North Central Texas Council of Governments

A Garden State: Stewarding Water Resources through Community Agriculture

NCTCOG Webinar
August 25, 2026

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EPA United States Environmental Protection Agency

Texas Commission on Environmental Quality

North Central Texas Council of Governments Environment & Development

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This project was funded by the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.

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Welcome and Introduction of Speakers

Webinar Agenda

- ***Rain Gardens for Community Gardens–*** Texas Water Resources Institute
- ***Coppell Community Gardens Corporation – History and Water Management-*** Coppell Community Gardens Corporation
- Discussion and Q&A

Speaker Introduction

Dean Minchillo

Urban Water Program Specialist

Texas Water Resources Institute

RAIN GARDEN FOR COMMUNITY GARDENS

Watershed Protection Project

August 25, 2026

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Texas Water Resources Institute
make every drop count

Texas A&M AgriLife

Texas Commission on Environmental Quality

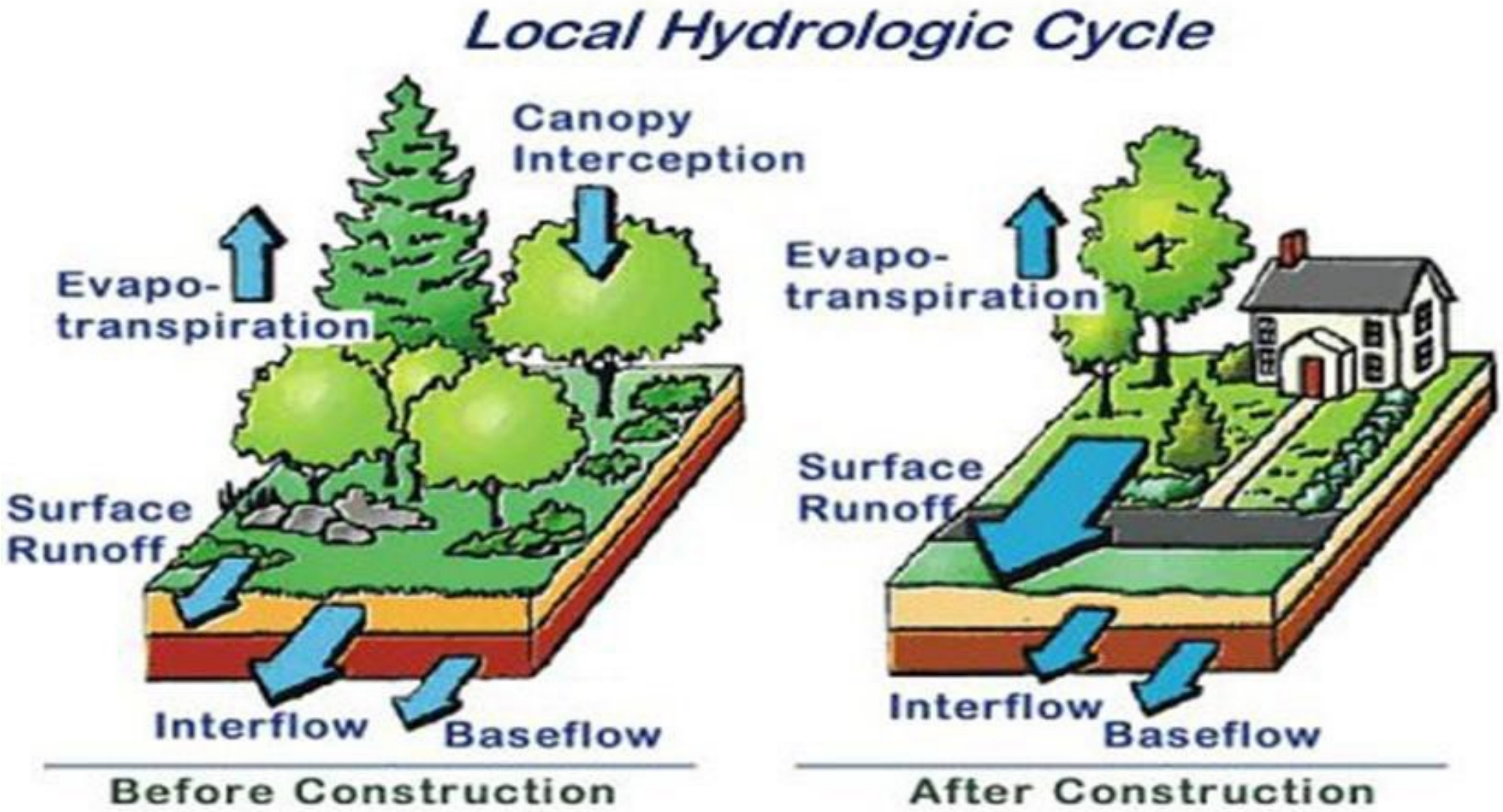
EPA United States Environmental Protection Agency

Funding for the Arlington Project is provided by the United States Environmental Protection Agency under assistance agreement 582-23-40232 to Texas Commission on Environmental Quality.

AGENDA

1. Background on watershed management
2. Project information
3. Rain garden information and design
4. Preliminary results

URBAN VS NATURAL HYDROLOGY



Bacteria Impairment *E. coli*

- Impacted by urbanization
- Pets as one of main sources

- **Impacts:**
  - Listed as impaired waters
  - Spread of disease among both humans and animals
  - Closing recreational waters
  - Cost of treating drinking water
  - Habitat degradation
  - Decline in abundance and biodiversity

Credit: USEPA

Evaluating Best Management Practices at Community Gardens in DFW

Background:

- Urban agriculture is gaining popularity
- Environmental impacts needs to be managed
- **Project purpose:** Evaluate water quality from community garden & assess impact of BMPs (Rain gardens)

Project Overview

Motivation & Objectives:

- *Aims to assess the effectiveness of implemented community gardens BMPs.*

BMP (rain garden) Effectiveness Monitoring at Community Gardens

↓

Conduct Outreach Activities for Community Gardens

↓

Estimate Pollutant Loads and Load Reductions

Data Collection and Project sites

- Automatic and /or manual samplers at three sites in DFW:
  - Owenwood farm and neighborhood space
  - Eagle Ford Community garden
  - Tarrant County Community College

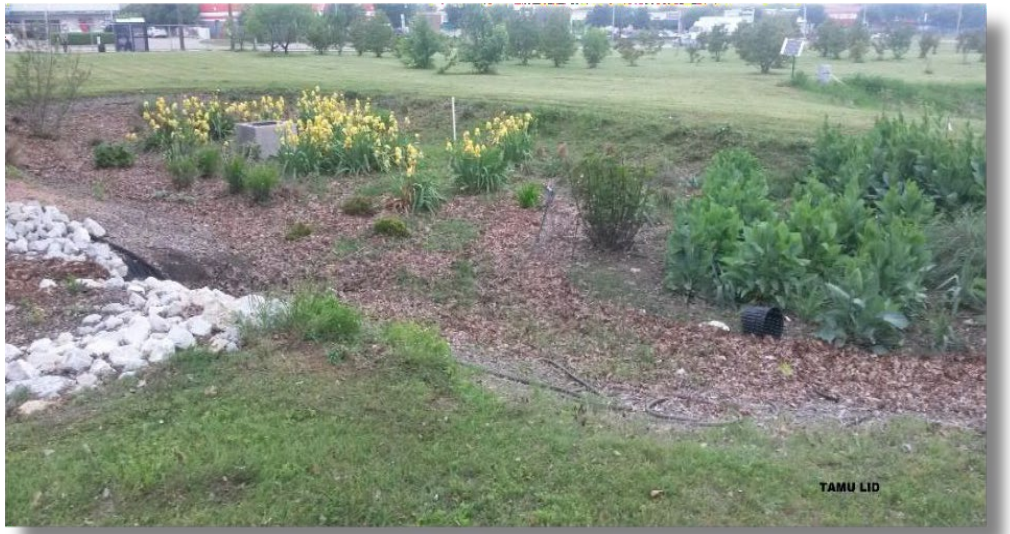
Blue-Green Infrastructure/ Nature-based Solutions

- Rain garden-bioretention areas
- Porous pavements
- Bioswales
- Rainwater harvesting

RAIN GARDEN-BIORETENTION AREAS

Rain gardens:

mulched vegetated depression designed to capture and infiltrate a portion of surface stormwater runoff



Bioretention cells:

a sophisticated rain garden, usually involving the removal of native soil that is replaced with a high infiltration engineered soil mix. Bioretention areas often include a perforated pipe midway through the total depth

RAIN GARDEN BENEFITS

- Reduce the volume and speed of water flowing into storm drains, streams, and rivers→ prevent
  flooding, erosion, and damage to natural waterways

- filters contaminants such as phosphorus, sediments, fertilizers, and other chemicals → improves water quality and the health of local ecosystems

- Support biodiversity by providing habitat for a variety of wildlife, including pollinators such as bees and butterflies

- climate resilience moderate temperature extremes in urban environments, reducing the urban heat island effect, and increasing soil moisture retention

- Aesthetic and social benefits

RAIN GARDEN DESIGN (PAGE 3 OF THE BOOKLET)

- Catchment area estimation
- Runoff volume estimation
- Volume per square foot calculation
- Calculating the size

$$\text{Runoff depth} = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

Where:

P is precipitation (inches).

$$S = \frac{1000}{CN} - 10$$

CN is the curve number.

Table 1. Curve numbers for various types of land and hydrologic groups.

Cover Type and Hydrologic Soil Group	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.)	49	69	79	84
Paved parking lots, roofs, driveways, etc.	98	98	98	98
Streets and roads:				
Paved, curbs and storm drains	98	98	98	98
Paved, open ditches	83	89	92	93
Gravel	76	85	89	91
Dirt	72	82	87	89
Urban areas:				
Commercial and business (85% impervious)	89	92	94	95
Industrial (72% impervious)	81	88	91	93
Developing urban areas: Newly graded areas (pervious areas only, no vegetation)	77	86	91	94

(Adapted from TXDOT Hydraulic Design Manual)

Hydrologic Soil Group Descriptions
A: Well-drained sand and gravel, high permeability
B: Moderate to well-drained, moderately fine to moderately coarse texture, moderate permeability
C: Poor to moderately well-drained, moderately fine to fine texture, slow permeability
D: Poorly drained, clay soils with high swelling potential, permanent high water table, claypan, or shallow soils over nearly impervious layer(s)

$$\text{Runoff volume (gallons)} = \text{Runoff depth (inches)} \times \text{area (ft}^2\text{)} \times 0.623$$

$$\text{Volume per square foot (gallons)} = \text{Water depth (inches)} \times 0.623$$

$$\text{Surface area of rain garden (ft}^2\text{)} = \frac{\text{Volume of runoff (gallons)}}{\text{Volume per square foot (gallons per ft}^2\text{)}}$$

RAIN GARDEN DESIGN (PAGE 3 OF THE BOOKLET)

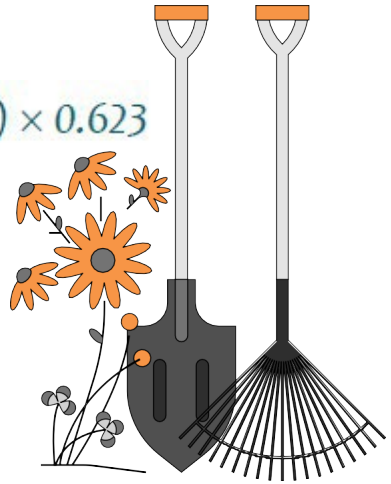
- For clay soil, use a mix of 50 percent yard waste compost, 25 percent native soil and 25 percent expanded shale (or similar material). For sandy soils, use a 50 to 75 percent native soil and 25 to 50 percent compost mix.
- Add 2 inches of mulch, preferably well-aged shredded hardwood.
- Build the rain garden to hold 6 to 9 inches of water over the top of the soil
- Assuming that the gravel and soil are 30 percent pore space, calculate the depth of water the rain garden will hold at full capacity. One and a half feet of expanded shale/clay/compost mix with a 30 percent pore space will hold 5.4 inches of water.
- Add the 6 inches of standing water on top of the raingarden soil for a total water depth of 15 inches

- Volume per square foot calculation

$$\text{Volume per square foot (gallons)} = \text{Water depth (inches)} \times 0.623$$

- Calculating the size

$$\text{Surface area of rain garden (ft}^2\text{)} = \frac{\text{Volume of runoff (gallons)}}{\text{Volume per square foot (gallons per ft}^2\text{)}}$$



Rain GARDEN Plant selection

- Plant palette has grown as rain garden soils have improved
- Natives are good
- Avoid invasives and ‘spreaders’

Raingarden plant selection for Owenwood Farm and Community Garden

Common Name	Latin Name	Texas Native	Description	
Lindheimer's Muhly	*Muhlenbergia l ind he ime r i*	Yes	Large clump grass grows 2-5 feet high in part shade to full sun conditions and is well suited many soil types. After frost the leaves turn from green to almost white with tan plumes. Trimming back after the last frost of the season is often done but not necessary.	
Texas Star Hibiscus for Halberdleaf Hibiscus	*Hibiscus coccineus*	Na tur a l ize d	A naturalized Texas perennial that grows 3-6 feet in a wide range of soils from dry to wet. However, like other hibiscus, a deep watering will help during extreme drought. The bloom resembles a red Texas star with its distinct five open pedals.	
Rock Rose	*Pavonia lasiopetala*	Yes	Rock Rose is a shrubby perennial that handles a variety of soils and sun conditions. The bright pink blooms will open in the morning and close each evening. Rock Rose has a long bloom period and an attention getter.	
Texas Lantana	*Lantana horrida*	Yes	Grows 1-3 feet with orange and yellow blooms spring to frost. Thrives is a variety of soils in part shade to full sun conditions. Trim back after last freeze of the season.	
Seep Muhly	*Muhlenbergia reverchonii*	Yes	1-3 foot clump grass that is at home in a range of soils and in the full sun. Delicate seedheads, usually white, form on slender stalks. An interesting trait of seep muhly is the curly mass of old leaf blades that form at the base ass it ages. Can be trimmed back after last frost but it's not necessary.	
Webberville Sedge	*Carex perdentata*	Yes	Webberville Sedge is one of the toughest, sun and drought tolerant sedges. Webberville Sedge grows in dry woodlands and full sun open prairies.	
Prairie Verbena	*Glandularia bipinnatifid a*	Yes	Prairie Verena is a low growing perennial that prefers dry to medium moist soils that are well drained. Purple blooms on and off spring through fall.	

RAIN GARDEN DESIGN MAINTENANCE

Rain garden is Low Maintenance…

…but not *NO* maintenance

Rain GARDEN Maintenance

- Visit site within 24 hours of 1 inch rain event (avg 11-12 /yr)
- If water is still ponded site has clogged
- Action needed
- Do this once or twice per year

Internal Erosion from poor water delivery

Plant Density

Keep it open!

EXAMPLE RAIN GARDEN MAINTENANCE TASK SCHEDULE

Task	Frequency	Maintenance Notes
PRUNING	1 – 2 times/yr	Nutrients in runoff often cause bioretention vegetation to flourish
MOWING	2 – 12 times/yr	Frequency depends upon location and desired aesthetic appeal
MULCH REMOVAL	Once every 2 – 3yrs	Mulch accumulation reduces available water storage volume. Removal of mulch also increases infil. rate
WATERING	Once every 2 -3 days for first few months. Seldom after establishment	During droughts, watering after initial year may be needed
FERTILIZATION	Once initially	
REMOVE AND REPLACE DEAD PLANTS	Once per year	>10% of plants may die, survival rates increase over time
MISCELLANEOUS	Monthly	Trash collection, spot weeding, removing mulch from overflow

Preliminary Results

Date collected	Type	TSS	TP	Nitrate + Nitrite	volume (gallon)	TSS load (gr)	TP load (gr)	Nitrite load (gr)	change in TSS Load	Change in TP Load	Change in Nitrate + Nitrite Load
2/16/2026	Owenwood Parking lot	147	0.652	0.3	4766.52	1810.54	8.03	3.69			
2/16/2026	Owenwood Rain Garden Inflow	48	0.429	4.62	6939.78	860.75	7.69	82.85			
2/16/2026	Owenwood Rain Garden Outflow	64	0.419	2.11	41.74	6.90	0.05	0.23	-99.20	-99.41	-99.73
2/16/2026	Eagle Ford Area	117	1.19	1.8	334.36	101.09	1.03	1.56			
2/16/2026	Eagle Ford Rain Garden Inflow	50	1.24	3.47	731.18	94.47	2.34	6.56			
2/16/2026	Eagle Ford Rain Garden Outflow	661	0.679	1.86	42.68	72.90	0.07	0.21	-22.83	-96.80	-96.87
2/16/2026	TCC Community garden	26	0.927	2.2	1486.74	99.88	3.56	8.45			
3/5/2026	Owenwood Parking lot	20	0.377	0.43	2.04	0.11	0.00	0.00			
3/5/2026	Owenwood Rain Garden Inflow	173	0.508	1.32	87.85	39.27	0.12	0.30			
3/5/2026	Owenwood Rain Garden Outflow	22	0.513	0.65	161.82	9.20	0.21	0.27	-76.57	86.02	-9.29
3/5/2026	Eagle Ford Area	158	1.01	1.74	0.004	0.002	0.000	0.000			
3/5/2026	Eagle Ford Rain Garden Inflow	104	0.465	4.91	71.29	19.16	0.09	0.90			
3/5/2026	Eagle Ford Rain Garden Outflow	187	0.78	5.94	79.84	38.58	0.16	1.23	101.38	87.86	35.49
3/5/2026	TCC Community garden	24	1.34	1.77	1051.09	65.18	3.64	4.81			
3/11/2026	Owenwood Parking lot	27	1.21	0.45	3492.47	243.66	10.92	4.06			
3/11/2026	Owenwood Rain Garden Inflow	19	0.349	0.57	4867.50	238.97	4.39	7.17			
3/11/2026	Owenwood Rain Garden Outflow	25	0.349	0.56	57.29	3.70	0.05	0.08	-98.45	-98.82	-98.84
3/11/2026	Eagle Ford Area				275.61	0.00	0.00	0.00			
3/11/2026	Eagle Ford Rain Garden Inflow	51	1.73	2.9	645.02	85.00	2.88	4.83			
3/11/2026	Eagle Ford Rain Garden Outflow	95	2.24	27.25	45.84	11.25	0.27	3.23	-86.76	-90.80	-33.22
3/11/2026	TCC Community garden	11	0.858	1.08	965.46	27.44	2.14	2.69			

- Three rain events when data was collected – February and March
- Overall, positive reductions across all three parameters
- One outlier on March 5th at the Eagle Ford site

Closing remarks

- Goal: Community integration and engagement with community gardeners and understand their willingness to adopt rain gardens
- The results from today will be included in the final report from the project
- Any questions or comments?

Speaker Introduction

Richard Heyes

Treasurer

Coppell Community Gardens Corporation

Garden History and Water Management
NCTCOG – August 2026

COPPELL COMMUNITY GARDEN

DONATIONS BY WEIGHT

24,973 lbs. in 2025

(400,000+ lbs. Since 1998)

CCGC's 2025 donations represented about 45% of the North Texas Food Bank Garden Network Production (17 Gardens)

CCGC is the largest bed based donation garden in greater DFW

10,000+ Volunteer Hours Completed in 2025

by **150+** Gardening Families and Local Youth

We are the largest volunteer organization in the City of Coppell

We are a social charity under IRS “supporting organization” rules

CCGC's Origins / Structure 1998-2003

- The Coppell Community Garden was organized by the Coppell City Manager and volunteers in 1998. They wanted to start a Parks and Rec sponsored recreational bed-based garden program in the City of Coppell.
- Initially, Coppell Community Garden Corporation (CCGC) was formed to operate the effort as essentially a city sponsored steering/advisory team. CCGC was originally an Ag co-operative, not a charity.
- Hope was that CCGC would be able to fund raise, reduce program cost for the City of Coppell.
- A modest corporate gift was received to fund the initial phase of two donation gardens with a total capacity of about 100 beds. Both gardens on governmental owned properties.
- The plan was to develop each garden in 3-4 phases. To add beds in incremental expansion phases as the volunteer base grew. First beds added for Spring 1998.
- In hindsight, opening multiple gardens, to be expanded in phases, was critical to our success.
- Funding from City of Coppell in the first five years was minor, under $2,000.

CCGC's Origins, cont. 1998-2003

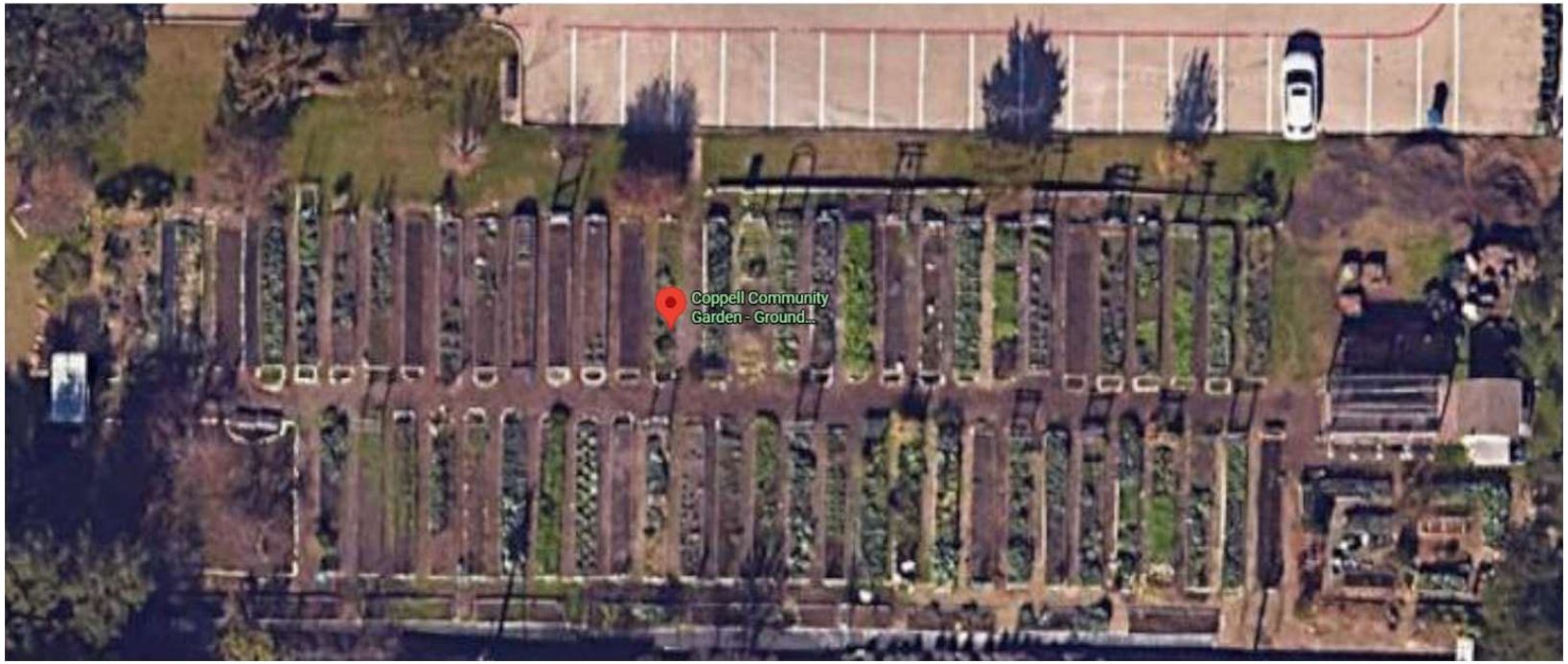
- In 2000-2001 CCGC realized that to attract significant donations, it must become truly charitable.
- CCGC worked with tax experts, found that if 85%+ of harvest was donated to a bona fide social charity, CCGC could claim charitable status as a "charitable Co-Op".
- Detailed production record keeping put in place to document 85%+ donation rates. CCGC's partnership with Metrocrest Services was expanded. Mandated gardeners donate at least 80% of their production.
- IRS granted charitable status in 2003. IRS views CCGC as an "supporting organization" to Metrocrest Services. We are considered a social charity.
- To comply with IRS rules, CCGC converted from an advisory board to a social charity structure with an independent fiduciary board, City of Coppell was required to give up control of entity. (Limited to one board seat by IRS regs.) CCGC became quasi-independent. AND SUCCEEDED.
- A critical lesson learned in 1998-2003 was that a good accountant volunteer is critical. Perhaps more than gardening experts. In hindsight having volunteers who were CPAs was important to CCGC's success in the first 5 years.

Establishing a charitable donation garden . . . other factors to consider.

- Texas statutes contain liability protections for Community Gardens. Those are maximized if one is a “fee free” community garden. Coppell Community Gardens has been fee free since its inception.
- Due to use of government-owned land, organic practices a must. One cannot apply pesticides or herbicides, due to risk of soil or water contamination.
- Under the Texas Statute related to food donation product liability, produce must be deemed “wholesome” at the time of donation to receive product liability protection. Organic practices support this.
  - With organic practices one knows donated produce is not contaminated with herbicides or pesticides.
  - Visual inspection of produce is sufficient to determine acceptable quality.
  - No lab testing required.
- Routine safety walk throughs of a community garden looking for hazards to children a must. Should be done quarterly, conditions that are potentially hazardous noted and remediated ASAP. Take pictures of conditions.
- There are risks associated with attempting to compost residential waste. Don’t do it! Food poisoning risk. May trigger the need for testing equipment to determine if produce is “wholesome”. Best to only compost materials from commercial entities. Landscapers, coffee shops, etc.
- Gardener Parking / Dump Truck Access – Should be close / Available

Helping Hands Garden

Established 1999 - 42 Beds



Ground Delivery Garden

Established 1999 - 66 Beds

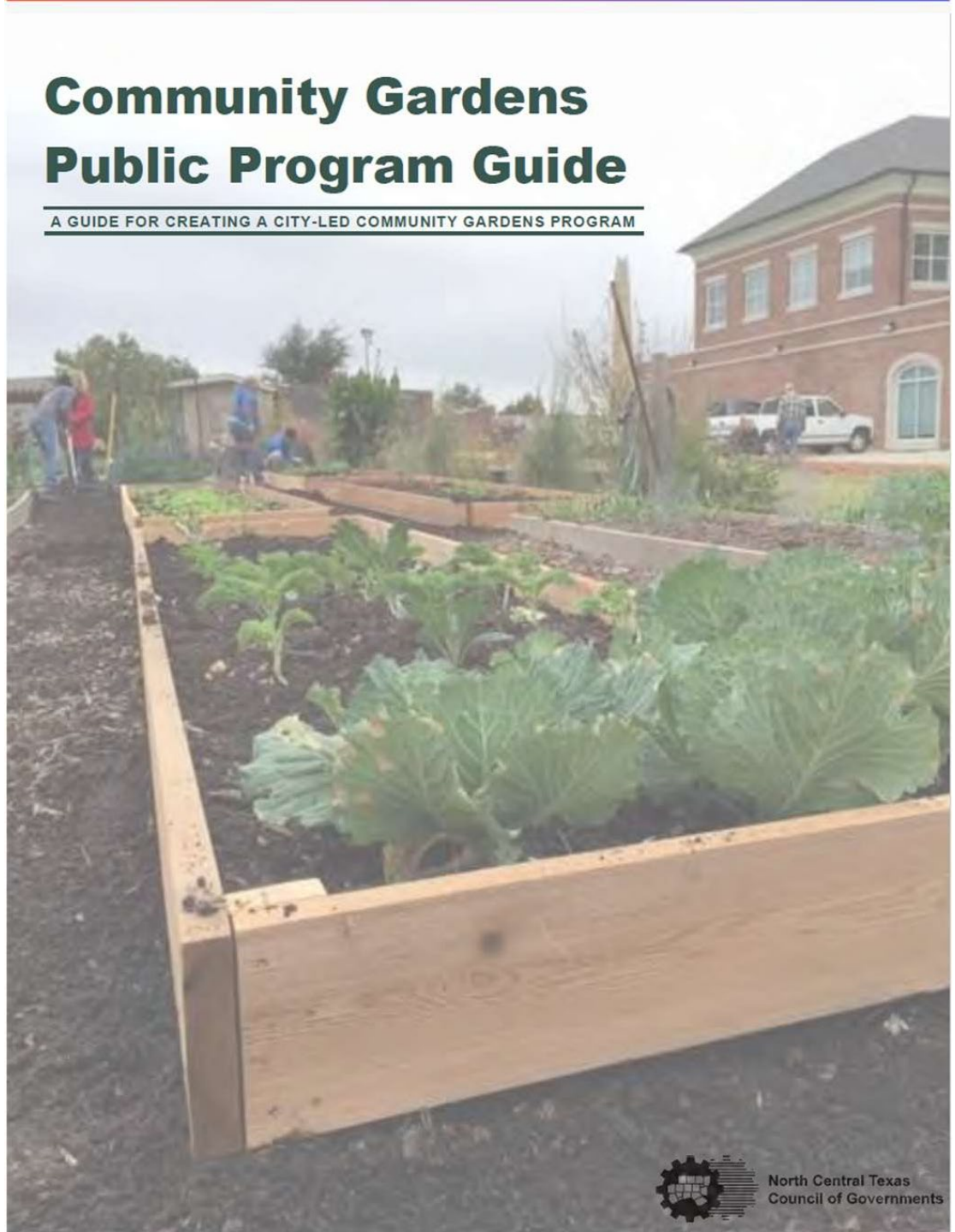
Old Town Garden & Greenhouse

Established 2017 - 43 Beds

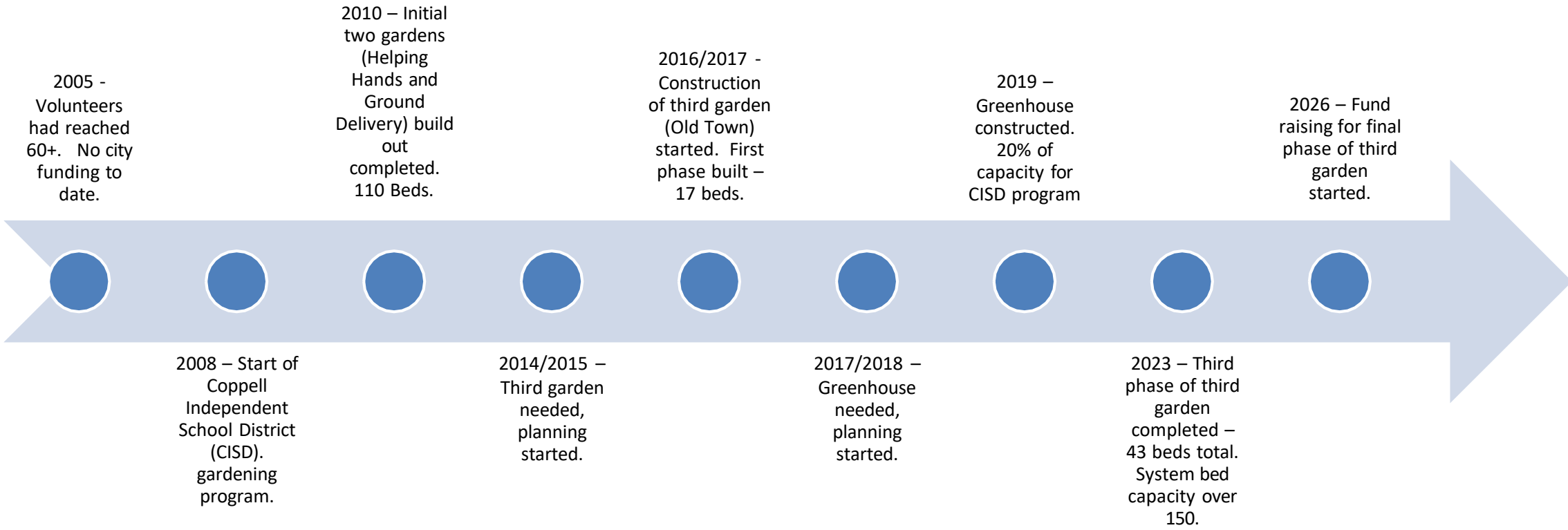
Phase 4 in 2027 will add 14 beds

Greenhouse

Our Helping Hands Garden graces the cover of NCTCOG's Community Garden Program Guide. 😀



CCGC's evolution 2005-2025 – Over $300K Funds Raised / $500K in Produce Value Donated



CCGC becomes a Municipal Recreational Gardening Program that is majority funded by donations. CCGC's approach of building multiple 45-70 bed gardens was validated with the success of our third garden. Each garden has developed a distinct culture. Gardeners pick the garden where they best fit. One is "building communities", not facilities.

Water Management at CCGC

- Water management at CCGC has a number of focus areas:
  - Garden sizing
  - Minimization of irrigation system leakage and waste.
  - Limited Chemical Use / Management of storm water run off from garden areas.
  - Allowing use of automated watering systems and drip irrigation in garden beds.
  - Selecting plants that are appropriate for the Texas climate and do not require excessive watering.
  - Mulching of orchard and other areas to reduce amount of irrigation required.
  - Rain capture systems – Limited benefit due to no large roofed structures.

Garden Sizing

- CCGC's experience is that water management issues, particularly storm water management, are easier with medium size gardens vs mega gardens.
- We chose to develop 3 gardens, each with 40-60 gardeners, vs one mega 150 gardener complex.
- Each garden maintains their own infrastructure, with a small floating team of maintenance experts who provide support system wide when needed.

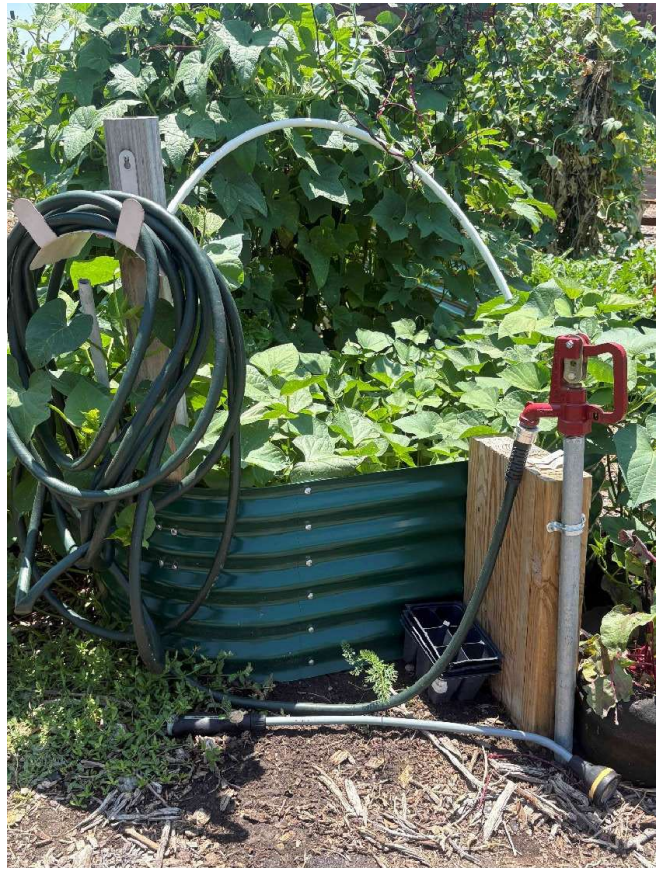
Irrigation Systems

- Irrigation systems are often an overlooked system in a community garden. They are an investment, not worth cutting corners. Heavy duty, large capacity, deeply buried, systems are a important factor!
  - Poorly built systems leak / waste water.Pipe breaks, hose breaks, leaking valves, etc. Underground pipe breaks can go a very long time without detection, result in a large loss of water.
  - Using Big Box residential irrigation components not a good idea. Use Ag grade components, and do pipe size calculations based on beds supported. Assume 1/3 of valves open for sizing calc.
  - Freeze events with poorly designed system can cause catastrophic waste of water. Properly design systems with easy, rapid freeze protection procedures, allow 3 season, 12-month gardening.
    - All our beds are planted and growing in winter. Many gardens shut down due to need to layup irrigation system.
  - Failed irrigation system in July/August can lead to loss of season harvest in a matter of days.
  - Shared valve points result in distribution hoses that are tripping hazards.

Irrigation Systems – Build it and they will come!

- For each of our three gardens we put the full underground irrigation piping and valve boxes in first. Beds installed in 3 - 4 phases over time. Faucets installed with the beds.
- Systems are designed to operate in the winter. Can be quickly laid up for winter deep freeze events.
- There should be a written procedure for deep freeze protection layup, and 2 people assigned to monitor for need to invoke it in Dec – February.
- Our experience is that each bed should have a dedicated commercial grade frost free yard hydrant.
- Yard hydrant must be firmly secured to a 4 x 4 post or other structure. Otherwise, underground connection will be stressed as gardeners yank hoses, fitting will break at point of underground hydrant/line connection and one will have water losses. That can go undetected for long periods.

Typical Hydrant Installation



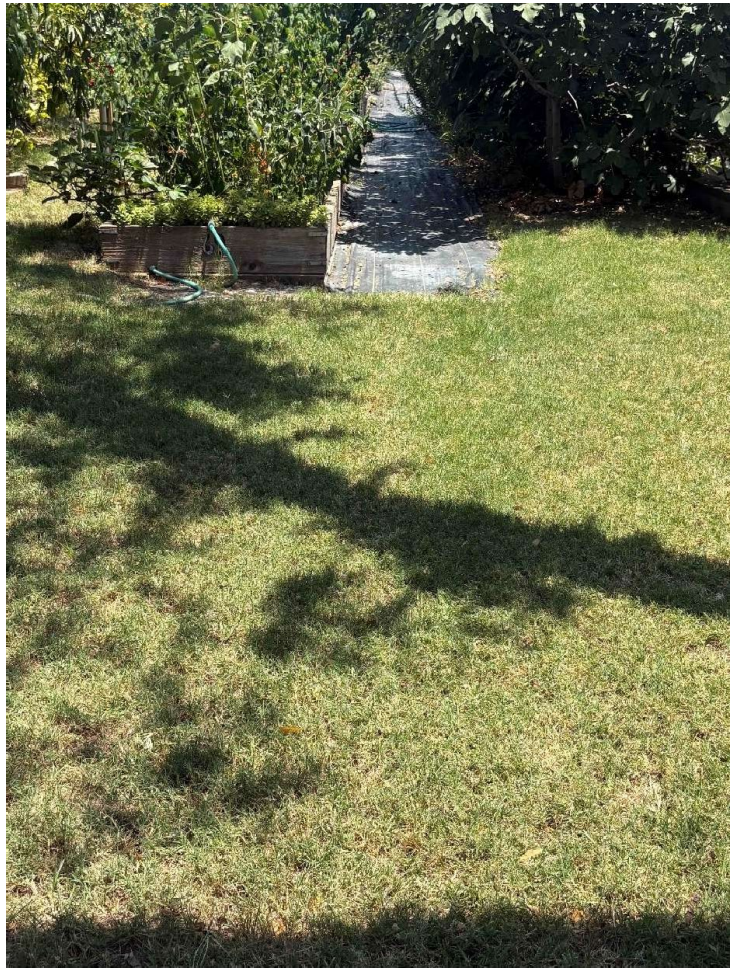
Old Town Garden & Greenhouse

Original site graphic – On “Day One” underground irrigation for all beds installed

Storm Water Runoff Management

- Gardens are like an athletic field. They need to be properly graded for drainage. Grading should be done after installation of irrigation systems.
- A garden is continuously watered, soil is almost always moist, when it rains, water runs off.
- We made an effort to have all three of our gardens drain into grassy fields. None of our storm water run off ends up in a drain. For two gardens it took years of adjustments to get drainage right.
- For one garden we had to add drainage channels to stop water from going into storm drains. These are 3 foot wide channels lined with heavy-duty landscaping cloth. Storm water drains into these channels and out into a neighboring grassy area. Work like a mini-canal.
- One may need mulch fences. If paths are mulched, and not graded properly, one can get large amounts of mulch being washed out of a garden. We just had to replace/upgrade one garden's mulch fence to improve retention of mulch during storm events. Put in an 100 foot long, 18 inch stone wall with weep holes.

Storm Water Channel / Mulch Fence



Rain Capture Systems

- CCGC put rain barrel systems on each of our garden sheds.
- Water recovered was small when compared to the garden's needs. Shed roofs not very large.
- Also, CCGC found it difficult to move water to where it is needed.
- Finally, the rain barrels would at times fill with mosquito larvae, CCGC found mosquito control difficult.
- As a result, none of CCGC's rain barrel installations receive use. A community garden probably needs more than a small shed roof to make them worthwhile.
- Two of our gardens are next to large flat roofed city owned buildings with significant rain capture potential. In theory one could put in a cistern and pump system to water a garden, but would be cost prohibitive.

Automated drip irrigation / Bed mulching

- To conserve water, we allow gardeners to install buried automated irrigation systems in their beds.
- Gardener needs some basic expertise to install.
- Generally, gardeners using these system believe they significantly reduce water consumption and significantly increase yield.
- Beds may be mulched to conserve water, but in organic gardening mulch can cause nitrogen shortage through the mulch decay. Bacteria scavenge the available soil nitrogen. If one wants to mulch for water conservation, one needs larger, slow to decay, chips from a tree chipper or similar source.

THANK YOU

Questions & Discussion

Webinar Feedback

- Please provide your feedback on today's webinar in this brief survey. Thank you!

Provide Webinar Feedback Here

Water for North Texas Online Library

- Resources related to today's topic and other water-related subjects can be found on the Water for North Texas Online Library

Wrap-Up

- If you have submitted an RSVP for this webinar, you will receive an email with the presentation slides and a link to the recording.
- All webinar slides and recordings are posted on NCTCOG's website under the green banner, "Webinars" here:
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North Central Texas Council of Governments

Thank you for attending!

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August 25, 2026

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EPA United States Environmental Protection Agency

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

North Central Texas Council of Governments
Environment & Development

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