

RECLAMATION

Managing Water in the West

Lake Thunderbird Water Supply

Norman Project, Oklahoma



U.S. Department of the Interior
Bureau of Reclamation

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Bureau of Reclamation

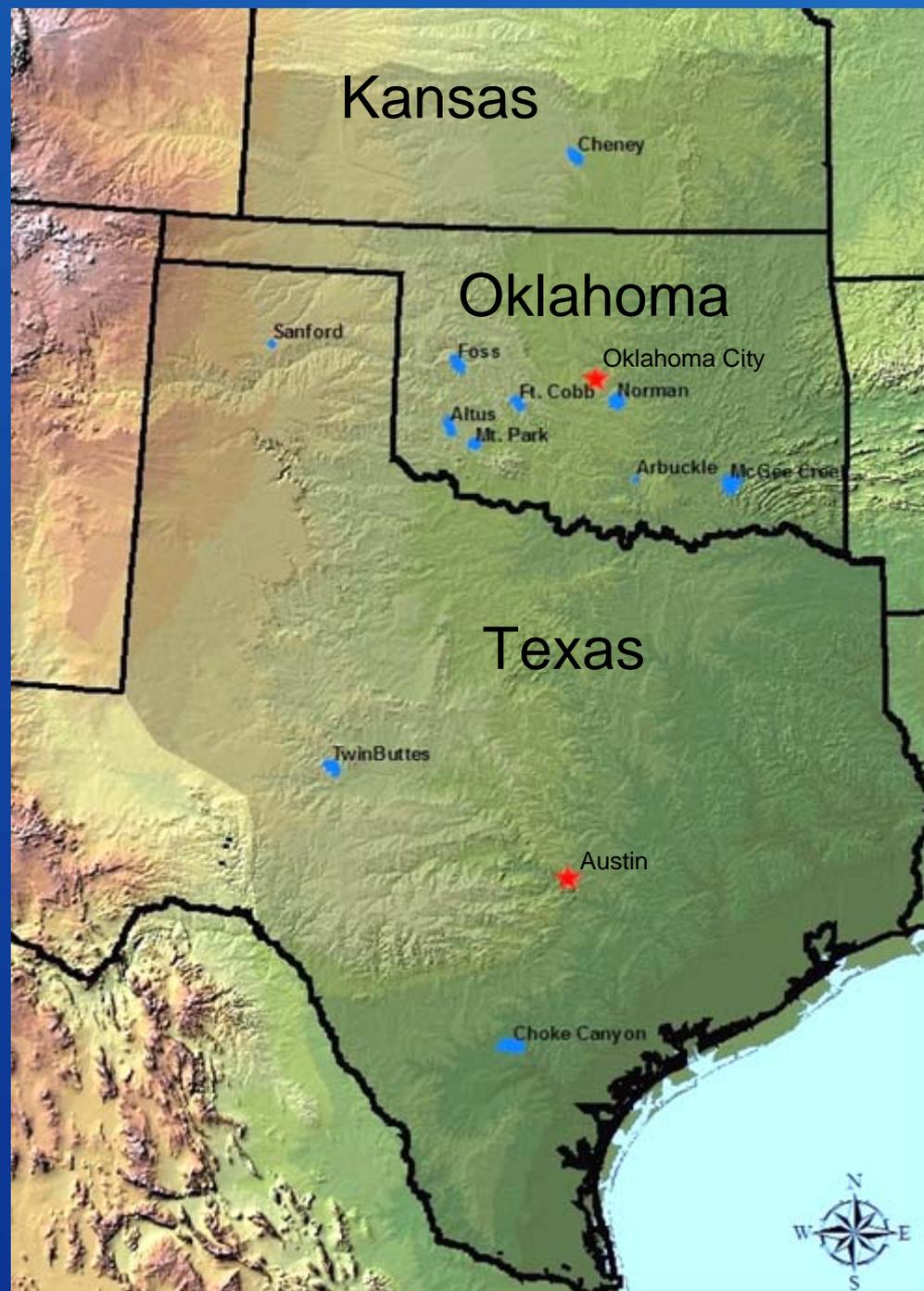
- Reclamation was established in 1902 to “reclaim” the arid West by bringing water and power to undeveloped regions of the U.S.
- Our mission is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.
- Reclamation has constructed more than 600 dams and reservoirs, including major projects such as Hoover Dam and Grand Coulee Dam.



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Oklahoma-Texas Area Office

- Oversight responsibility for 11 Reclamation projects in Oklahoma, Texas, and Kansas.
- This includes Norman Dam and Lake Thunderbird.



Norman Project

Benefits

- Municipal and Industrial Water Supply
- Flood Control
- Recreation
- Fish and Wildlife Enhancement

Conservation Storage

- 105,927 acre-feet

Water Permit

- 21,600 acre-ft/yr (M&I)



Norman Project

- Reclamation completed construction of Norman Dam in 1965.
- The United States owns the Norman Project which consists of:
 - Norman Dam
 - Pumping plants and pipelines
 - 6,080 acre reservoir (Lake Thunderbird)
 - 7,035 acres of surrounding project land



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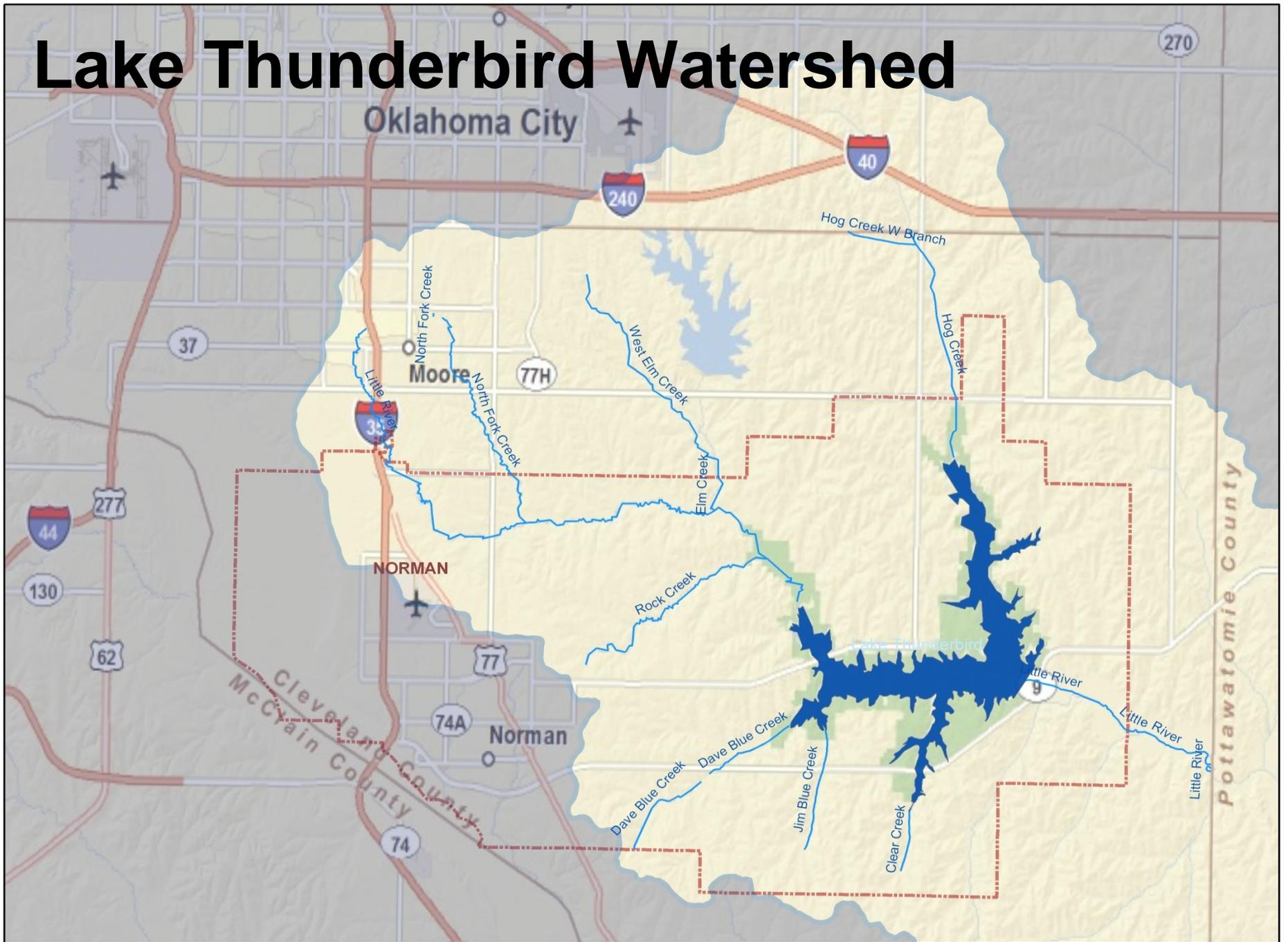
Norman Project

- The Central Oklahoma Master Conservancy District is responsible for operation of the Dam and Reservoir.
- The District provides Project water from Lake Thunderbird to the City of Norman, Midwest City, and Del City using 2 pumping plants and 30 miles of pipeline.
- Oklahoma Tourism and Recreation Department is responsible for managing project lands and recreation areas.



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Lake Thunderbird Watershed



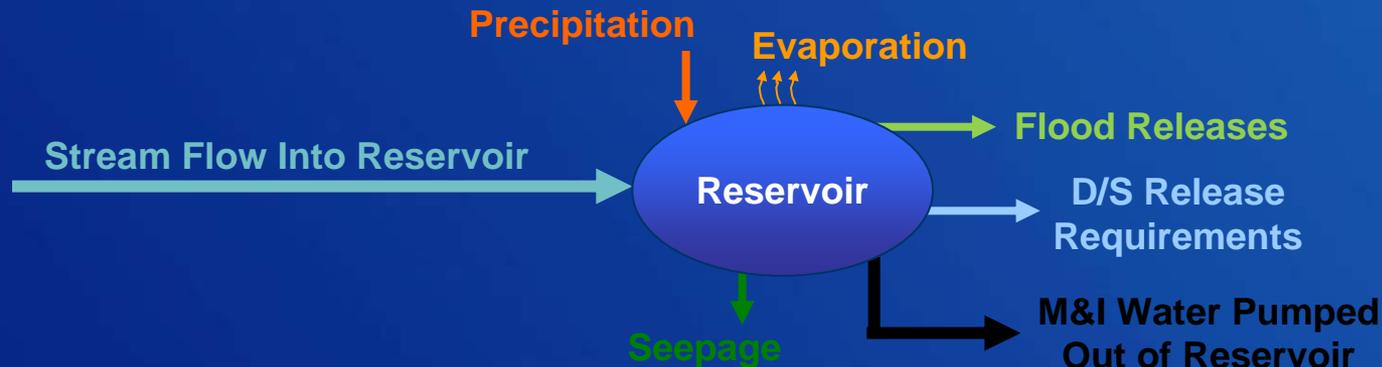
Surface Water Permit for Norman Project

- The Oklahoma Water Resources Board issued a surface water permit to the District based on the original yield calculations for Lake Thunderbird.
- Storage quantity required to deliver the Project yield far exceeds the yield itself due to evaporation losses and other variables.
- Water Permit is 21,600 ac-ft/year (~7 billion gallons/year).



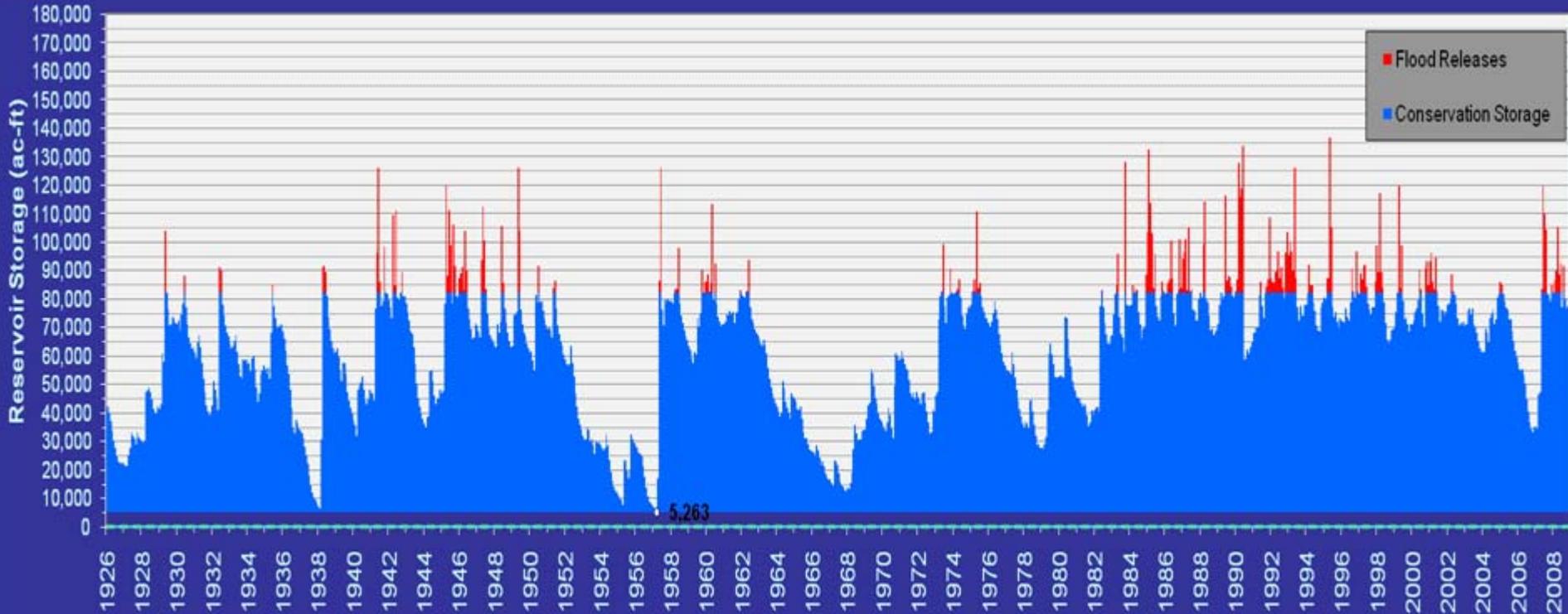
Reservoir Yield

- Amount of water that can be used each year including the years of the most critical drought without emptying the Reservoir.
- Calculated using an operational model.
- Based on historic inflow and evaporation data.
- Water balance on a monthly time step.
- $\text{Initial Vol.} + \text{Total In} - \text{Total Out} = \text{Final Vol.}$
- Considers future sediment accumulation.

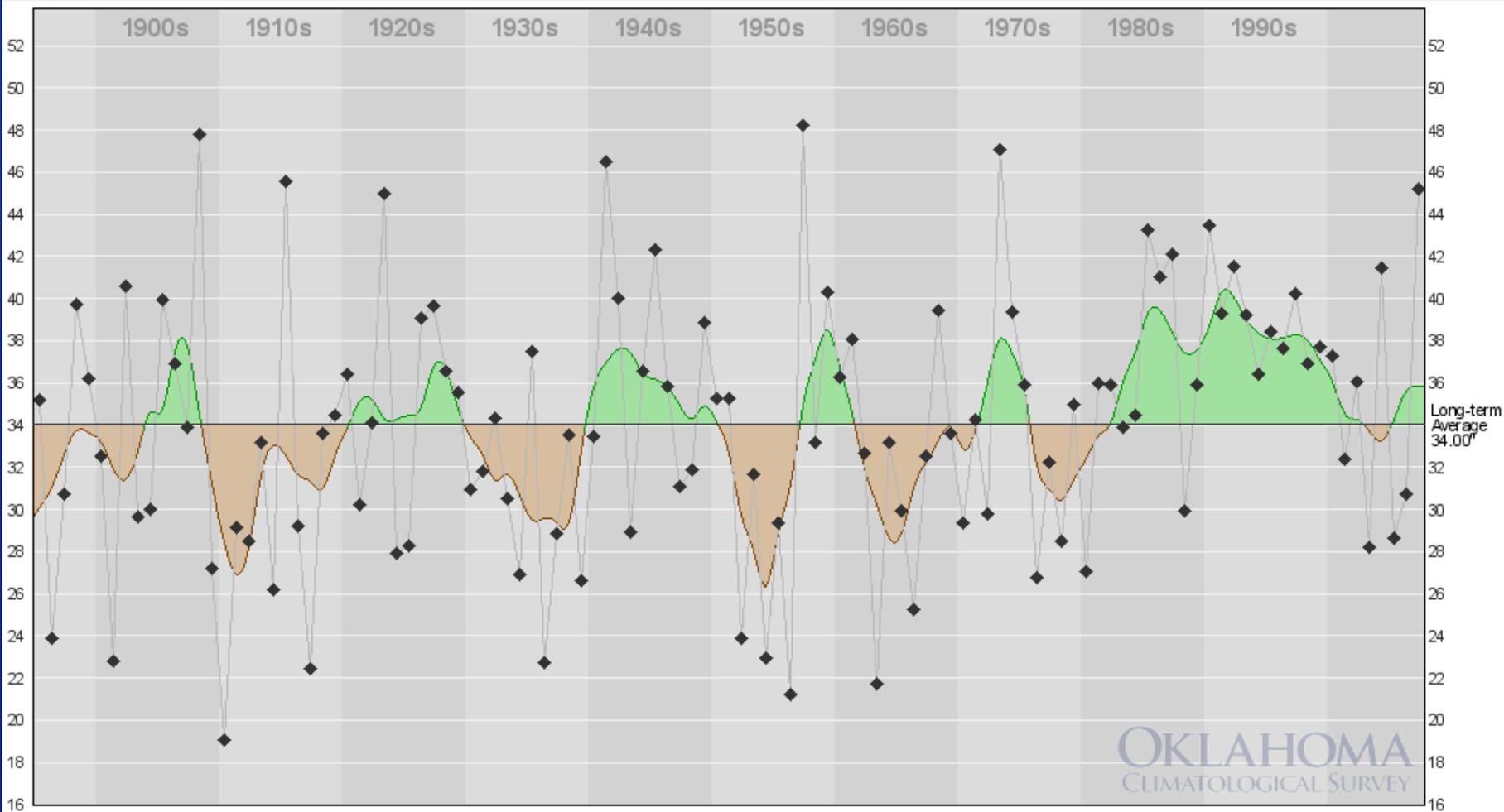


Modeled Reservoir Storage

Reservoir model assuming full delivery of permitted water.



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OKLAHOMA
CLIMATOLOGICAL SURVEY



Annual Precipitation History with 5-year Tendencies
Oklahoma Statewide: 1895-2007

- Wetter historical periods
- Drier historical periods
- Individual Annual precipitation value

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Norman Project Yield

- Norman Project yield is a conjunctive yield which relies on both reservoir water and supplemental groundwater.
- Conjunctive yield increases water availability by supplying 100% of the demand from the Reservoir during wet periods and relying on groundwater to supplement the Reservoir during the most severe droughts.



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Norman Project Yield Cont...

- Based on this conjunctive yield, when reservoir storage falls below 31,000 ac-ft (i.e., below elevation 1,020 feet), the District must reduce deliveries from the reservoir to prevent the Reservoir from going dry.
- The Cities must have supplemental groundwater supplies to offset reduced deliveries from the Reservoir when this occurs.
- The lowest reservoir elevation to date was ~1,030 feet during the 2006 drought, which did not trigger reduced deliveries from the Reservoir.



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Reservoir Augmentation

- As the City of Norman has grown, it has become increasingly dependent on groundwater as a primary water source rather than a supplemental water supply for the reservoir.
- An alternative to the City's supplemental groundwater supply will be needed to offset reduced water deliveries from the reservoir when storage is less than 31,000 ac-ft.
- The District is currently evaluating alternate supplemental water supplies.



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