

Snake/Salt River Basin Plan 2011 Update

Status Report Snake/Salt Basin Advisory Group Meeting May 11, 2011

Prepared By:

THE STATE



OF WYOMING

Water Development Office

Snake/Salt River Basin Plan 2011 Update

Focus to Date: Surface Water

Spreadsheet Model Updates
&
Estimates of Available Surface Water

TOPICS OF DISCUSSION:

1. Spreadsheet Model Updates
 - Hydrologic Database
 - Integration of Database & Spreadsheet
2. Preliminary Results
3. Pending Updates

Basin Plan Update
Being Performed “In-House”
at the
Wyoming Water Development Office

1. Spreadsheet Model Updates

Review of Spreadsheet Models

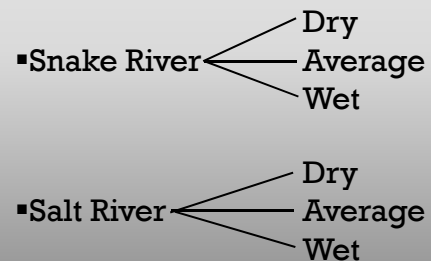
○ Objectives:

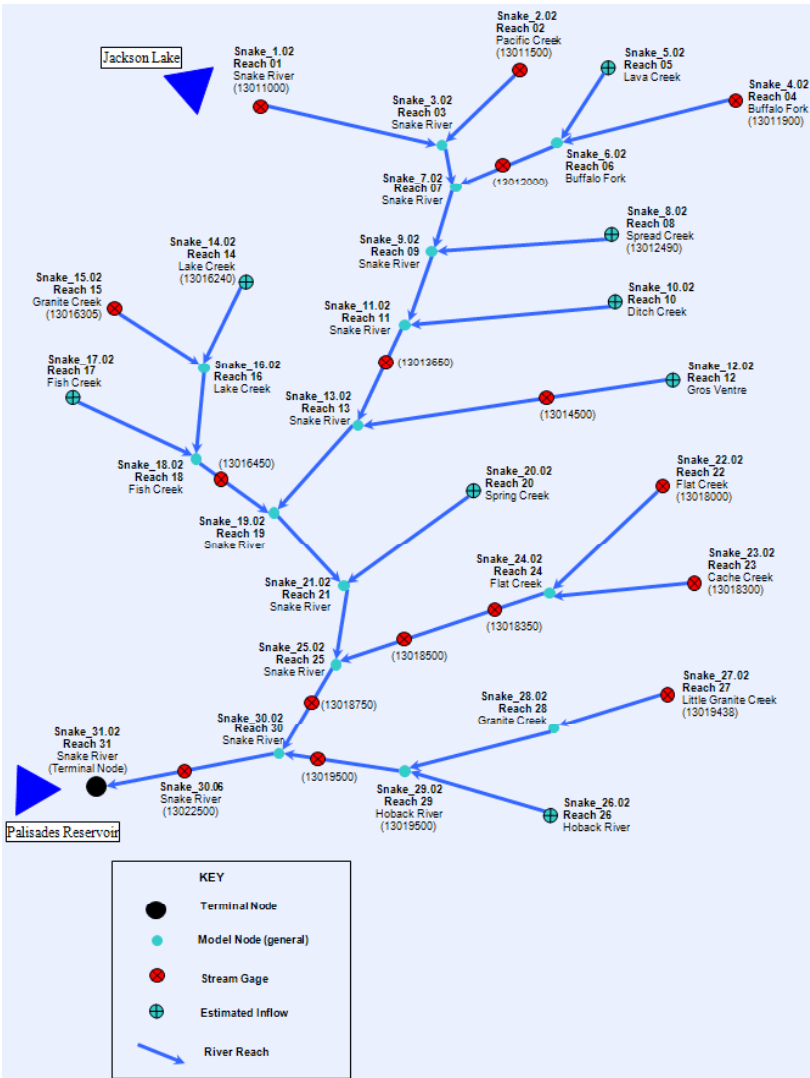
- Determine monthly streamflow during dry, average, and wet years.
- Assist in estimating available water supply.

○ Spreadsheet Models in Previous Basin Plan (2003):

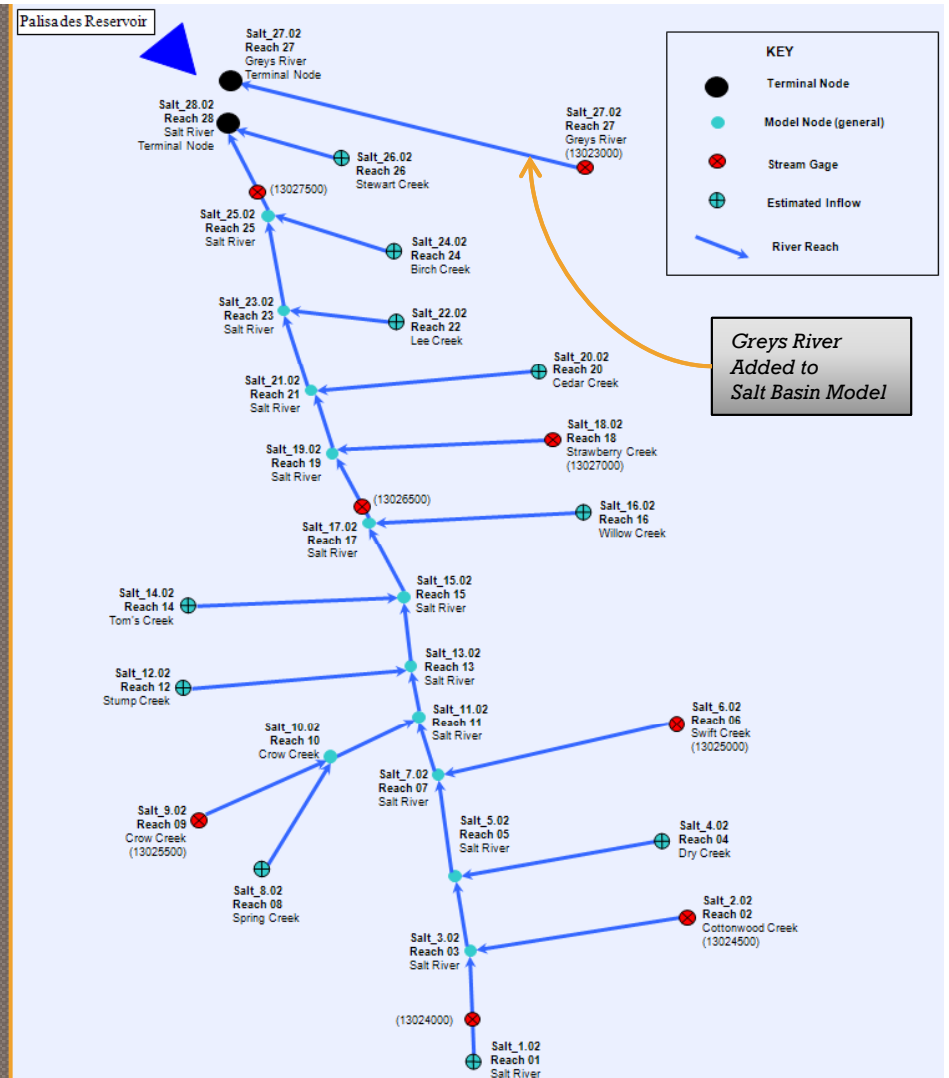
- Data stored and processed in separate spreadsheets.
- Cumbersome and not transparent.

Six Separate Spreadsheet Models:





Model Map Networks



Hydrologic Database

- Created in *Microsoft Access*®.
- Uses standard *Access*® tables and queries to store & process data.
- Linked to spreadsheet models.
- Houses all datasets required by the spreadsheet models:
 - Streamflow Data
 - Natural Flow Data
 - Diversion Data

Startup Screen - Microsoft Access

Home Create External Data Database Tools

Views Paste Copy Format Painter Font Rich Text Refresh All Save Spelling Delete More Records Filter Advanced Toggle Filter Size to Fit Form Switch Windows Find Replace Go To Select

All Access Objects

Tables

- tbiDates
- tbiDates_DaysInMonth
- tbiDivisions_Acres
- tbiDivisions_CIR
- tbiDivisions_Days
- tbiHydro_Gages
- tbiHydro_KeyGageDAW_Salt
- tbiHydro_KeyGageDAW_Snake
- tbiHydro_Streamflow_Month_Salt
- tbiHydro_Streamflow_Month_Snake
- tbiHydro_USGS_Daily
- tbiNatFlow_Correlation_Sites
- tbiNatFlow_MBE_Sites
- tbiNodes
- tbiStrawberry_Area
- tbiStrawberry_Sites

Queries

- qryHydro_AnnFlow_Salt
- qryHydro_AnnFlow_Snake
- qryHydro_DAW_Years_Salt
- qryHydro_DAW_Years_Snake
- qryHydro_Streamflow_DAW_Salt
- qryHydro_Streamflow_DAW_Snake
- qryHydro_USGS_Month
- qryModel_Diversions
- qryModel_NatFlow_Salt
- qryModel_NatFlow_Snake
- qryModel_Strawberry
- qryModel_Streamflow_Salt
- qryModel_Streamflow_Snake
- qryNatFlow_Calc_MBE_Annual
- qryNatFlow_Calc_Salt
- qryNatFlow_Calc_Snake
- qryNatFlow_Correlation_Salt_Annual
- qryNatFlow_Correlation_Salt_Monthly
- qryNatFlow_Correlation_Snake_Annual
- qryNatFlow_Correlation_Snake_Monthly
- qryStrawberry_DAW


Forms

Form View

Snake/Salt River Basin

Hydrologic Database

Welcome to the Hydrologic Database for the
2011 Snake/Salt River Basin Plan Update



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Navigation Buttons

[Spreadsheet Models](#)

[Snake River DRY](#) [Salt River DRY](#)

[Snake River AVG](#) [Salt River AVG](#)

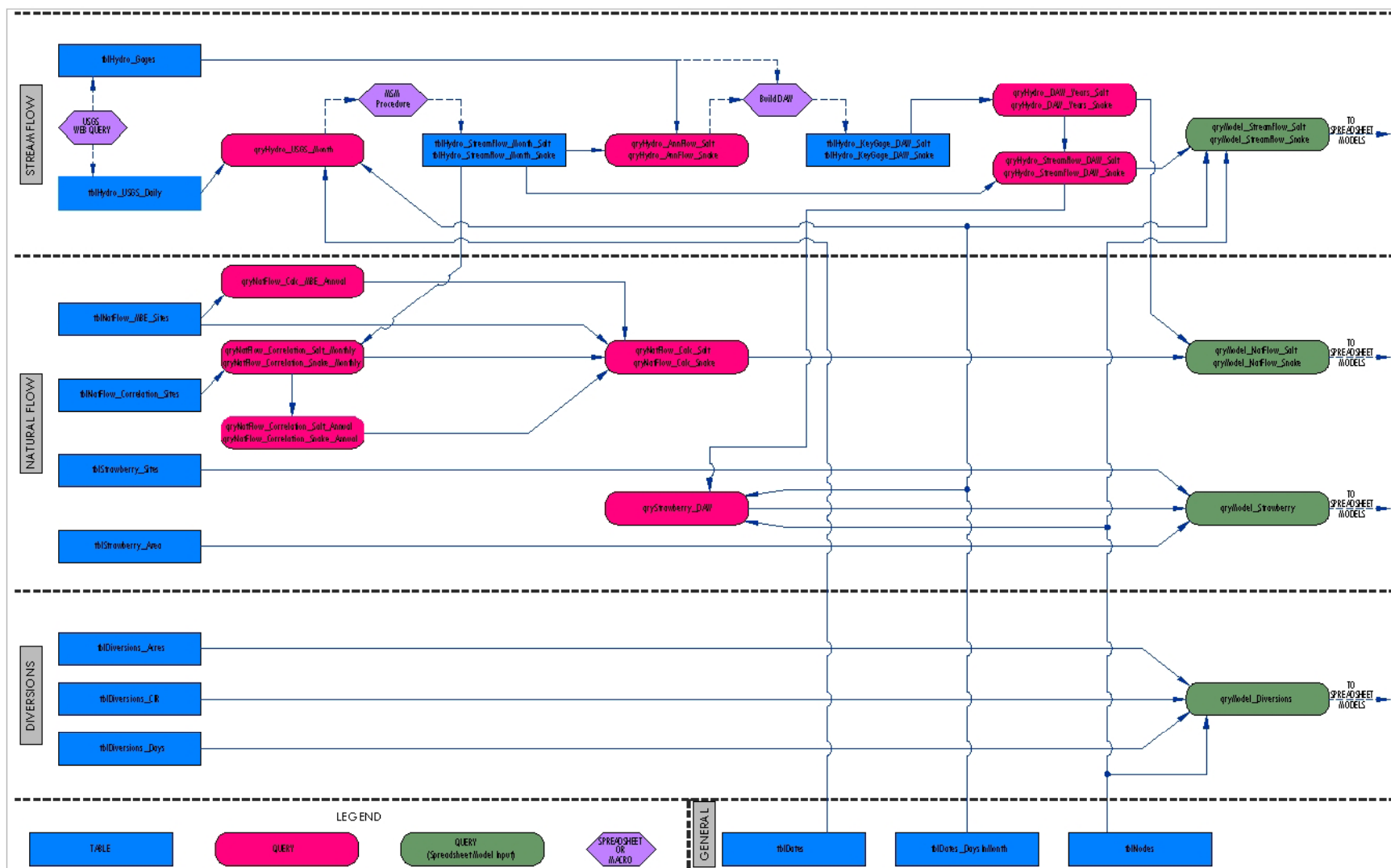
[Snake River WET](#) [Salt River WET](#)

[Database Macros](#)

[BuildDAW](#)

[Proceed to Database](#)

Hydrologic Database Startup Screen



Hydrologic Database Schema

1.0 Spreadsheet Model Updates

1.1 Hydrologic Database

Streamflow Data

- Source:
 - USGS
- Method:
 - Automated by USGS Web Query Spreadsheet
- Missing Data:
 - Mixed Station Method (MSM) program
- D.A.W. Classification:
 - Automated with macro in Hydrologic Database

Snake Basin: 16 Gage Stations
Salt Basin: 8 Gage Stations

New Study Period:
1971 - 2010

Mixed Station Model

File Help

Open Run Save Reset

Control Card Information

Regression Type (Log Transform)

Simple Linear Regression

Dependent Stations

1 Beginning Station

17 Ending Station

Cyclicality

SEP Dependent

Independent Stations

☒ Search All Stations

☐ Use Designated Station

Additional Controls

1904 Beginning Year

2010 Ending Year

5 Minimum Concurrent Values

95 % Confidence Interval

Selected File "Snake MSM Input 2010.xbg" Has Been Read In 1 File Open

SnakeSalt USGS Web Query.xls [Compatibility Mode] - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Developer

Normal Page Break Custom Full Workbook Views Show/Hide

Gridlines Headings Message Bar

Zoom 100% Zoom to Selection

New Window Arrange All Freeze Panes Hide Split View Side by Side Synchronous Scrolling Reset Window Position Save Switch Workspace Windows Macros

A1 B. Run USGS Web Query

1. Enter the Database Name and the Daily Table Name from the database (green cells).
2. Click button to run the USGS web query and fill table in database.

Database Name SnakeSalt Database 2010.mdb
Database Daily Table Name tblHydro_USGS_Daily
Data Row for Web Query 1000
Number of Stations 24

Keyword: Snake

Run USGS Web Query

RUN STATUS

Completed Sub: RunWeb_Query
Completed Sub: SiteLoop
Completed Sub: DAOClearRowsAccess
Completed Sub: SiteWebQuery
Completed Sub: CleanData
Completed Sub: DAOFromExcelToAccess

LAST RUN COMPLETED
1/4/2011 10:41

USGS Site Number	Station Name	Number of Data Values Obtained
13024000	Salt River near Smoot, WY (13024000)	9,254
13024500	Cottonwood Creek near Smoot, WY (13024500)	9,132
13025000	Swift Creek near Afton, WY (13025000)	13,881
13025500	Crow Creek near Fairview, WY (13025500)	7,854
13026500	Salt River near Thayne, WY (13026500)	12,876
13027000	Strawberry Creek near Bedford, WY (13027000)	4,140
13027500	Salt River above Reservoir near Etna, WY (13027500)	20,915
13023000	Greys River above Reservoir Near Alpine, WY (13023000)	34,151
13011000	Snake River near Moran, WY (13011000)	39,178
13011500	Pacific Creek at Moran, WY (13011500)	34,137
13011900	Buffalo Fork above Lava Creek near Moran, WY (13011900)	16,541
13012000	Buffalo Fork near Moran, WY (13012000)	15,765
13013650	Snake River at Moose, WY (13013650)	5,753
13014500	Gros Ventre River at Kelly, WY (13014500)	33,806
13016305	Granite Creek above Granite C Supplemental near Moose, WY (13016305)	5,696
13016450	Fish Creek at Wilson, WY (13016450)	6,131
13018000	Flat Creek near Jackson, WY (13018000)	22,016
13018300	Cache Creek near Jackson, WY (13018300)	17,720
13018350	Flat Creek below Cache Creek, near Jackson, WY (13018350)	7,942
13018500	Flat Creek near Cheney, WY (13018500)	27,852
13018750	Snake River below Flat Creek near Jackson, WY (13018750)	12,838
13019438	Little Granite Creek at mouth near Bondurant, WY (13019438)	3,979
13019500	Hoback River near Jackson, WY (13019500)	15,060
13022500	Snake River above Reservoir near Alpine, WY (13022500)	26,958

USGS Gage Master List web_usgs key_gage

Ready 88%

USGS Web Query Spreadsheet

1.0 Spreadsheet Model Updates

1.1 Hydrologic Database

Natural Flow Data

- Ungaged tributary inflow estimated with Lowham Equation.
- Annual flow converted to monthly flow by correlation to gaged flow.

$$Q_a = 0.0015 A^{1.01} \left(\frac{Elev}{1000} \right)^{2.88}$$

Used Same Correlation Sites from
Previous Basin Plan

Drainage Basin Area and Elevations
Confirmed During Update

Snake Basin: 8 Ungaged Tributaries
Salt Basin: 9 Ungaged Tributaries

1.0 Spreadsheet Model Updates

1.1 Hydrologic Database

Diversion Data

- Actual diversion records sparse or non-existent; therefore, diversions were estimated.

Snake Basin: 29 Demand Nodes
Salt Basin: 25 Demand Nodes

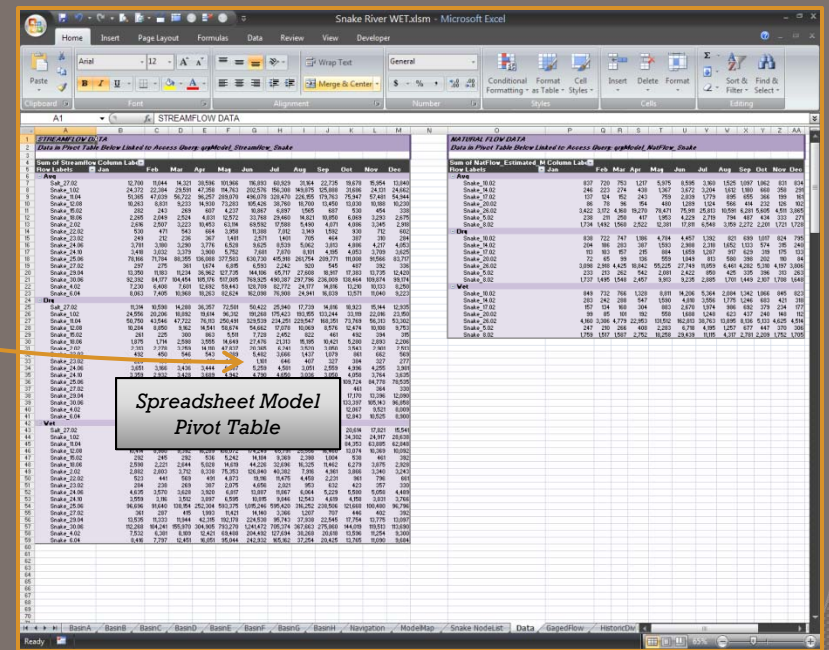
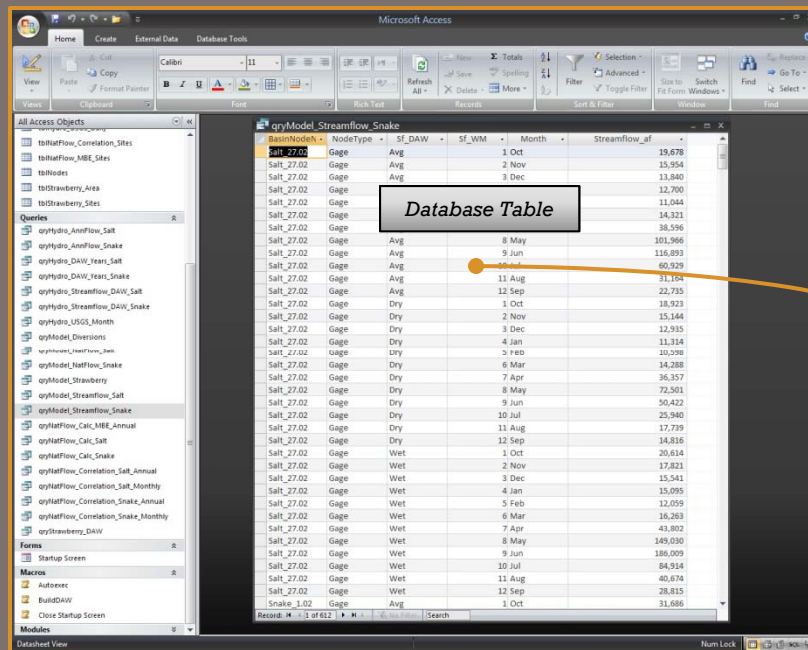
$$Diversion = Acres \times CIR \times Fraction$$

- Acres
 - Acreages from Previous Basin Plan (2003)
- CIR
 - Consumptive use (CU) & crop irrigation requirements (CIR) (currently being updated)
 - StateCU
 - Cropping patterns (currently being updated)
- Fraction
 - Fraction of month irrigated (currently being updated)

1.1 Database & Spreadsheet Integration

Data Integration

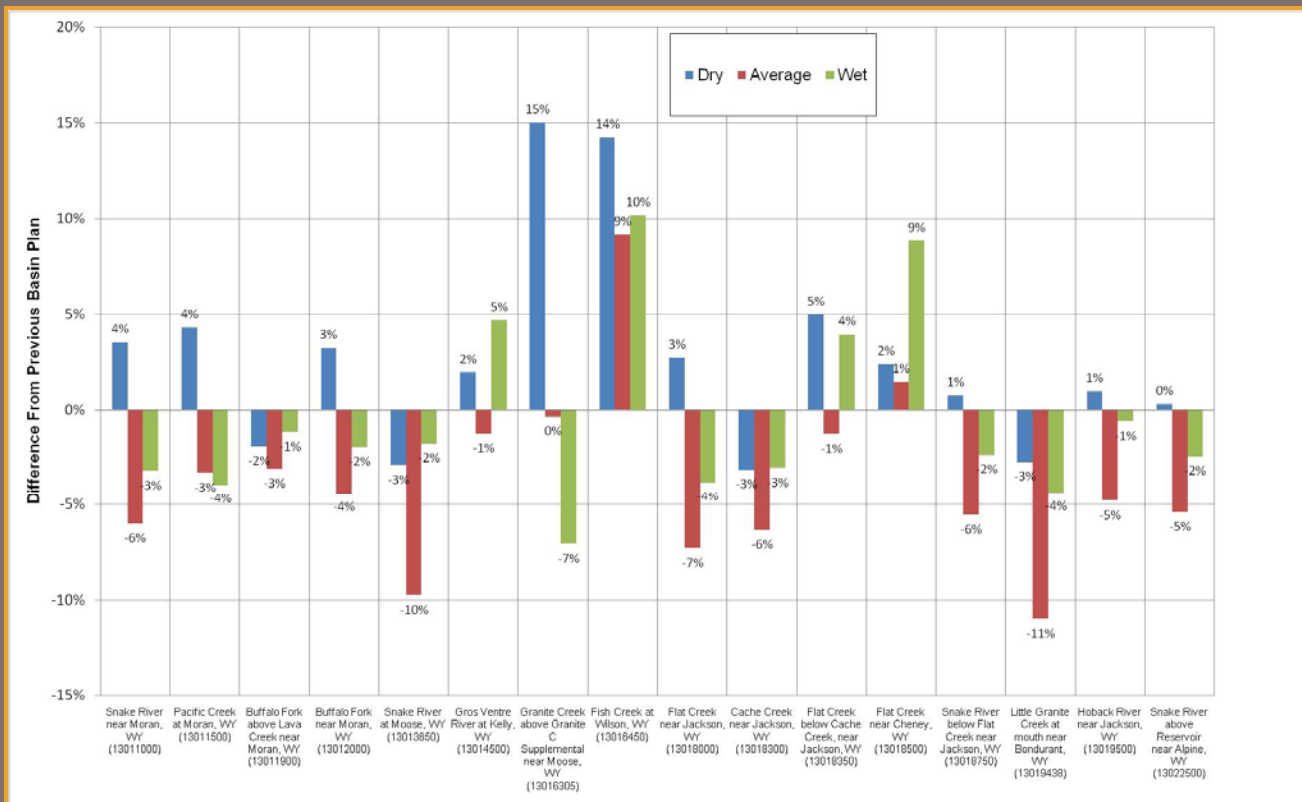
Hydrologic Database Linked to Spreadsheet Models by Pivot Tables



2. Preliminary Results

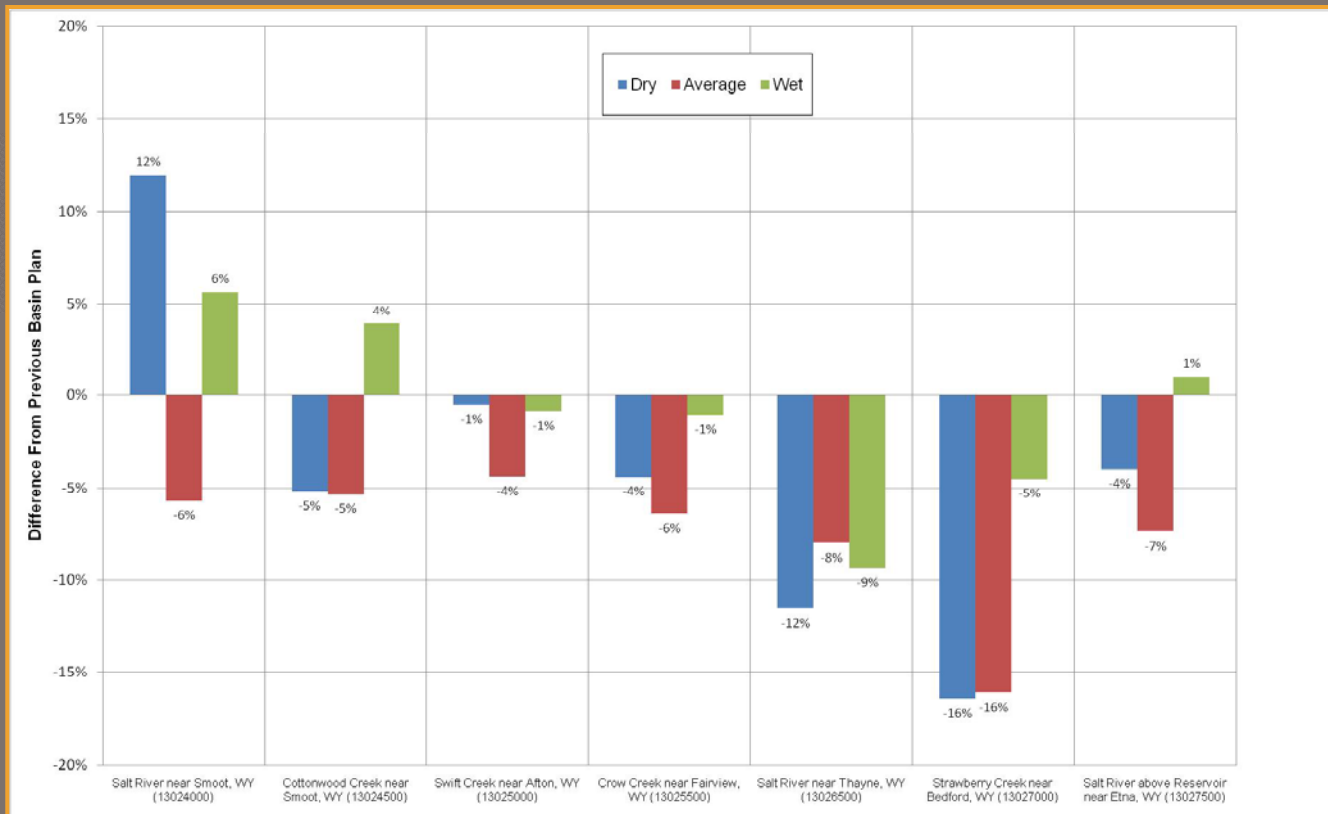
2.0 Preliminary Results

Snake River Average Annual Gaged Streamflow Comparison to Previous Basin Plan (2003)



2.0 Preliminary Results

Salt Basin Average Annual Gaged Streamflow Comparison to Previous Basin Plan (2003)



2.0 Preliminary Results

Annual Available Flow

Adjusted for instream flow requirements and Jackson Lake operations

Description	Comparison	DRY Year (AFY)	AVG Year (AFY)	WET Year (AFY)
Snake River	2011	1,775,752	2,717,548	4,049,867
	2003	1,768,960	2,885,631	4,158,807
	Change	6,793	-168,084	-108,940
	Percent Change	0% ▲	6% ▼	3% ▼
Salt River	2011	199,146	410,732	701,686
	2003	216,251	458,155	694,496
	Change	-17,105	-47,424	7,191
	Percent Change	8% ▼	10% ▼	1% ▲
Greys River	2011	117,292	278,374	488,441
	2003	--	--	--
	Change	--	--	--
	Percent Change	--	--	--
2011 Total		2,092,191	3,406,653	5,239,994

PRELIMINARY RESULTS ONLY
Subject to change pending updates to
crop water requirements

2.0 Preliminary Results

Annual Available Flow per Compact Limitations

Accounting for Snake River Compact

DRY YEAR

Remaining Allowance (for Dry Year):	2011	89,582
	2003	89,837
	Change	-255
	Percent Change	0% ▼

AVERAGE YEAR

Remaining Allowance (for Average Year):	2011	144,500
	2003	154,587
	Change	-10,087
	Percent Change	7% ▼

WET YEAR

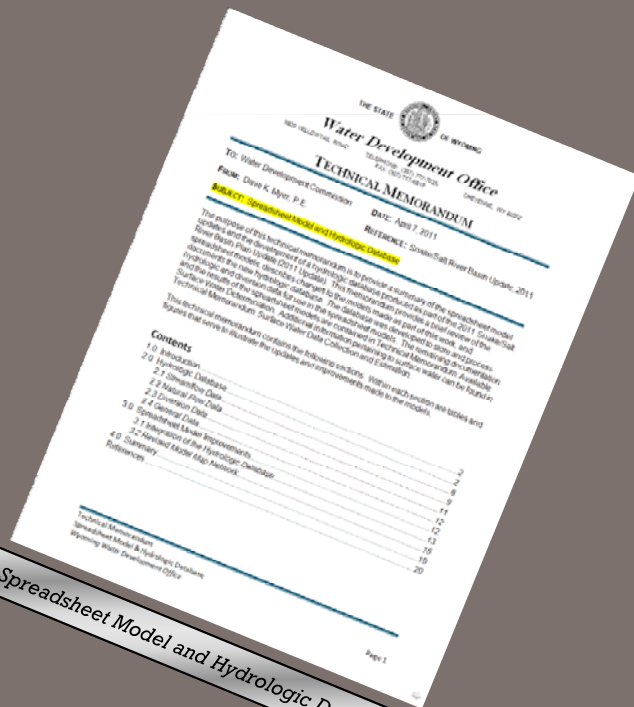
Remaining Allowance (for Wet Year):	2011	216,818
	2003	221,283
	Change	-4,465
	Percent Change	2% ▼

PRELIMINARY RESULTS ONLY

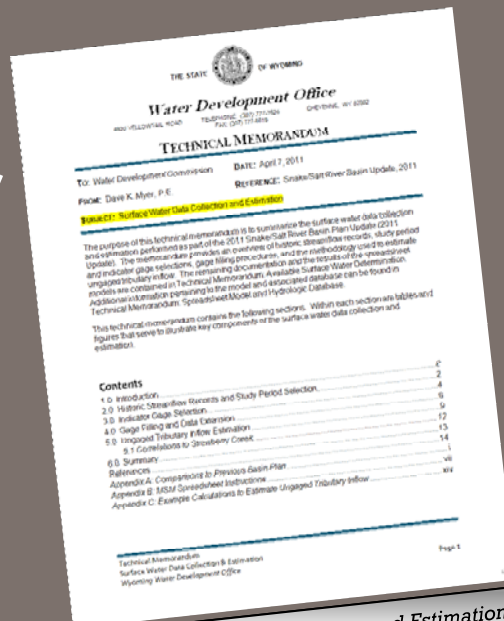
Subject to change
pending updates to
crop water use

2.0 Preliminary Results

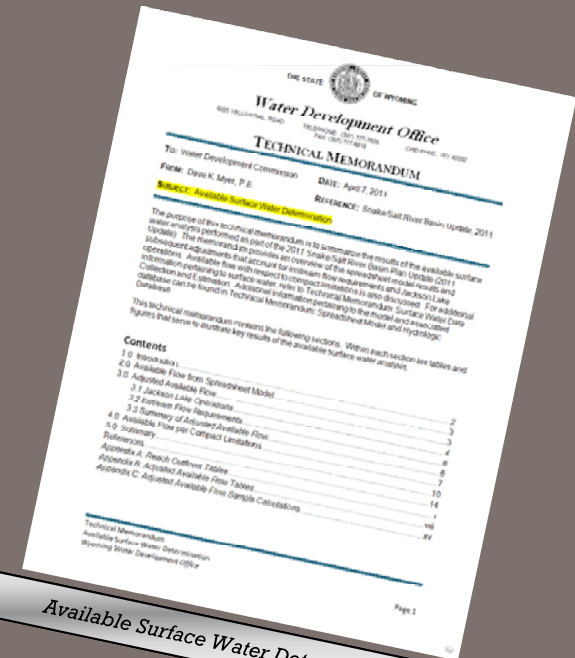
Technical Memorandums



Spreadsheet Model and Hydrologic Database



Surface Water Data Collection and Estimation



Available Surface Water Determination

3. Pending Updates

Pending Updates

- Crop Water Use

- Consumptive use (CU)
- Crop irrigation requirements (CIR)
- Temperature and precipitation Data
- Cropping patterns
- Number of irrigation days per month

- Basin Plan Report

- Groundwater Determination
- Water use profile
 - Agriculture, Municipal, Domestic, Industrial, Recreational, etc.
- Demand projections
- Future water use opportunities

Snake/Salt River Basin Plan 2011 Update

Thanks for Your Attention
Questions?

Prepared By:

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