

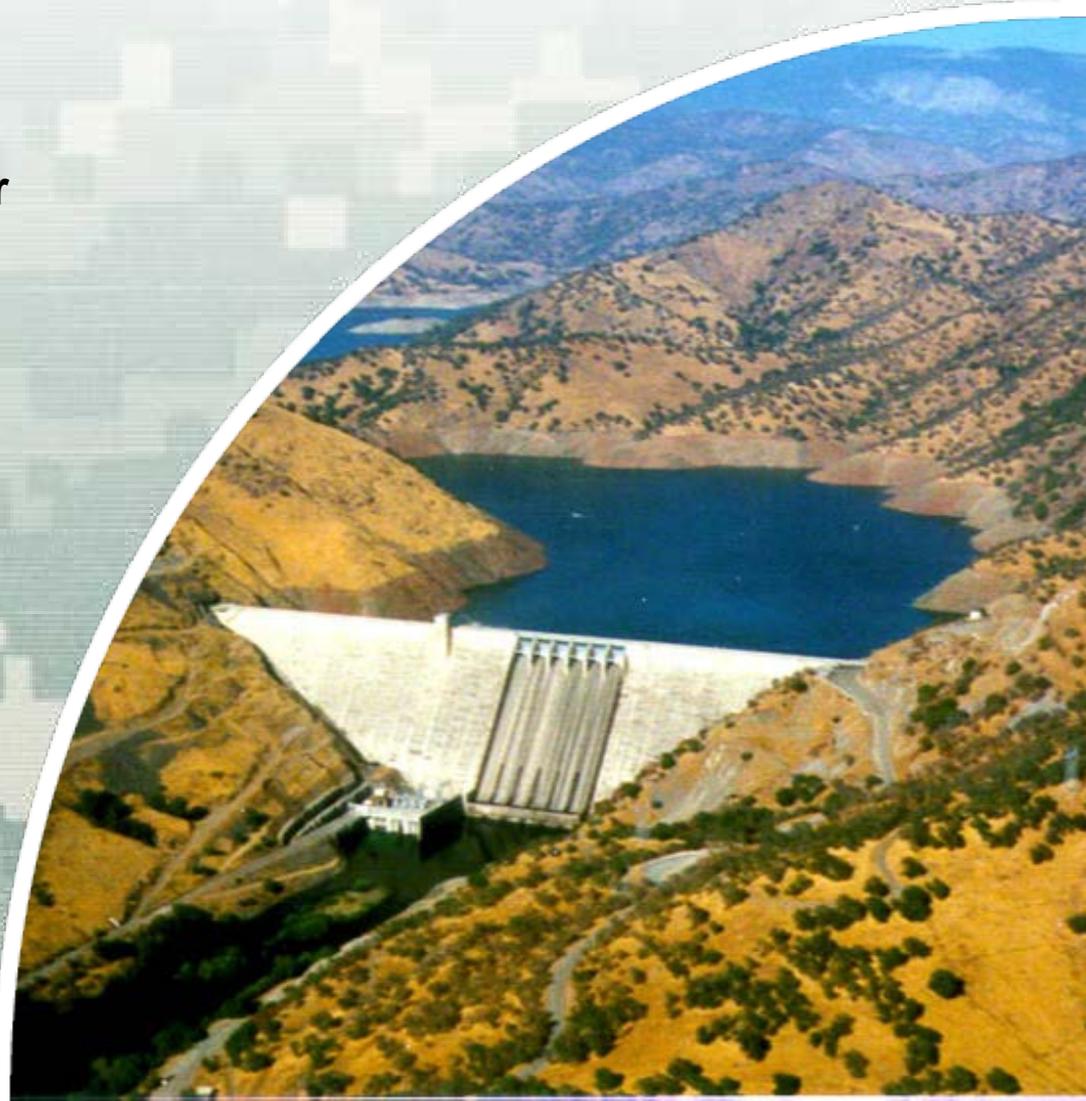
Forecast-Based Operations Assessment Using “The Matrix”

FIRO Workshop
June 28, 2016
Southwest Fisheries Service Center
La Jolla, CA

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US Army Corps of Engineers



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Agenda

- **Background on Modernization Matrix**
- **Matrix Category Development**
- **Forecast-Based Operations Screening Process**



Background

- **May 2015 - Coordination with David Ford Consulting to help develop the initial framework for prioritizing water control manual updates, i.e. a modernization matrix**
- **July 2015 – Presented Modernization Matrix to the Sacramento District Corporate Board, and it was well-received**
- **February 2016 – Weekly meetings were scheduled by the reservoir operator team in SPK Water Management to further the development of the matrix**





Matrix Categories

- Drought Contingency Plans
- Seasonal Frequency Analysis
- Forecast-Based Operations
- Probable Maximum Floods
- Climate Change Impacts
- Target Level of Protection
- Variable Flood Storage



Matrix – Assessment Progress

Modernization Action Potential - By Project

Project	Gross Pool (ac-ft)	Modernization Action Potential								
		Drought Contingency Plan Update	Seasonal Frequency Analysis	Forecast-Based Operations Assessment	PM Update	PMP Update	Climate Change Assessment	Level of Protection Assessment	Variable Flood Control Space Assessment	Notes
SACRAMENTO RIVER BASIN										
Shasta	4,552,100									Possible dam raise
Oroville	3,538,000									Interested in Forecast-Based Ops
Folsom	977,000									
New Bullards Bar	966,000									Interested in Forecast-Based Ops; Possible new low outlet
Indian Valley	300,600									
Black Butte	136,200									
Englebright	70,000									
SAN JOAQUIN RIVER BASIN										
New Melones	2,420,000									
Don Pedro	2,030,000									Interested in changing WCD draw down
New Exchequer/ McClure	1,024,000									Possible raise to ungated and gated spillway
Friant/Millerton	520,500									New reservoir upstream will change WCD
Camanche	417,100									
New Hogan	317,100									
Buchanan/Eastman	150,000									
Hidden/Hensley	90,000									
Tulloch	67,000									
Farmington	52,000									
Los Banos	34,600									
Big Dry Creek	30,200									Interested in re-allocation of water (adding conservation space)
Mariposa	15,000									
Bear	7,700									
Burns	6,800									
Owens	3,600									
TULARE LAKEBED BASIN										
Pine Flat	1,000,000									
Isabella	568,100									Dam being raised; new spillway
Terminus/Kaweah	185,600									
Success	82,300									Possible dam raise
TRUCKEE RIVER BASIN										
Martis Creek	20,400									
Boca	41,100									Possible restriction due to dam safety; Construction starting 2017
Stampede	226,500									Dam Safety Construction beginning in 2016
Prosser	29,800									
RUSSIAN RIVER BASIN										
Coyote	116,470									
Warm Springs	381,000									
CENTRAL COAST BASIN										
Del Valle	63,000									

LEGEND
No need to act
Action - Easy to Implement
Action - Medium Difficulty to Implement
Action - Hard Difficulty to Implement

Matrix – FBO

	(1)	(2)	(3)	(4)					
Project	Gross Pool (ac-ft)	Is this a dam that has a controlled outlet?	Ranking for Column (1)	Is this project currently operated for flood control only?	Ranking for Column (2)	Are there dam safety concerns at the project that has changed operations temporarily?	Ranking for Column (3)	Is the project considered a re-regulation project?	Ranking for Column (4)
SACRAMENTO RIVER BASIN									
Shasta	4,552,100	YES	1	NO	0	NO	0	NO	0
Oroville	3,538,000	YES	1	NO	0	NO	0	NO	0
Folsom	977,000	YES	1	NO	0	NO	0	NO	0
New Bullards Bar	966,000	YES	1	NO	0	NO	0	NO	0
Indian Valley	300,600	YES	1	NO	0	NO	0	NO	0
Black Butte	136,200	YES	1	NO	0	NO	0	NO	0
Englebright	70,000	NO	0	N/A	0	NO	0	NO	0
SAN JOAQUIN RIVER BASIN									
New Melones	2,420,000	YES	1	NO	0	NO	0	NO	0
Don Pedro	2,030,000	YES	1	NO	0	NO	0	NO	0
New Exchequer/ McClure	1,024,000	YES	1	NO	0	NO	0	NO	0
Friant/Millerton	520,500	YES	1	NO	0	NO	0	NO	0
Camanche	417,100	YES	1	NO	0	NO	0	NO	0
New Hogan	317,100	YES	1	NO	0	NO	0	NO	0
Buchanan/Eastman	150,000	YES	1	NO	0	NO	0	NO	0
Hidden/Hensley	90,000	YES	1	NO	0	NO	0	NO	0
Tulloch	67,000	YES	1	NO	0	NO	0	YES	50
Farmington	52,000	YES	1	YES	50	NO	0	NO	0
Los Banos	34,600	YES	1	NO	0	NO	0	NO	0
Big Dry Creek	30,200	YES	1	YES	50	NO	0	NO	0
Mariposa	15,000	NO	0	N/A	0	NO	0	NO	0
Bear	7,700	NO	0	N/A	0	NO	0	NO	0
Burns	6,800	NO	0	N/A	0	NO	0	NO	0
Owens	3,600	NO	0	N/A	0	NO	0	NO	0
TULARE LAKEBED BASIN									
Pine Flat	1,000,000	YES	1	NO	0	NO	0	NO	0
Isabella	568,100	YES	1	NO	0	YES	50	NO	0
Terminus/Kaweah	185,600	YES	1	NO	0	NO	0	NO	0
Success	82,300	YES	1	NO	0	NO	0	NO	0
TRUCKEE RIVER BASIN									
Martis Creek	20,400	YES	1	YES	50	YES	50	NO	0
Boca	41,100	YES	1	NO	0	NO	0	NO	0
Stampede	226,500	YES	1	NO	0	NO	0	NO	0
Prosser	29,800	YES	1	NO	0	NO	0	NO	0
RUSSIAN RIVER BASIN									
Coyote	116,470	YES	1	NO	0	NO	0	NO	0
Warm Springs	381,000	YES	1	NO	0	NO	0	NO	0
CENTRAL COAST BASIN									
Del Valle	77,000	YES	1	NO	0	NO	0	NO	0



Matrix – FBO Assessment Process

- 1. Start by asking questions that eliminate certain reservoirs where FBO implementation would be extremely unlikely:**
 - “Does the dam have a controlled outlet?”**
 - “Are there dam safety concerns that have temporarily changed the project operations?”**
- 2. Follow with questions that address the ability of the reservoirs to release water quickly and safely:**
 - “At what percent encroachment can the project release at channel capacity?”**
 - “No. of days to evacuate max volume of flood control pool at channel capacity with no inflow?”**





Matrix – FBO Assessment Process

3. Then examine the current state of the forecast data and analysis:
 - “Is there a forecasted inflow to the reservoir already being produced?”
 - “Is a hindcast already available to evaluate the reliability of current forecasted inflow?”
4. Create the legend with corresponding scoring range based on the number of questions and possible score per question



Matrix – FBO Assessment Process

5. Assign a score to each answer
 - The lower the number, the easier it would be to update the water control manual for FBO based on that particular aspect

6. Sum the scores



Questions or Comments



Thank You



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Bands or Buffer Zones in CA Flood Control Reservoirs

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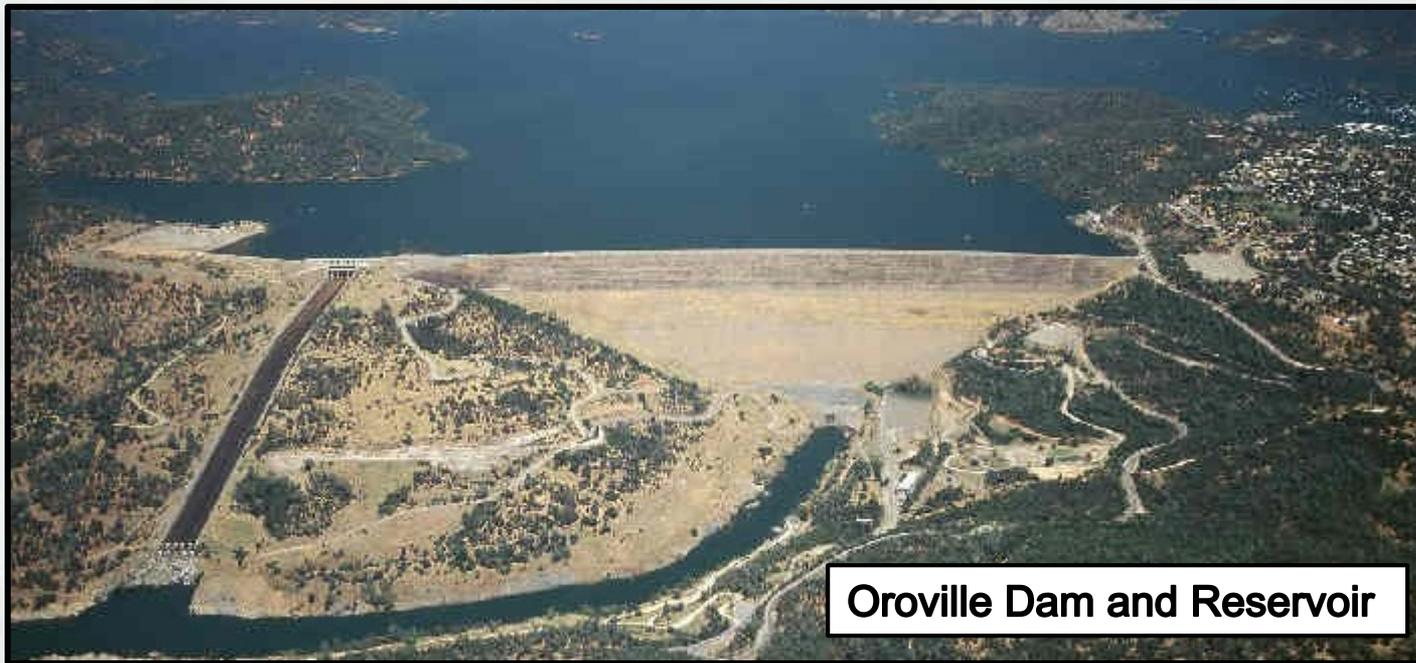
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Pine Flat Dam and Lake

Agenda

- **Brief Introduction to USACE Flood Control Authority**
- **What is a “Band” or “Buffer Zone”?**
- **Water Control Diagram Characteristics**
- **Water Control Diagram Examples**



Oroville Dam and Reservoir

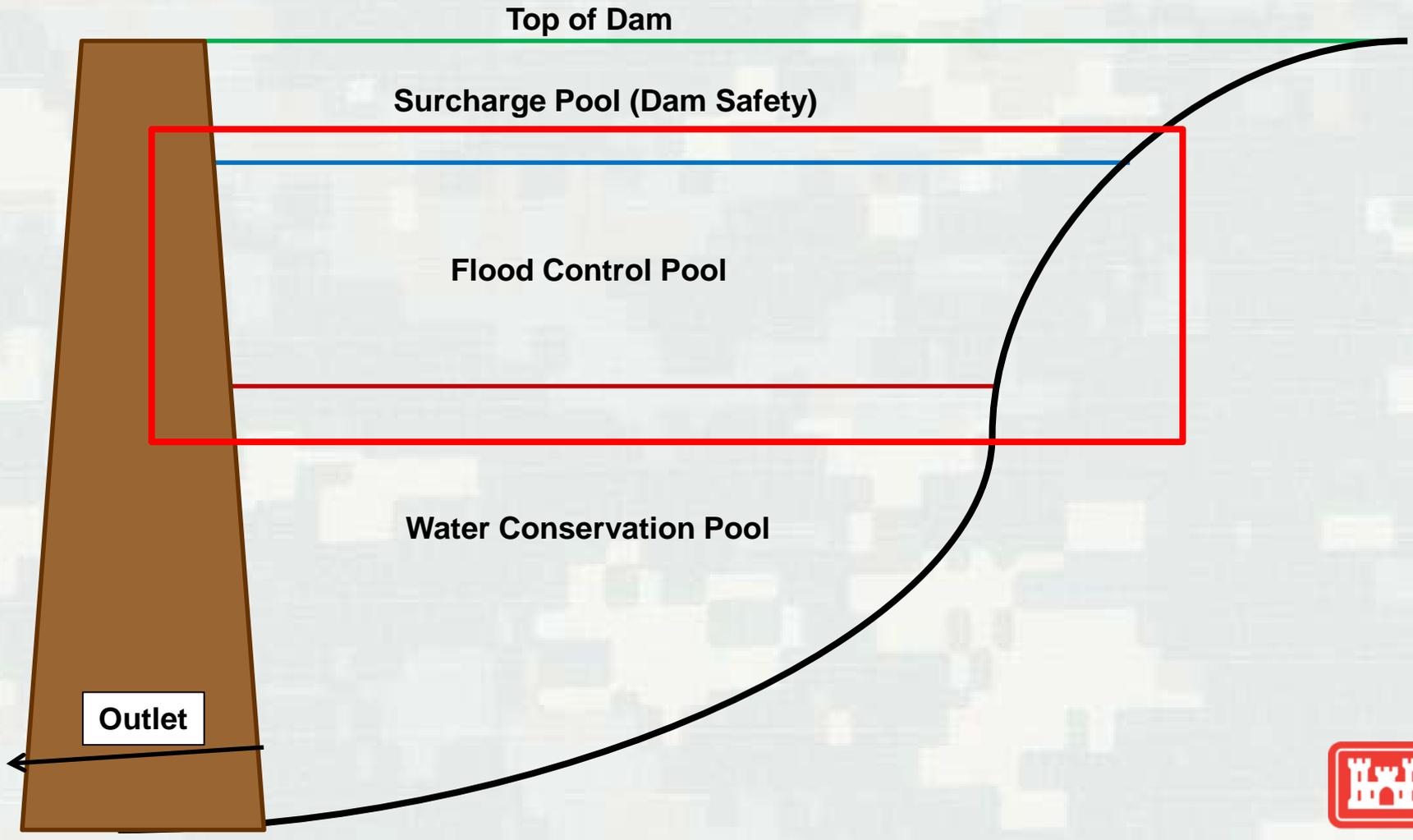


USACE Authority for Flood Control Space

- **Section 7 of the Flood Control Act of 1944**
- **Prescribe flood control rules and regulations for all reservoirs where:**
 - **Flood control is an authorized purpose**
 - **Reservoir was constructed using Federal funds**



Simplified Diagram of Reservoir





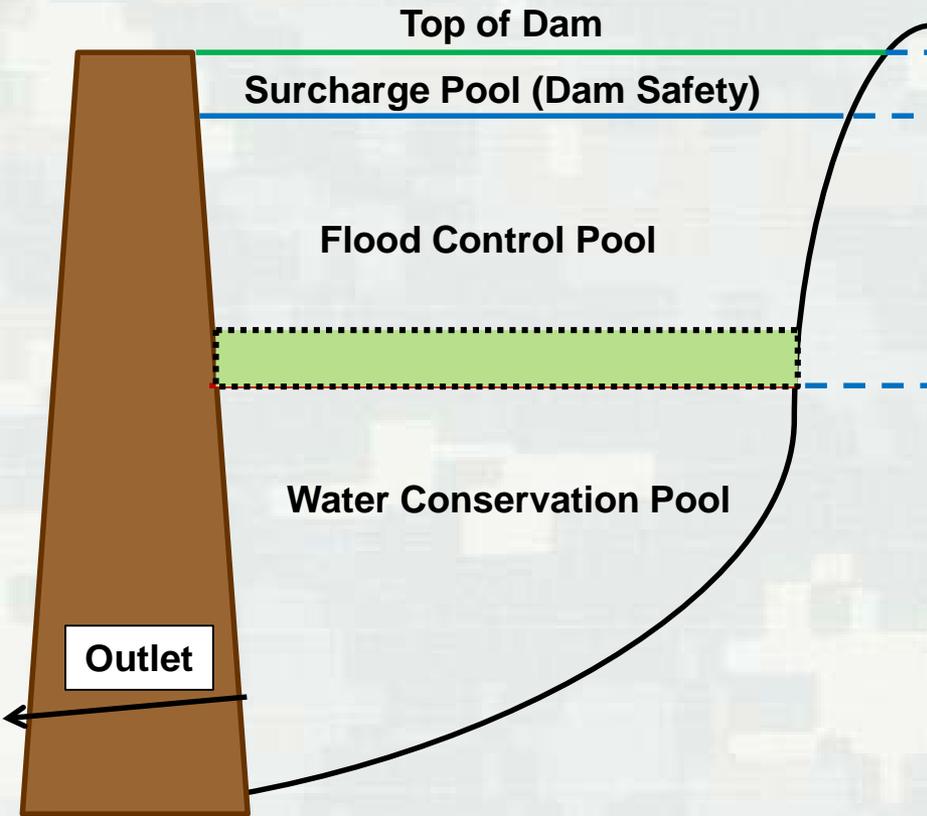
What is a “Band” or “Buffer Zone”?

- **More commonly called:**
 - “variable (flood control) space” or
 - “conditional (flood control) space”
- **The space in a reservoir (as depicted by a water control diagram) where the top of conservation can vary based on certain flood control parameters**

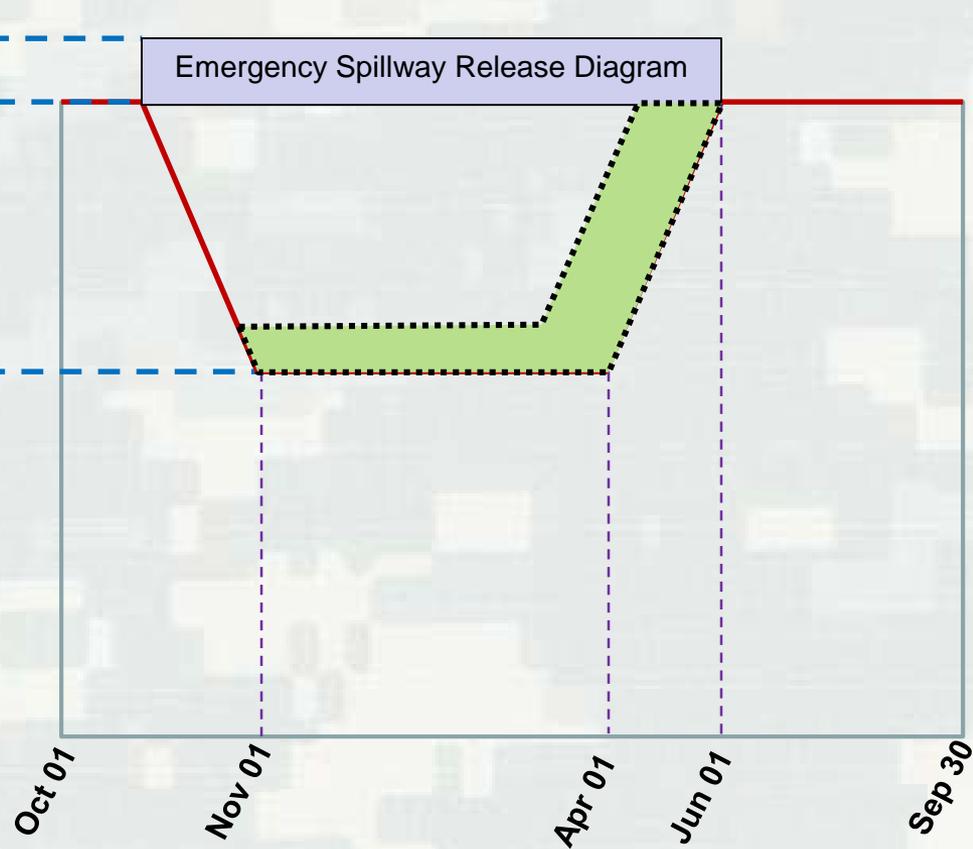


Flood Control Storage Buffer Zone

Simplified Diagram of a Reservoir



Typical Water Control Diagram



Note: NOT TO SCALE



Water Control Diagram Characteristics

- **Common ways flood control space can vary in water control diagrams:**
 - **Date**
 - **Upstream storage credit**
 - **Basin wetness parameter**
 - **Snowmelt parameter**
- **These highlighted variables create the buffer zones**



Water Control Diagram Characteristics

- **Upstream Storage Credit**
 - Reservoir(s) upstream of flood control project whose empty space can count towards meeting the required flood control space
- **Basin Wetness Parameter**
 - Typically based on measured precipitation from certain gages that indicate how saturated the soil in the basin is
- **Snowmelt Parameter**
 - Typically based on remaining snowpack that will eventually melt and flow into the reservoir





Locations of Water Control Diagram Examples

