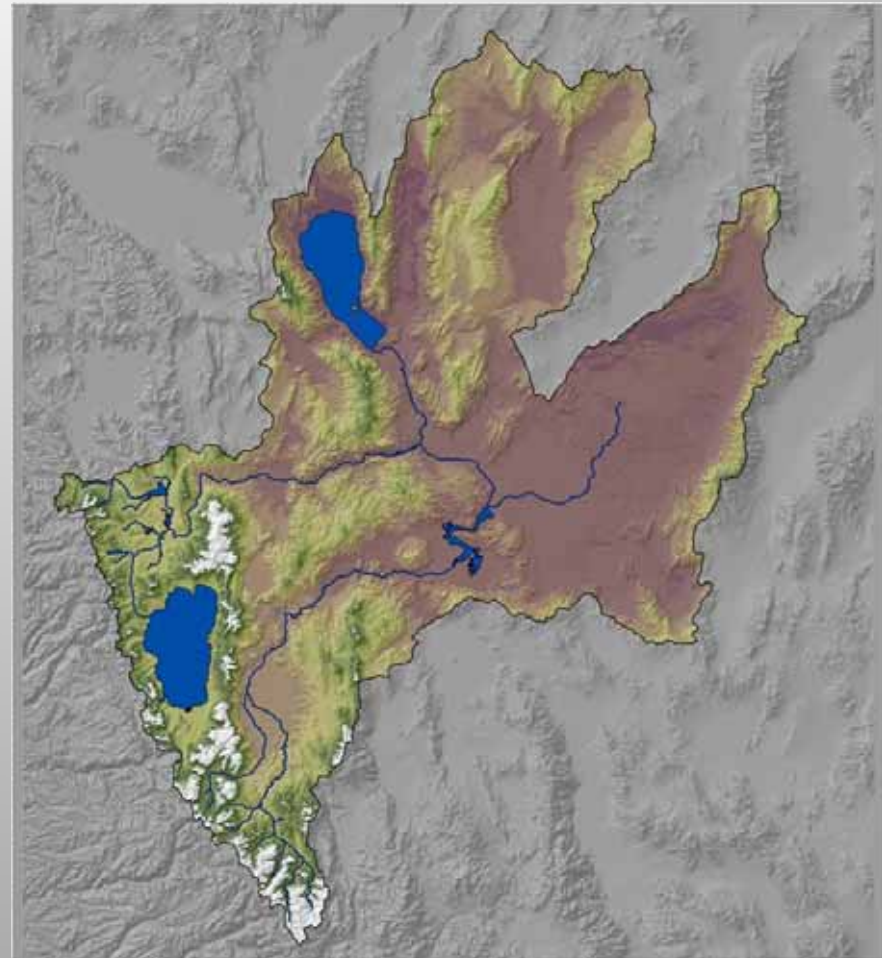# Modeling the Truckee River Operating Agreement in RiverWare

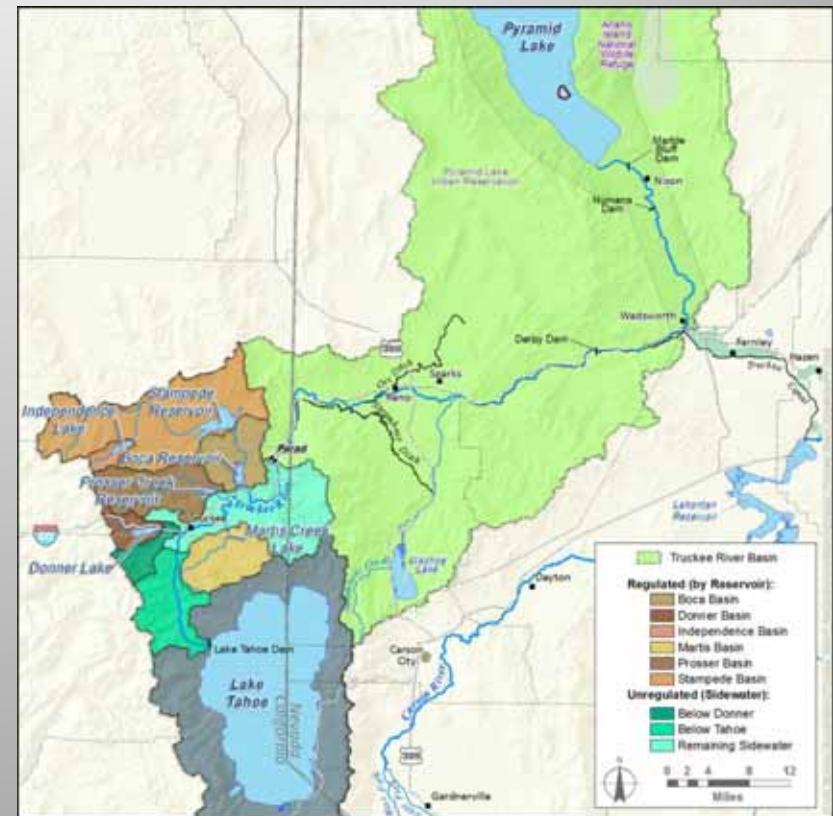RiverWare User Group
August 27th, 2013

Shane Coors, PE
Precision Water Resources Engineering
www.precisionwre.com

PWRE PRECISION

Truckee Basin Location

P | W | R | E

TROA Introduction

- Origin – Public Law 101-618 - Under the 1990 Settlement Act, Secretary of the Interior is directed to negotiate an operating agreement for the Truckee River Reservoirs

- Purpose – To improve operational flexibility and efficiency of Truckee River reservoirs while satisfying water rights in conformance with existing decrees

- Signatory Parties
  - Secretary of the Interior (United States)
  - State of California
  - State of Nevada
  - Pyramid Lake Paiute Tribe
  - Truckee Meadows Water Authority

- Status – Signed into law in 2008, but still making its way through the courts. Implementation date is unknown.

PWRE

Pre-TROA Operations
The Big Idea – Floriston Rate

Reservoirs

CA | NV
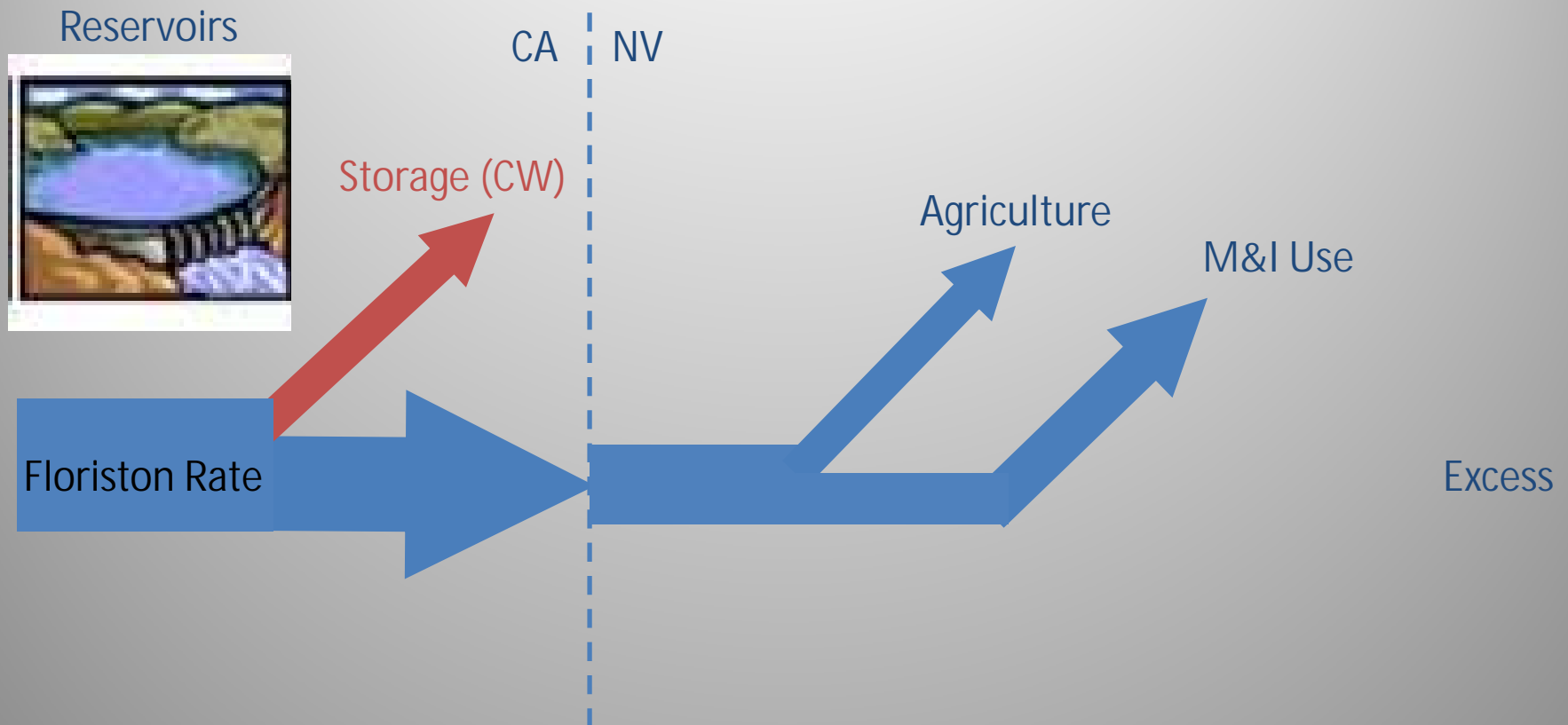
Agriculture

M&I Use

Floriston Rate

Excess
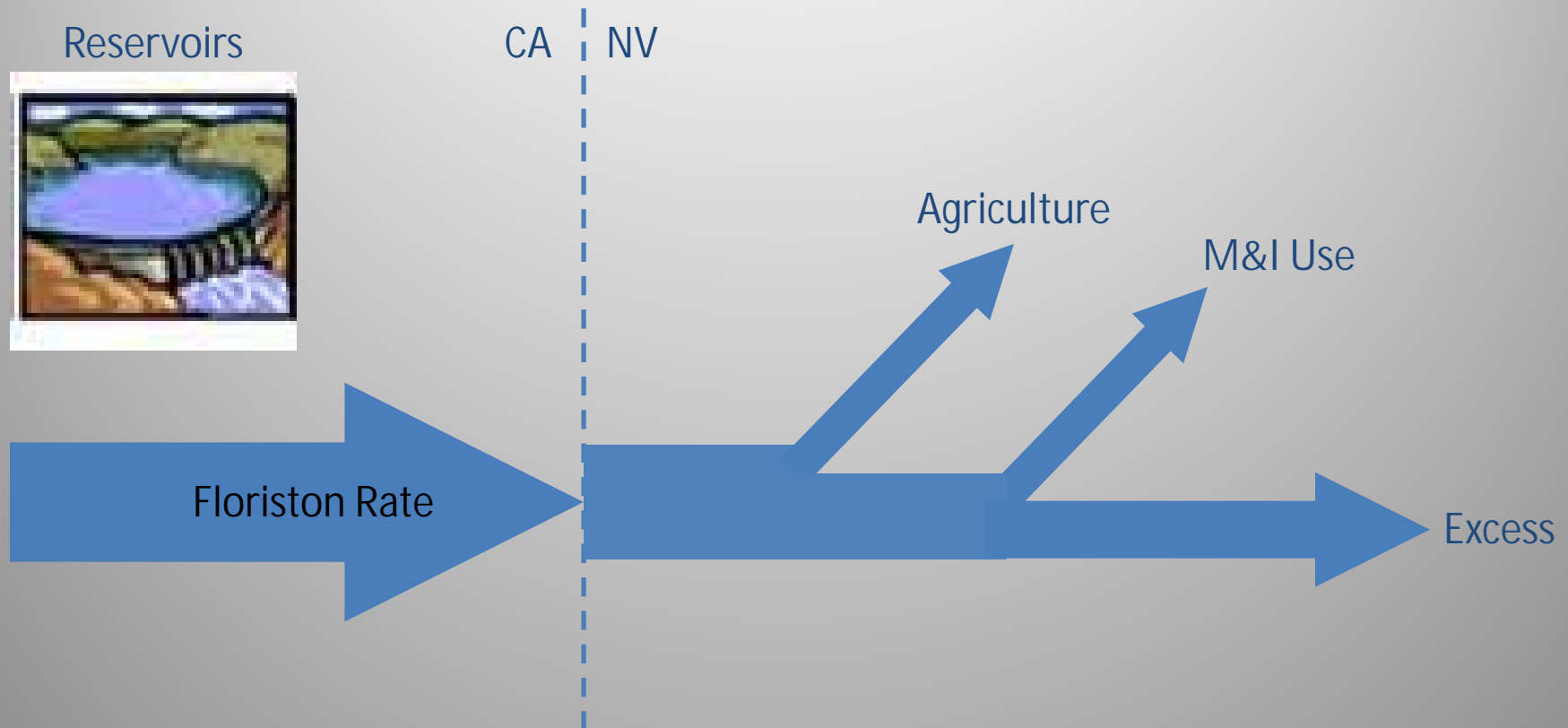
- All water rights are satisfied when the Floriston Rate is met
- Easy to implement, and simplifies system operations
- Inefficient as there is always "undemanded" water remaining at the bottom

TROA Operations
The Big Idea – Credit Water

Reservoirs

CA | NV

Storage (CW)

Agriculture

M&I Use

Floriston Rate

Excess

- Unneeded water can be held back (diverted to storage) in the reservoirs
- Increased efficiency as only the demanded water is released to the system
- CW of several varieties is created and managed by stakeholders
- Floriston Rate is still the basis of the system, but it need only be met theoretically
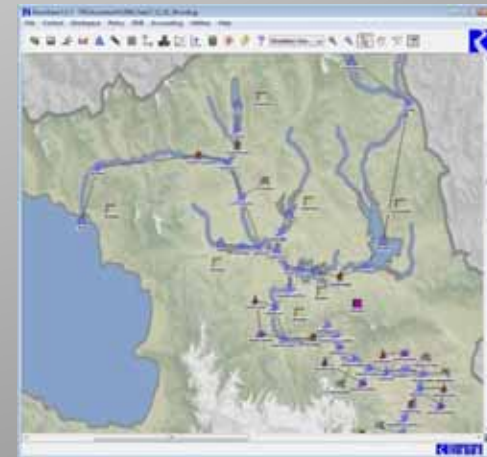
TROA Credit Water Operations

1. **Credit Water Establishment**

    1. Establishment by Floriston Rate Holdback Concept
    2. RiverWare Implementation
    3. Results

2. **Credit Water Management / Movement**

    1. Credit Water Exchange Concept
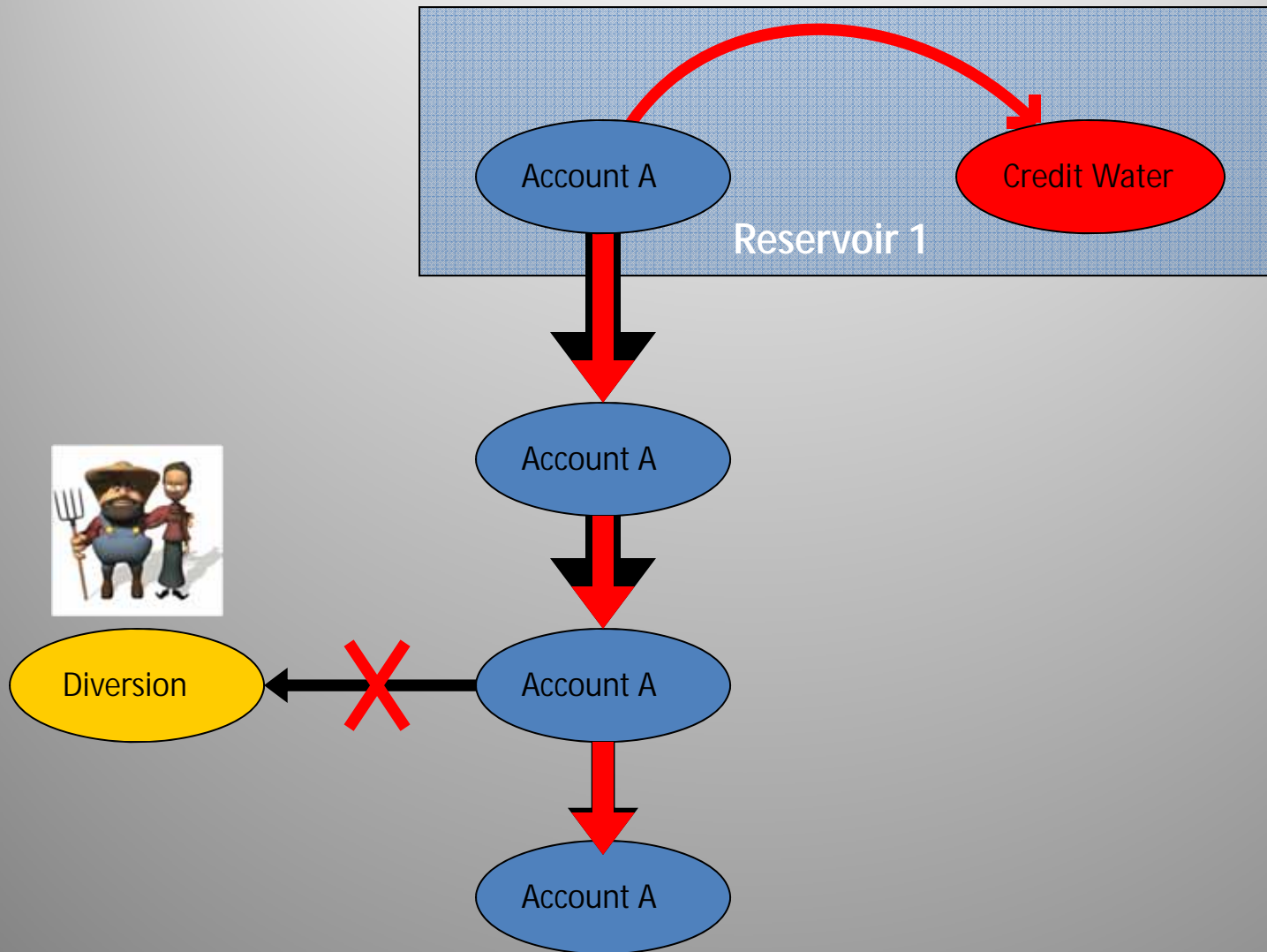   2. RiverWare Implementation
    3. Results

3. **Credit Water Delivery**

    1. Incremental Conveyance Loss Concept
   2. RiverWare Implementation
    3. Results

Credit Water Establishment – Concept

Credit Water Establishment – RiverWare Implementation

1. Calculate and Set all Floriston Rate Reservoir Releases

2. Calculate and set all diversions

3. Calculate CW establishment limit

   1. Reservoir Limit

   2. Scheduling Party Limit (Water Right)

   3. System Holdback Limit

4. Cycle through reservoirs in user-defined priority order and holdback releases, where possible, up to total CW establishment limit

5. Convert like amount of FR water to Credit Water on each reservoir where a holdback occurred
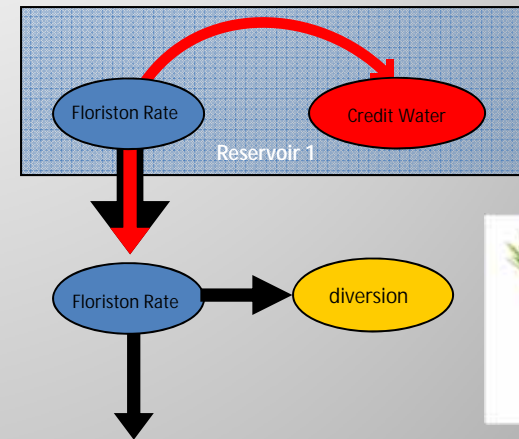
	Stampede NONE	Tahoe NONE	Boca NONE	Independence NONE	Prosser NONE
0:00 Jan 1	1.00	3.00	2.00	-1.00	-1.00

Credit Water Establishment - Results
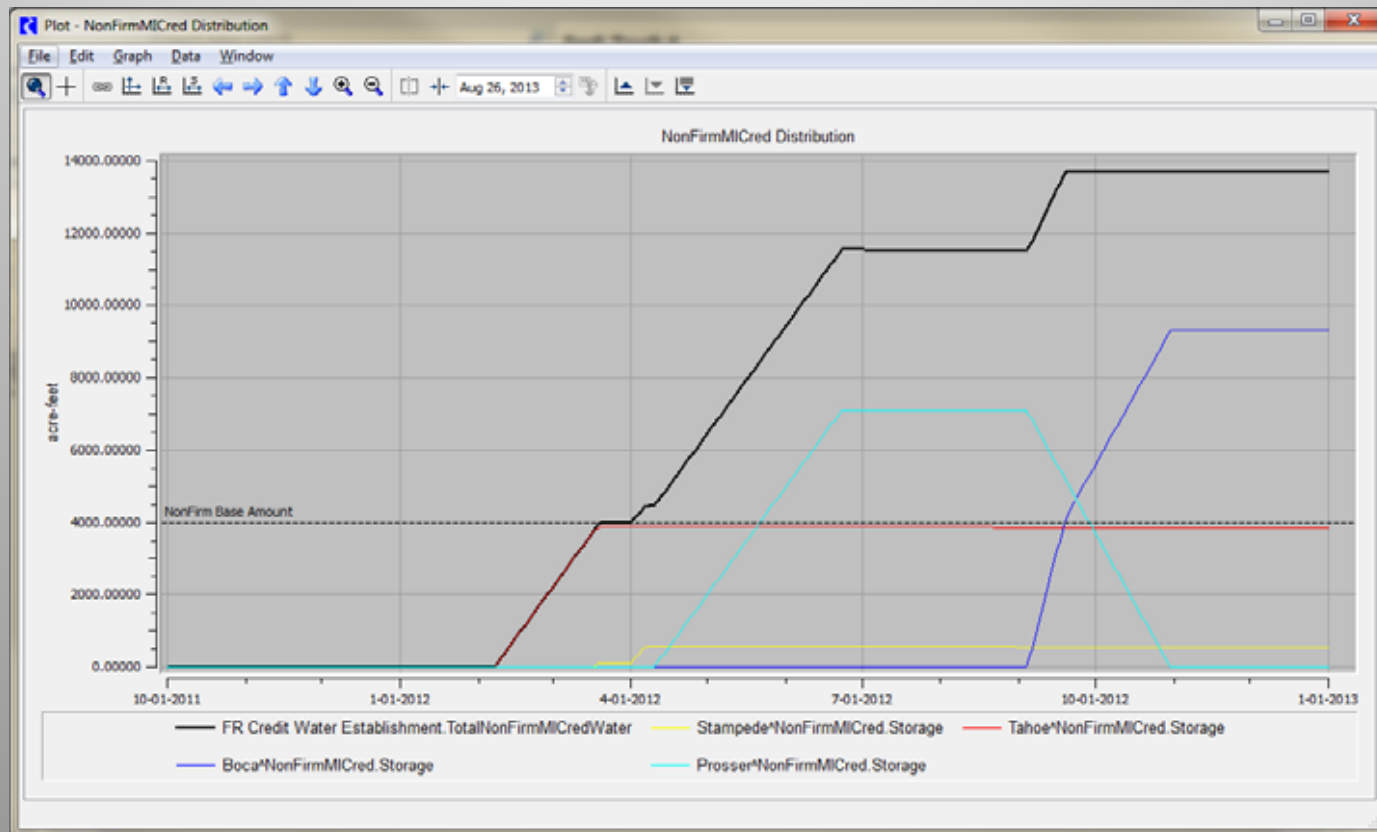
Exchanges – Concept
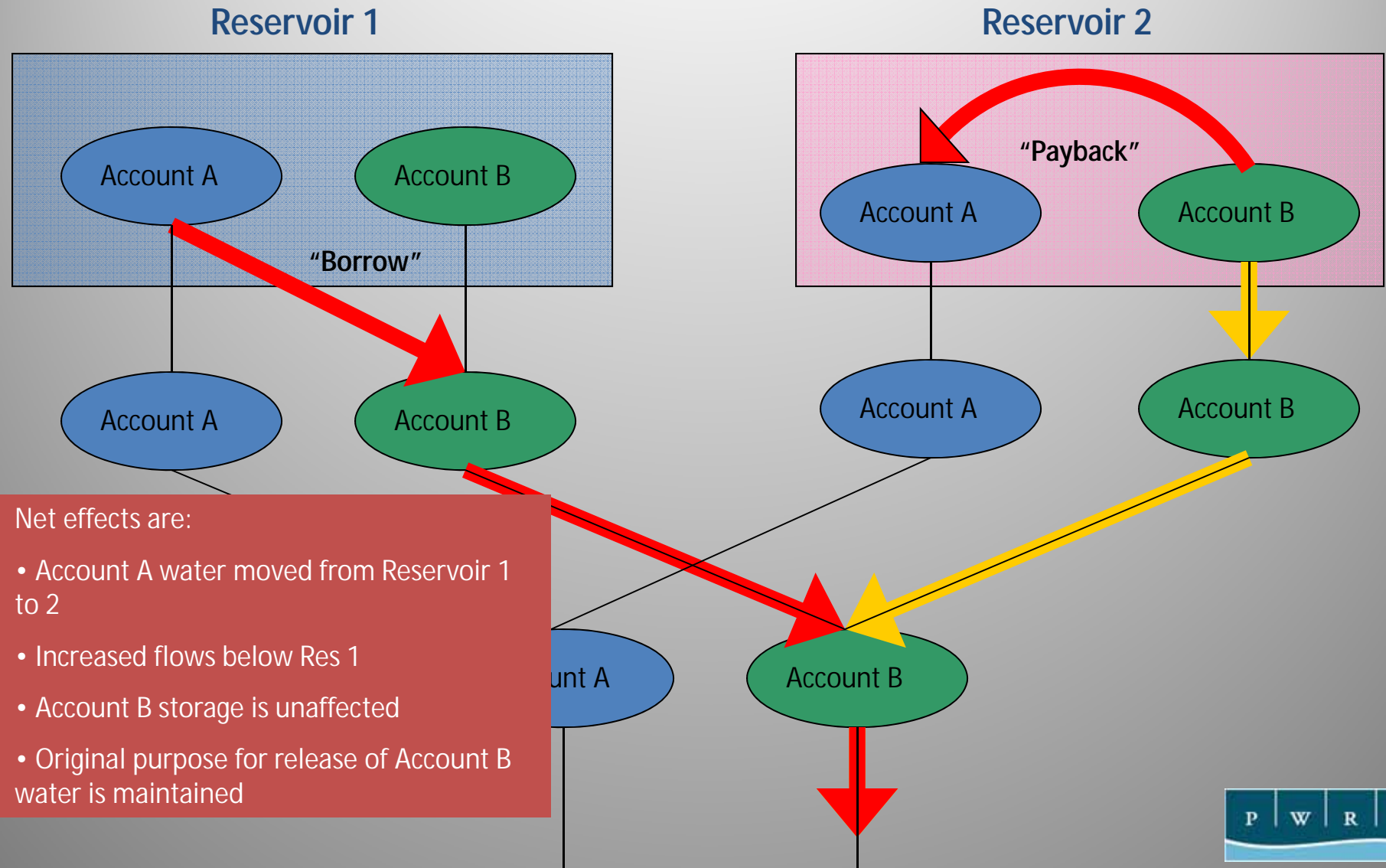
Exchanges – RiverWare Implementation

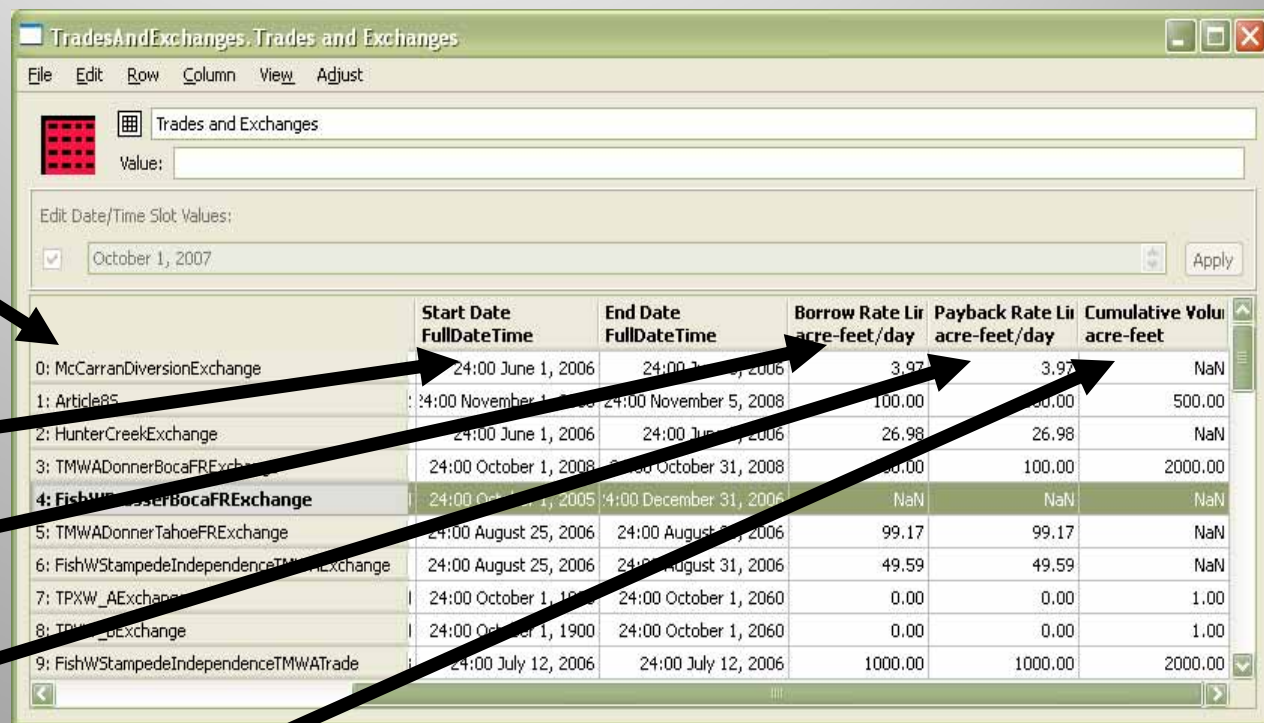1) Schedule an exchange on the Exchanges table (operator entry)

Exchange Name

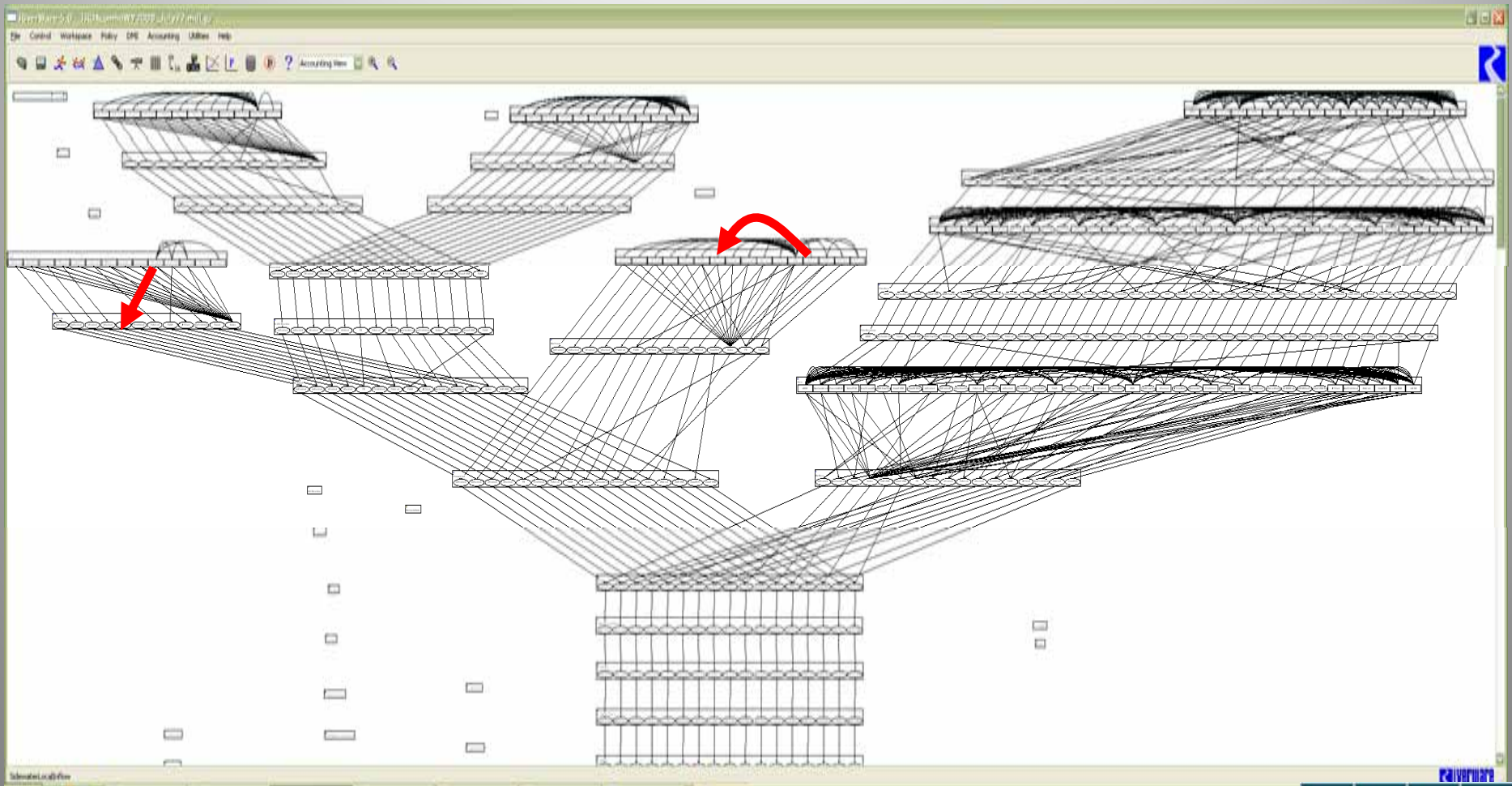Exchange Dates

Borrow Rate

Payback Rate

Cumulative Volume Limit

Exchanges – RiverWare Implementation

2) Create Supplies with appropriate attributes

Exchanges – RiverWare Implementation

1) In principle there is a very large number of feasible exchanges that could be created

2) It is impractical to set up infrastructure for each potential exchange

3) Development team decided to build exchanges on an as-requested basis

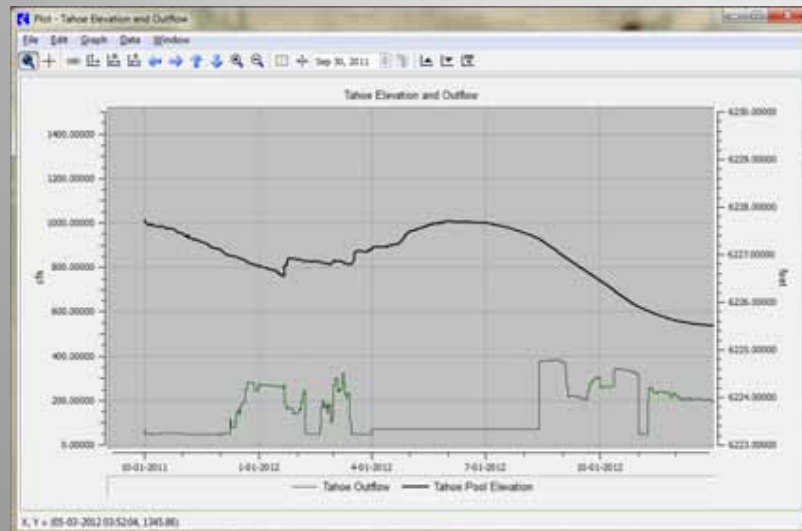4) CADSWES developed an automated Exchange Builder for TROA

Credit Water Establishment - Results

No Exchange

Exchange
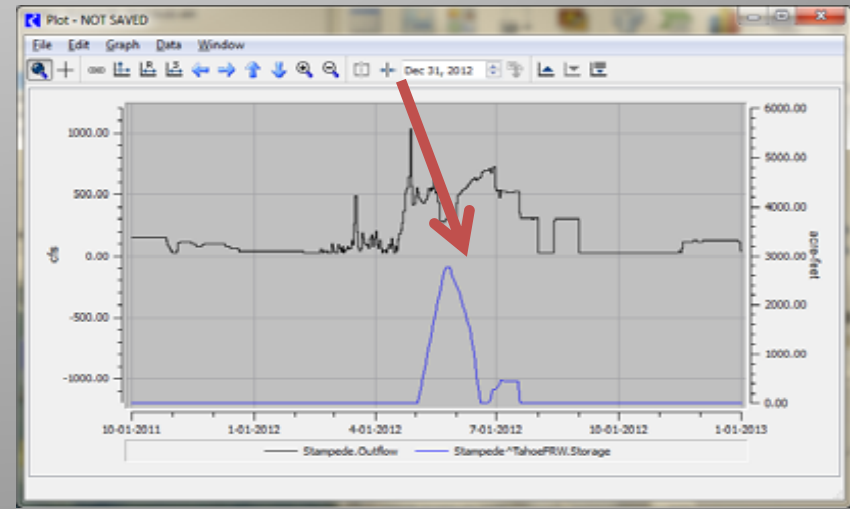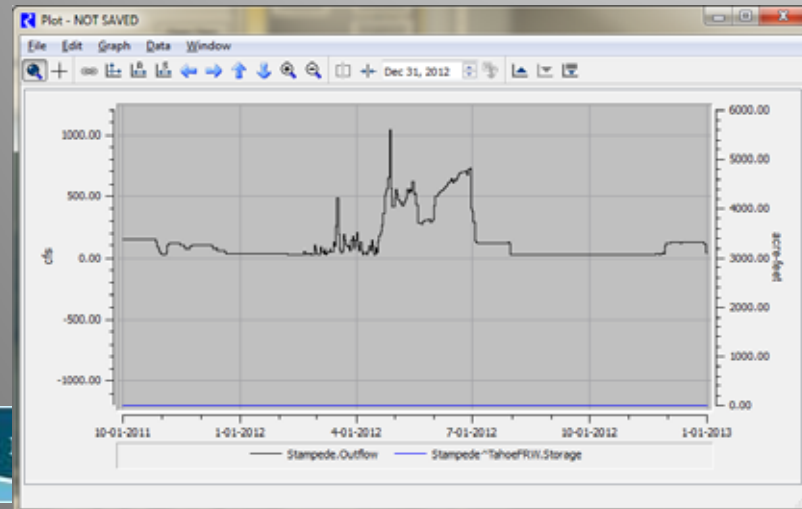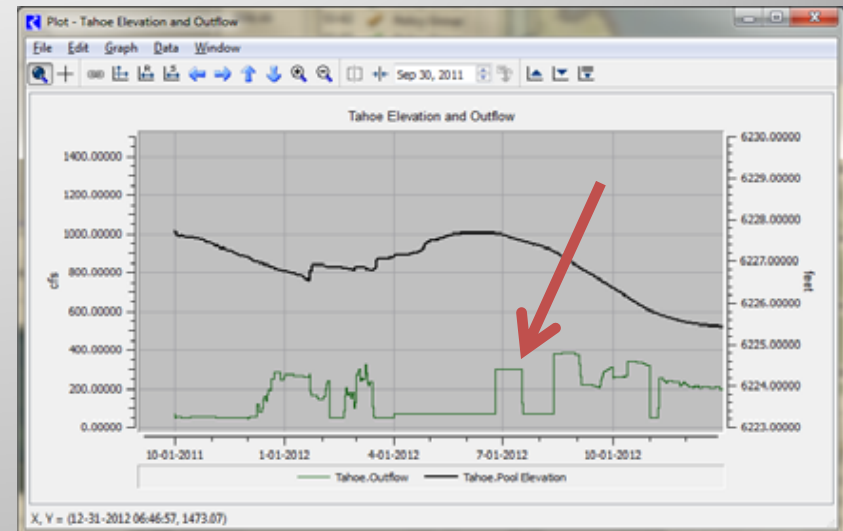
Incremental Conveyance Loss - Concept

1. Pre-TROA, the Floriston Rate water takes all of the losses as it flows downstream

2. When Credit Water is released on top of pre-TROA waters, an incremental increase in losses (or decreased gain) is experienced

3. TROA specifically calls for calculation and assigning of incremental conveyance losses to the credit water(s) in the river each day.

4. The calculated incremental loss is then transferred from the credit water account to the Floriston Rate account

Floriston Rate

P | W | R | E
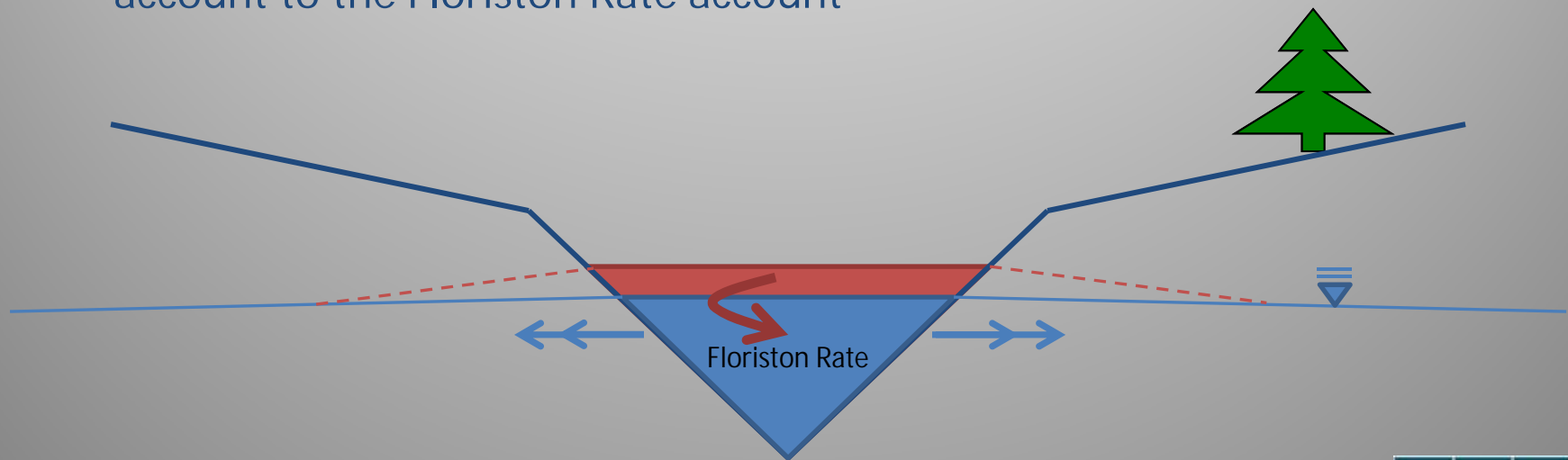
Incremental Conveyance Loss - Concept

1. The TROA Planning Office commissioned a study by the Desert Research Institute in 2010 to develop a method to estimate the incremental conveyance loss charge for credit waters

$$V_{total}(t) = 4Lc\left(\frac{S_s Kb\Delta t}{\pi}\right)^{1/2}$$

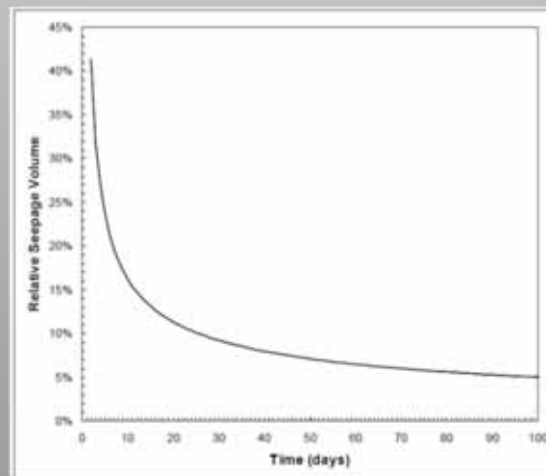2. The conveyance loss decays over time such that the longer the credit water is in the river, the smaller the conveyance loss charge becomes

Incremental Conveyance Loss – RiverWare Implementation

1. In real operations credit water releases are not steady

2. When the credit water in the system increases a new "layer" of credit water is introduced

3. It is therefore possible to have as many layers as days in the system, which quickly becomes impractical to model individually.
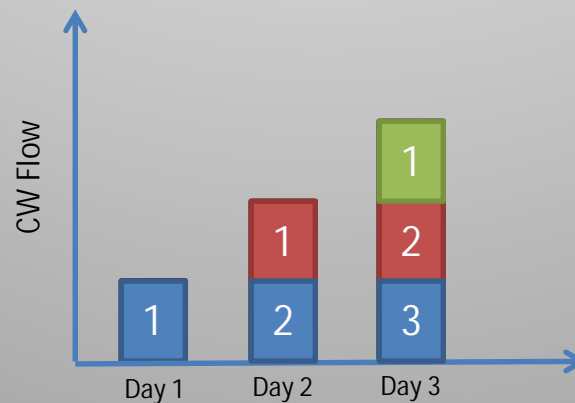
Incremental Conveyance Loss – RiverWare Implementation

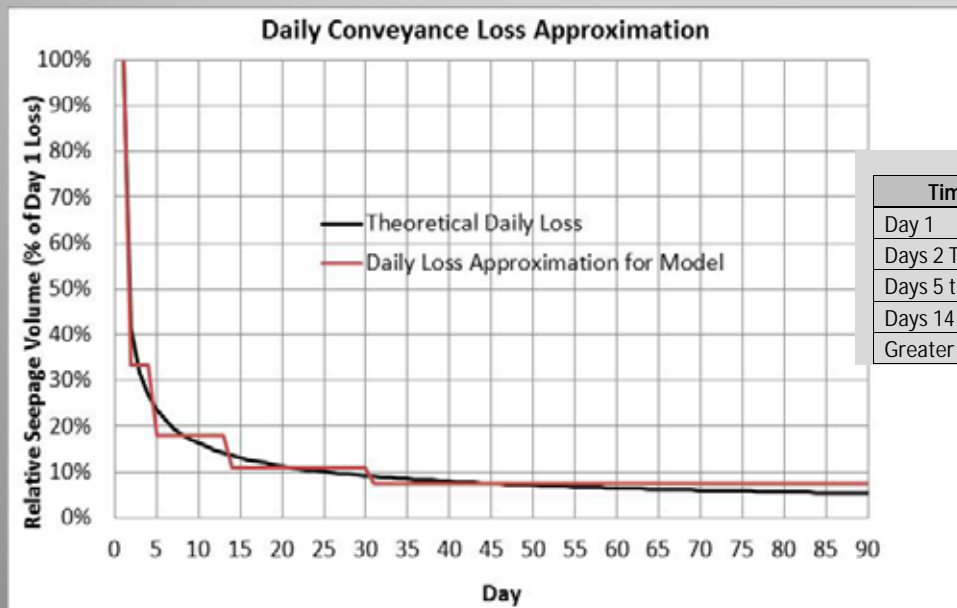1. To reduce the maximum number of layers that could be tracked for a single credit water account on a single reach, the decay curve was approximated with 5 bins or stair steps

Time Period	Relative Seepage Loss	Calculation Method for Model
Day 1	100.0%	Loss Equation
Days 2 Through 4	33.3%	Averaged Relative Seepage Loss Days 2-4
Days 5 through 13	17.8%	Averaged Relative Seepage Loss Days 5-13
Days 14 through 30	11.0%	Averaged Relative Seepage Loss Days 14-30
Greater than 30 Days	7.6%	Averaged Relative Seepage Loss Days 31-60

Incremental Conveyance Loss – RiverWare Implementation Detail

1. Conveyance Loss is calculated in every river reach (gage to gage) in the model for every credit water account every day for up to 5 age classes of credit water.

2. Account transfer from conveyance loss calculation takes place at the upstream streamgage

3. The process is currently being implemented in rules in order to test and demonstrate to stakeholders.

4. Eventually a request will be made to CADSWES to formalize this process in an accounting method

Floriston Rate

Questions???