

North Central Texas Water Quality Project

Watershed Protection Plan Development for the Cedar Creek Watershed

Darrel Andrews
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Why We're Here

- Proactive approach to solving water quality issues opposed to regulatory action through a TMDL (Total Maximum Daily Load)
- Trend of increasing Chlorophyll a levels in Cedar Creek Reservoir
- Listing on the 303 (d) Water Quality list for impairments

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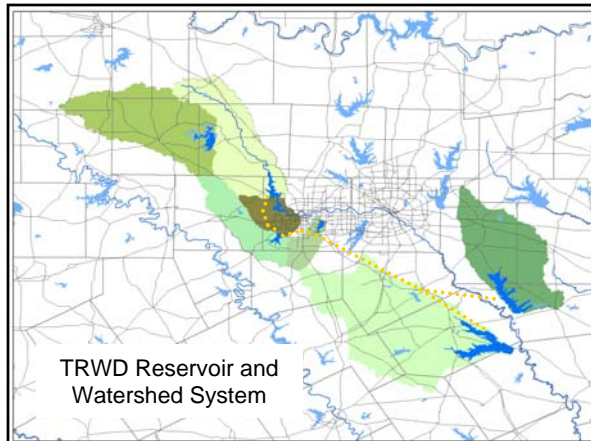
Background

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Tarrant Regional Water District

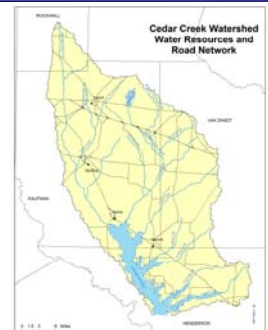
- Serves 1.7 million people
 - Eleven counties in and around Fort Worth
- Expected to serve a population of 2.6 million people by 2050
- Contracts with 66 cities
- Manages 5 major reservoirs
 - Cedar Creek, Eagle Mountain, Richland-Chambers, Bridgeport and Benbrook.



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Cedar Creek Reservoir

- Watershed size – 1,007 square-miles
- Surface area - 34,000-acres
- Conservation Storage - 678,000 ac/ft
- Mean Depth – 20 ft
- Maximum Depth – 55 ft
- Shoreline – 320 miles



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Water Quality Criteria Applicable to Cedar Creek

- Numeric Criteria
 - Dissolved Oxygen
 - pH
 - Chlorophyll a
- Narrative Criteria
 - Nitrogen
 - Phosphorus
 - Excessive Algal Growth

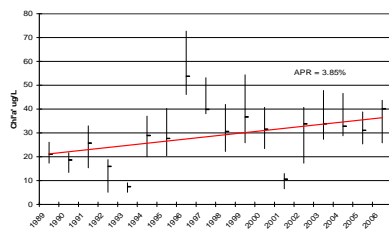
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Water Quality - 303 (d) Listing Draft 2006 Data

- High pH
 - Category 5c, on 303(d) list
 - Additional data and information will be collected before a TMDL is scheduled
- Use Concerns
 - Depressed Dissolved Oxygen
 - Aquatic Life Use Concern
 - Ammonia, Orthophosphorus, Total Phosphorus, Nitrite
 - Nutrient Enrichment Concern
 - Excessive Algal Growth, Chlorophyll a
 - Algal Growth Concern

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18-Year Trend (Chl'a') in Cedar Creek

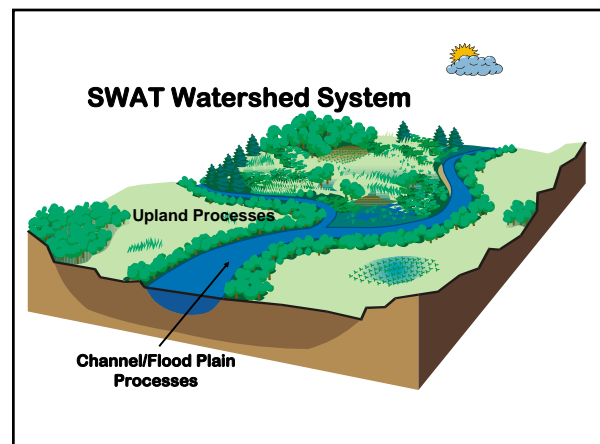


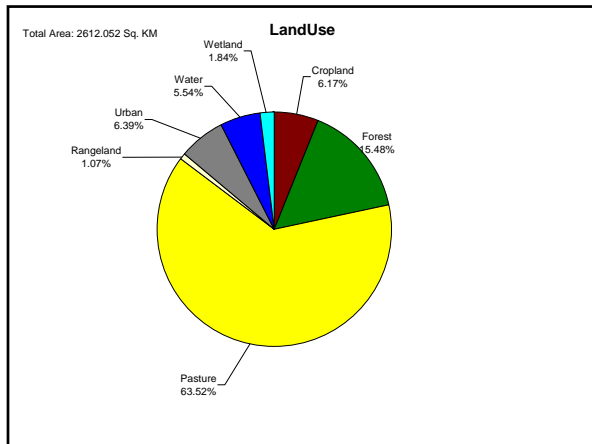
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Water Quality Research

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Watershed Modeling: SWAT





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Cedar Creek Watershed

- Point Source Discharges
 - Terrell
 - Willis Point
 - Kaufman
 - Kemp
 - Mabank
 - Eustace
 - Athens
 - East Cedar Creek
 - Cherokee Shores

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Lake and Watershed Survey

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Field Survey Channel Erosion Category

- 30 to 35% of total sediment from channel erosion

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Reservoir Modeling: WASP

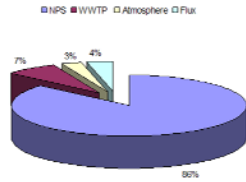
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Cedar Creek Reservoir Model Representation using WASP

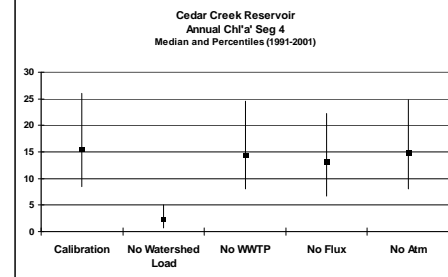
Vertical View

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Cedar Creek WASP Model Nutrient Budget – TP (1991-2001)



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Cedar Creek Watershed Point Source Evaluation

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Approach

- Each plant was assessed for the ability to properly treat projected 2050 flows under three sets of discharge limits for nutrients.
 - Level I: Existing permit conditions
 - Level II: Phosphorus limit of 1 mg/L
Total nitrogen limit of 10 mg/L
 - Level III: Phosphorus limit of 0.5 mg/L
Total nitrogen limit of 5 mg/L

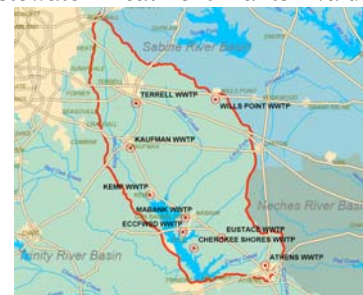
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Approach (continued)

- Plant effluent quality was examined and characterized for current treatment level
- Field assessment and permit review led to recommended facilities upgrades and conceptual level cost estimates
- Individual plant and total nutrient loads were calculated based on current, Level II and Level III permit limits for projected 2050 flows

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Wastewater Treatment Plants Evaluated



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Nutrient Loads* Associated with Each Level Upgrade (2050 Loads vs. Current)

City or Facility	Total Phosphorous Load (lbs/day)			
	Current Permitted Flow	2050 Flows		
		Level I	Level II	Level III
Athens	24	27	10	5
Cherokee Shores	5	6	2	0.8
East Cedar Creek	11	29	13	7
Eustace	5	5	1	0.5
Kaufman	29	39	14	7
Kemp	5	3	0.9	0.5
Mabank	13	17	4	2
Terrell	151	194	48	24
Willis Point	18	11	4	2
Total Loads	261	331	97	49
Increase or (Decrease) from Current Load		70	(164)	(212)

*Current and Level I loads based on average effluent concentration determined by nutrient testing done by the cities