CALIFORNIA DEPARTMENT OF WATER RESOURCES

Earth Genome

Sustainable Conservation

Developing Multi-Benefit Flow-Through Basins for Risk Reduction, Groundwater Recharge, and Habitat Enhancement

2025 CWEMF Annual Meeting

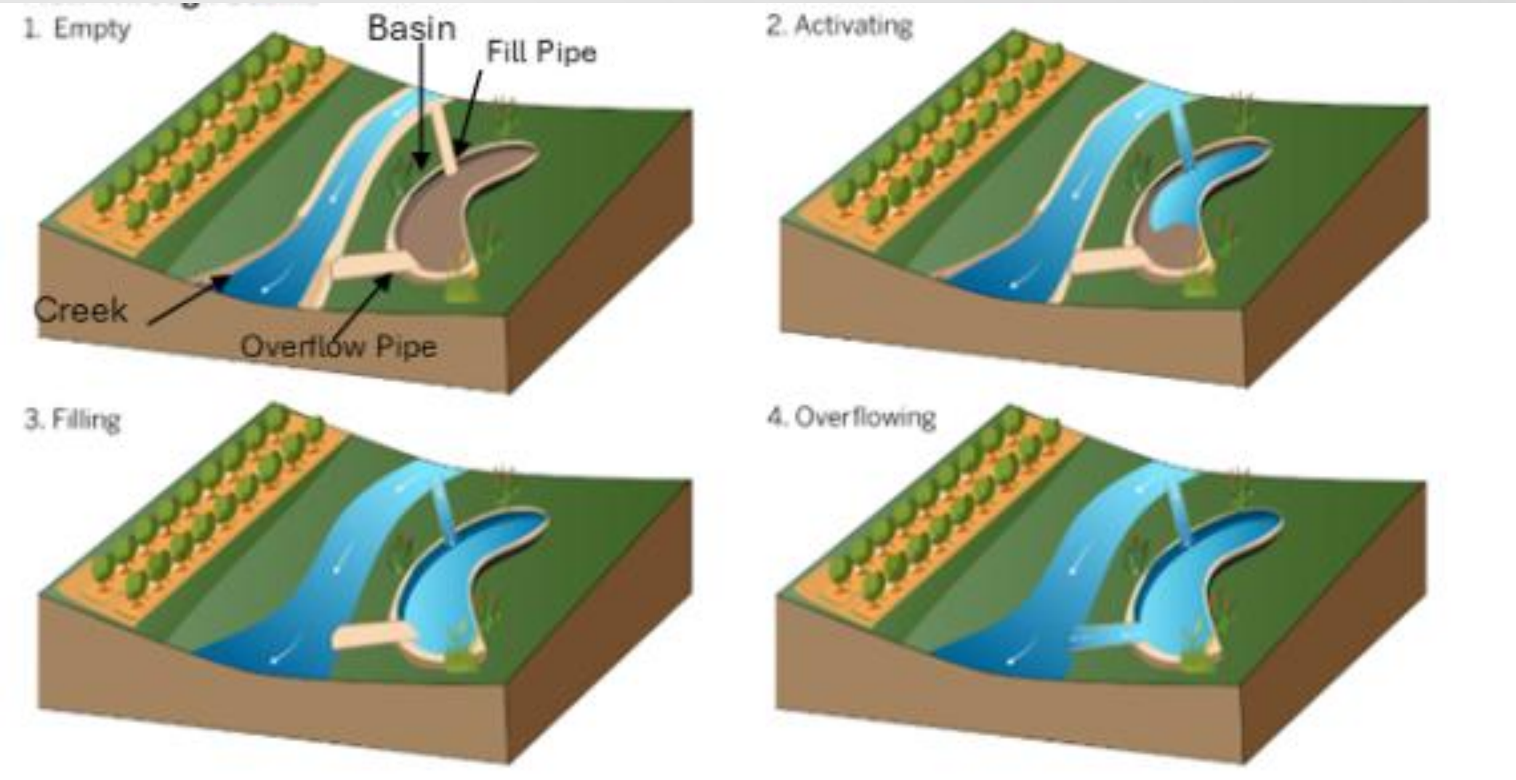
May 13, 2025

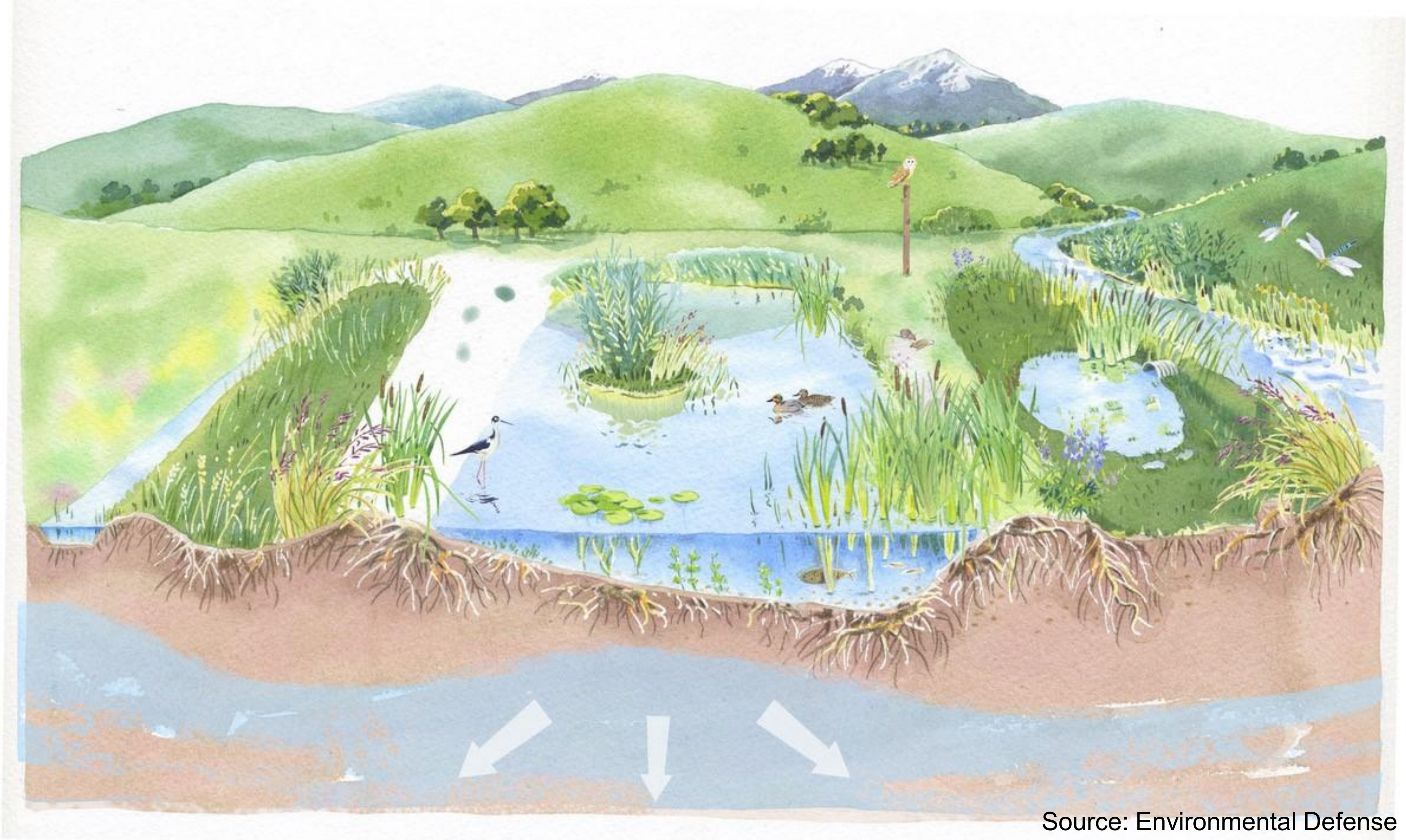
What is a Flow Through Basin?

- Passively activated “mini-floodplain” on small, flashy creeks

- Brings benefits to areas that that don’t have storage or conveyance networks
    - Reduce peak flows
    - Recharge aquifer
    - Create habitat

- Rural equivalent of low-impact development





Source: Environmental Defense Fund

Locating Flow Through Basins

Must be in areas with minimal elevation differences between the water surface and the surrounding land surface. Priority is areas that are:

- Known and probable flooding areas
- Upstream of known bottlenecks in creeks and conveyance infrastructure
- Suitable SAGBI soil types

Additional considerations:

- Near disadvantaged communities
- Near groundwater-supported ecosystems (i.e., GDEs).
- Near other FTBs (habitat connectivity)

FTB acreage can be no more than 1% of a any watershed

Modelling Framework

1. Create HEC-RAS model for each creek to reconstruct daily flow time series.
2. Determine 2 year flood event. All water beyond that volume is available.
3. On days when water is available, fill FTB up to maximum storage volume (or up to maximum water available).
4. FTBs have maximum water storage equal to 1.5 ft times their area, and have infiltration rate set by SAGBI (does not vary according to volume stored).

SAGBI Soil Type	K_{sat} (ft/day)
Excellent	7.93
Good	3.00
Moderately Good	1.05
Moderately Poor	0.51
Poor	0.45
Very Poor	0.37

NOTES: ft/day = feet per day; K_{sat} = rate of saturation; SAGBI = Soil Agricultural Groundwater Banking Index

SOURCE: O'Geen, pers. comm., 2022

Metrics

1. **Recharge Volume and Recharge Intensity** - how does this compare to other available recharge methods?

2. **Flood Events** – can we reduce peak flows enough to reduce flood damages?

3. **Acre-Days of Inundation** – how much waterbird habitat is created?

RESULTS

Operations

Watershed	Climate Scenario	Active Years	Active Days per Active Year	Maximum Acreage Used
Calaveras	Baseline	63	10	1,197 (90%)
	+2°C	70	10	1,198 (90%)
Stanislaus	Baseline	62	7	506 (100%)
	+2°C	71	7	506 (100%)
Tuolumne	Baseline	48	10	1,001 (100%)
	+2°C	56	10	1,001 (100%
Merced	Baseline	77	19	3,027 (100%)
	+2°C	77	19	3,027 (100%)
Upper San Joaquin	Baseline	58	4	435 (19%)
	+2°C	65	5	435 (19%)

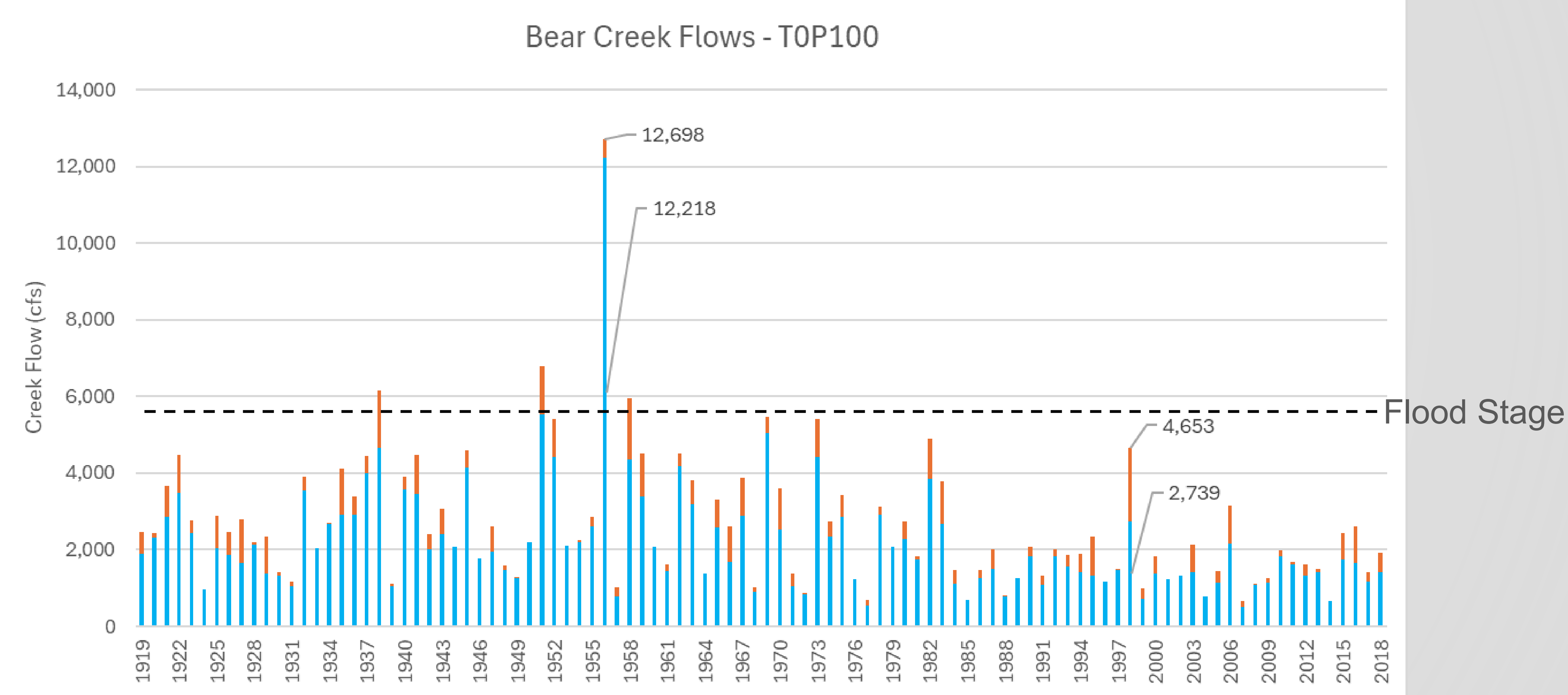
Groundwater Recharge

Watershed	Climate Scenario	Average Annual Water Applied (AF / active year)	Recharge Intensity (AF / acre / active year)
Calaveras	Baseline	1,710	1.4
	+2°C	1,743	1.5
Stanislaus	Baseline	317	0.6
	+2°C	390	0.8
Tuolumne	Baseline	1,429	1.4
	+2°C	1,517	1.5
Merced	Baseline	8,765	2.9
	+2°C	8,765	2.9
Upper San Joaquin	Baseline	328	0.8
	+2°C	483	1.1

Habitat Creation

Watershed	Climate Condition	Acre-Days of Inundation
Calaveras	Current	4,320
	+2°C	4,408
Stanislaus	Current	438
	+2°C	489
Tuolumne	Current	2,520
	+2°C	2,681
Merced	Current	11,204
	+2°C	11,204
Upper San Joaquin	Current	375
	+2°C	523

Flood Risk Reduction
Flood Stage



Conclusions

- Recharge intensity (land use efficiency for recharge benefit) is comparable to on farm recharge, and increases as climate warms
- Even small amounts of acreage dedicated to FTBs (~1% of land area) can reduce frequency of flood events substantially
- Potential to create lots of shorebird habitat in Merced watershed, where there are lots of flashy small creeks. Opportunity is more limited in other watersheds due to more limited local runoff.