

Urban water conservation in Southern California

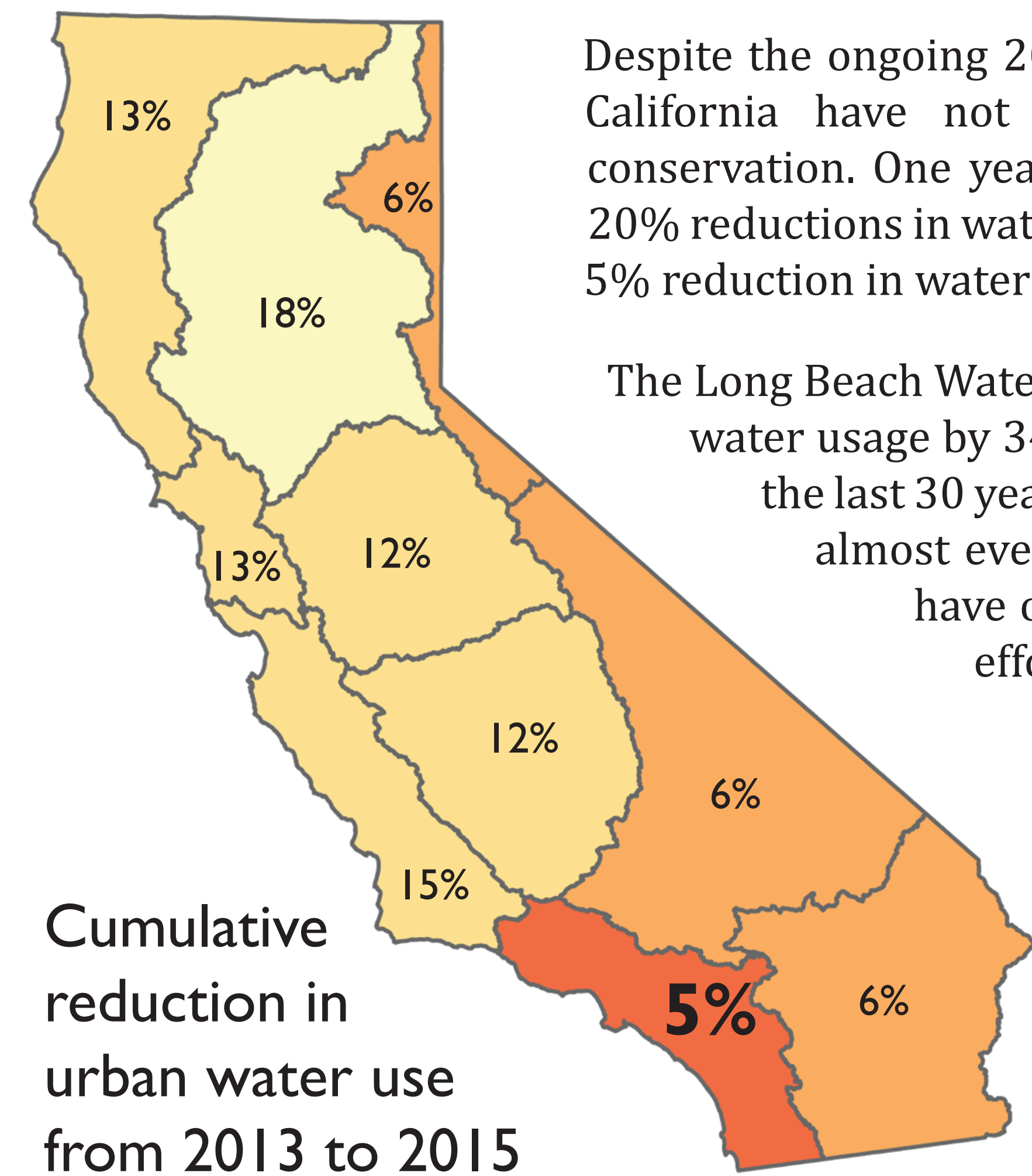
Encouraging conservation through tradable allocations and market mechanisms

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Why didn't water agencies in Southern California conserve more in response to the drought?



Despite the ongoing 2012-15 drought, urban water agencies in Southern California have not responded aggressively to statewide calls for conservation. One year after Governor Jerry Brown called for voluntary 20% reductions in water usage, the South Coast region had achieved only a 5% reduction in water use, the smallest reduction in the state.

The Long Beach Water Department has been an exception, reducing their water usage by 34% through aggressive conservation measures over the last 30 years. Long Beach now uses less water per-person than almost every other urban agency in Southern California. Why have other agencies not undertaken similar conservation efforts?

Research questions

1. How does the existing water allocation system encourage conservation?
2. Can we design an alternative system that better incentivizes conservation?

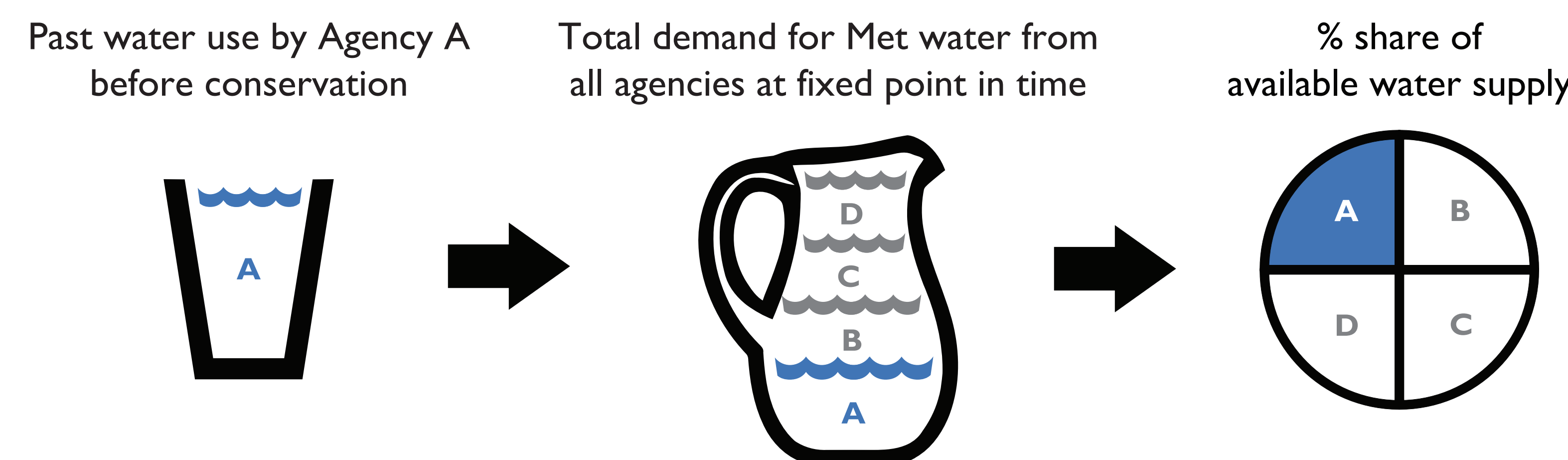
2 Our alternative system of water allocation

Designing an alternative system to encourage conservation

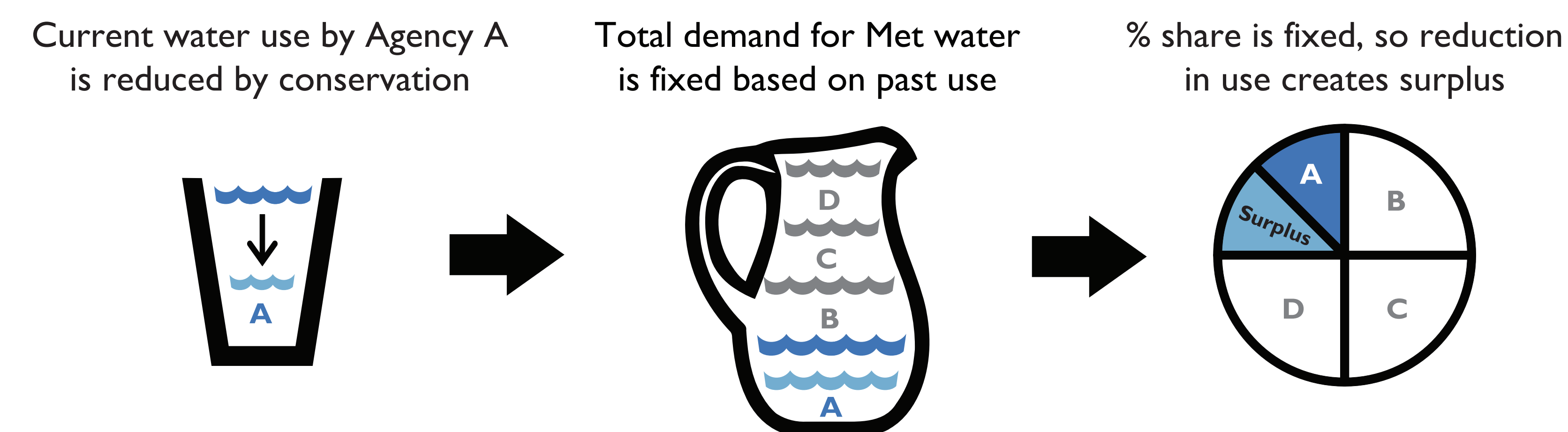
1. **Secure right**
Agencies which reduce their use through conservation are able to keep the conserved water as a buffer supply during drought. Agencies can also trade this conserved water, further incentivizing conservation.
2. **Fixed point in time**
Because the allocation is based on a fixed point in time rather than an agency's most recent use, agencies are not penalized for reductions in water use achieved over time.

How our alternative system allocates water

An agency's water allocation is based on their water use at a fixed point in time in the past. Adding the total past water use of all agencies determines what the total demand for Met water would be if agencies did not undertake any conservation. A percentage share of the total available Met water supply is then assigned to each agency.

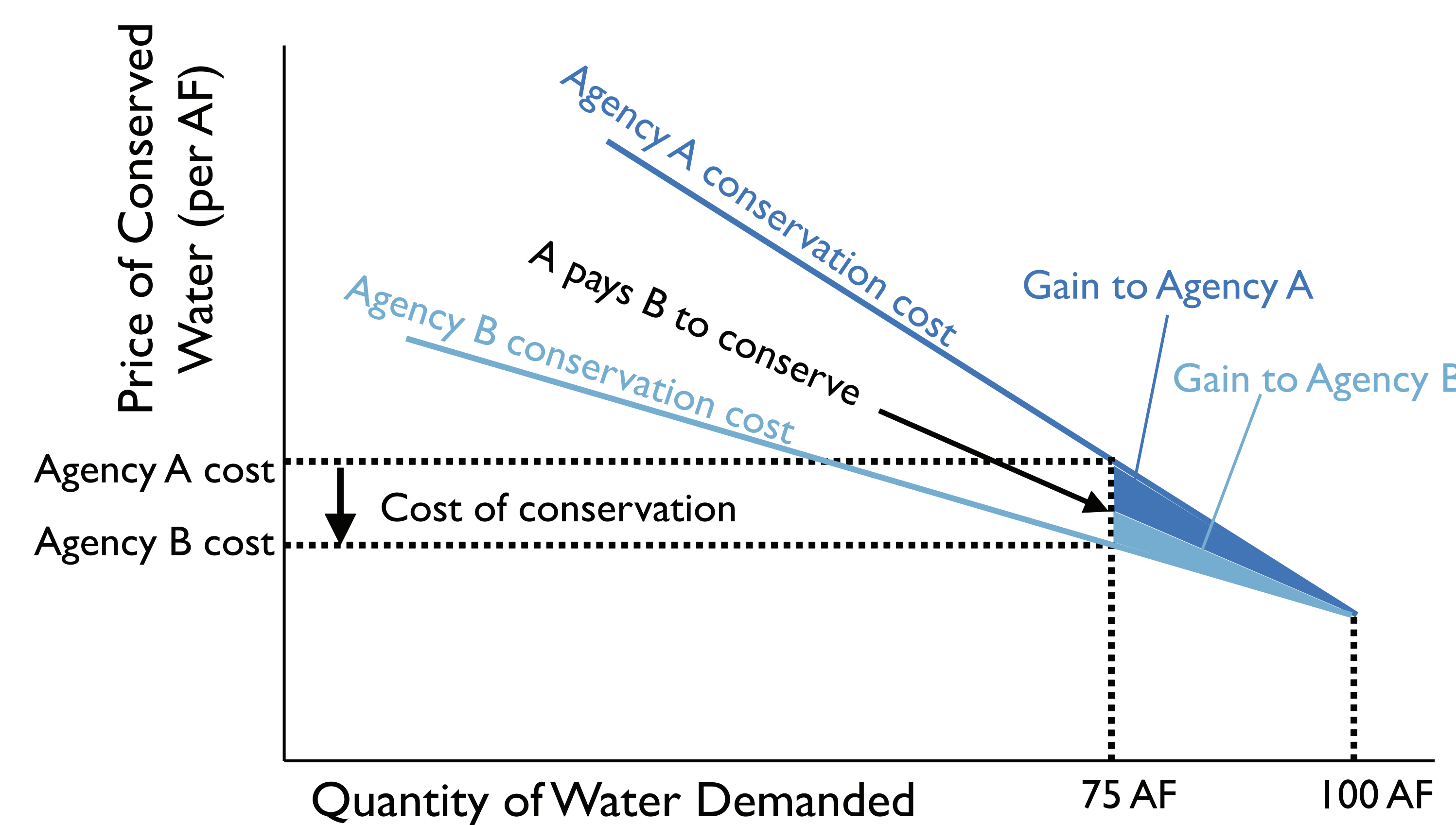


Under the alternative system, when an agency conserves, their allocation will not be reduced. The amount of water an agency receives will now be greater than their needs, resulting in a surplus.



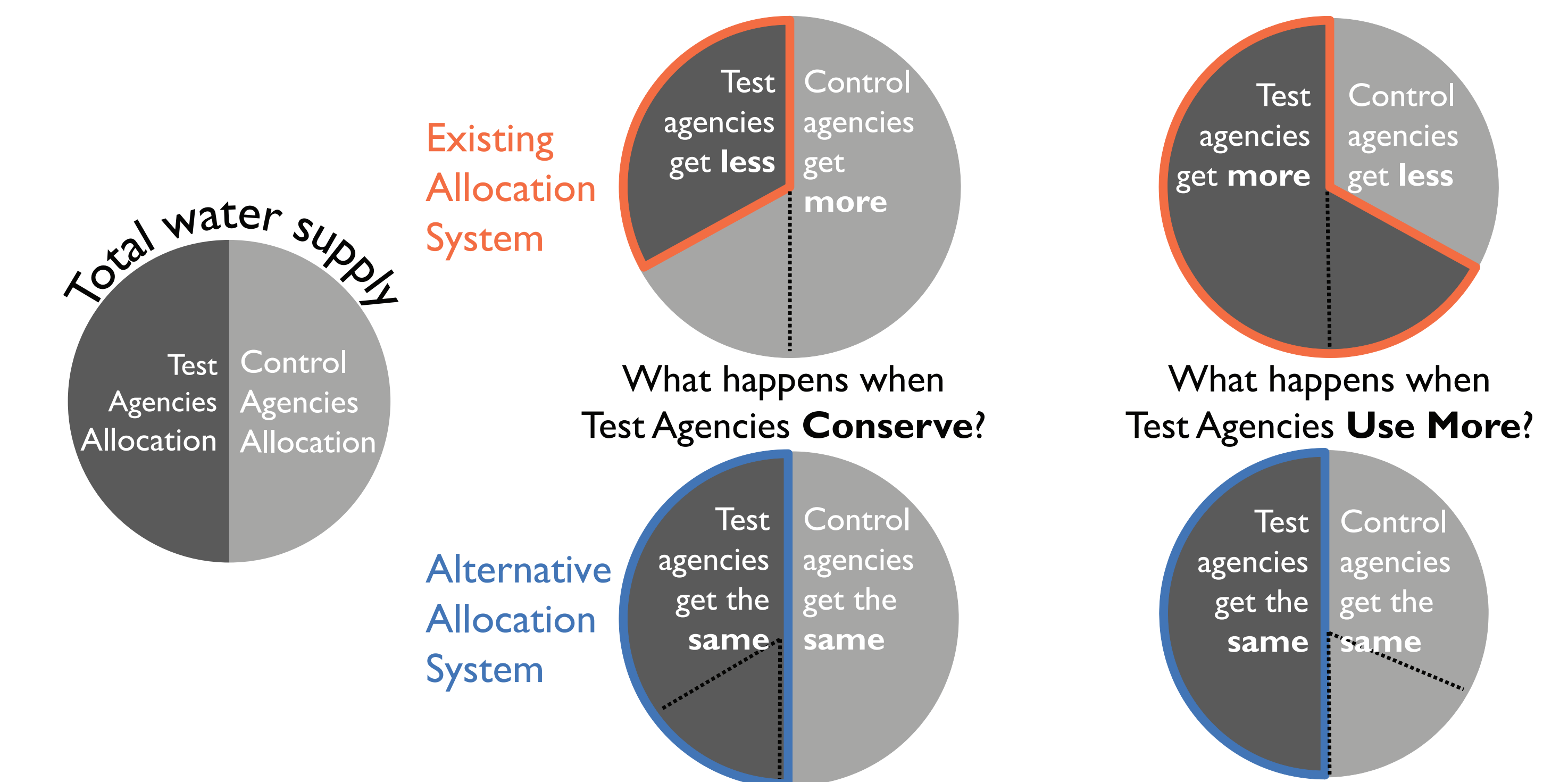
Benefits of trading conserved water

Under the alternative system, when the cost of conservation for Agency A is higher than for Agency B, Agency A can pay Agency B to conserve. Agency A benefits by acquiring water or meeting conservation goals at a lower cost than if they had conserved on their own. Agency B benefits by receiving payment in excess of what it costs them to conserve.



Comparing the existing and alternative systems

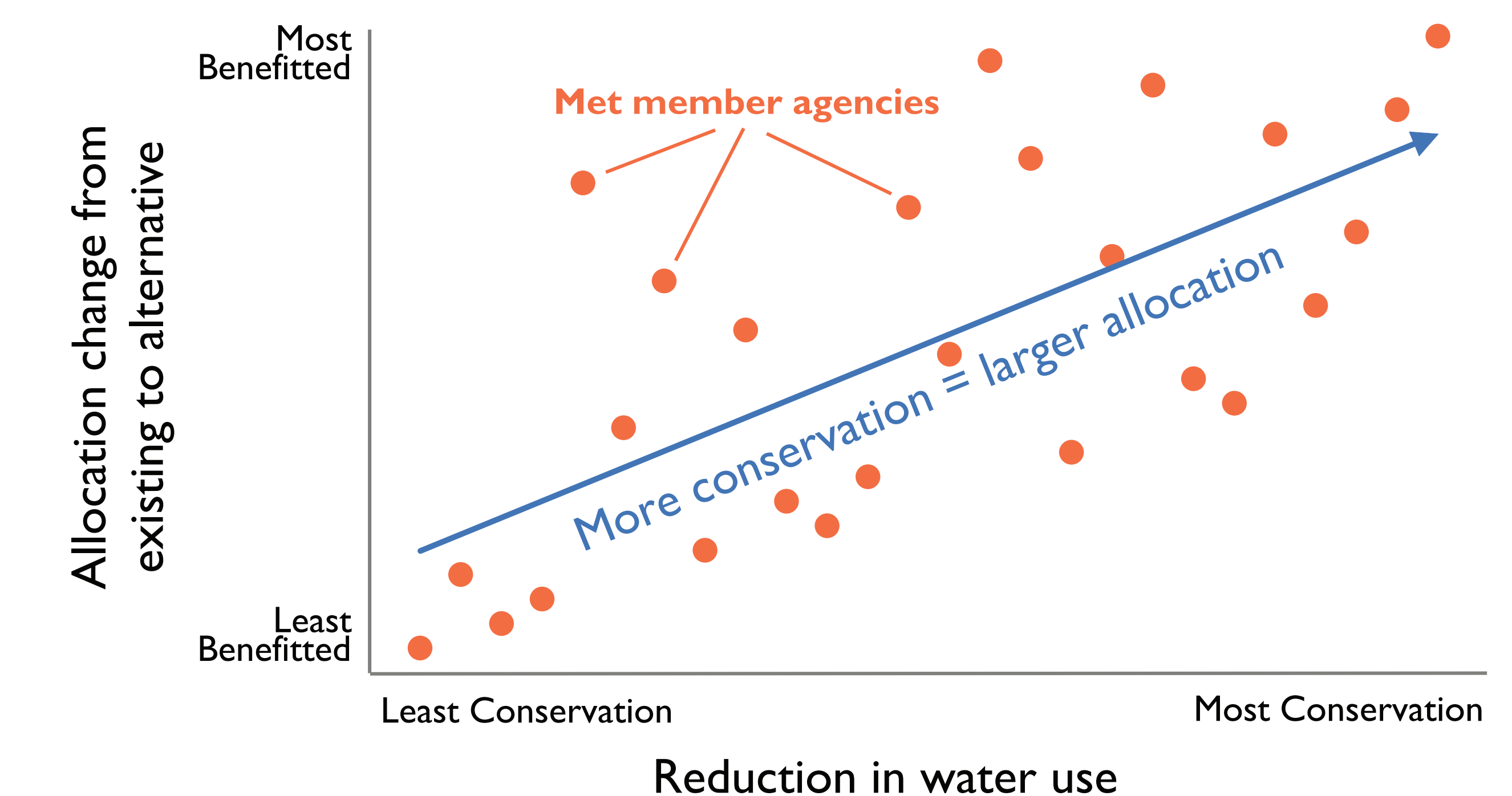
Under the existing system, the water made available by conserving agencies is redistributed to other agencies. Conserving agencies are not compensated for the water they provide to the system. When agencies use more they get more, leaving less water remaining for the other agencies.



Under the alternative system, agencies receive the same allocation regardless of recent water use. When agencies use more, their demand will exceed their allocation, resulting in a deficit. When agencies conserve, their allocation will exceed their demand, resulting in a surplus.

Alternative system rewards conservation

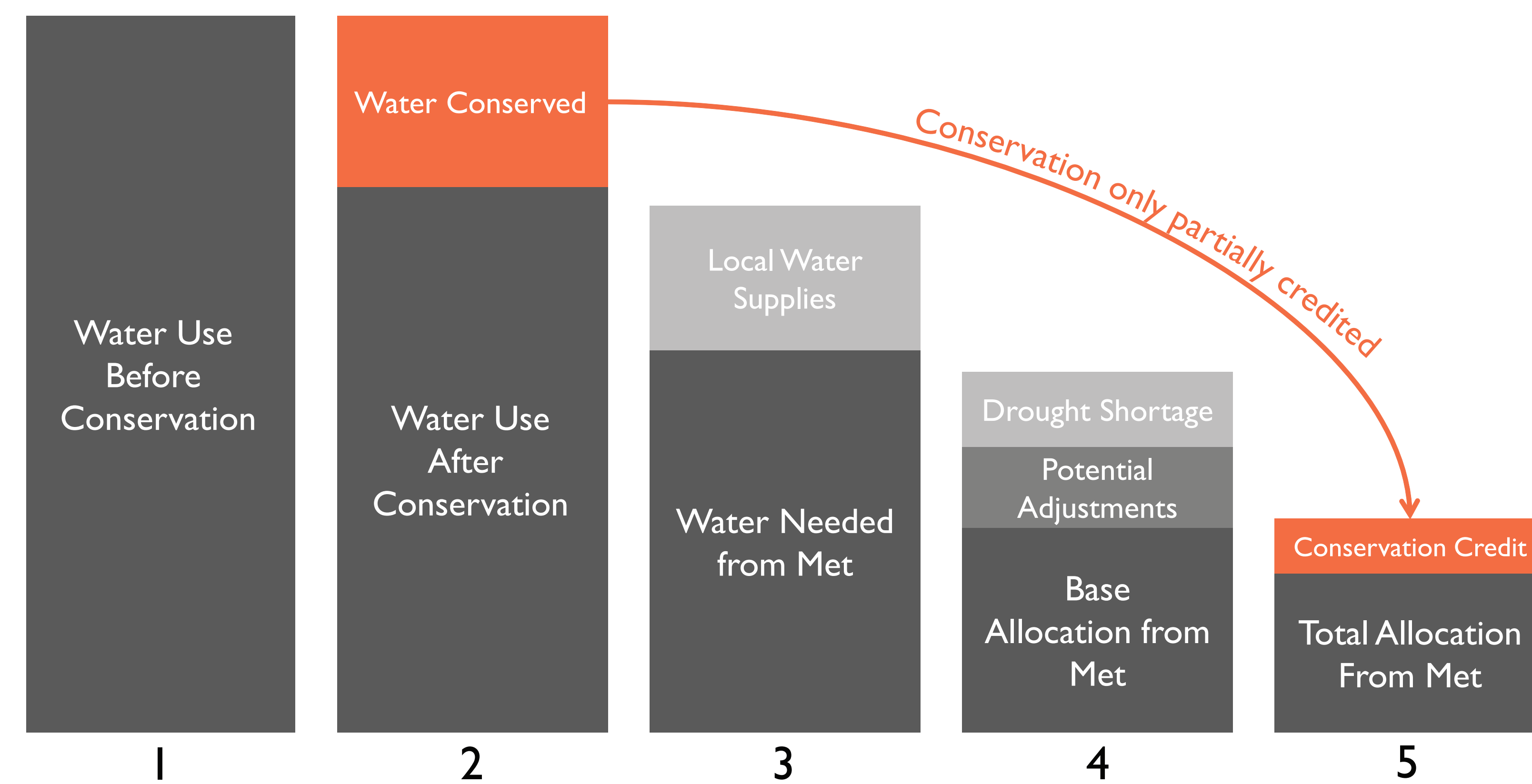
The agencies that have conserved the most in recent years also benefit the most under the alternative system, earning larger allocations of water compared to the existing system.



1 The existing system of water allocation

We begin by analyzing the existing system of water allocation in Southern California. Metropolitan Water District of Southern California (Met) provides water to the majority of cities and water agencies in the region. Therefore, we examine how Met allocates water to its member agencies during times of water shortage such as the current drought.

How the existing system allocates water



1. Calculating how much water an agency will get from Met begins by determining how much water the agency has needed historically.
2. Water conservation efforts over time reduces the amount of water an agency needs to meet its demands, thereby reducing the amount of water it needs from Met.
3. A portion of the water used by agencies can come from local water supplies such as groundwater. The remainder of water needed will come from Met.
4. During droughts when Met can only partially meet demands, a base allocation is given with potential adjustments to account for unique agency situations.
5. An agency receives credit for a fraction of the total amount of water conserved. The more an agency conserves, the less water it gets during a drought when it needs it most.

The existing system discourages conservation in two ways:

1. **Use it or lose it**
Agencies which reduce their use through conservation lose access to the conserved water, and this water is redistributed to other agencies during times of drought.
2. **Conservation is soon forgotten**
How much water an agency receives during a drought is mostly based on their most recent water use. Long term conservation efforts are not rewarded and essentially forgotten.

Conclusion

The challenge for California over the next century is to live within our current water supplies even as our population and economy grow. To do so, we must better manage our demand by identifying methods to incentivize conservation.

Drawbacks of existing system

Costly additional supplies: When Met cannot supply enough water to meet demand it must seek costly additional supplies from groundwater, desalination, or irrigation districts.

No conservation incentive: Agencies are better off increasing their water demand before a drought in order to secure a larger share of the supply when a water shortage occurs.

Benefits of alternative system

Promotes Conservation: Incentivizing conservation makes current supplies more resilient to drought and population growth.

Generates flexibility: Agencies with a surplus allocation have the flexibility to sell their conserved water, use it for local development, or store it for future years.

Environmental Benefits: Less water used means a reduced need for environmentally destructive water infrastructure projects and more water left in rivers.

Acknowledgments

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