



DWR California Cooperative Surveys Forecasting Methodologies



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Outline of Presentation

- 1. CCSS Forecast Products
 - Bulletin 120 and Water Supply Index (WSI)

- 2. Data Required
 - to Produce a Forecast

- 3. Forecast Methodologies
 - Statistical (Current & Continually Developing)
 - Physical (Developing)

- 4 Forecasting Issues

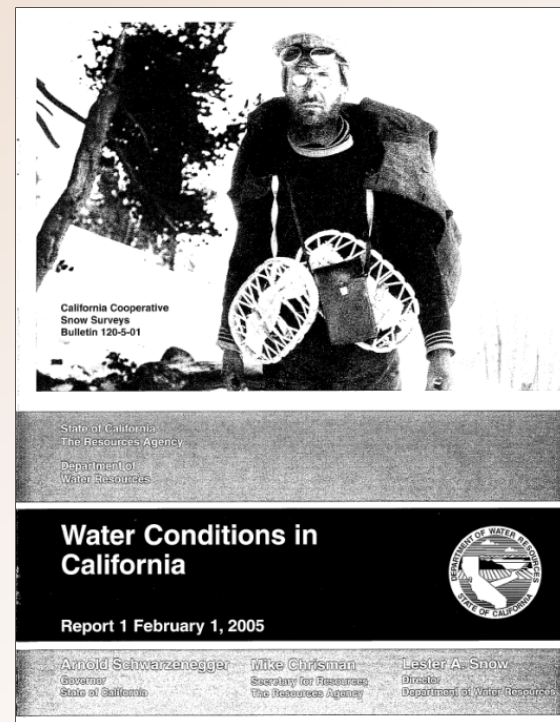
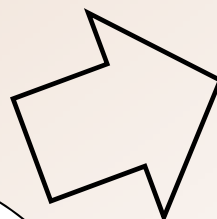


Forecasts Produced: **Bulletin 120 and WSI**

Bulletin 120
is a volumetric forecast of
April-July and Water Year
Runoff (TAF)

Trinity River Forecast

Published Feb, Mar, Apr, May



<http://cdec.water.ca.gov/snow/bulletin120/index2.html>



B120 Monthly Forecast

Trinity River Forecast
 Published Feb, Mar, Apr, May

B120 (05/08/12 1330)

Department of Water Resources
 California Cooperative Snow Surveys

May 1, 2012 FORECAST
 OF UNIMPAIRED RUNOFF
 (in thousands of acre-feet)

April-July Forecast

	April thru July	Percent of Average	80% Probability Range
NORTH COAST			
Trinity River at Lewiston Lake	720	111%	680 - 790
Scott River near Fort Jones	240	133%	
SACRAMENTO RIVER			
Sacramento River above Shasta Lake	310	103%	
McCloud River above Shasta Lake	420	107%	
Pit River above Shasta Lake	820	78%	
Total inflow to Shasta Lake	1670	92%	1480 - 2070
Sacramento River above Bend Bridge	2240	90%	2010 - 2770
Feather River at Oroville	1400	80%	1210 - 1810
Yuba River at Smartsville	840	84%	730 - 990
American River below Folsom Lake	910	74%	780 - 1110
SAN JOAQUIN RIVER			
Cosumnes River at Michigan Bar	100	78%	87 - 140
Mokelumne River inflow to Pardee	260	56%	230 - 310
Stanislaus River below Goodwin Res.	370	53%	330 - 500
Tuolumne River below La Grange	660	54%	590 - 830
Merced River below Merced Falls	320	50%	295 - 430
San Joaquin River inflow to Millerton Lk	680	54%	550 - 850
TULARE LAKE			
Kings River below Pine Flat Res.	650	53%	550 - 770
Kaweah River below Terminus Res.	175	60%	150 - 230
Tule River below Lake Success	45	71%	36 - 67
Kern River inflow to Lake Isabella	230	49%	190 - 300
NORTH LAHONTAN			
Truckee River, Tahoe to Farad accretions	150	59%	
Lake Tahoe Rise, in feet	0.8	58%	
West Carson River at Woodfords	29	55%	
East Carson River near Gardnerville	90	48%	
West Walker River below Little Walker	75	48%	
East Walker River near Bridgeport	20	32%	

Water-Year (WY) Forecast and Monthly Distribution

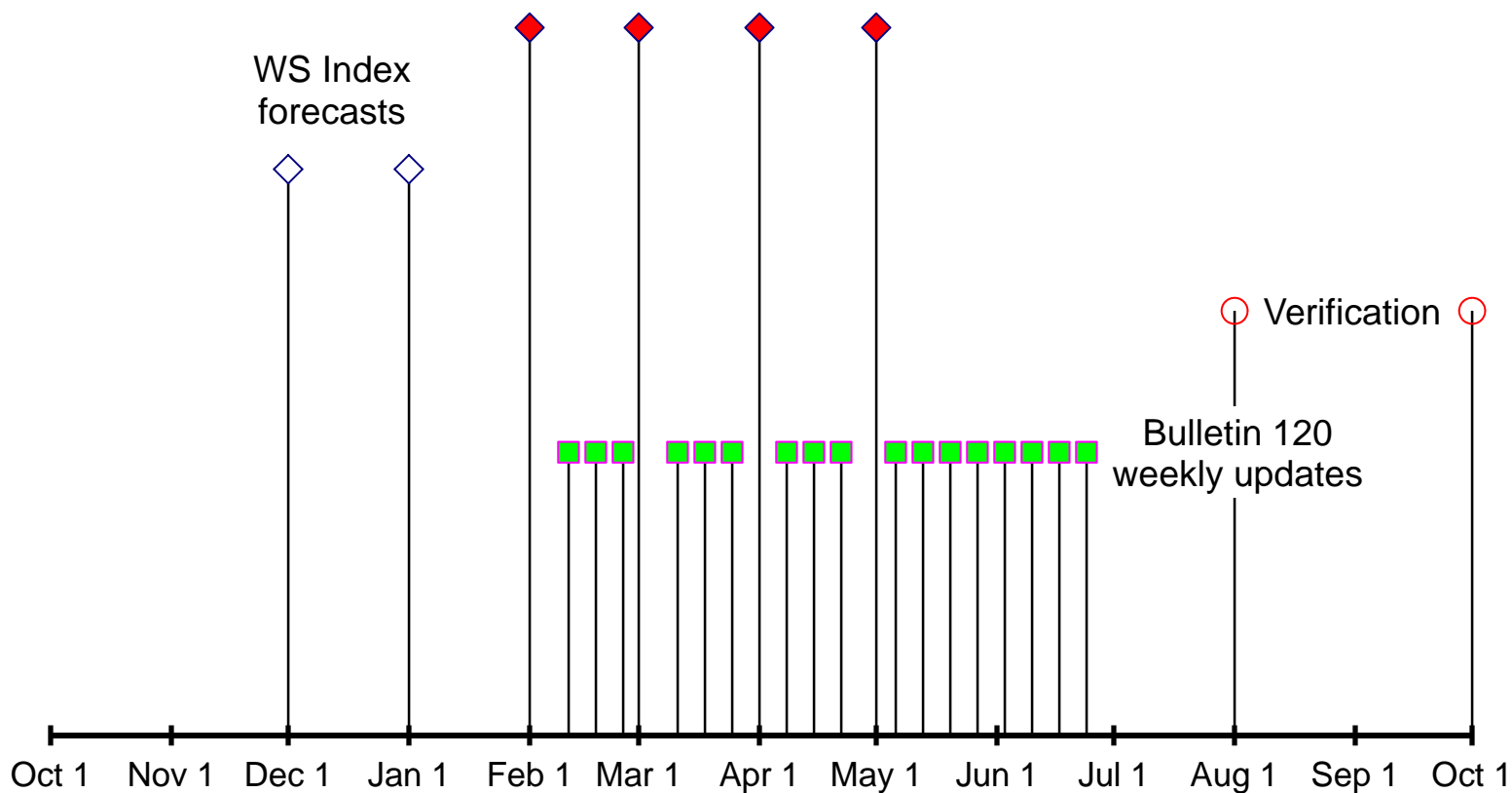
	Oct thru Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Water Year	80% Probability Range	WY % Avg
Trinity, Lewiston	116	65	190	308	240	130	42	21	15	1125	1060 - 1195	82
Inflow to Shasta	950	260	830	775	405	270	220	205	195	4110	3860 - 4580	69
Sacramento, Bend	1415	350	1190	1125	505	345	265	250	235	5680	5360 - 6330	65
Feather, Oroville	515	155	680	695	410	185	110	80	70	2900	2685 - 3350	64
Yuba, Smartsville	190	55	425	465	275	75	25	15	15	1540	1420 - 1700	66

http://cdec.water.ca.gov/cgi-progs/iodir_ss/b120



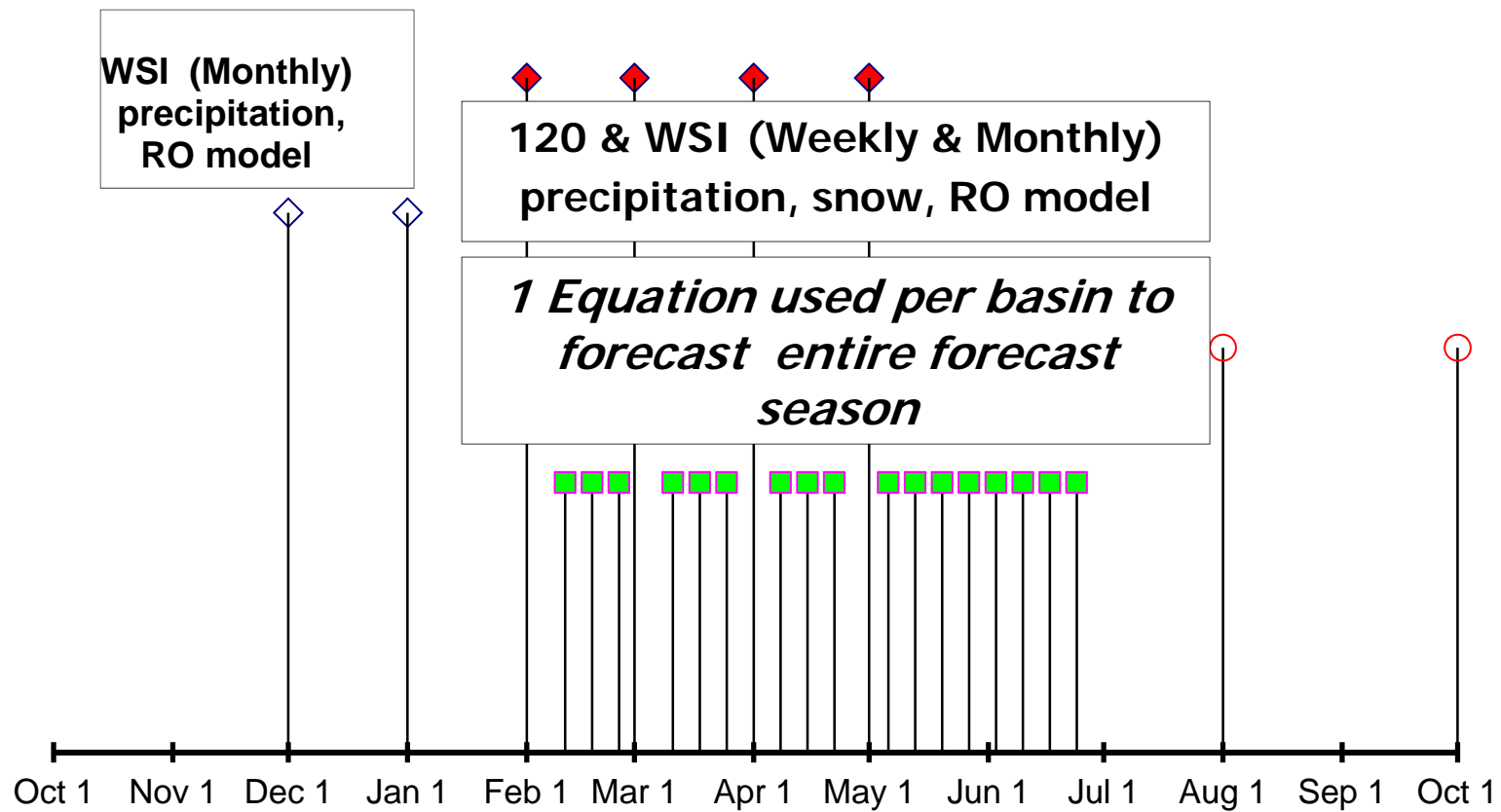
Forecast Produced: Forecast Schedule

Water Supply Forecast Schedule





Forecast Produced: Statistical (Current)





Data Required: to Forecast

- 1. Daily and Monthly Precipitation Data
- 2. Daily & Monthly Snow Water Content Data
- 3. Monthly Full Natural Runoff Data



Data Required: Precipitation



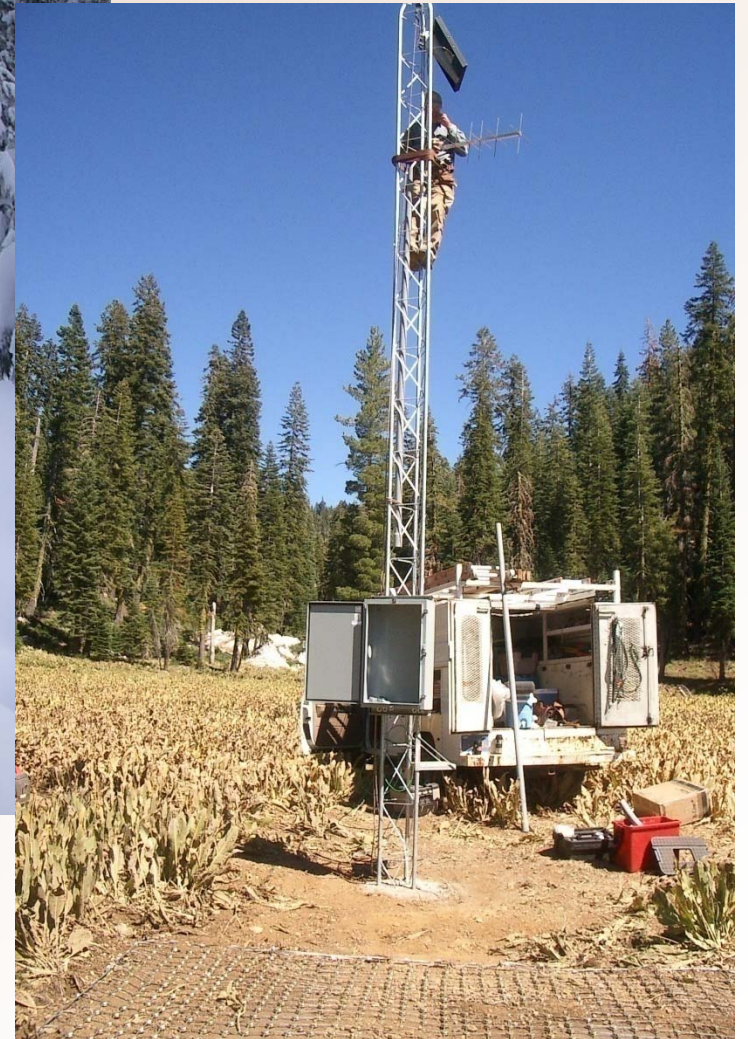


Trinity Precipitation Stations used for forecast

CFF	Coffee Creek RS	⊕	4400'
MLD	McCloud RS	→	3280'
WVR	Weaverville RS	↙	2050'
WHI	Whiskeyt'n Dam	↓	1300'
BGB	Big Bar RS	↙	1270'
SHA	Shasta Dam	↘	1075'



Data Required: Snow Water Content (SWC)





Trinity Snow Courses used for forecast

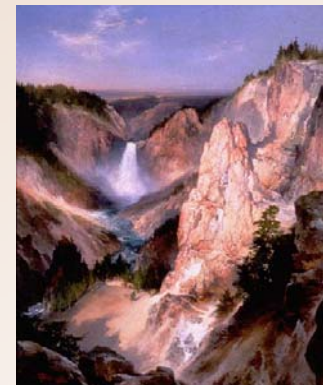
DDF	Deadfall Lakes	Trin	↗	7200'
PRK	Parks Creek	Shas	↗	6700'
RRM	Red Rock Mountain	Trin	←	6700'
BBS	Bear Basin	Trin	←	6500'
GYR	Gray Rock Lakes	Sac	↗	6200'
SHM	Shimmy Lake	Trin	←	6400'
WLC	Wolford Cabin	Trin	↑	6150'
HIG	Highland Lakes	Trin	↗	6000'
SWT	Sweetwater	Shas	↗	5850'
MUM	Mumbo Basin	Trin	↗	5650'
WHN	Whalan	Trin	↗	5400'
BFT	Big Flat	Trin	←	5100'



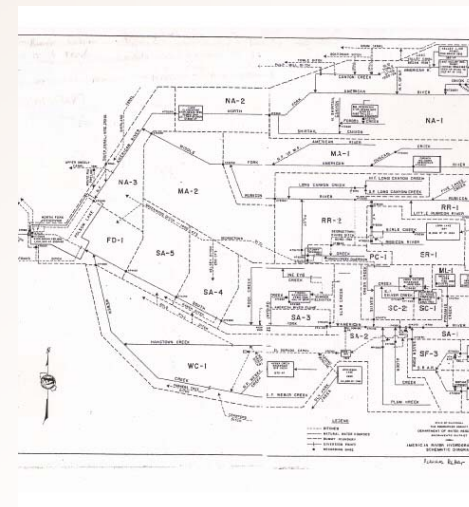
Data Required: Full Natural Flow Data (FNF)

Data Needed for Computation

- Measured flow at forecast point
- Reservoir storage
- Diversions
- Reservoir evaporation
- Accretions



Estimates are made if records look incomplete.





Trinity River @ Clair Engle Lake FNF

- BOR Daily FNF:
 - <http://www.usbr.gov/mp/cvo/vungvari/trndop.pdf>
- DWR Daily FNF Report:
 - http://cdec.water.ca.gov/cgi-progs/snowsurvey_ro/FNF

Trinity Lake
(Clair Engle)





Trinity River at Lewiston (FNF) Monthly

- DWR Monthly FNF:
 - http://cdec.water.ca.gov/cgiprogs/snowsurvey_ro/FLOWOUT

TNL Flow +Judd F Carr PH (Div)+ TNL (Evap)+TNL Δ Storage =TNL FNF

Trinity River
@ Lewiston





Forecast Methodologies: Statistical (Current)

How do we produce DWR AJ Forecast?

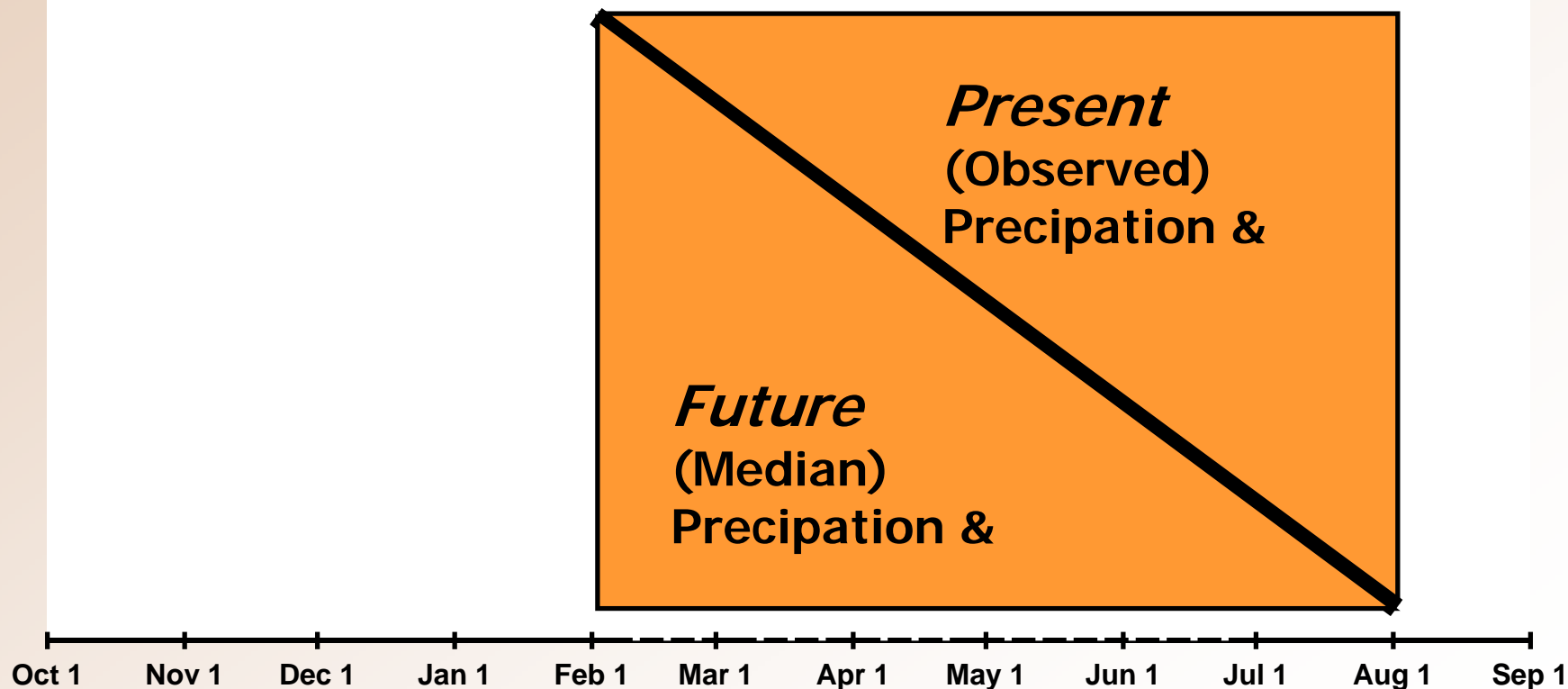
- Dependent Variable → April-July (AJ) FNF RO

- Independent Variables → Prior Year AJ FNF RO
- → Oct-Mar FNF
- → 4/1 Snow Index
- → Oct-Mar Precipitation Index
- → April-June Precipitation Index



Forecast Methodologies: Statistical/Operations

1 Equation used per basin to forecast entire forecast season

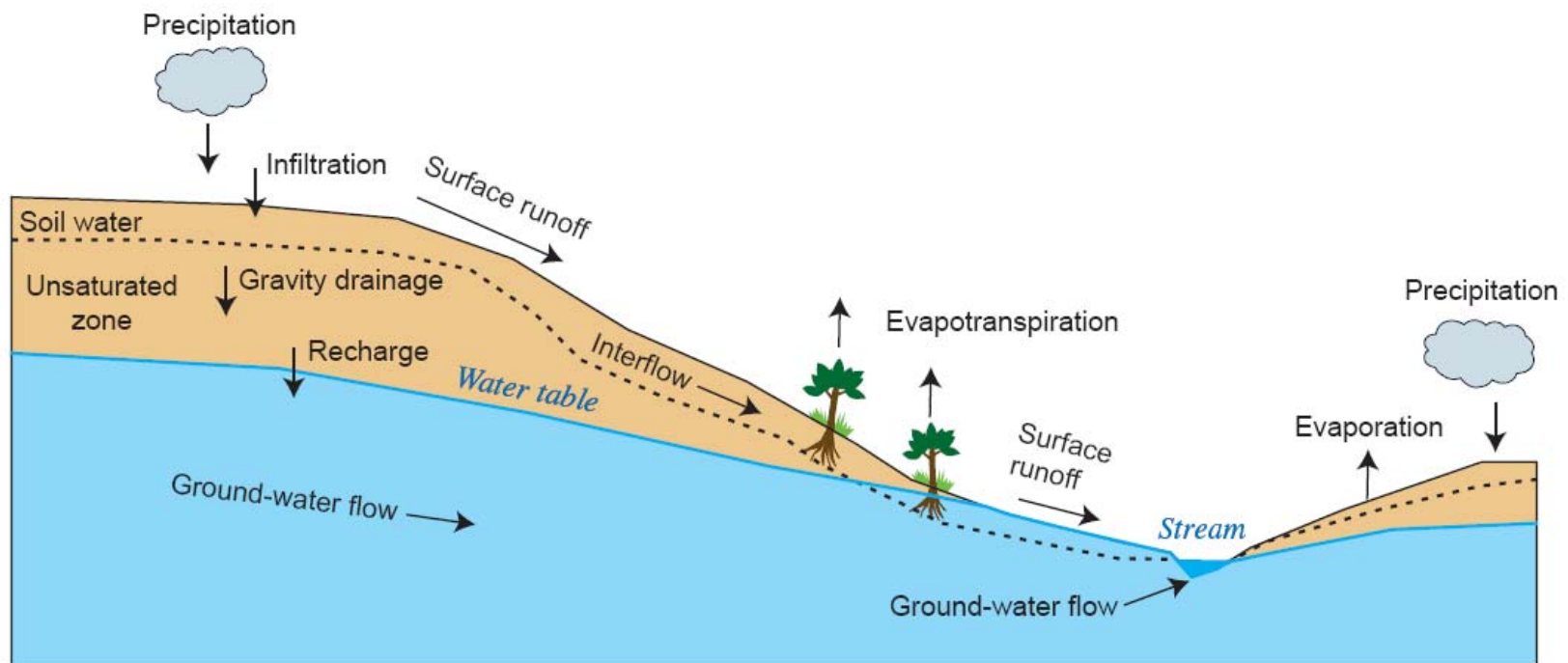




Future: Physical/Developing USGS Precipitation Runoff Model System (PRMS)

Data Required: Precipitation, Temperature, Runoff, GIS data-
17 parameters (DEM, vegetation, soil type....)

Physical Computation: Hydrological Water Balance





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