Snake / Salt River Basin Plans

Surface Water Modeling

Why a Model?

- Validate the basin water use profile
  - Source and amount of supply
  - Water uses (location, timing and amounts)
- Develop an integrated understanding of the system
- Develop a tool to estimate available water supply and analyze future uses in average, wet and dry years

How Do We Develop a Surface Water Model?

- Collect data
- Select study period
- Estimate missing data
- Construct model
- Calibrate model

Collect Data

- Streamflow
- Irrigation diversion

- Reservoirs
- M&I uses

Select Study Period

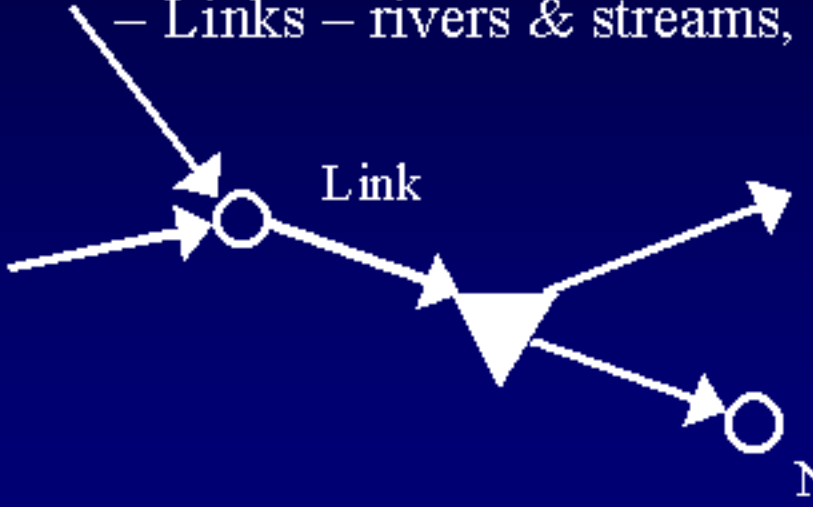
- Historical period used to characterize basin
- Selection of study period based on:
  - Available streamflow records
  - History of basin operations
  - Suitability of hydrologic conditions

Estimate Missing Data

- Fill gaps and/or extend records
  - streamflow
  - reservoir releases and end-of-month contents
  - diversions

Construct Model

- Portray river system as a network
  - Nodes – gage, reservoir, diversion structure
  - Links – rivers & streams, canals, pipelines



- 3 models
  - Average
  - Wet
  - Dry

Construct Model

- Simplifying assumptions
  - Individual water rights are not explicitly modeled
  - Smaller users aggregated to a single node

Construct Model

- "Accounting" model

$$Q_{out} = Q_{in} + Q_{return} + Q_{gain} - Q_{diverted}$$

Node 14.07 Little Snake River downstream of Lizzie gage												
Inflows To This Node	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Node 14.01 Node Inflow	4,242	7,880	20,959	47,884	180,481	120,578	18,004	1,250	817	5,275	8,194	4,818
Node 14.01 Irrigation Returns	0	0	0	0	0	0	0	0	0	0	0	0
Reach C Ungaged Gains	1,382	1,825	0	5,328	4,084	925	1,499	0	0	0	268	1,994
Node 14.01 Import/Export	0	0	0	0	0	0	0	0	0	0	0	0
Total Node 14.07 Inflows	5,624	9,705	20,959	53,212	184,565	121,503	19,503	1,250	817	5,275	8,462	6,812
Outflows From This Node												
Ungaged Losses	0	0	0	0	0	0	0	0	0	0	0	0
Node 14.01 Diversions	0	0	0	0	0	0	0	0	0	0	0	0
Total Node 14.07 Outflows	0	0	0	0	0	0	0	0	0	0	0	0
Node 14.07 NET Flow In - Out	5,624	9,705	20,959	53,212	184,565	121,503	19,503	1,250	817	5,275	8,462	6,812

Node 14.04 Willow Creek and Muddy Creek												
Inflows To This Node	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Node 14.04 Node Inflow	5,624	9,455	20,959	52,212	184,581	121,501	19,442	1,250	817	5,275	8,462	5,950
Node 14.04 Irrigation Returns	0	0	0	0	542	1,880	1,880	1,095	567	133	32	0
Ungaged Gains	0	0	0	0	0	0	0	0	0	0	0	0
Node 14.04 Import/Export	0	0	0	0	0	0	0	0	0	0	0	0
Total Node 14.04 Inflows	5,624	9,455	20,959	52,212	185,123	123,381	21,322	2,345	1,384	5,408	8,494	5,950
Outflows From This Node												
Ungaged Losses	0	0	0	0	0	0	0	0	0	0	0	0
Node 14.04 Diversions	0	0	0	0	494	1,082	928	181	82	0	0	0
Total Node 14.04 Outflows	0	0	0	0	494	1,082	928	181	82	0	0	0
Node 14.04 NET Flow In - Out	5,624	9,455	20,959	52,212	184,629	122,299	20,394	2,164	1,302	5,408	8,494	5,950

Node 14.08 Lower Baggs												
Inflows To This Node	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Node 14.08 Node Inflow	5,624	9,455	20,959	52,212	184,809	122,099	20,197	2,184	1,129	5,468	8,578	5,950
Node 14.08 Irrigation Returns	0	0	0	0	0	0	0	0	0	0	0	0
Ungaged Gains	0	0	0	0	0	0	0	0	0	0	0	0
Node 14.08 Import/Export	0	0	0	0	0	0	0	0	0	0	0	0
Total Node 14.08 Inflows	5,624	9,455	20,959	52,212	184,809	122,099	20,197	2,184	1,129	5,468	8,578	5,950
Outflows From This Node												
Ungaged Losses	0	0	0	0	0	0	0	0	0	0	0	0
Node 14.08 Diversions	5	5	4	1	[illegible]	2	10	3	8	4	4	5
Total Node 14.08 Outflows	5	5	4	1	[illegible]	2	10	3	8	4	4	5
Node 14.08 NET Flow In - Out	5,619	9,450	20,954	52,211	[illegible]	122,097	20,187	2,181	1,121	5,464	8,574	5,945

END OF REACH 14

Calibrate Model

- Assess the reasonableness of the reach gain/loss term
  - Adjust diversion efficiencies, return flow patterns and return flow points
  - Adjust the distribution and location of reach gain/loss

Final Results

- Tool that can be used to evaluate new or enhanced water supply projects and/or uses