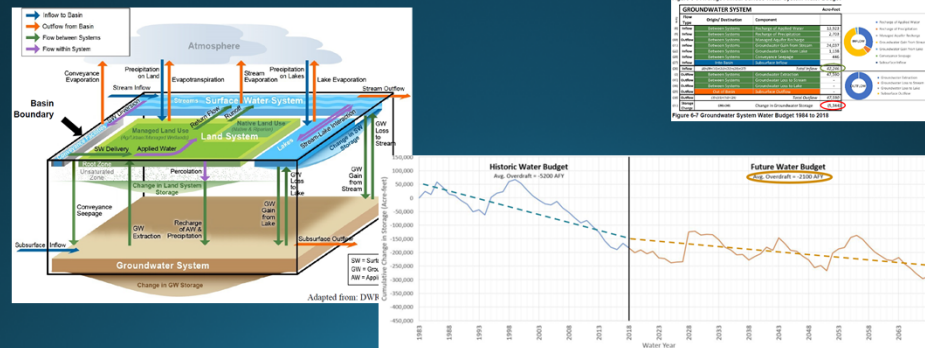


Groundwater Sustainability Plan for Big Valley Groundwater Basin Lassen and Modoc Counties

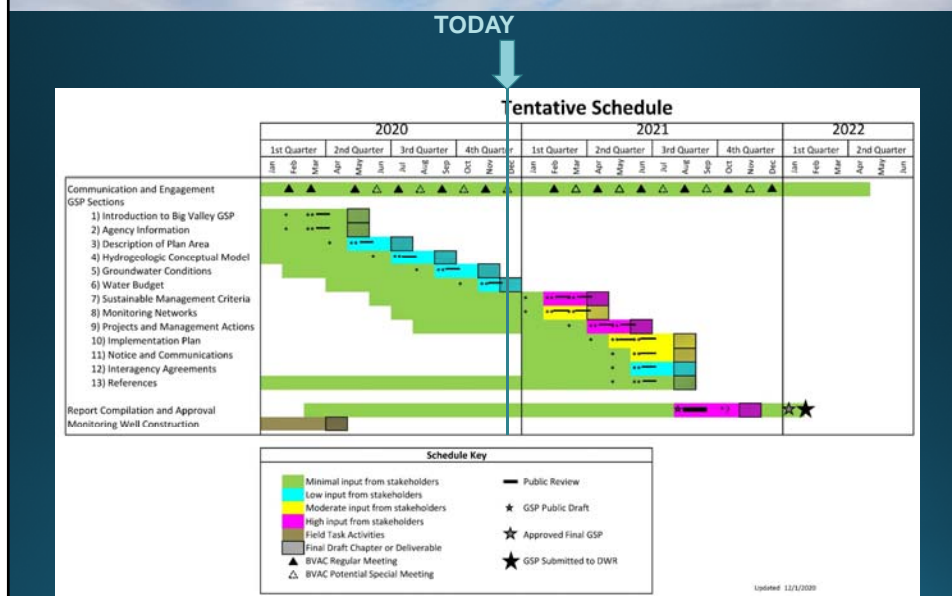
Advisory Committee Meeting 6

December 2, 2020



GENERAL UPDATES AND SCHEDULE

GSP DEVELOPMENT SCHEDULE

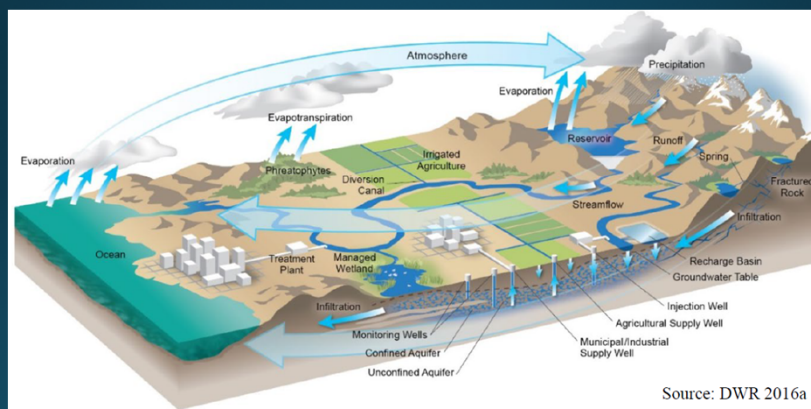


AGENDA

- Subject #1
 - Chapter 6 – Water Budget
- Subject #2:
 - New Stream Gages
- Subject #3
 - Proposed Schedule for 2021

SUBJECT #1: CH 6 WATER BUDGET

Hydrologic Cycle

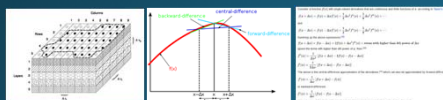
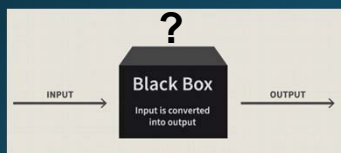


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SUBJECT #1: CH 6 WATER BUDGET – APPROACHES TO MODELING

• Numerical Model

- Specialized software
 - MODFLOW
 - IWFEM
- Specially trained professional
- Higher implementation cost
- “Black box”



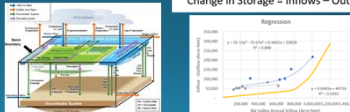
• Spreadsheet Model

- Uses Excel
- Accessible to a broader range of professionals
- More easily modified and adjusted
- Lower implementation cost
- Greater transparency

Flow Type	Origin/Destination	Component	Acres Feet
Inflow	Into Basin	Precipitation on Land System	135,134
Inflow	Into Basin	Precipitation on Lakes	990
Inflow	Into Basin	Stream Inflow	372,145
Inflow	Into Basin	Subsurface Inflow	100
Inflow	Into Basin	Subsurface Inflow	607,280
Outflow	Out of Basin	Stream Evaporation	1,125,173
Outflow	Out of Basin	Lake Evaporation	2,128
Outflow	Out of Basin	Groundwater Evaporation	1,562
Outflow	Out of Basin	Groundwater Evaporation	821
Outflow	Out of Basin	Groundwater Evaporation	378,539
Outflow	Out of Basin	Subsurface Outflow	122,551
Outflow	Out of Basin	Subsurface Outflow	122,551
Change	Change in Total System Storage		85,988

Figure 6-4 Average Annual Total Basin Water Budget

Change in Storage = Inflows – Outflows

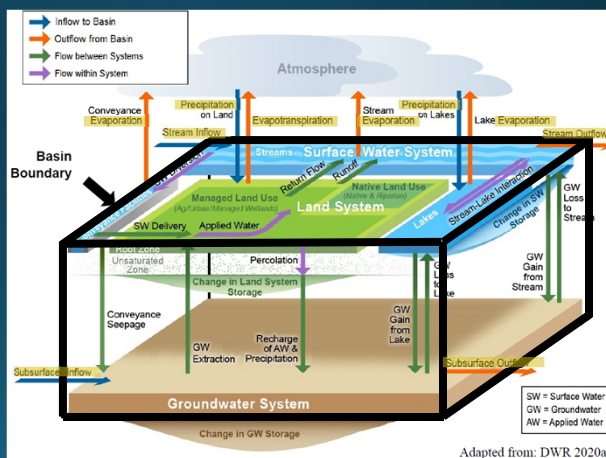


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SUBJECT #1: CH 6 WATER BUDGET

Groundwater Basin External Components

- Stream Inflow/Outflow
- Precipitation
- Evaporation and Evapotranspiration
- Subsurface Inflow/Outflow

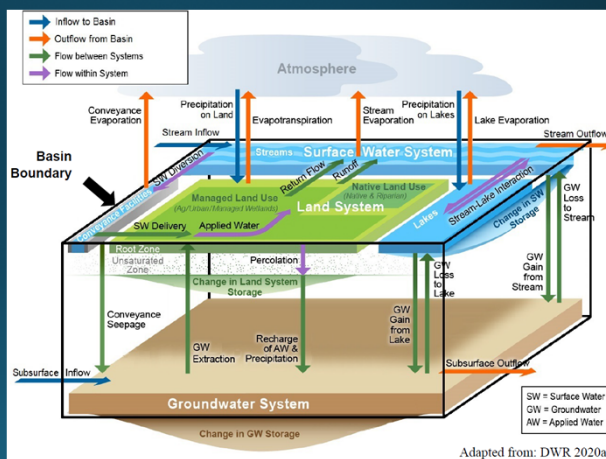


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SUBJECT #1: CH 6 WATER BUDGET

Three Systems:

- Surface Water
- Land
- Groundwater

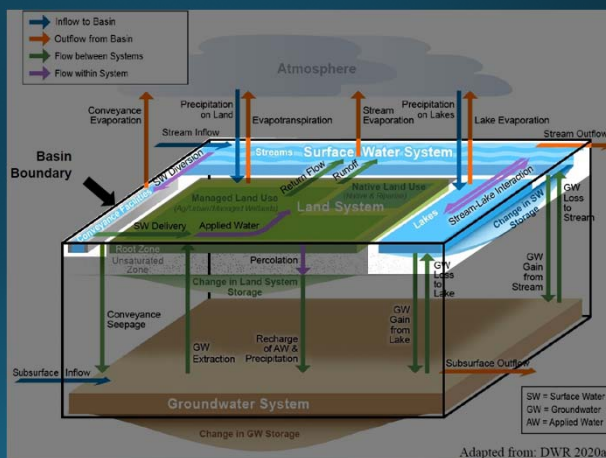


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SUBJECT #1: CH 6 WATER BUDGET

Three Systems:

- **Surface Water**
 - Assume in balance from year to year
- **Land**
- **Groundwater**

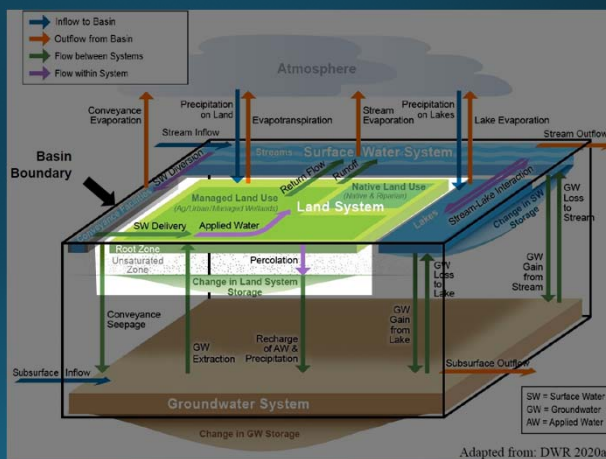


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SUBJECT #1: CH 6 WATER BUDGET

Three Systems:

- **Surface Water**
- **Land**
 - Assume in balance from year to year
- **Groundwater**

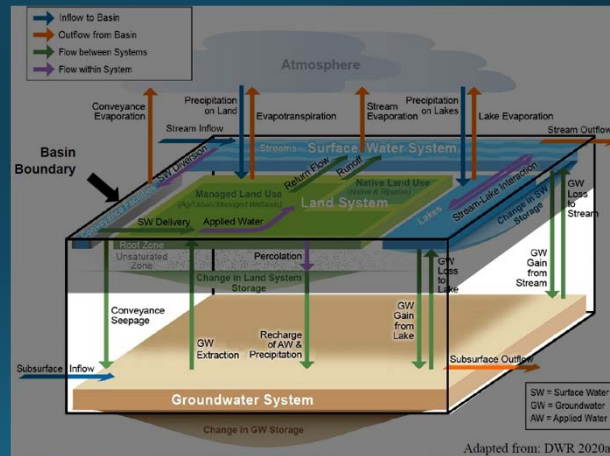


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SUBJECT #1: CH 6 WATER BUDGET

Three Systems:

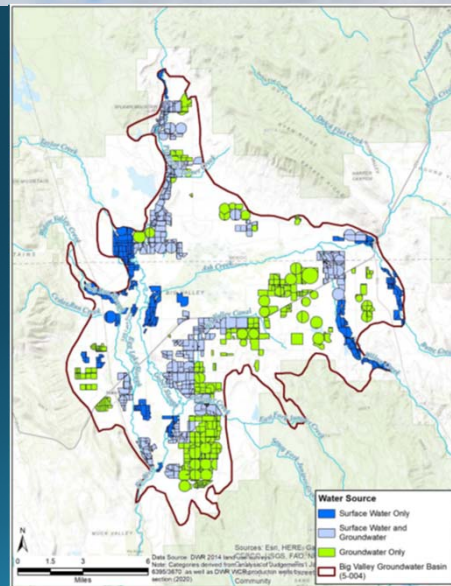
- Surface Water
- Land
- Groundwater
 - Allowed to vary from year to year



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SUBJECT #1: CH 6 WATER BUDGET – WATER BUDGET REFINEMENTS

- Water Source (surface vs groundwater)
 - Used information from BVAC members from last month's meeting
 - Used surface water right places of use
 - Used location of wells
 - Used aerial imagery to try to locate water source
 - 50-50 split SW-GW in places with mixed use
 - Resulted in overall 35-65 split in SW-GW
- Precipitation
 - Used precipitation based on PRISM model in Bieber, rather than McArthur
 - Overall slightly lower Precip
- Evapotranspiration
 - Used CIMIS model based in Bieber rather than McArthur
 - Overall slightly lower ET
- Runoff
 - Used "Curve Number" method
 - Resulted in variable 75-85% runoff
- Subsurface Inflow
 - Estimated inflow from Round Valley
 - <1 Acre-feet per year



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SUBJECT #1: CH 6 WATER BUDGET

Overall Basin

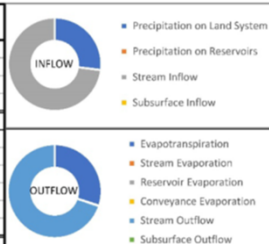
Major Inflows:

- Stream Inflow (73%)
- Precipitation (27%)

Major Outflows:

- Stream Outflow (70%)
- Evapotranspiration (30%)

TOTAL BASIN WATER BUDGET				Acre-Feet
Flow Type	Origin/ Destination	Component		
(1) Inflow	Into Basin	Precipitation on Land System		136,801
(14) Inflow	Into Basin	Precipitation on Reservoirs		501
(13) Inflow	Into Basin	Stream Inflow		371,148
(27) Inflow	Into Basin	Subsurface Inflow		1
(32) Inflow	(1)+(14)+(13)+(27)	Total Inflow		508,451
(5) Outflow	Out of Basin	Evapotranspiration		154,040
(24) Outflow	Out of Basin	Stream Evaporation		385
(23) Outflow	Out of Basin	Reservoir Evaporation		722
(19) Outflow	Out of Basin	Conveyance Evaporation		46
(18) Outflow	Out of Basin	Stream Outflow		358,486
(29) Outflow	Out of Basin	Subsurface Outflow		-
(33) Outflow	(5)+(24)+(23)+(19)+(18)+(29)	Total Outflow		513,678
(34) Storage Change	(32)-(33)	Change in Total System Storage		(5,227)



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SUBJECT #1: CH 6 WATER BUDGET

Groundwater System

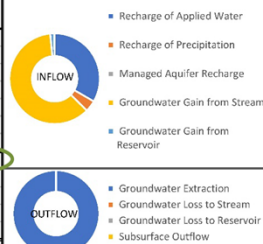
Major Inflows:

- Stream Recharge (61%)
- Applied Water Rechg (33%)
- Precipitation Rechg (4%)

Major Outflows:

- Groundwater Extraction (100%)

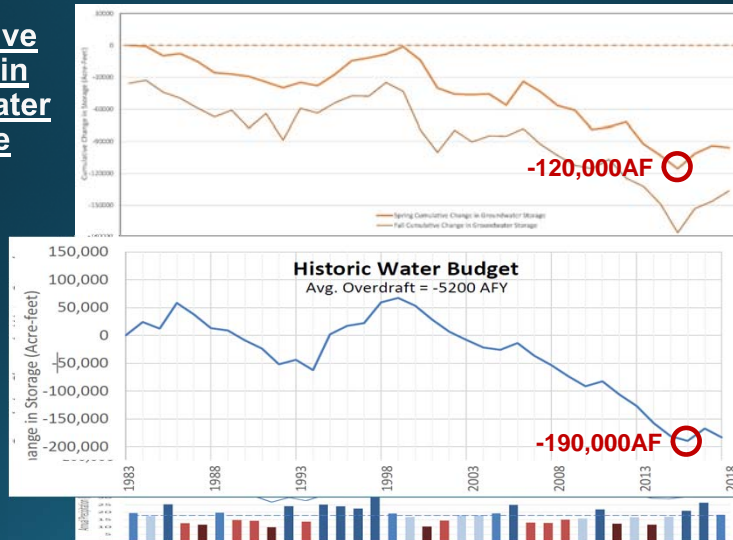
GROUNDWATER SYSTEM				Acre-Feet
Flow Type	Origin/ Destination	Component		
(8) Inflow	Between Systems	Recharge of Applied Water		13,133
(9) Inflow	Between Systems	Recharge of Precipitation		1,601
(10) Inflow	Between Systems	Managed Aquifer Recharge		-
(21) Inflow	Between Systems	Groundwater Gain from Stream		24,037
(22) Inflow	Between Systems	Groundwater Gain from Reservoir		596
(20) Inflow	Between Systems	Conveyance Seepage		27
(27) Inflow	Into Basin	Subsurface Inflow		1
(28) Inflow	(8)+(9)+(10)+(21)+(22)+(20)+(27)	Total Inflow		39,395
(3) Outflow	Between Systems	Groundwater Extraction		44,622
(15) Outflow	Between Systems	Groundwater Loss to Stream		-
(16) Outflow	Between Systems	Groundwater Loss to Reservoir		-
(29) Outflow	Out of Basin	Subsurface Outflow		-
(30) Outflow	(3)+(15)+(16)+(29)	Total Outflow		44,622
(31) Storage Change	(28)-(30)	Change in Groundwater Storage		(5,227)



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SUBJECT #1: CH 6 WATER BUDGET

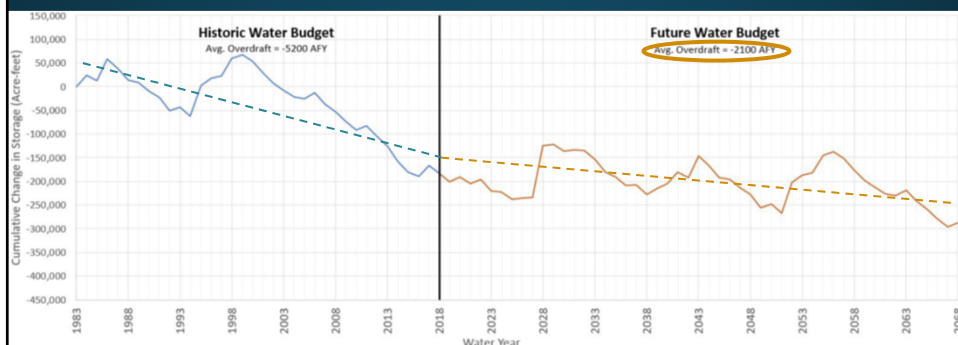
Cumulative Change in Groundwater Storage



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SUBJECT #1: CH 6 WATER BUDGET FUTURE WATER BUDGET

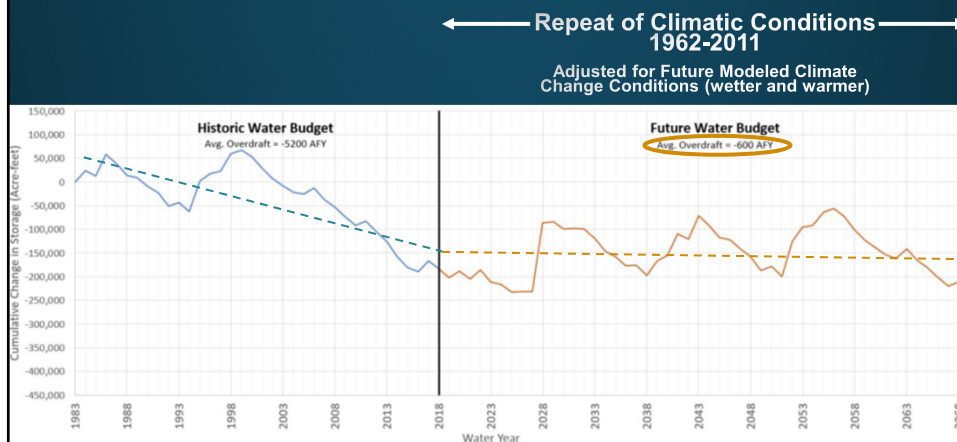
← Repeat of Climatic Conditions →
1962-2011
(50 years)



Note: Water use (irrigated acreage) remains constant in for future projections

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SUBJECT #1: CH 6 WATER BUDGET FUTURE WATER BUDGET WITH CLIMATE CHANGE



Notes: Water use (irrigated acreage) remains constant in for future projections
Future adjustments for climate change provided by DWR

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SUBJECT #1: CH 6 WATER BUDGET

Questions and Clarifications?

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SUBJECT #1: CH 6 WATER BUDGET

Comments and Discussion

Set aside?

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SUBJECT #2: NEW STREAM GAGES

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BIG VALLEY GROUNDWATER SUSTAINABILITY PLAN (GSP) WATER MEASUREMENT ENHANCEMENT PROJECT

MODOC COUNTY GROUNDWATER SUSTAINABILITY AGENCY



FUNDING FOR THIS PROJECT HAS BEEN PROVIDED IN FULL
OR IN PART FROM THE CALIFORNIA DROUGHT, WATER,
PARKS, CLIMATE, COASTAL PROTECTION, AND OUTDOOR
ACCESS FOR ALL ACT OF 2018 (PROPOSITION 68) AND
THROUGH AN AGREEMENT WITH THE STATE DEPARTMENT
OF WATER RESOURCES.”

NORTH LOCATION FOR STREAM GAGE



REASONING FOR SELECTING THE POTENTIAL STREAM GAGE LOCATION

- EASE OF ACCESS
- CONSISTENT STREAM BANK WITH LOW LEVEL OF ALTERATION DUE TO HIGH FLOWS
- POOL-TO-RIFFLE RELATIONSHIP WHICH CREATES STAGED DATA AND A CONSISTENT RATING TABLE
- LOCATION IS ABOVE ALL WATER PUMPING INTO RIVER FOR USE AS CONVEYANCE
- LOWER FISCAL IMPACT FOR LONG TERM MAINTENANCE OF STREAM GAGE

SOUTH LOCATION FOR STREAM GAGE



REASONING FOR SELECTING THE POTENTIAL STREAM GAGE LOCATION

- EASE OF ACCESS
- CONSISTENT STREAM BANK WITH LOW LEVEL OF ALTERATION DUE TO HIGH FLOWS
- POOL-TO-RIFFLE RELATIONSHIP WHICH CREATES STAGED DATA AND A CONSISTENT RATING TABLE
- RESEARCH OF THIS LOCATION IS IN PROGRESS TO DETERMINE IF LOCATION IS CURRENTLY CONDUCTING MEASUREMENTS AND IF SO REQUESTING TO HAVE THE INFORMATION SHARED WITH THE GSA'S

What is a rating curve? Why does it change over time?

In order to convert water height (or “stage”, usually expressed as feet) into a volume of water (or “discharge”, usually expressed as cubic feet per second), USGS hydrographers must establish a relationship between them. This [stage-discharge relationship](#) is called a rating curve. It's developed by making frequent direct discharge measurements at stream gaging stations.

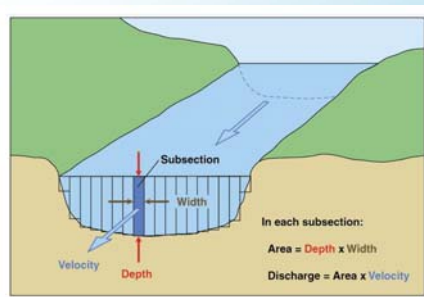
The rating curve depends on the hydraulic characteristics of the stream channel and floodplain, and will vary over time at almost every station.

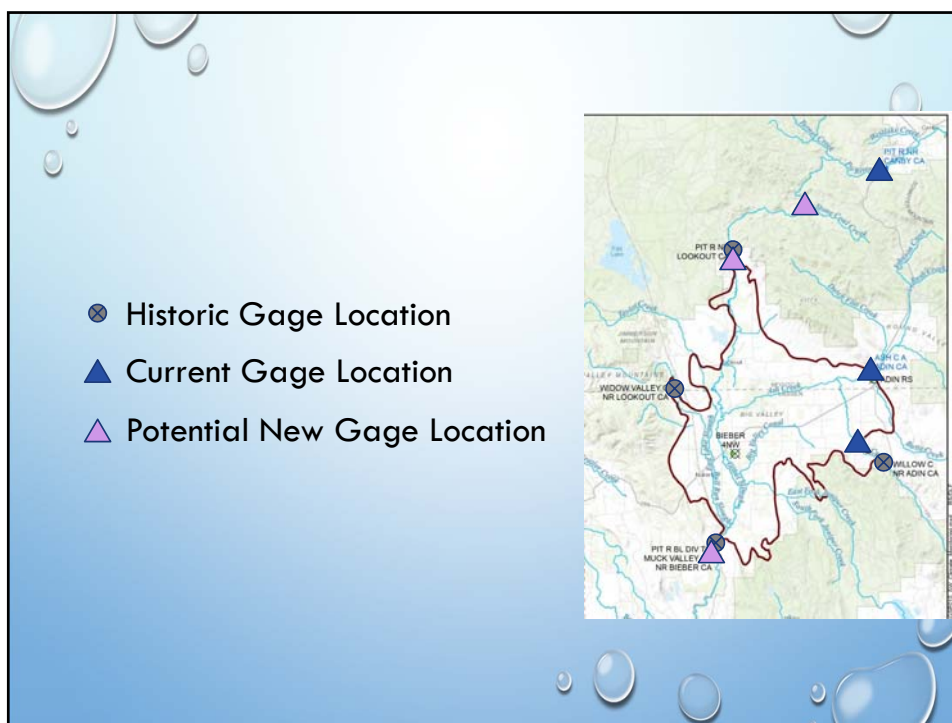
There might be subtle changes to a stream channel, such as the growth of aquatic vegetation in the summer, frequent shifting of a sand-bed stream bottom, catastrophic changes due to floods, or man-made changes such as construction of a bridge. These changes might require only minor or temporary adjustments to streamflow records, or could require a complete reevaluation of the rating curve.

Diagram of Channel Cross Section With Subsections.

THE MOST COMMON METHOD USED BY THE USGS FOR MEASURING VELOCITY IS WITH A CURRENT METER. HOWEVER, A VARIETY OF ADVANCED EQUIPMENT CAN ALSO BE USED TO SENSE STAGE AND MEASURE STREAMFLOW. IN THE SIMPLEST METHOD, A CURRENT METER TURNS WITH THE FLOW OF THE RIVER OR STREAM.

THE CURRENT METER IS USED TO MEASURE WATER VELOCITY AT PREDETERMINED POINTS (SUBSECTIONS) ALONG A MARKED LINE, SUSPENDED CABLEWAY, OR BRIDGE ACROSS A RIVER OR STREAM. THE DEPTH OF THE WATER IS ALSO MEASURED AT EACH POINT. THESE VELOCITY AND DEPTH MEASUREMENTS ARE USED TO COMPUTE THE TOTAL VOLUME OF WATER FLOWING PAST THE LINE DURING A SPECIFIC INTERVAL OF TIME. USUALLY A RIVER OR STREAM WILL BE MEASURED AT 25 TO 30 REGULARLY SPACED LOCATIONS ACROSS THE RIVER OR STREAM.





FOR MORE INFORMATION ON STREAM GAGES

- VISIT THE FOLLOWING LINK:

[HTTPS://WWW.USGS.GOV/SPECIAL-TOPIC/WATER-SCIENCE-SCHOOL/SCIENCE/HOW-STREAMFLOW-MEASURED?QT-SCIENCE_CENTER_OBJECTS=0#QT-SCIENCE_CENTER_OBJECTS](https://www.usgs.gov/special-topic/water-science-school/science/how-streamflow-measured?qt-science_center_objects=0#qt-science_center_objects)

SUBJECT #2: NEW STREAM GAGES

Questions and Clarifications?

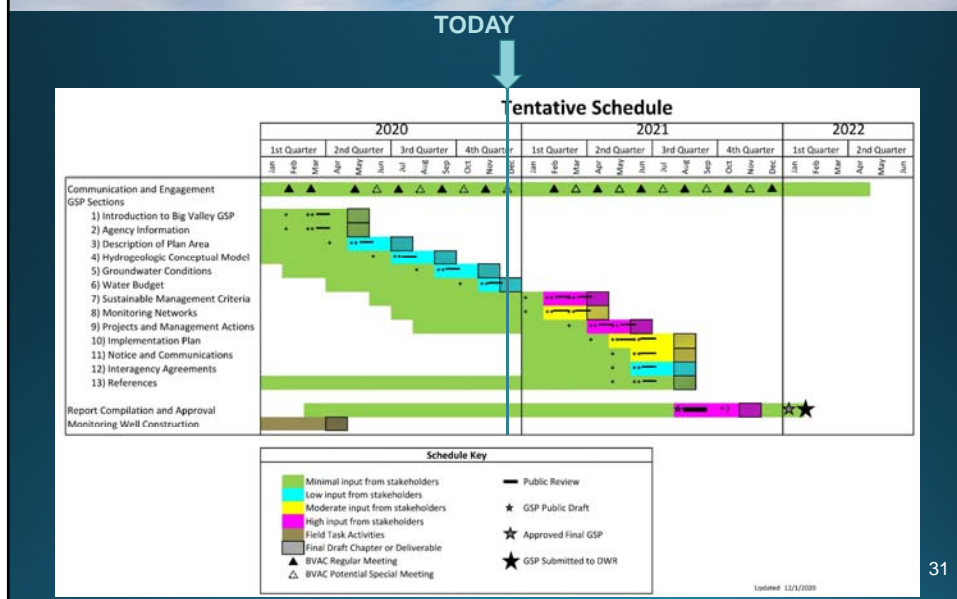
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SUBJECT #2: NEW STREAM GAGES

Comments and Discussion

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SUBJECT #3: PROPOSED 2021 SCHEDULE



SUBJECT #3: PROPOSED 2021 SCHEDULE

Questions and Clarifications?

SUBJECT #3: PROPOSED 2021 SCHEDULE

Comments and Discussion

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QUESTIONS OR COMMENTS FOR ITEMS NOT ON THE AGENDA



- GSA Staff and Consultants will be available after the meeting to talk, answer questions, and hear your concerns.

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