CPNRD
CENTRAL PLATTE
NATURAL RESOURCES DISTRICT

NORTH PLATTE
Natural Resources District

SOUTH PLATTE
NATURAL RESOURCES DISTRICT

Tri
Basin
Natural Resources District

TWIN PLATTE
NATURAL RESOURCES DISTRICT

NEBRASKA
DEPT. OF NATURAL RESOURCES

SINGLE PLANNING GROUP MEETING #4

November 16, 2016
North Platte, NE

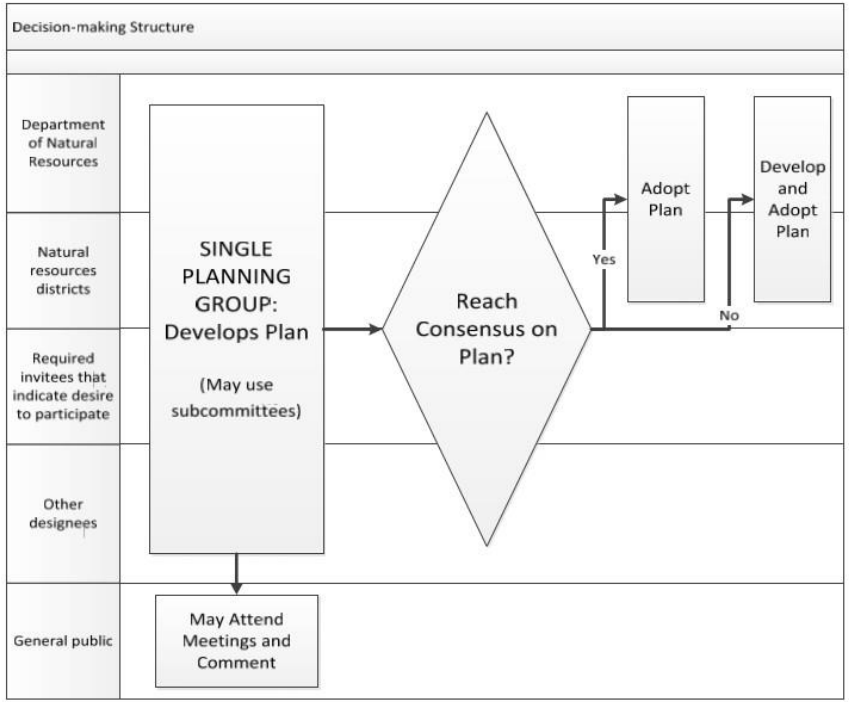
AGENDA

I. Administration
II. First Increment Review
III. Modeling Overviews
IV. Review and Refinement of First Increment Goals
V. Next Steps
VI. Public Comment

I. ADMINISTRATION

REVIEW OF ROLES & RESPONSIBILITIES

Figure 2. Planning structure



II. FIRST INCREMENT REVIEW

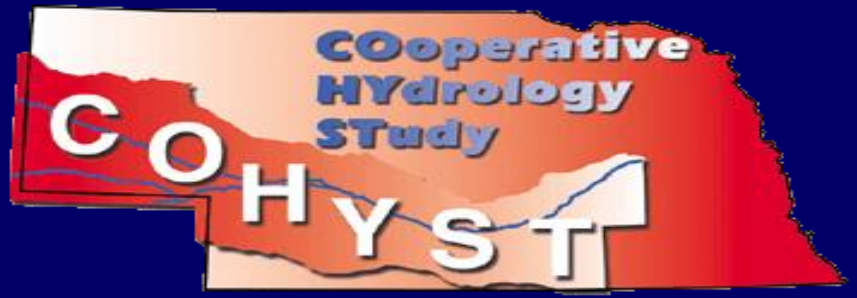
JANUARY SURVEY FOCUS

- Does the plan appropriately addresses the call to maintain the following in the river basin:
  - Economic viability
  - Social and environmental health
  - Safety
  - Welfare
- If no, what additional goals/objectives should be considered by the group?
- What are the metrics of success in each category?

III. MODELING OVERVIEWS

Cooperative Hydrology Study

Single Planning Group
Stakeholders meeting
November 16, 2016
By Duane Woodward
Central Platte NRD

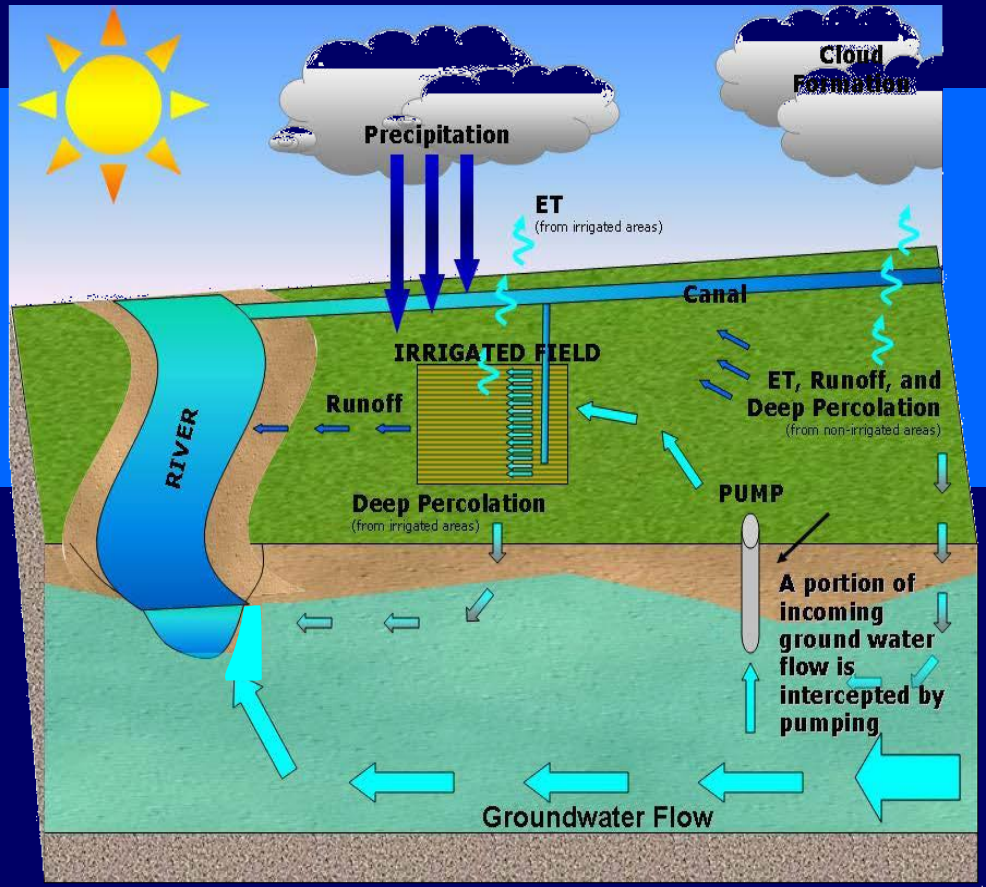


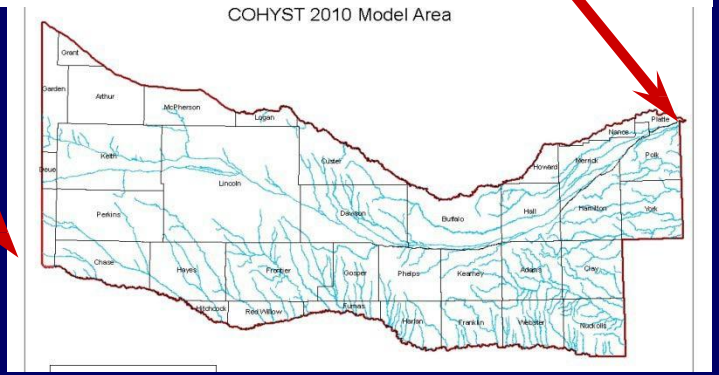
Sponsors for COHYST 2010

- Central Platte NRD
- Tri-Basin NRD
- Twin Platte NRD
- Central Nebraska Public Power & Irrigation District
- Nebraska Public Power District

COHYST 2010

A Total Water Budget Approach to Integrated Water Management





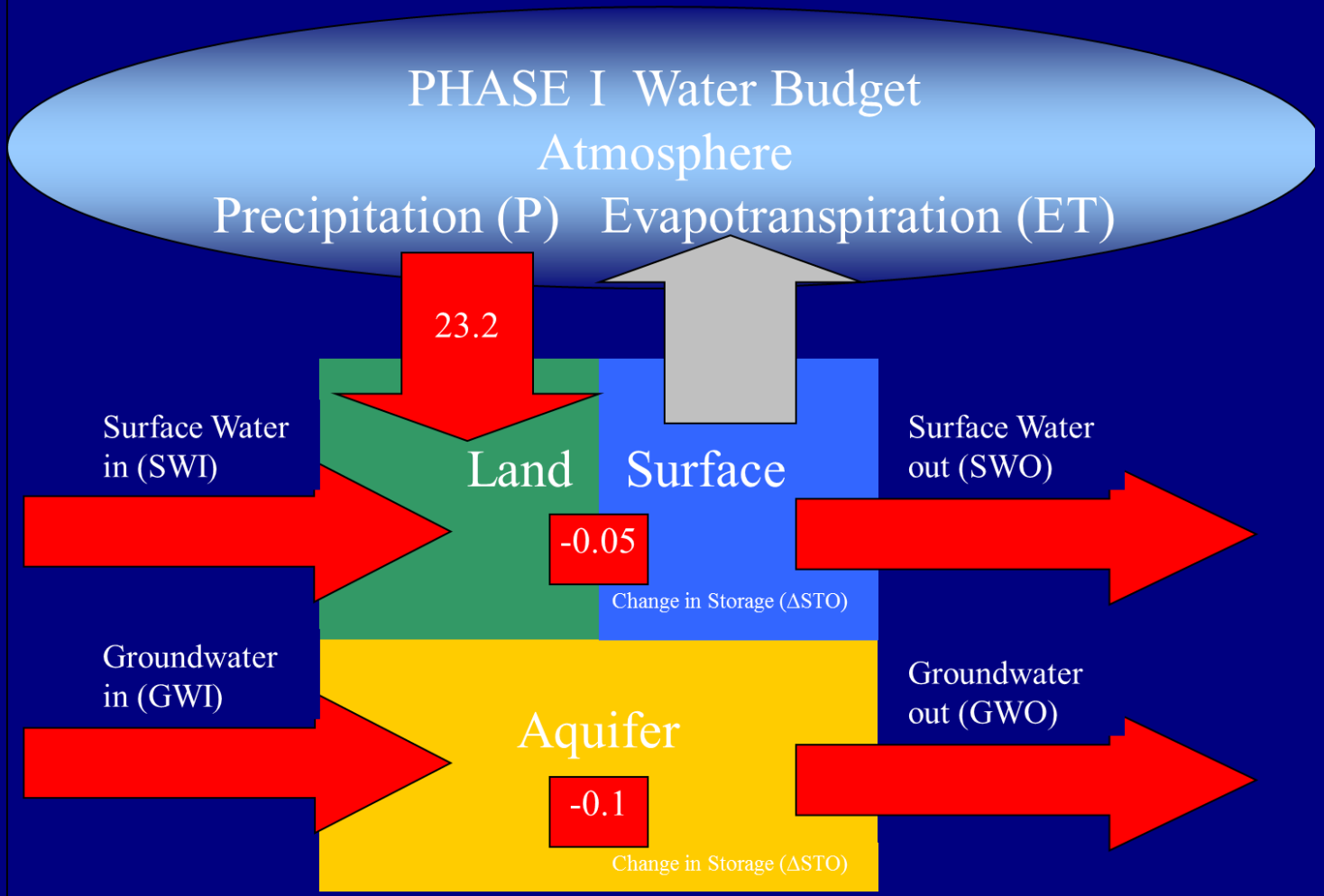
Model Area
12,000,000 acres

New Management Objectives

- Model must take into account:
  - Complete water budget
  - Temporal variability
  - Transient flow targets
  - Consumptive use
- Tracking and Accounting
- Incorporate surface water component
- Capable of management alternatives analysis

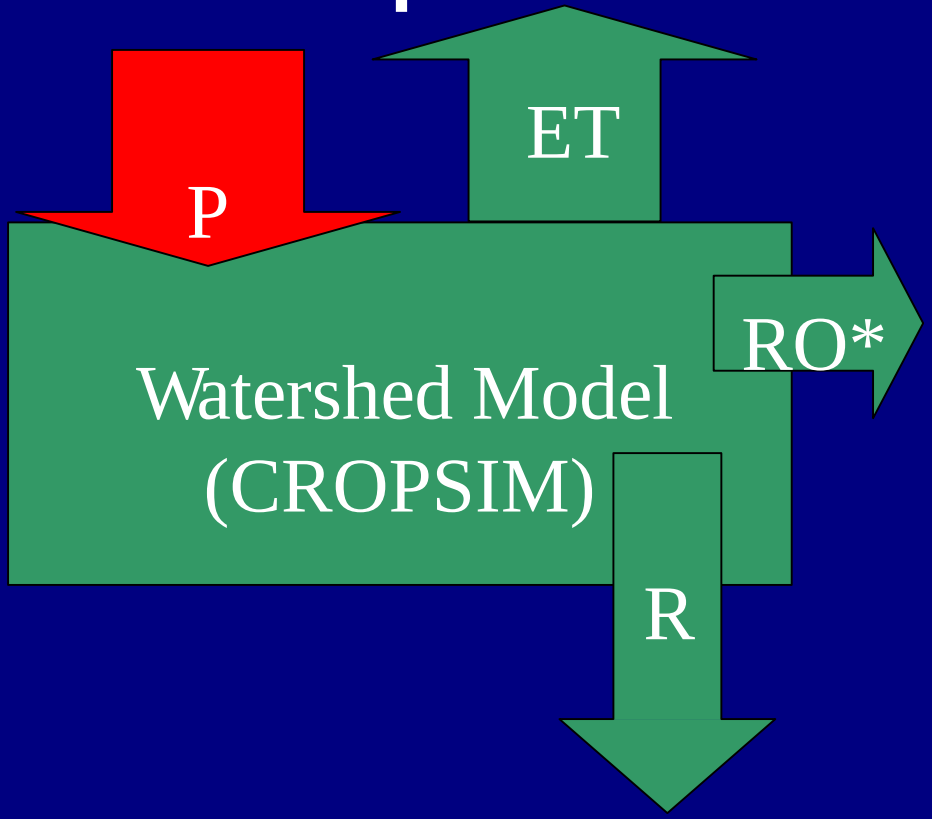
Phases for COHYST 2010

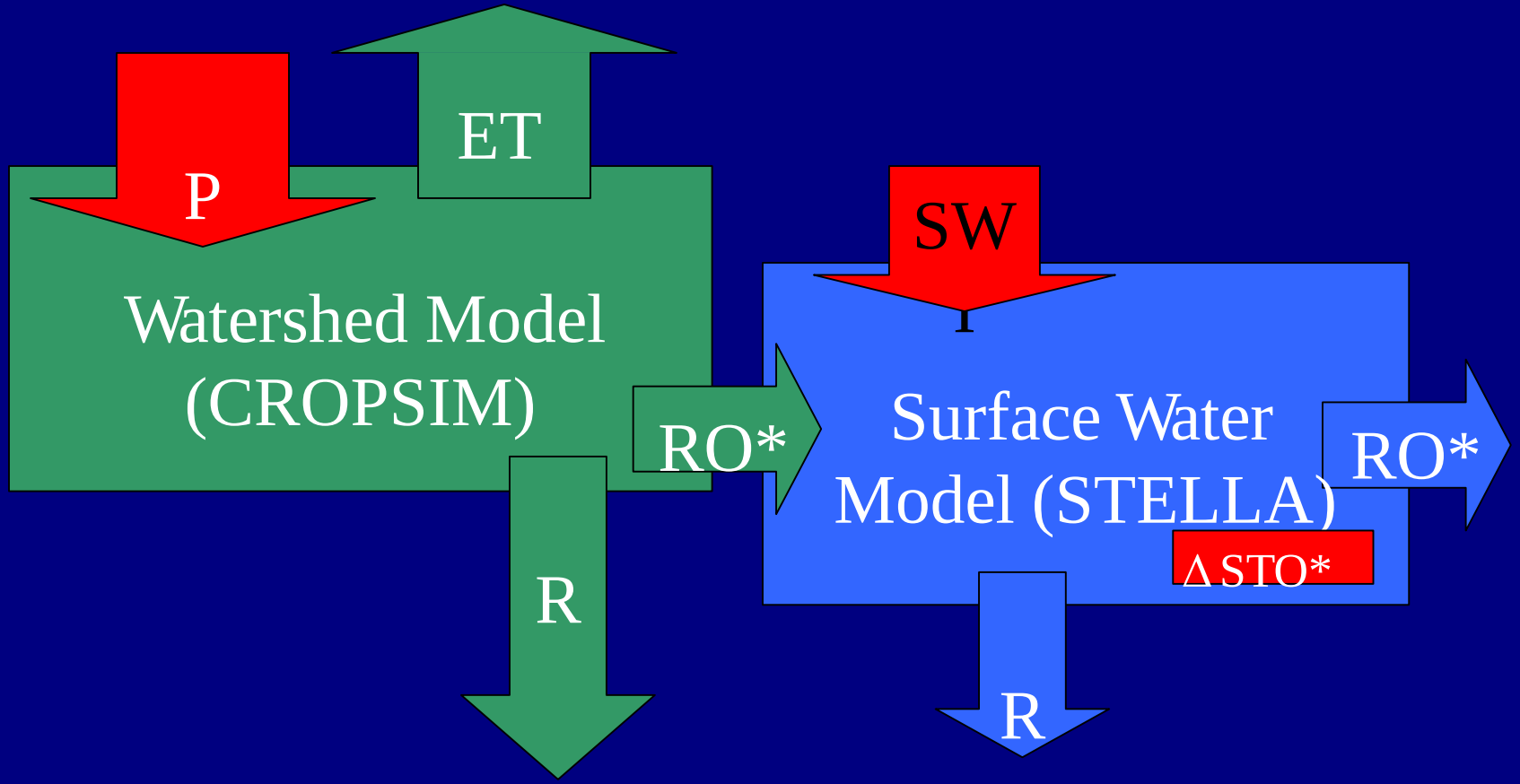
- Phase I: Water budget
- Phase II: Develop a suite of modeling tools
- Phase III: Apply developed tools

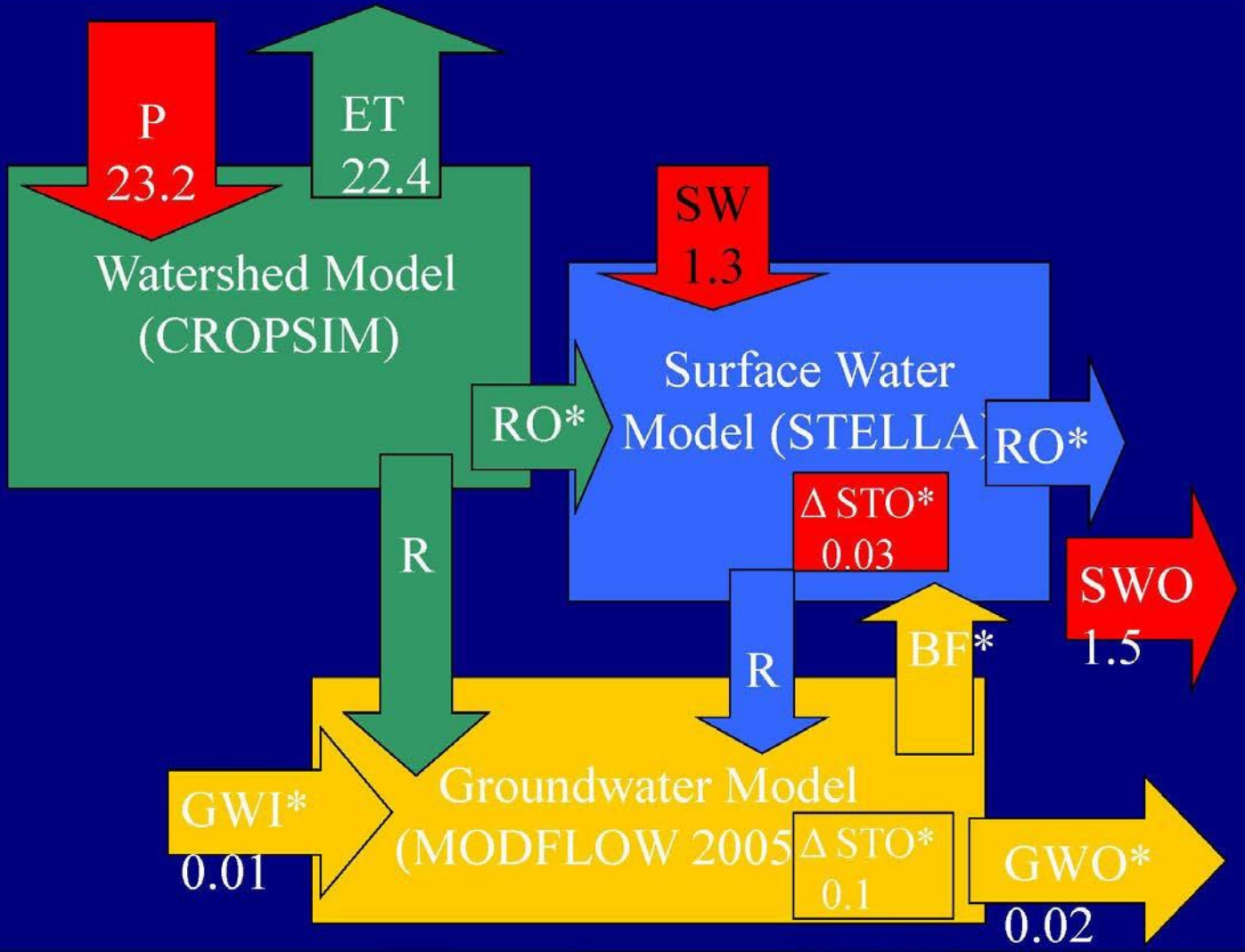


Measured water budget, mean conditions 1985 - 2005. Units = Million acre-feet/year

Develop a suite of tools




ET
P
Watershed Model
(CROPSIM)
R
RO*
SW
Surface Water
Model (STELLA)
ΔSTO*
RO*
R


P
23.2
ET
22.4
Watershed Model
(CROPSIM)
SW
1.3
Surface Water
Model (STELLA)
RO*
RO*
Δ STO*
0.03
R
R
BF*
SWO
1.5
GWI*
0.01
Groundwater Model
(MODFLOW 2005
Δ STO*
0.1
GWO*
0.02

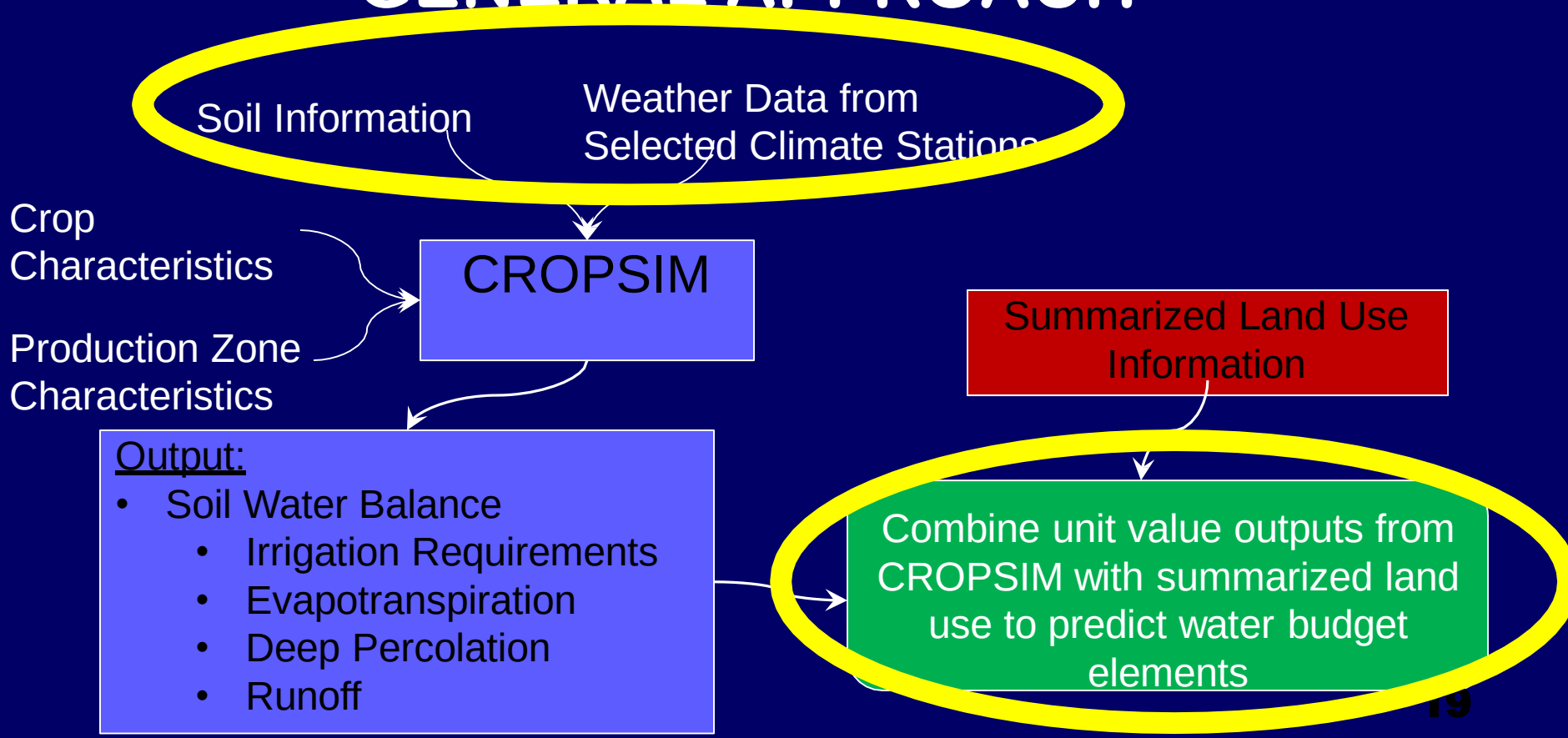
COHYST 2010

Watershed Field Level Analysis

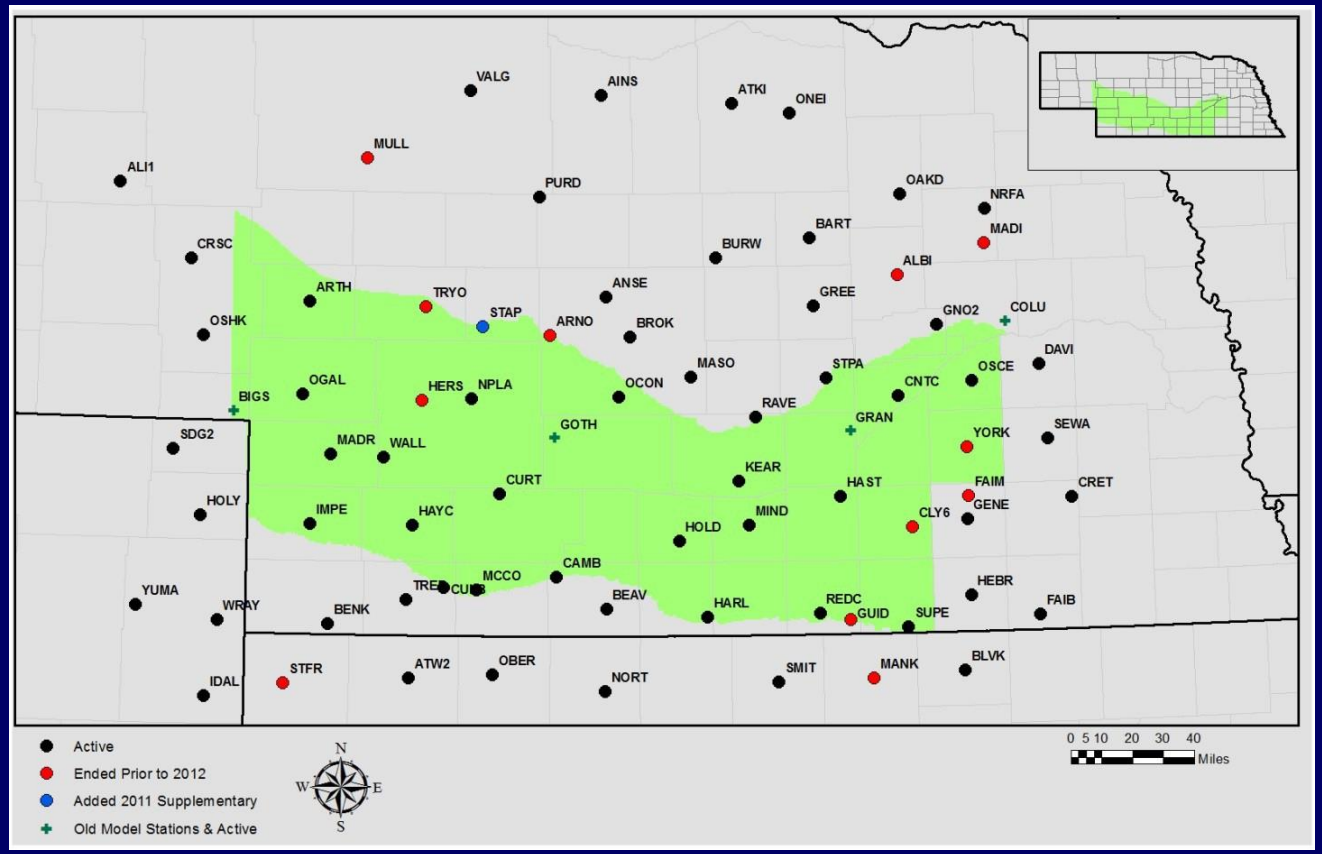
Inputs, Calibration Variables, and Initial Results

Marc Groff – The Flatwater Group, Inc.

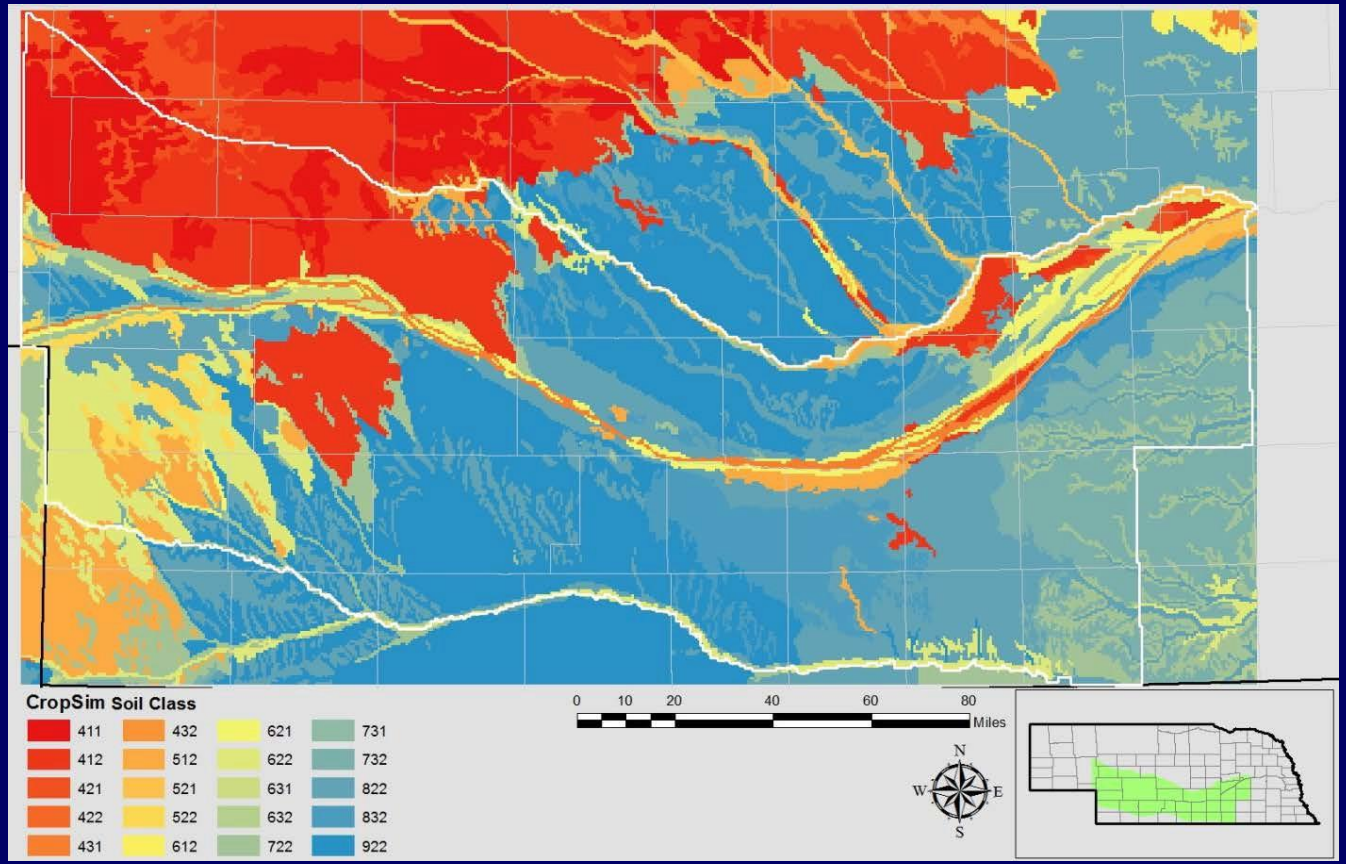
GENERAL APPROACH



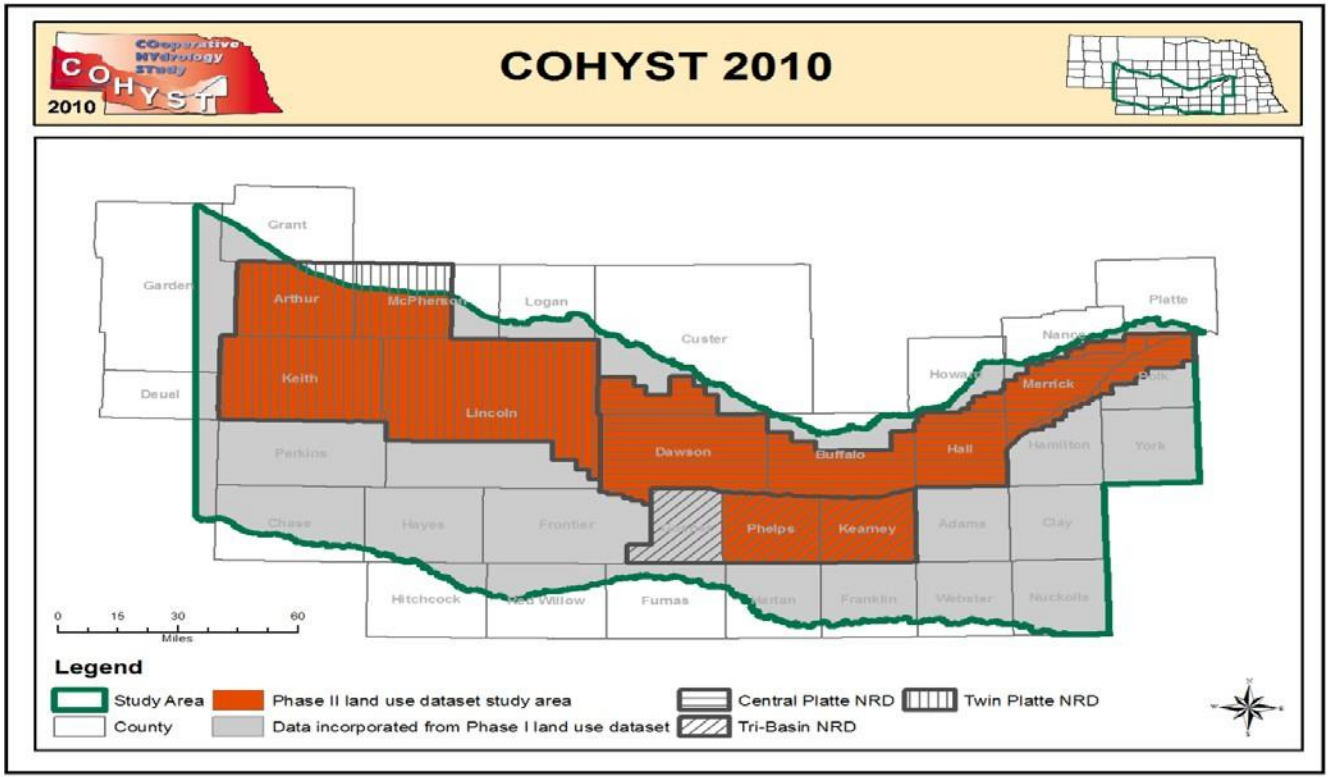
Run024: Weather Stations



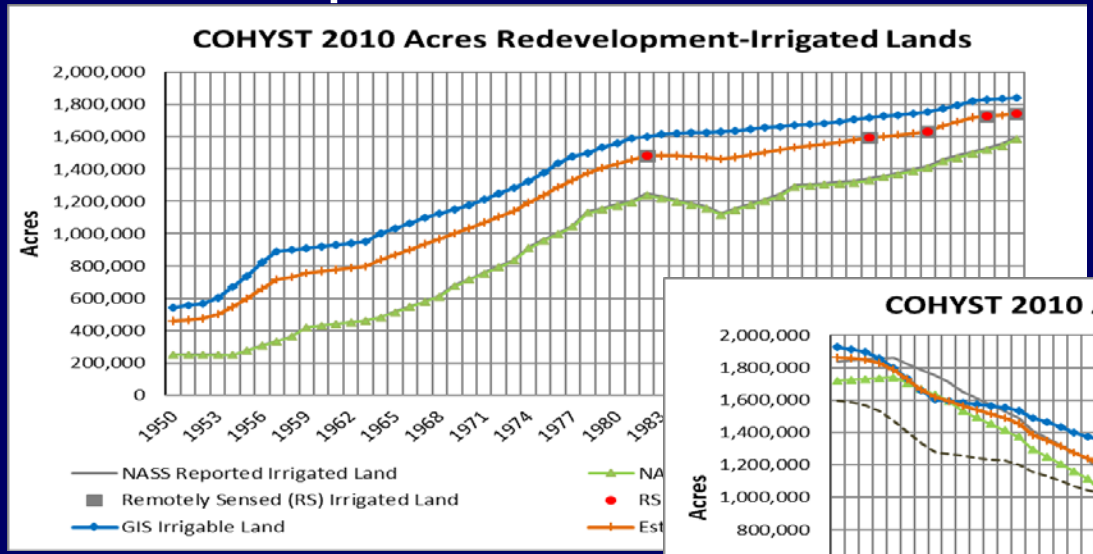
Run024: Model Soils

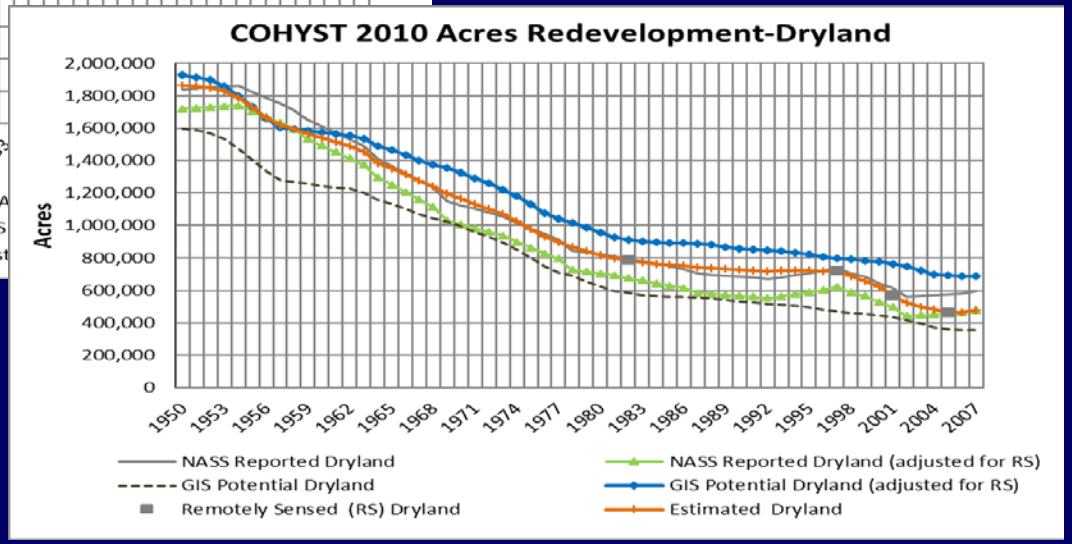


Redeveloped Land Use Data



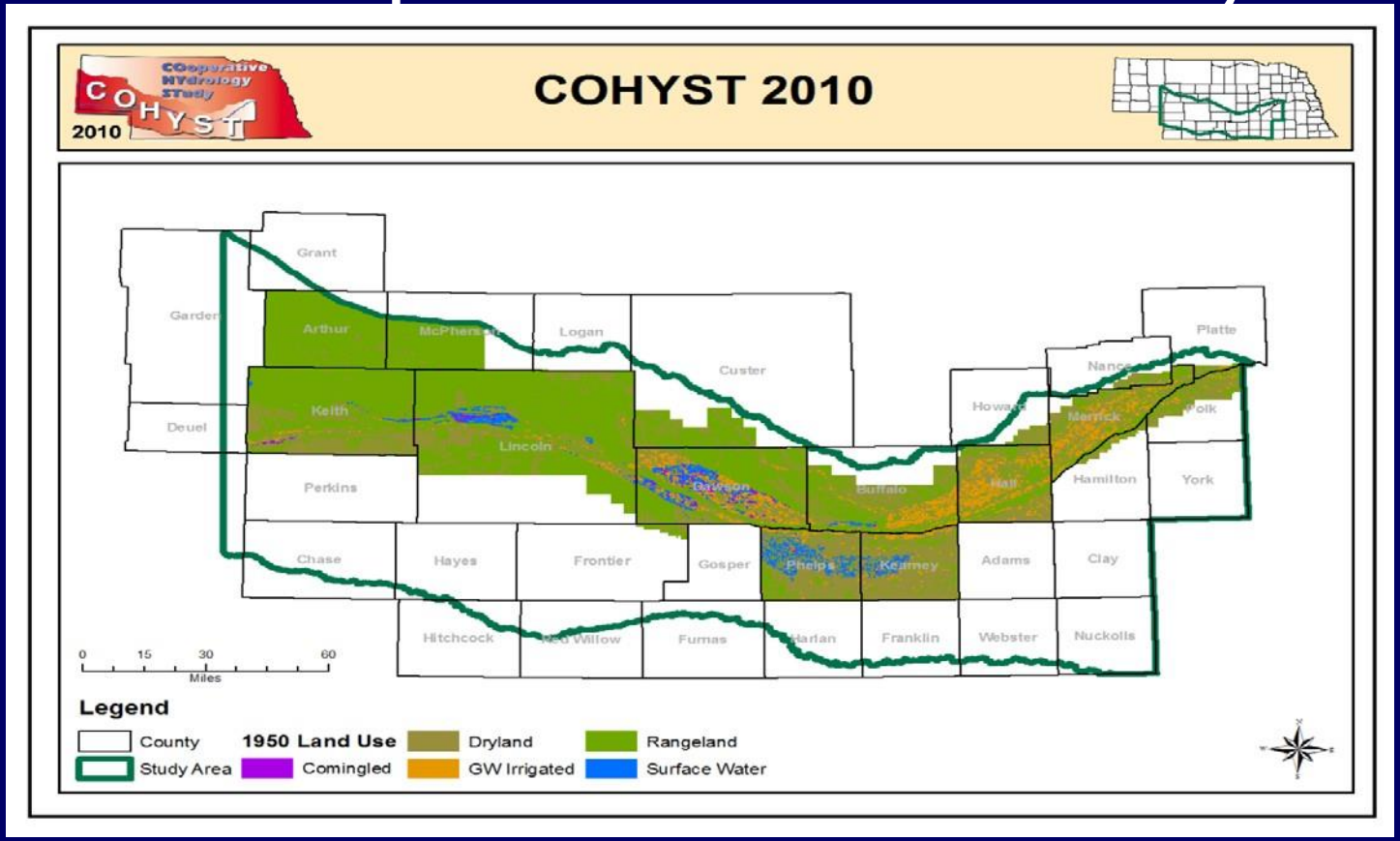
Redeveloped Land Use Data 1950 thru 2007



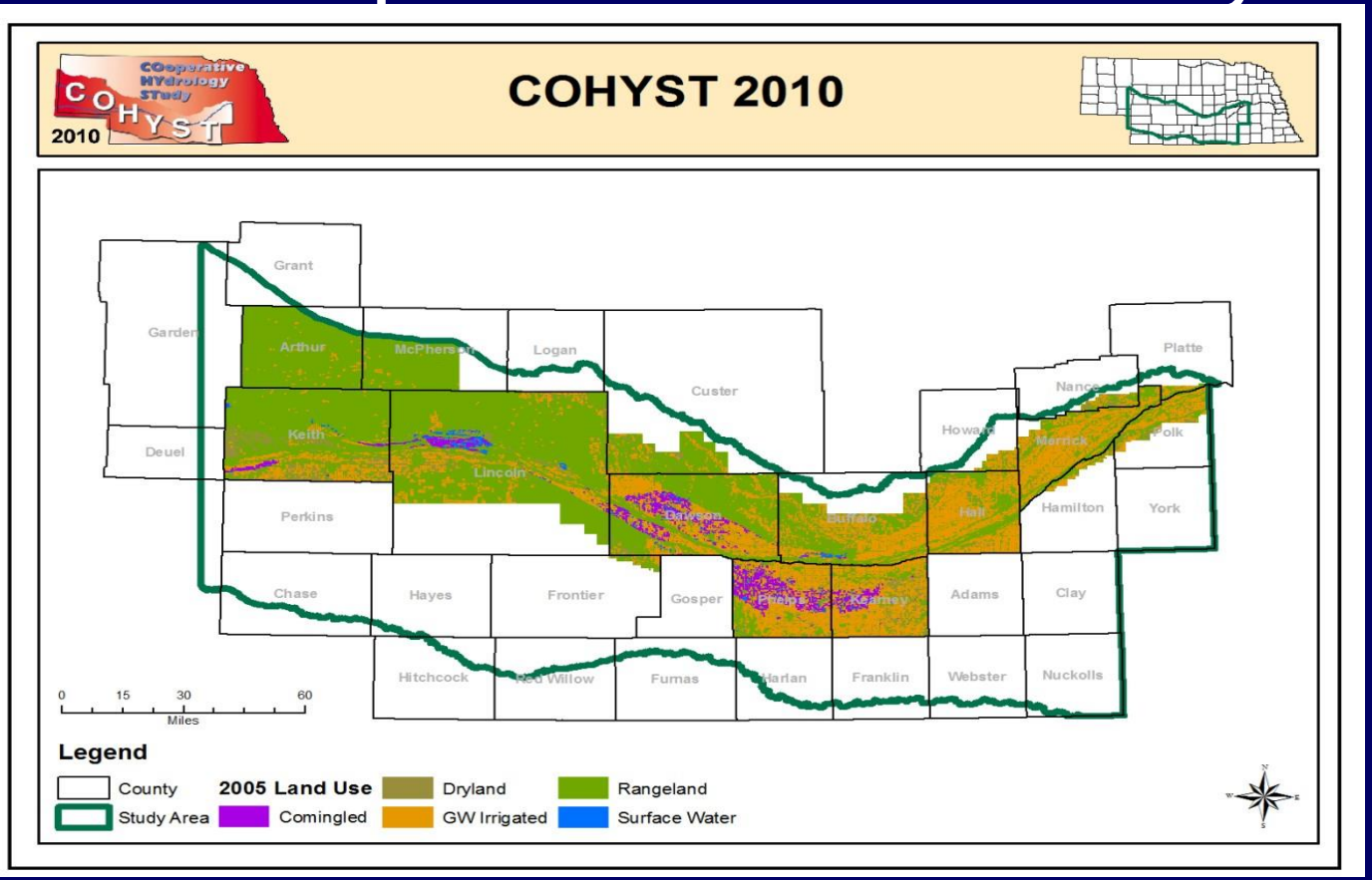


Certified Acres
Remotely Sensed CALMIT
Registered Wells
Surface Water right acres
NASS Census of Ag

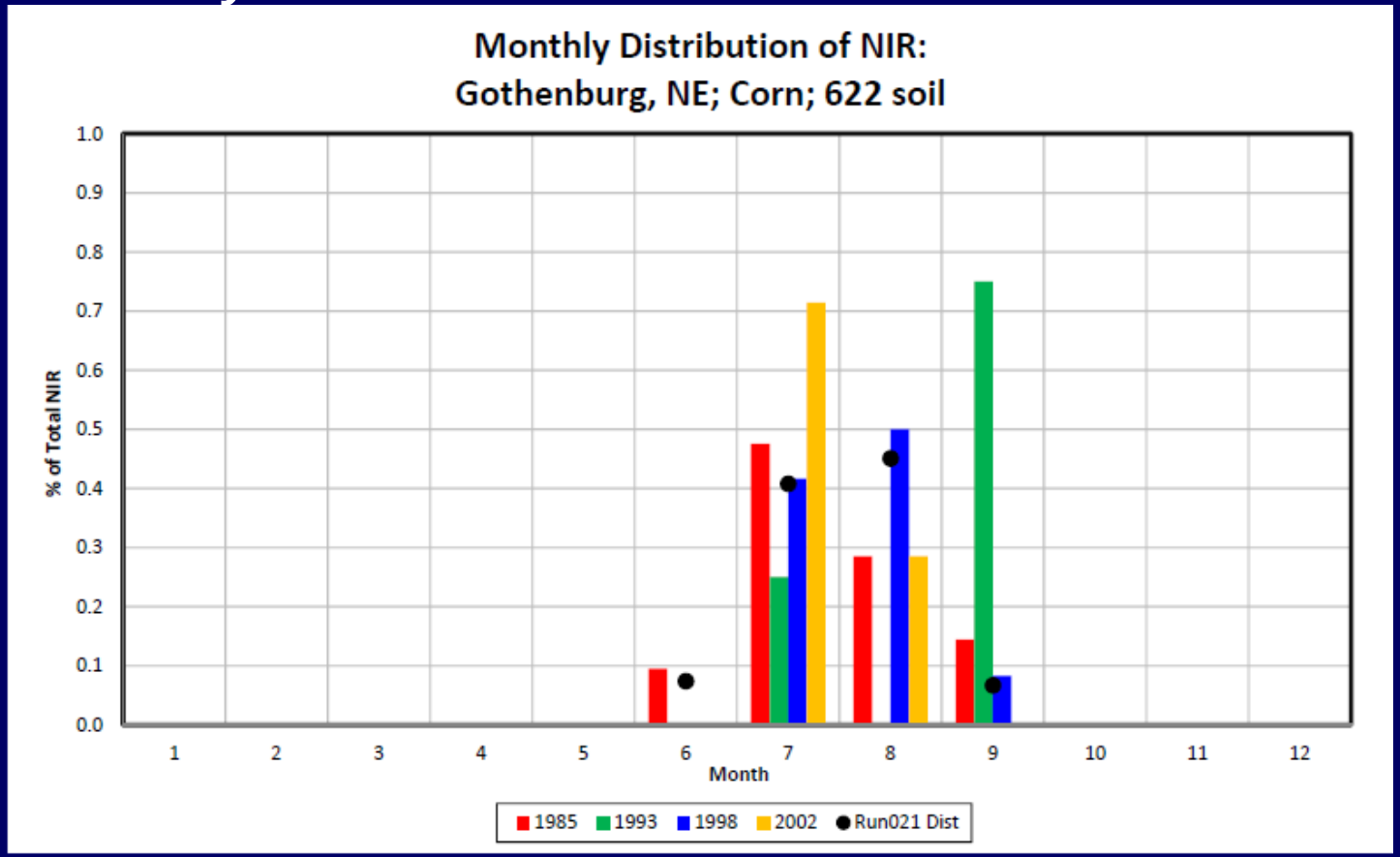
Redeveloped Land Use Data year 1950



Redeveloped Land Use Data year 2005



Monthly NIR Variation



COHYST 2010
Groundwater Tool

Miller , Pun, Osborn

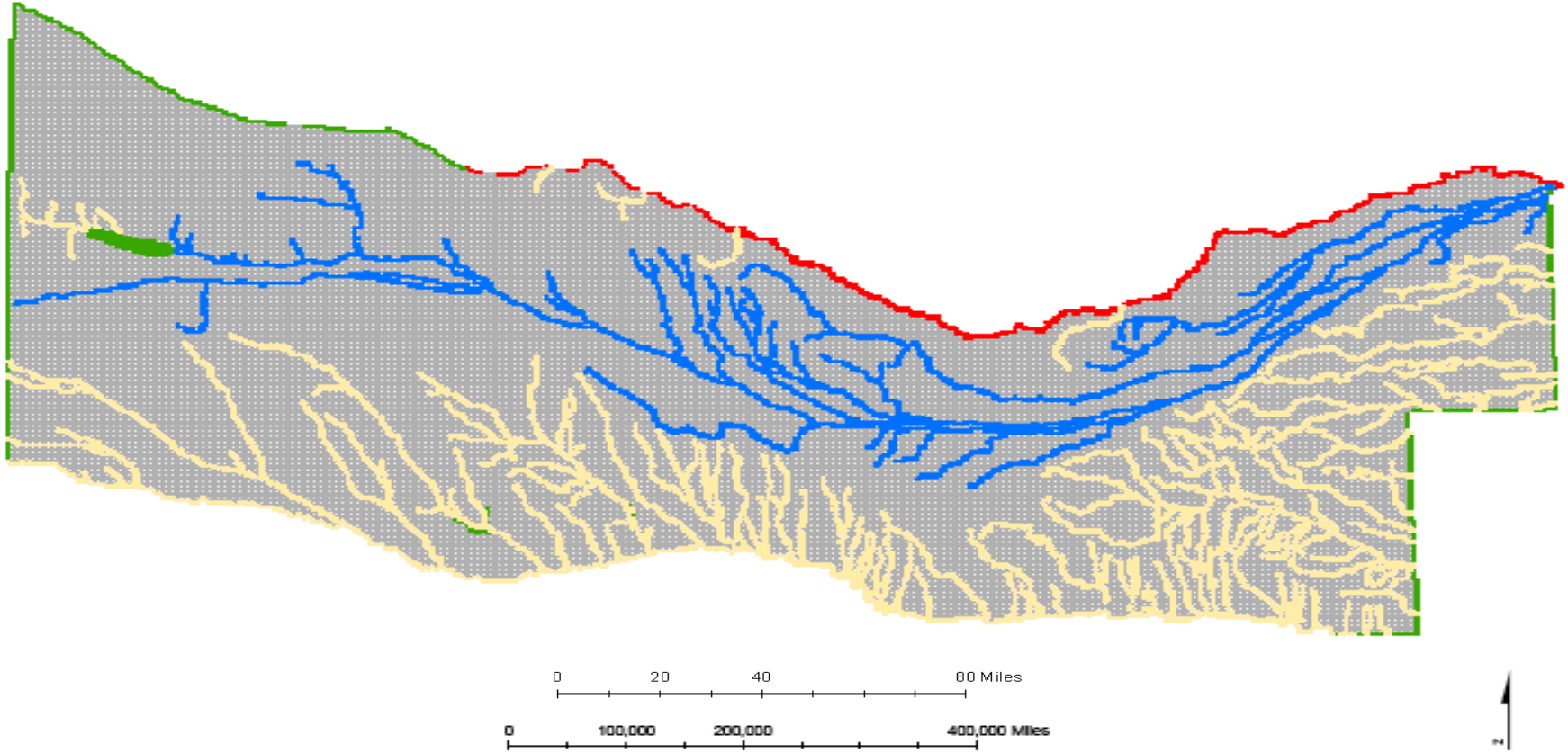
NEBRASKA
DEPT. OF NATURAL RESOURCES

Inputs:

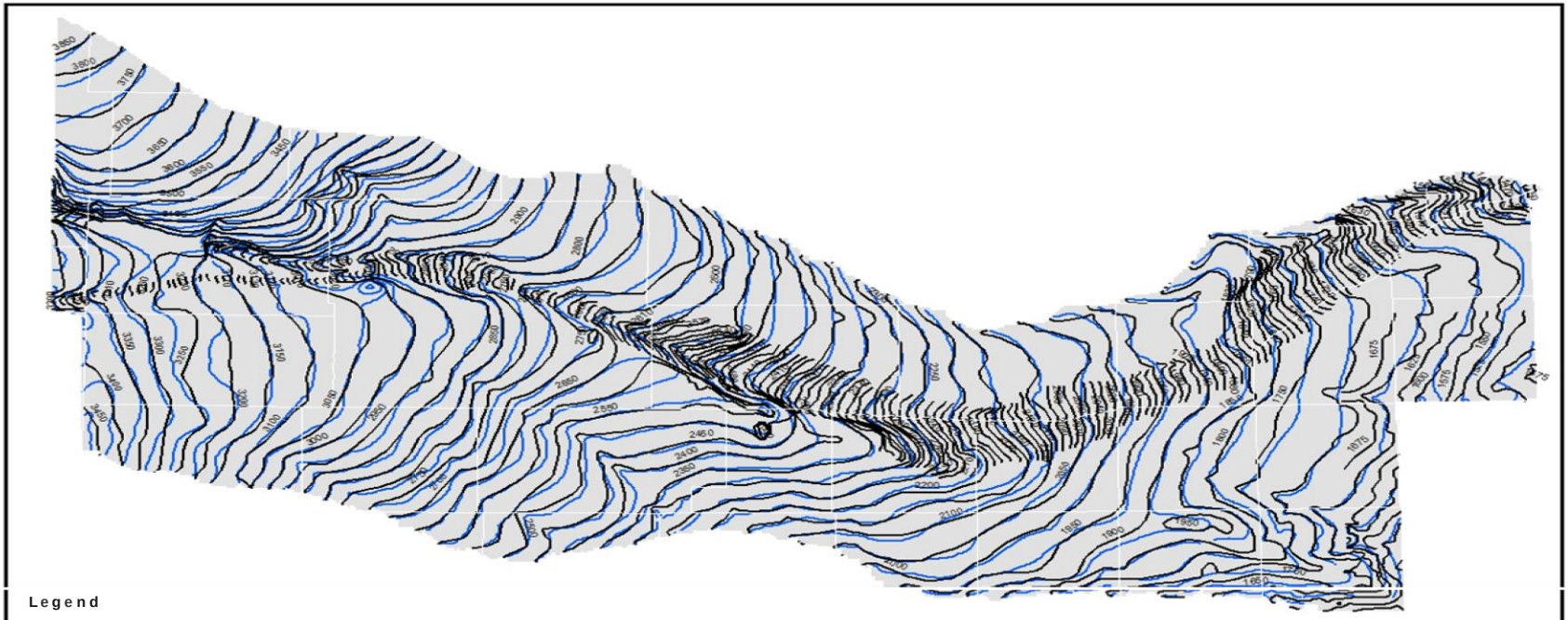
- Active area (IBOUND) – 77,300 160 acre cells
- Aquifer properties
  - Storage (Sy, Ss) – range 16 to 23%
  - Conductivity (Kx,y,z) – range 9 to 167 ft/day
- Boundary conditions
  - Temporal (initial conditions)
  - Head Dependent (STR, RIV, DRN, GHB, EVT)
  - Defined Flux (WEL, RCH)

COHYST 2010

Packages in Groundwater Model Grid

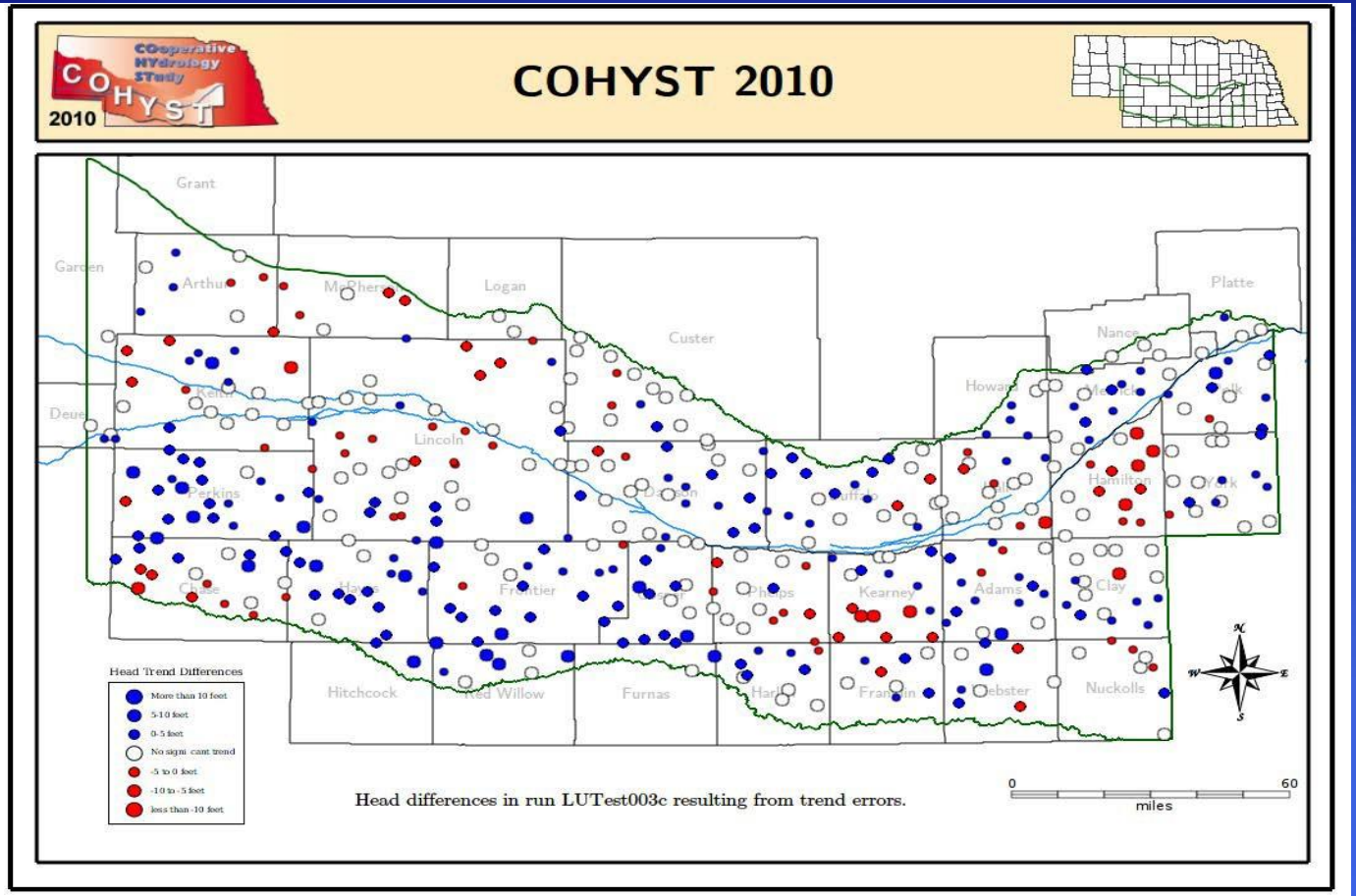


COHYST 2010

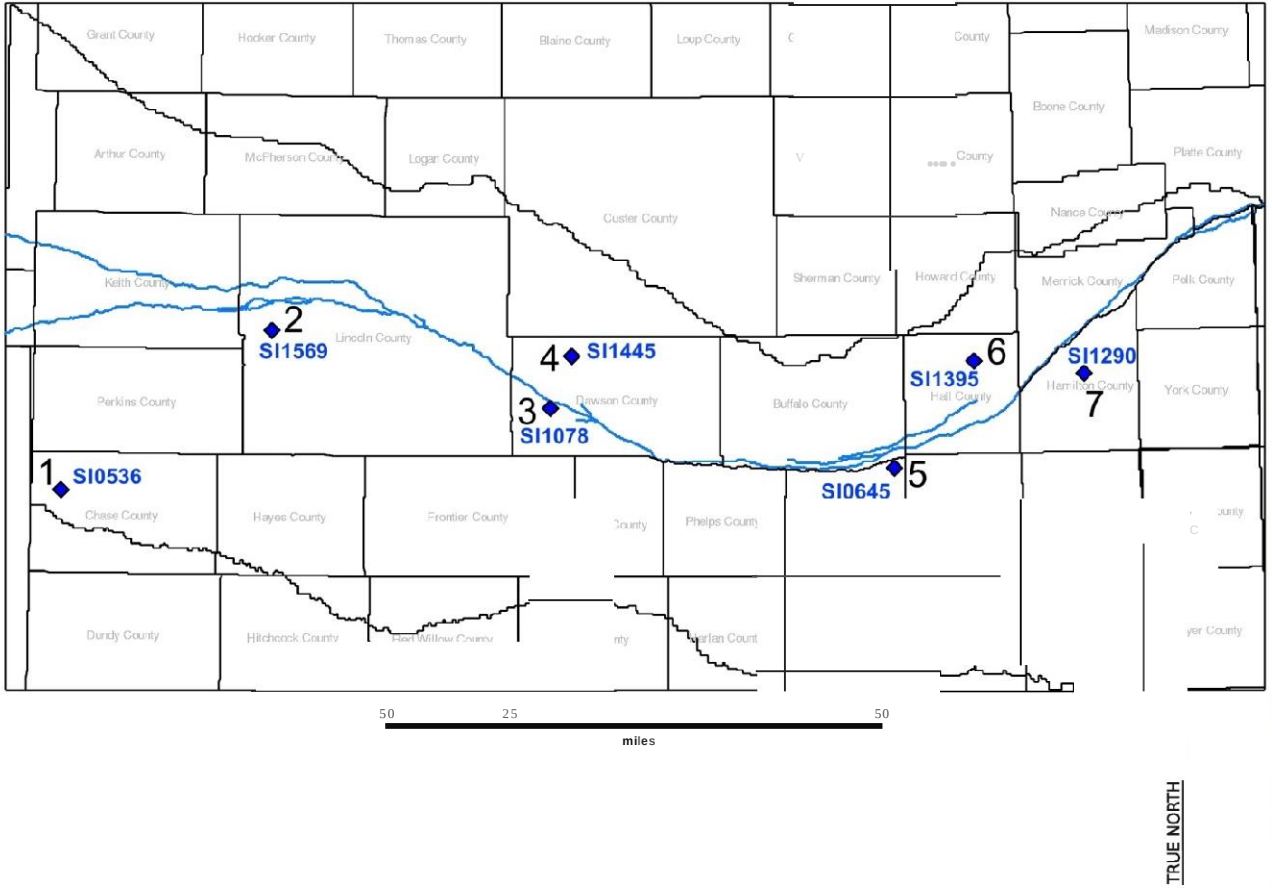


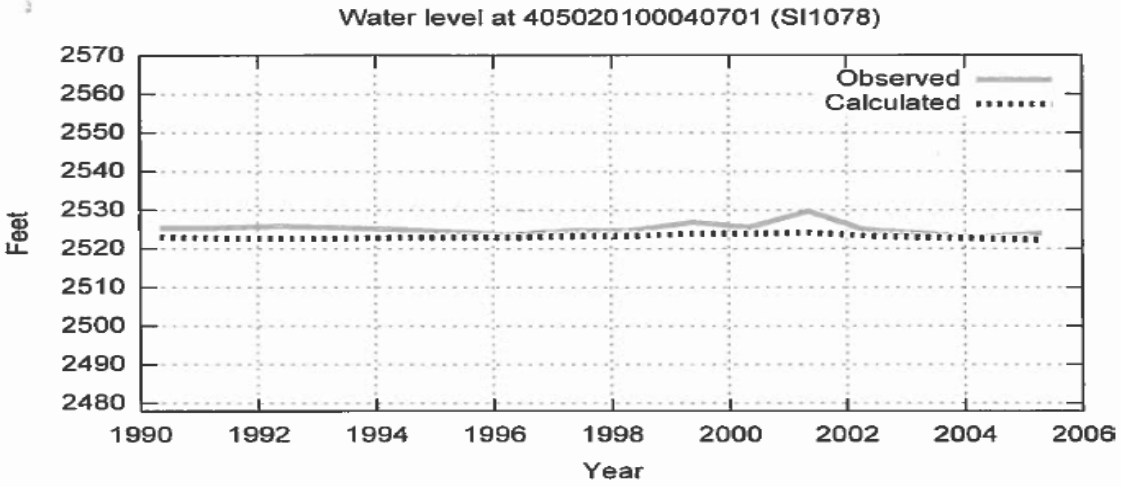
TREND MAPS

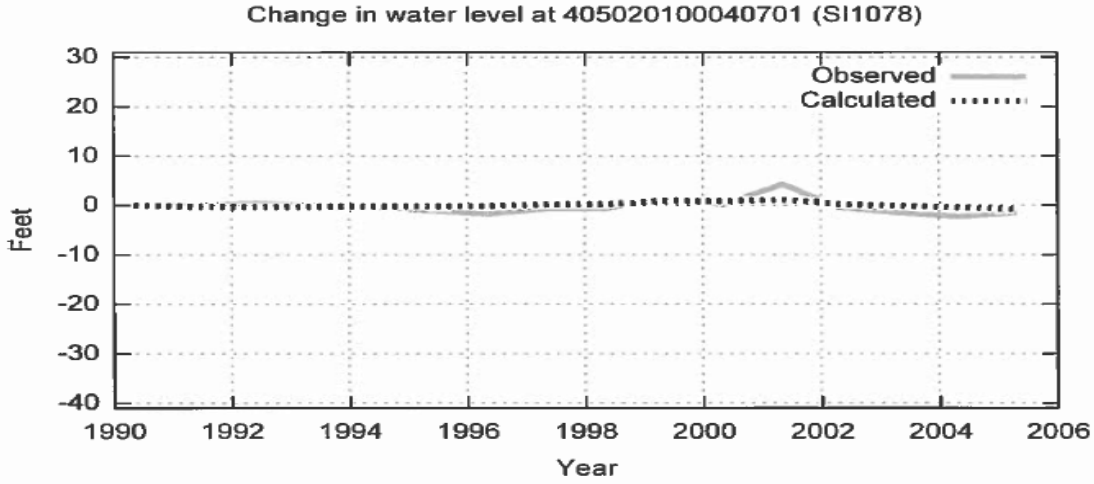
Groundwater Model Run 27



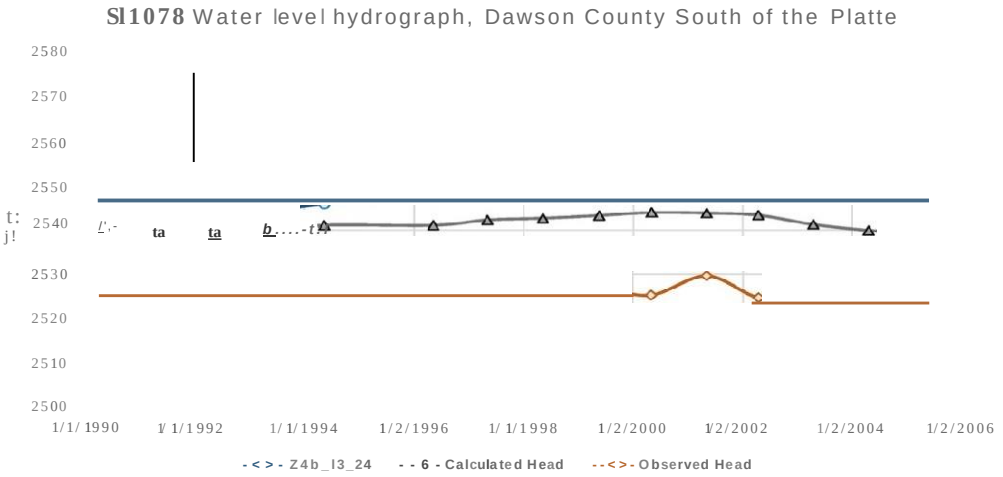
Hydrograph Locations

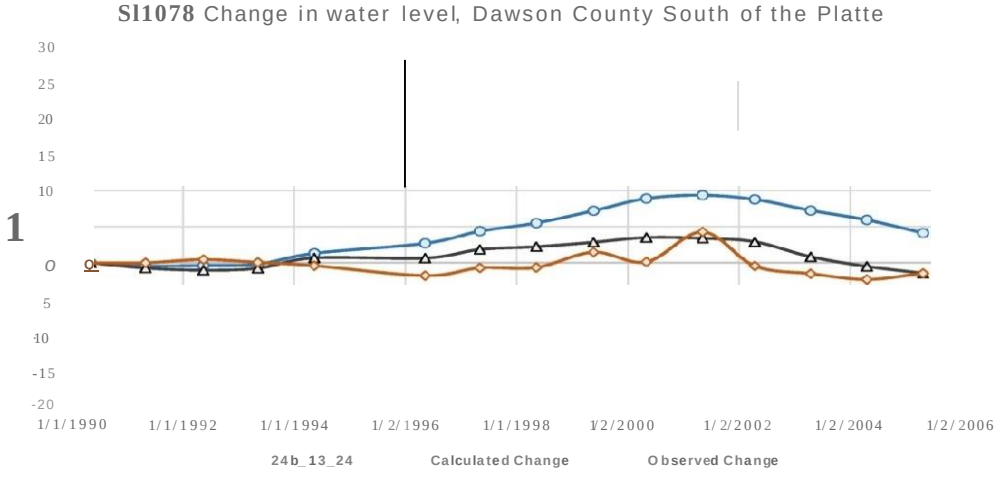



Water level at 405020100040701 (SI1078)
Observed
Calculated
Feet
2570
2560
2550
2540
2530
2520
2510
2500
2490
2480
1990
1992
1994
1996
1998
2000
2002
2004
2006
Year

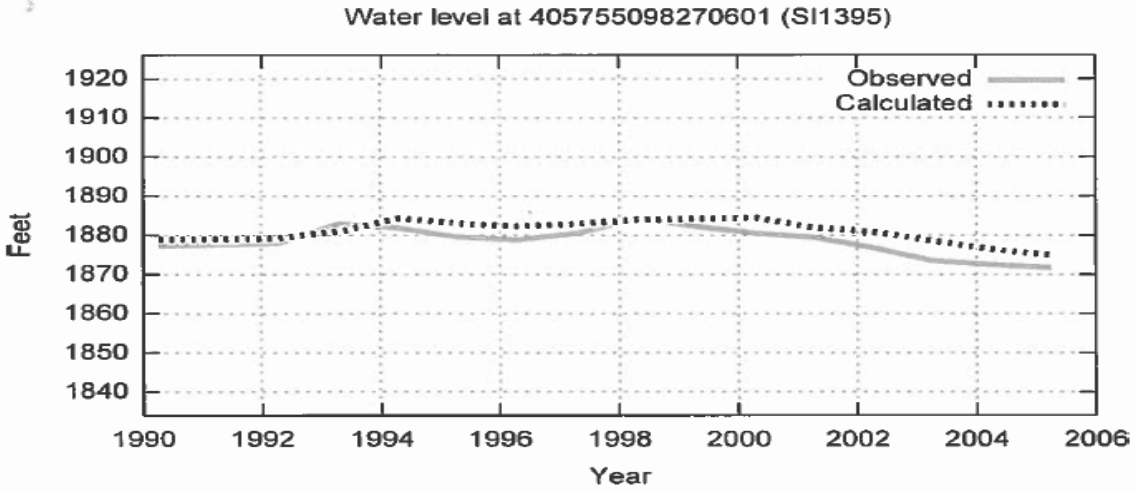

Change in water level at 405020100040701 (SI1078)
Observed
Calculated
Feet
30
20
10
0
-10
-20
-30
-40
1990
1992
1994
1996
1998
2000
2002
2004
2006
Year

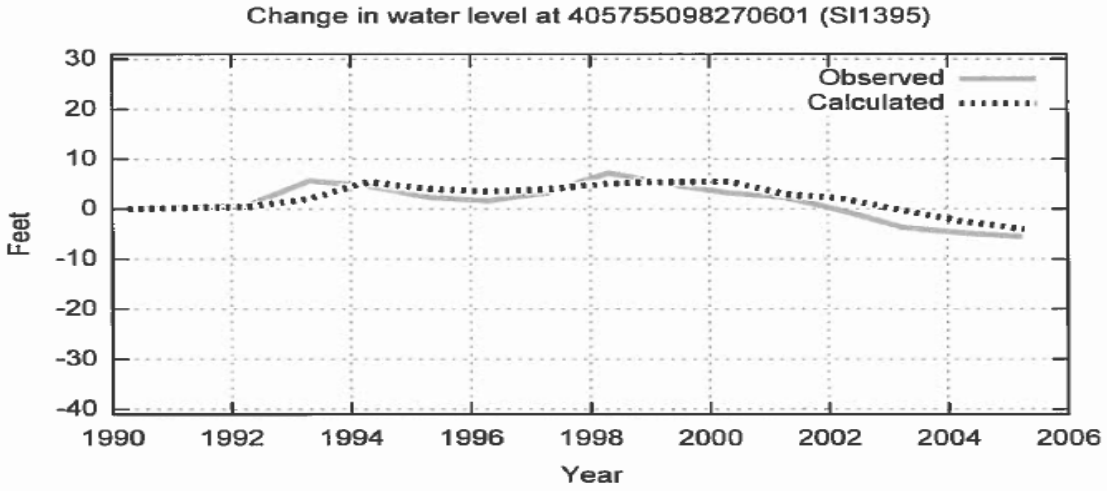
3


SI1078 Water level hydrograph, Dawson County South of the Platte
2580
2570
2560
2550
2540
2530
2520
2510
2500
1/1/1990
1/1/1992
1/1/1994
1/2/1996
1/1/1998
1/2/2000
1/2/2002
1/2/2004
1/2/2006
- < > - Z4b_l3_24
- - 6 - Calculated Head
- - < > - Observed Head

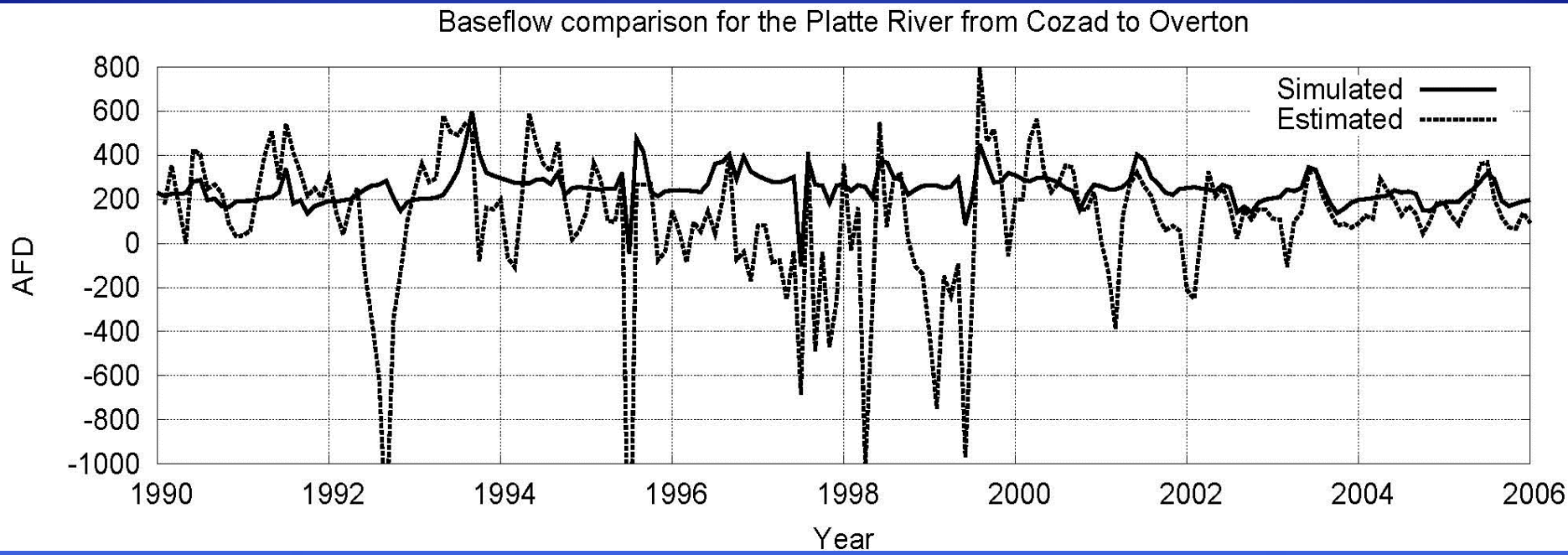

SI1078 Change in water level, Dawson County South of the Platte
30
25
20
15
10
5
0
5
10
15
20
1/1/1990
1/1/1992
1/1/1994
1/2/1996
1/1/1998
1/2/2000
1/2/2002
1/2/2004
1/2/2006
24b_13_24
Calculated Change
Observed Change

1


Water level at 405755098270601 (SI1395)
Observed
Calculated
Feet
1920
1910
1900
1890
1880
1870
1860
1850
1840
1990
1992
1994
1996
1998
2000
2002
2004
2006
Year

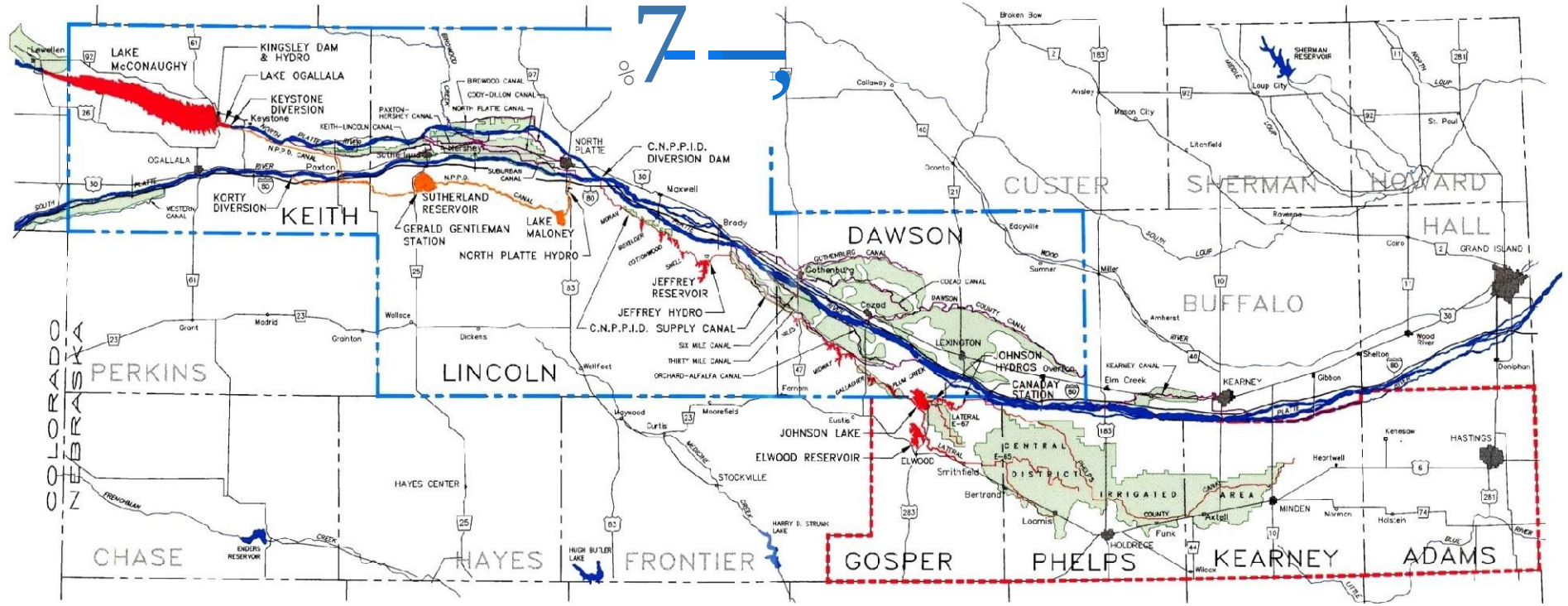

Change in water level at 405755098270601 (SI1395)
Observed
Calculated
Feet
30
20
10
0
-10
-20
-30
-40
1990
1992
1994
1996
1998
2000
2002
2004
2006
Year

BASEFLOW COMPARISON



Surface Water Operations Model - STELLA

- Simple to complex systems
- Flexible tool and user-friendly
- Transparent and easy to understand
- Ideal for consensus building process



SURFA :E IRRIGATION

Model Physical Components

- River Reaches
- Canal Diversions/Returns
- Reservoirs
- Hydropower

Platte River Gages

Platte River Gages	Period of Record
Duncan	1954-present
Grand Island	1954-present
Odessa	1954-present
Overton	1954-present
Cozad	1954-present
Brady	1954-present
North Platte (S. Platte and N. Platte)	1954-present
Roscoe	1982-present
Julesburg	1954-present
Sutherland	1954-present
Keystone	1954-present
Lewellen	1954-present

Canals

North Platte Canals	Platte Canals
Keith Lincoln Canal	Tri County Canal - CNPPID Supply Canal
North Platte Canal	Phelps County Canal
Paxton Hershey Canal	E65 Canal
Suburban Canal	E67 Canal
Cody Dillon Canal	Gothenburg Canal
Birdwood Canal	Cozad Canal
Keystone Canal	Dawson County Canal
South Platte Canals	Thirty Mile Canal
Western Canal	Six Mile Canal
Korty/Sutherland Canal	Orchard Alfalfa Canal
	Kearney Canal

Reservoirs

- Lake McConaughy/Lake Ogallala
- Sutherland Reservoir
- Lake Maloney
- Jeffrey Lake
- Johnson Lake
- Elwood Reservoir
- B1 Reservoir
- Kearney Reservoir

Hydropower

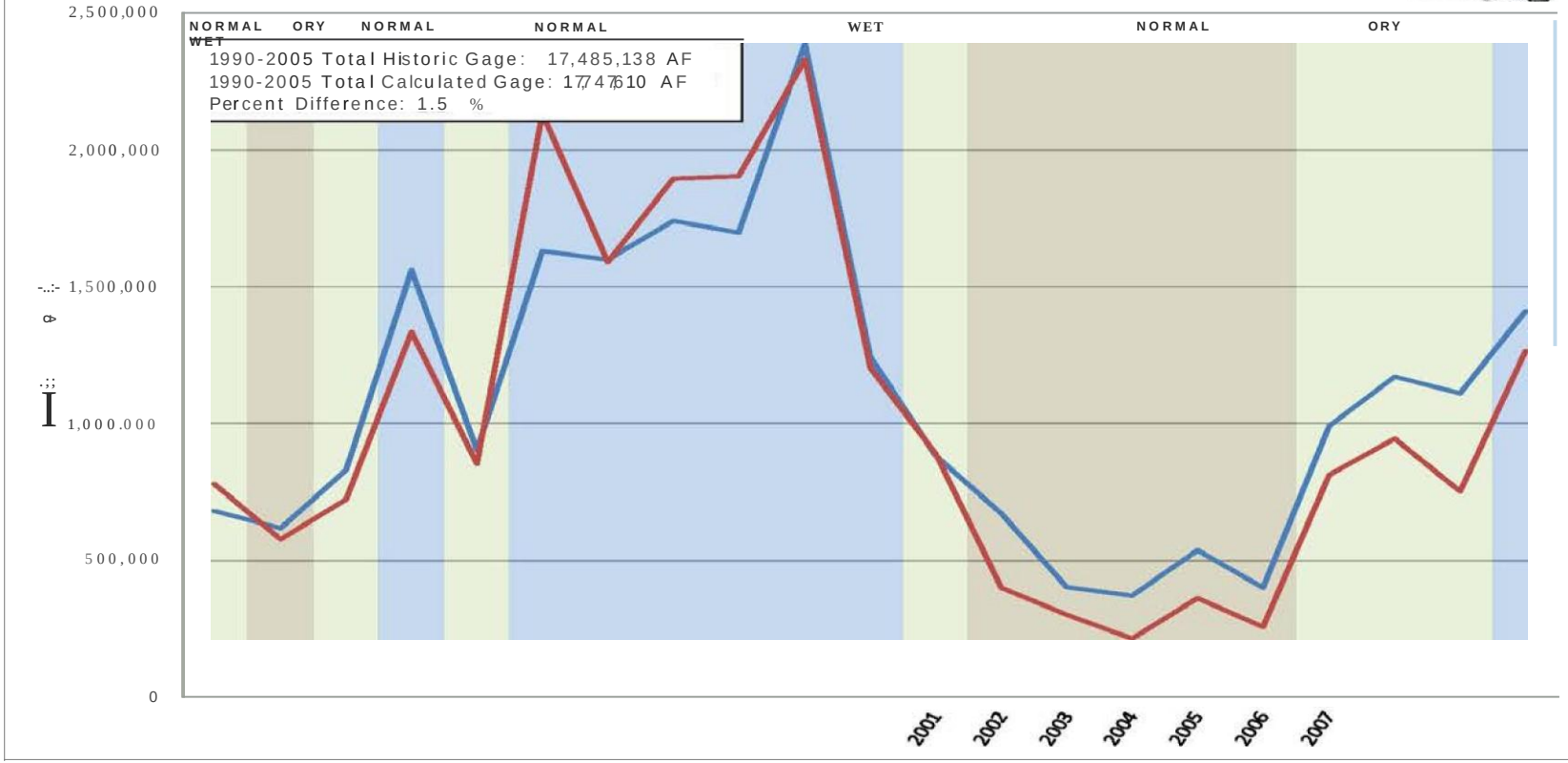
- Kingsley Hydropower
- North Platte Hydropower
- Jeffrey Hydropower
- J1 & J2 Hydropower
- Kearney Hydropower

Modeling Parameters

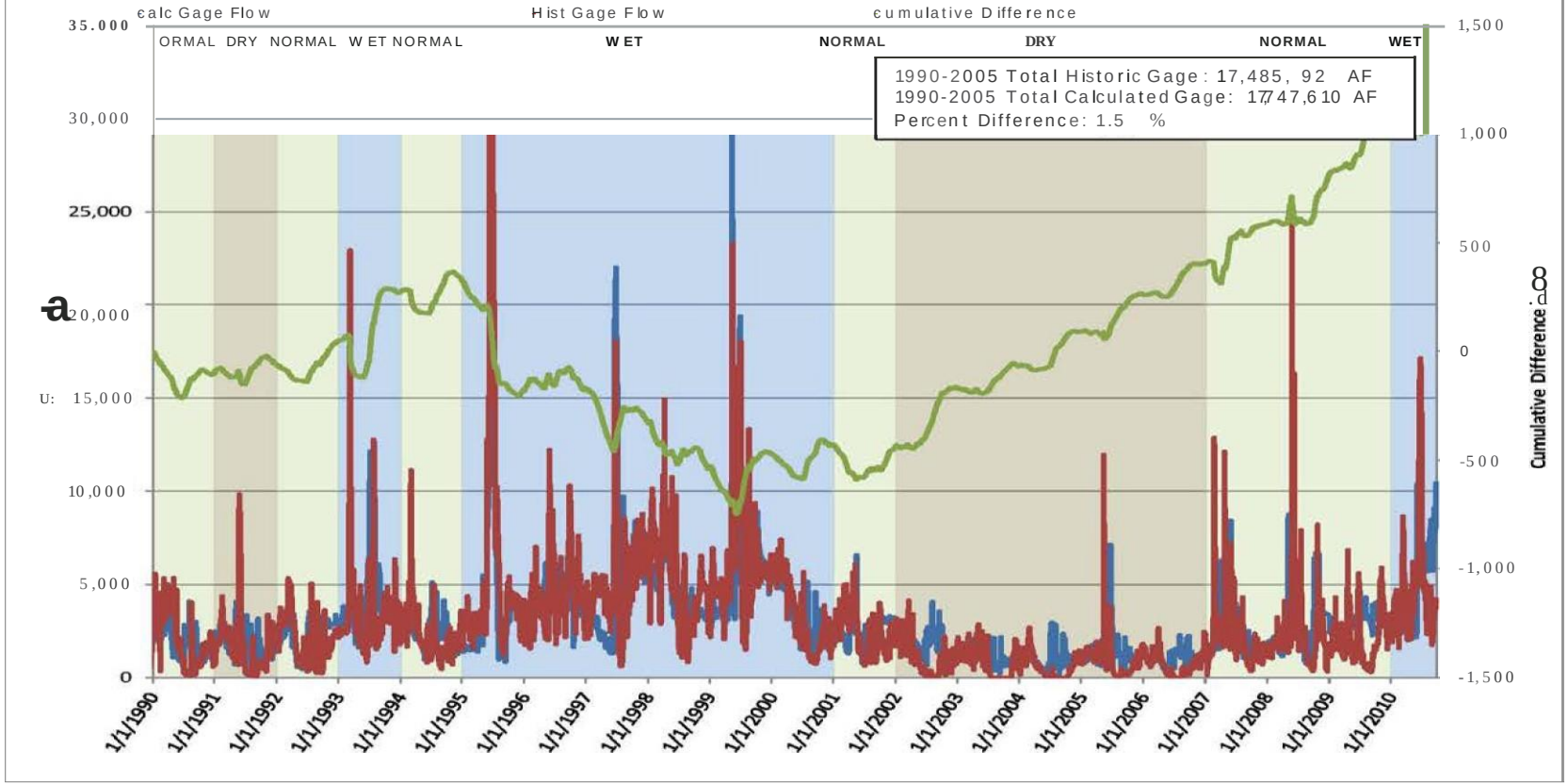
- 1985 – 2005 Calibration
- 2006 – 2010 Verification
- Daily Time Step
- External Boundary Conditions/Inputs
  - Lake McConaughy Inflow
  - Julesburg Gage
  - Initial Baseflow & Runoff Estimates

Platte River near Grand Island

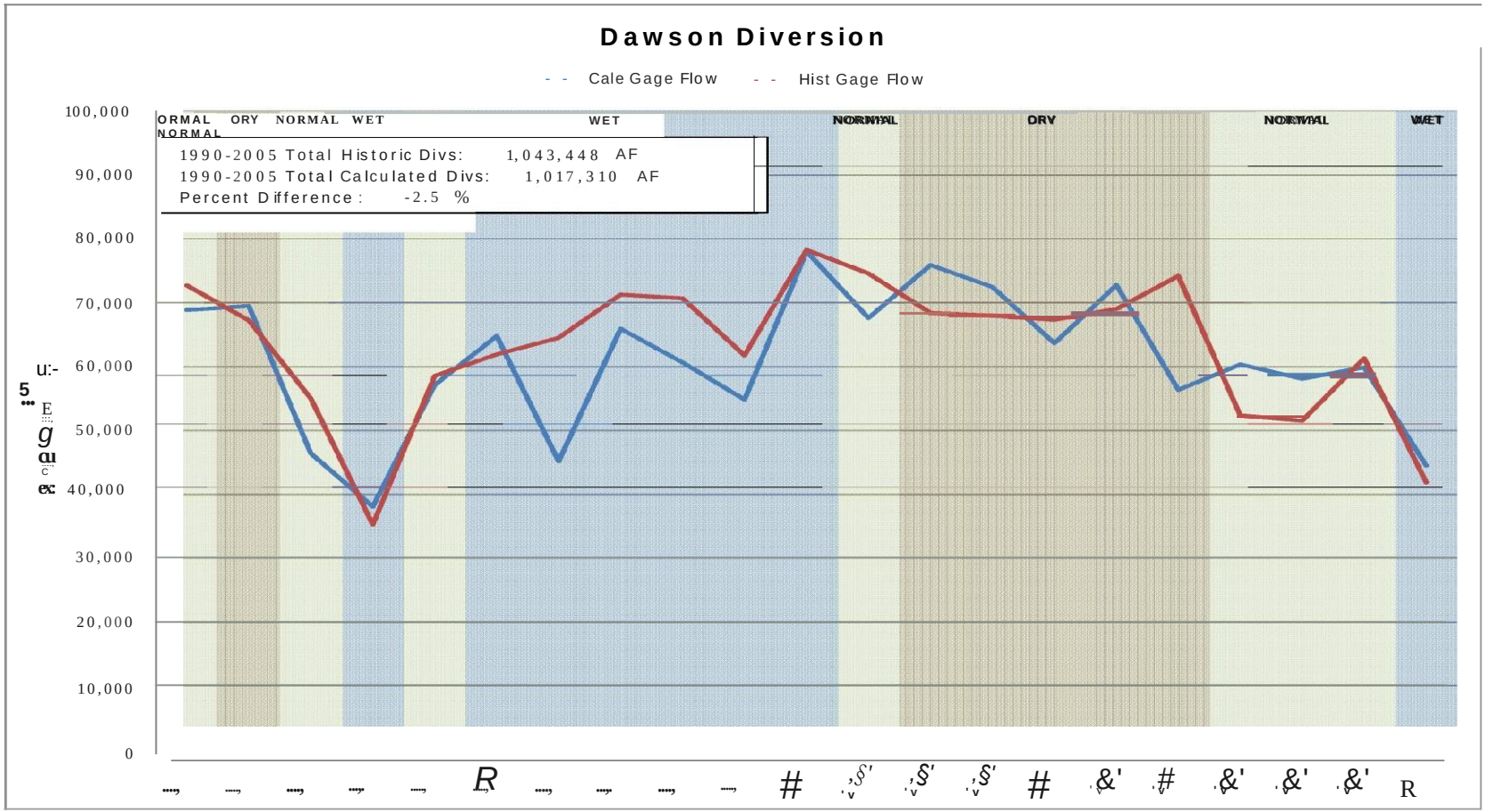
-- Calc Gage Flow -- Hist Gage Flow

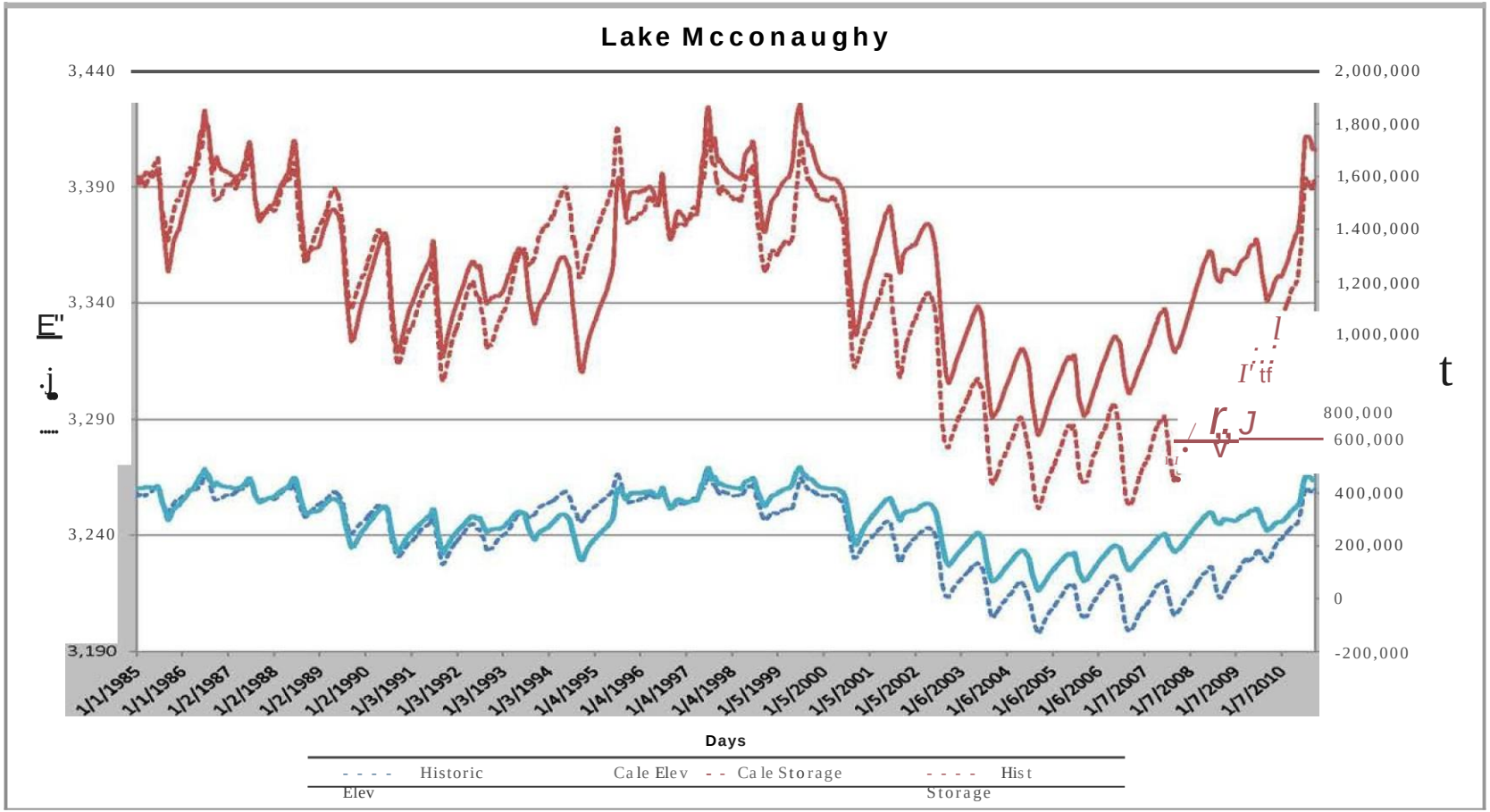


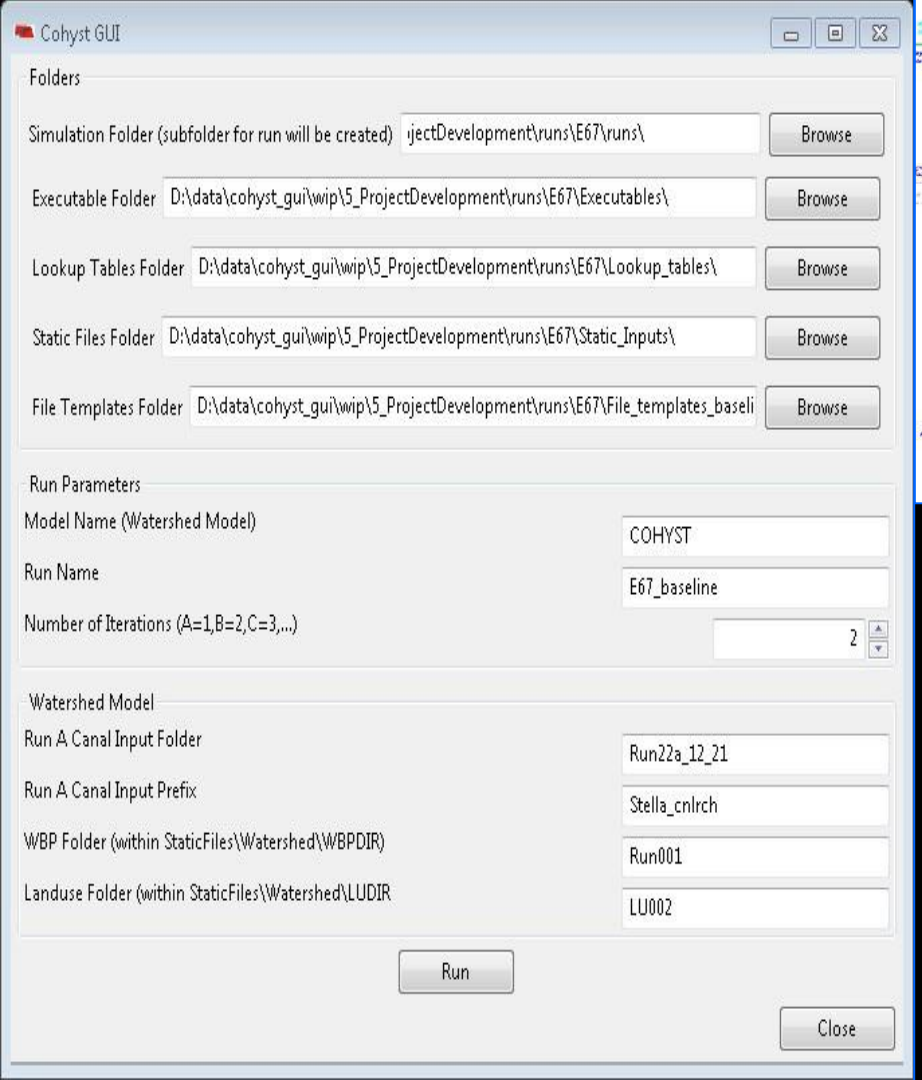
Platte River near Grand Island

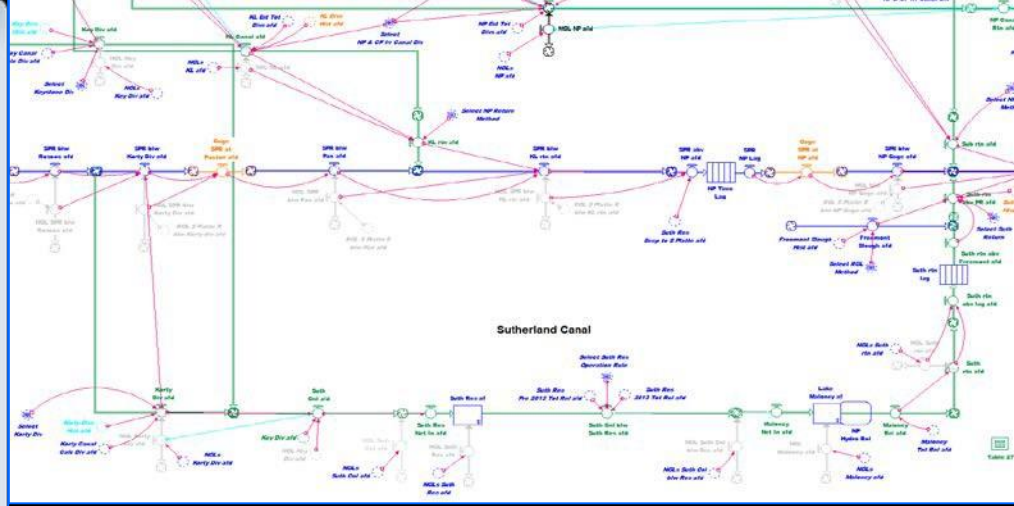


Dawson Diversion




Lake Mcconaughy
3,440
3,390
3,340
3,290
3,240
3,190
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
-200,000
1/1/1985
1/1/1986
1/2/1987
1/2/1988
1/2/1989
1/2/1990
1/3/1991
1/3/1992
1/3/1993
1/3/1994
1/4/1995
1/4/1996
1/4/1997
1/4/1998
1/5/1999
1/5/2000
1/5/2001
1/5/2002
1/6/2003
1/6/2004
1/6/2005
1/6/2006
1/7/2007
1/7/2008
1/7/2009
1/7/2010
Days
Historic Elev
Cale Elev
Cale Storage
Hist Storage

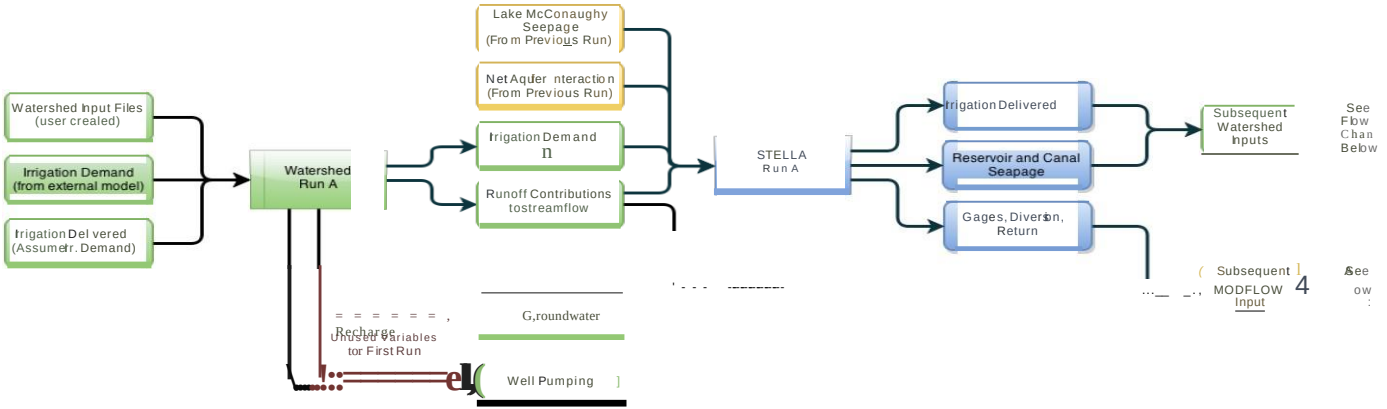




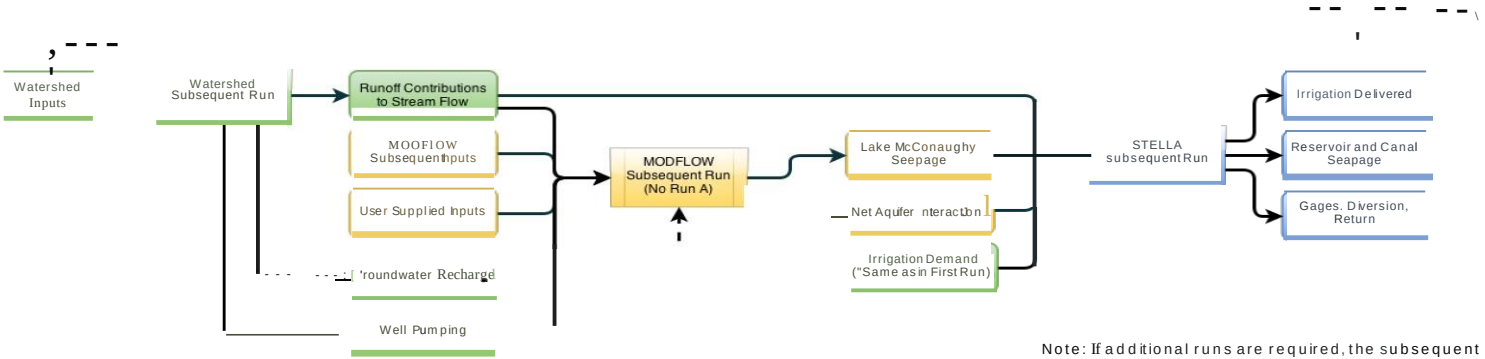
COHYST GUI

Introduction

First Run (Run A)



Subsequent Runs (Runs B,C,D,...)



Note: If additional runs are required, the subsequent runs will follow the order of the second run (B). (Watershed, MODFLOW, STELLA) hputs for runs past the second run, are marked with a dashedline.

GUI Benefits

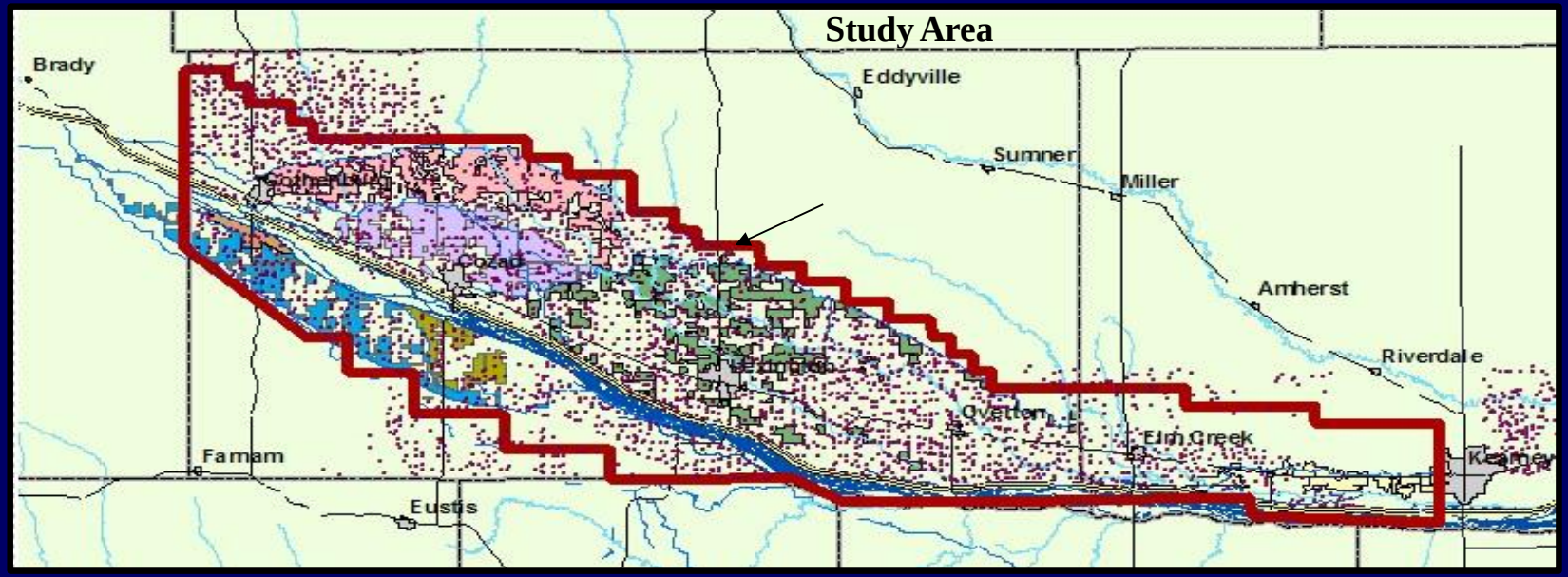
- Automated run (while you sleep)
- No missed steps
- Easier for one person to complete
- Data conversions done automatically
- Repeatable
- Log files record process/STELLA inputs
- Output processing tools provide standard information
- Easier to learn

COHYST 2010 Integrated Model Analysis

- Surface Water Canal Lining project
- Conjunctive Water Management Scenario Analysis
- Platte River Basin Robust Review
- Platte River Program Project Scoring Analysis

COHYST & Conjunctive Water Management

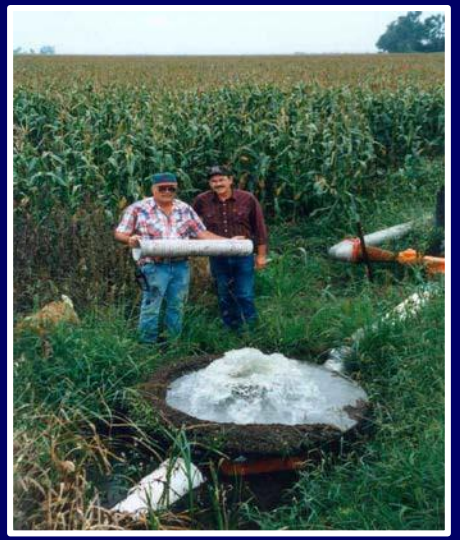
- Surface water / groundwater interrelationship
  - Where and how surface water and groundwater interact
  - Sustainable irrigation water supply



Platte River Basin Robust Review

- Baseline Run with COHYST 2010 Model
- Modified Model analysis for
  - Land Use changes (Acre retirements and transfers)
  - Crop Mix analysis (change in crop consumptive use)
  - Canal Recharge project analysis
  - Flow Augmentation analysis
  - Allocation analysis
  - M&I and Livestock feeding analysis

Questions?



Duane Woodward
Hydrologist
Central Platte Natural District

www.cpnrd.org

IV. REVIEW AND REFINEMENT OF FIRST INCREMENT GOALS

GOAL 1

Incrementally achieve and sustain a fully appropriated condition.

GOAL 1: OBJECTIVE 1

Offset impacts of streamflow depletions to (A) surface water appropriations and (B) water wells constructed in aquifers dependent upon recharge from streamflow to the extent those depletions are due to water use initiated after July 1, 1997

GOAL 1: OBJECTIVE 2

Actively pursue funding for offsets and develop and maintain data and analytical tools, such as the Cooperative Hydrology Study (COHYST) and other programs and projects needed to implement this Plan.

GOAL 1: OBJECTIVE 3

Continue to develop the methodology to calculate the difference between the current and fully appropriated levels of development in each NRD.

GOAL 1: OBJECTIVE 4

Conduct a technical analysis to determine whether the controls adopted in the respective plans or other management actions taken by the NRD are sufficient to offset depletions due to post- July 1, 1997, water uses and whether the provisions of this Plan and the IMPs are adequate to sustain progress toward a fully appropriated level of water use.

GOAL 4

Work cooperatively to identify and investigate disputes between ground water users and surface water appropriators and, if determined appropriate, implement management solutions to address such issues.

GOAL 4: OBJECTIVE 1

Identify disputes between ground water users and surface water appropriators.

GOAL 4: OBJECTIVE 2

Investigate and address issues between ground water users and surface water appropriators, based on investigation results.

V. NEXT STEPS

VI. PUBLIC COMMENT