



HEADWATERS
AT THE COMAL™

Put a LID on it: Low-Impact Development to Reduce Runoff in New Braunfels

Nancy Pappas – Managing Director, Headwaters at the Comal

Jack Downey – Programs and Restoration Coordinator, Headwaters at the Comal

Helen Salama Olivarez – Project Water Engineer, Arcadis

AGENDA

Introductions

Need for Sustainable Development in New Braunfels

Community Engagement

Low Impact Development at Home

Low Impact Development in the Community

Local Resources and Opportunities to Engage



HEADWATERS
AT THE COMAL™



NEED FOR SUSTAINABLE DEVELOPMENT IN NEW BRAUNFELS



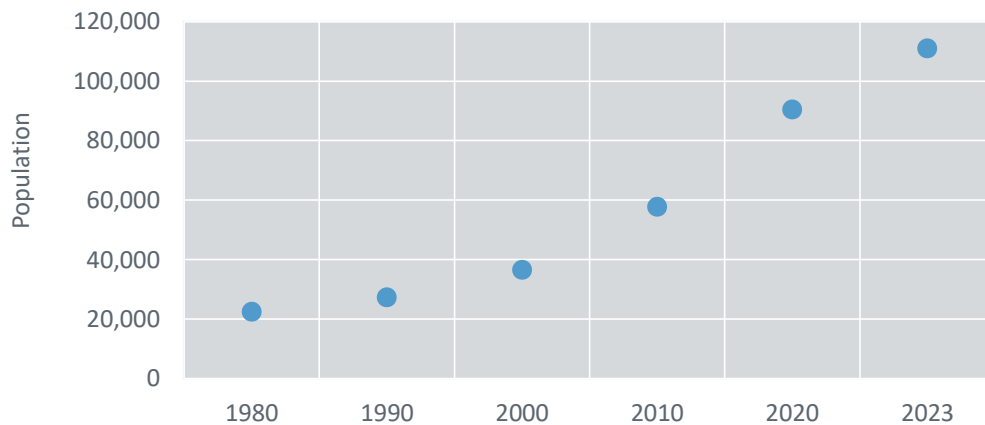
HEADWATERS
AT THE COMAL™

NEW BRAUNFELS HAS BEEN EXPERIENCING RAPID DEVELOPMENT

The New York Times

How This Texas Town Became One of America's Fastest-Growing Cities

Known for its German roots and its world-famous water park, New Braunfels, Texas, in the thriving corridor between San Antonio and Austin, grew 56 percent over the past decade.

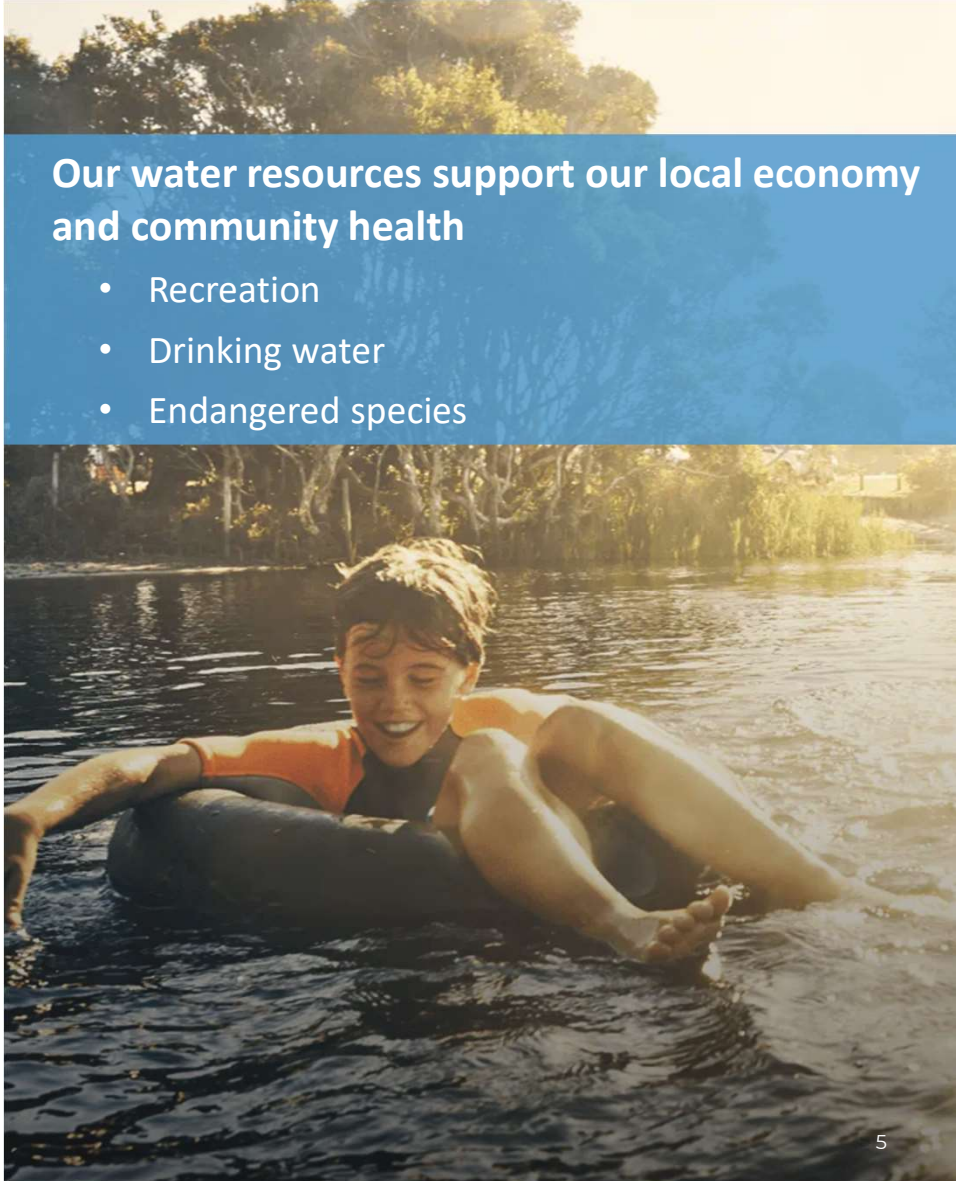


HEADWATERS
AT THE COMAL™



RAPID DEVELOPMENT IS IMPACTING OUR WATER RESOURCES

- Stressed water supplies
 - Additional use
 - Slower recharge
- Increased flash flooding
- Increased degradation of surface water bodies
- Water contamination due to stormwater runoff



Our water resources support our local economy and community health

- Recreation
- Drinking water
- Endangered species

LOW IMPACT DEVELOPMENT (LID) OR GREEN INFRASTRUCTURE CAN HELP!

Reduce stormwater runoff by collecting or allowing infiltration of stormwater before it leaves a site

1. Improve Water Quality

- Filter contaminants

2. Maintain Water Supply

- Allow for infiltration to replenish groundwater

3. Reduce Onsite Water Usage For Irrigation

- Improve sustainability
- Lower cost of living
- Reduce need for additional water supplies

4. Mitigate Localized Flash Flooding

- Reduce Erosion
- Slow the Flow of Stormwater





COMMUNITY ENGAGEMENT

ENGAGEMENT – COMMUNITY PARTNERSHIPS

Headwaters at the Comal

- 16-acre site at the headwaters to the Comal River
- Rejuvenation underway to restore the site
- Innovative, nature-oriented community space
- Led by a local nonprofit focused on conservation

Meeting people where they are in their journey to connecting with nature



Educate &
Demonstrate



Create
Community



Protect &
Conserve



Partner in
Research



Community Steering Committee



HEADWATERS
AT THE COMAL

Nancy Pappas
Managing Director

Jack Downey
Programs and Restoration Coordinator



Board Members
Comal County



Matthew Eckmann
Assistant Director of Public Works



Robin Gary
One Water Coordinator

ENGAGEMENT – COMMUNITY PARTNERSHIPS

Inspiring Community Mindset to **Sustainable** Development

Development of a
tailored LID
Guidance Manual



Community
ambassador training



LID demonstration
project

- Include under resourced communities in outreach and education
- Plan and offer solutions considering affordable and accessible solutions
- Train local workforce on LID implementation and maintenance
 - Small and HUB businesses
 - Technology center students
 - Community leaders
 - Habitat for Humanity
- Pilot a demonstration LID Solution



HEADWATERS AT THE COMAL LOCAL OUTREACH

Connecting community to nature and showcasing the significance of the Comal Springs

2023 YEAR IN REVIEW

THE CENTER AT HEADWATERS IS UNDER CONSTRUCTION!



HEADWATERS
AT THE COMAL™



seam
SCIENCE • ENGINEERING
ART • MATH

10 SEAM PROGRAMS
106 PARTICIPANTS

4 SPRING AND SUMMER CAMPS



22 FIELD TRIPS
852 YOUTH

2,474

VISITORS

566

EARTH DAY ATTENDANCE

71 ACTIVE VOLUNTEERS

2,870 HOURS
OF SERVICE



1,145	MAINTENANCE
944	EDUCATION AND OUTREACH
92	TRAINING
689	COMMUNITY SCIENCE

265

INDIVIDUAL DONORS

\$2.2M

AMOUNT RAISED

BECOME A COMAL COUNTY LID AMBASSADOR

- Connect with Headwaters at the Comal info@headwatersatthecomal.org
- Sign-up to become a Facilitator for the LID Workshop
- Implement a LID project at your home or business
- Offer your customers LID solutions

Share your story and photos with the Headwaters to be featured on their new LID Ambassador page!





LOW IMPACT DEVELOPMENT AT HOME



HEADWATERS
AT THE COMAL™

LID EVALUATION

INVESTMENT

- Equipment utilized
- Installation costs
- Maintenance costs

MEASURABLE IMPACT OR WATER SAVINGS

- Calculated water savings based on
 - TWDB data
 - Waterwise Landscape Potable Water data
 - Gallons saved

INVESTMENT:
COST, SAVINGS, MAINTENANCE:

LOW

MED

HIGH



LID AT HOME OVERVIEW

LID SYSTEMS AT THE HOME LEVEL

- Rain barrel
- Rain Garden Planter
- Rain Garden
- Xeriscaping
- Drought Tolerant Plants List
- Ribbon Driveway

TOPICS COVERED

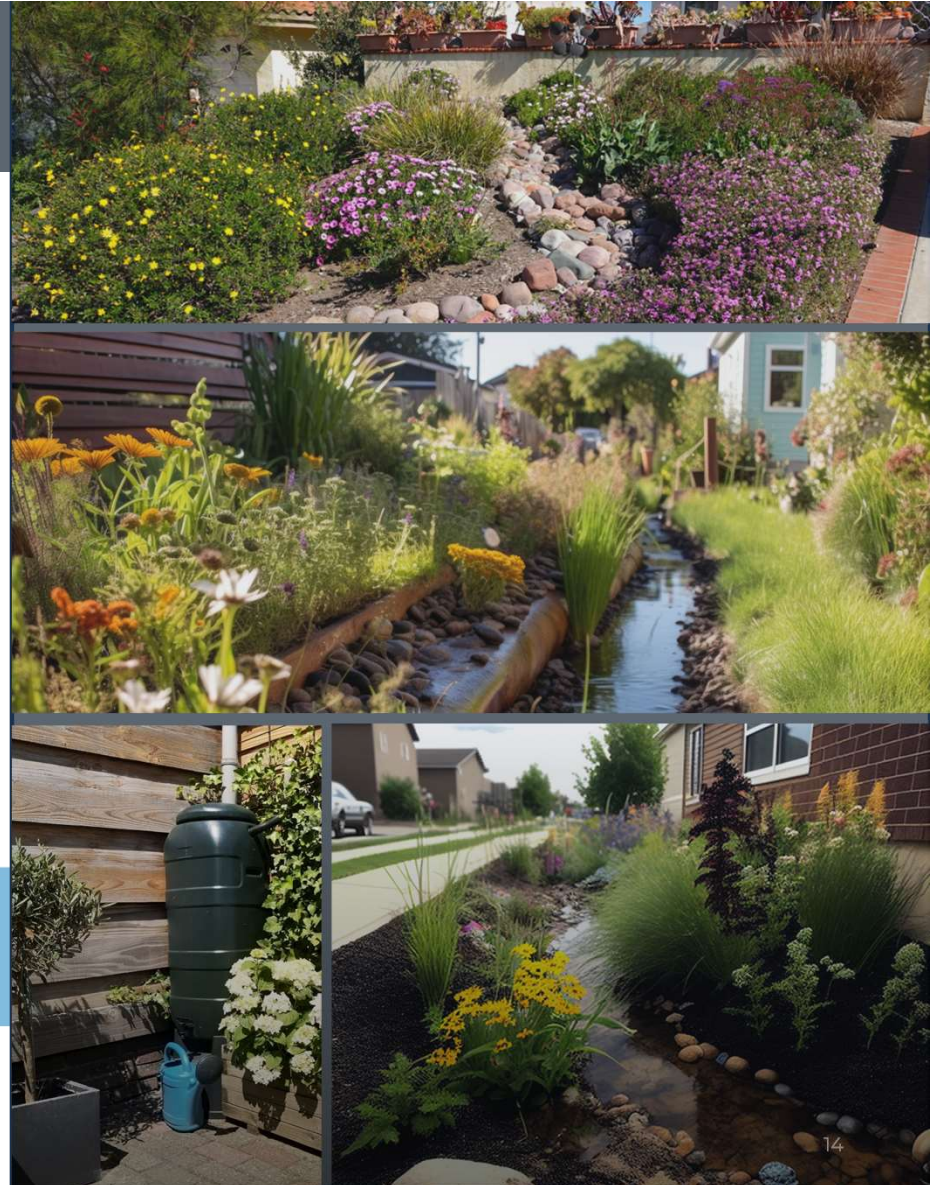
- Benefits
- Initial Investment
- Measurable Impact
- Keys to Success - “How-to steps”
- System Upkeep

INVESTMENT:
COST, SAVINGS, MAINTENANCE:

LOW

MED

HIGH



LID AT HOME

2,000 sq. ft. (.05 acre) Home on an 8,000 SF (.18 acre) Property

Goal: Increase pervious cover and decrease stormwater runoff

Today, it might look like this:



Impervious cover

Carpet grass requiring lots of water!

Runoff

Stormwater runoff floods our neighborhoods and carries pollutants into our waterways

Using LID, it could look like this:



1. Rain Barrel
2. Rain Garden Planter
3. Rain Garden
4. Xeriscaping with Native Drought-Tolerant Plants
5. Ribbon Driveway

RAIN BARREL

INVESTMENT:
COST, SAVINGS, MAINTENANCE

LOW

MED

HIGH

Capture water from the roof through a gutter system and store it for later use (e.g., watering lawns, gardens)

BENEFITS

- Reduce runoff
- Conserve potable water
- Reduce water bills
- Improve water quality

INITIAL INVESTMENT

L

~\$200 per 50-gallon barrel

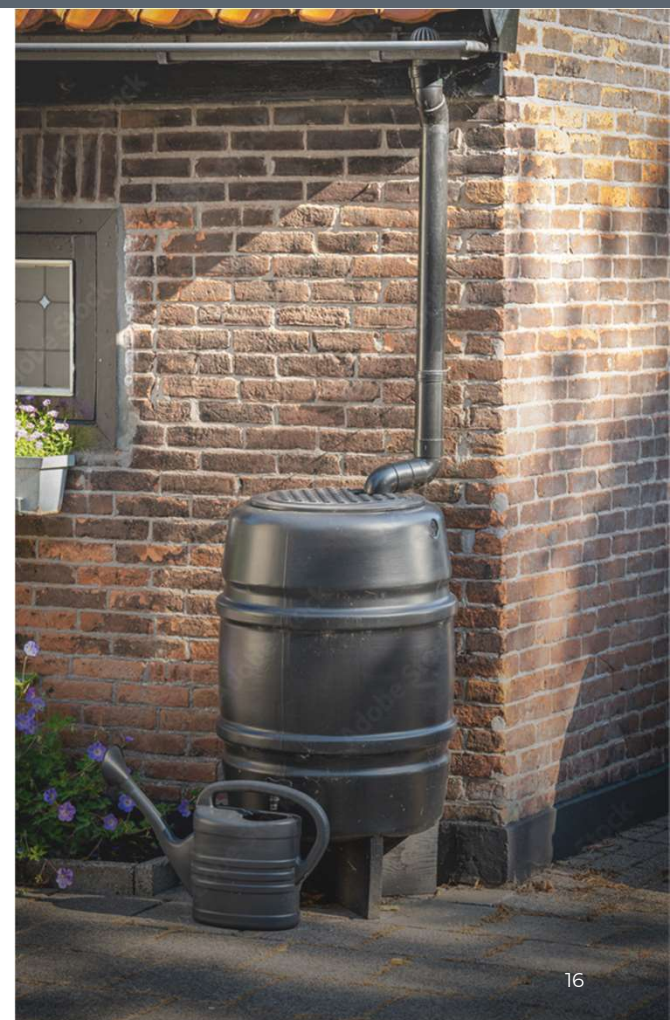
MEASURABLE IMPACT

L

~4,000 gal/year stormwater runoff
~2,500 gal/year drinking water or \$30/year

KEYS TO SUCCESS

- Elevate at least 6 inches (higher for pressure) on a level surface
- Utilize barrels in series for additional capacity
- Use opaque or painted materials to block light
- Install gutter guards/screens to block debris and prevent mosquitos
- Design overflow systems that prevent erosion/flooding
- Consider a slow-release valve or attaching a soaker hose



XERISCAPING

INVESTMENT:
COST, SAVINGS, MAINTENANCE

LOW

MED

HIGH

Drought-tolerant and native plants, mulch, and rocks that reduce or eliminate the need for irrigation

BENEFITS

- Reduce runoff / improve recharge
- Conserve water
- Reduce water bills
- Improve water quality
- Reduce maintenance
- Provide habitat
- Improved aesthetics

INITIAL INVESTMENT

M

~\$10,000 for front yard conversion at 1,400 sq. ft.

QUANTIFIED IMPACT

M

~30,000 gal/year potable water or
~\$300/year

KEYS TO SUCCESS

- Install native and drought-tolerant plants
- Aim for at least half coverage with plants (at full maturity)
- Use organic material and compost to improve soil condition
- Use mulch to keep the soil from compacting
- Avoid plastic weed liners that prevent infiltration



BEAUTIFUL DROUGHT-TOLERANT PLANTS FOR CENTRAL TEXAS

- **Native plants**
- Naturally occurring in a specific region, without human involvement
- **Drought-tolerant plants**
- Able to survive in the local landscape with less water than typical plants
- **Why?**
- Reduce irrigation water use by 20% to 50%
- Deeper roots allow plants to access deep soil moisture and often these plants do not require supplemental watering

Planting Information

[Link \(from New Braunfels Utilities\)](#)



Texas Gold Columbine



Blackfoot Daisy



Century Plant



Texas Lantana



Cape Plumbago



Salvia Greggii



Mexican Turk's Cap



Lindheimer Muhly



Texas Sage



HEADWATERS
AT THE COMAL™

Fundamentals of Xeriscaping

What is Xeriscaping? Literally, the word comes from the combination of two words "xeri" derived from the Greek word "xeros" for dry and "scape," meaning a view or scene. It translates to mean "dry scene."

It simply means landscaping with slow-growing, drought-tolerant plants to conserve water and reduce yard trimmings. It doesn't mean "no water" and it doesn't mean you can only plant cactus.

Texas has a limited supply of water, subject to ever-increasing demands. Xeriscaping fundamentals are an important way to immediately show cost savings through lower water bills. Xeriscaping can also reduce the amount of plant trimmings which must be disposed of or otherwise managed, thereby helping the community save resources. It means less work for the homeowner!



Guest columnist Bob Fitzsimmons is a Texas Master Certified Nurseryman, landscape designer, organic specialist, Texas native plant grower, and 20-year radio host in New Braunfels on KGNB and KNBT radio. He has answered garden related questions for New Braunfels and the surrounding Comal County for many years and is the owner of Southernwood Gardens in New Braunfels.

When planning your Xeriscape, use the following seven fundamentals:

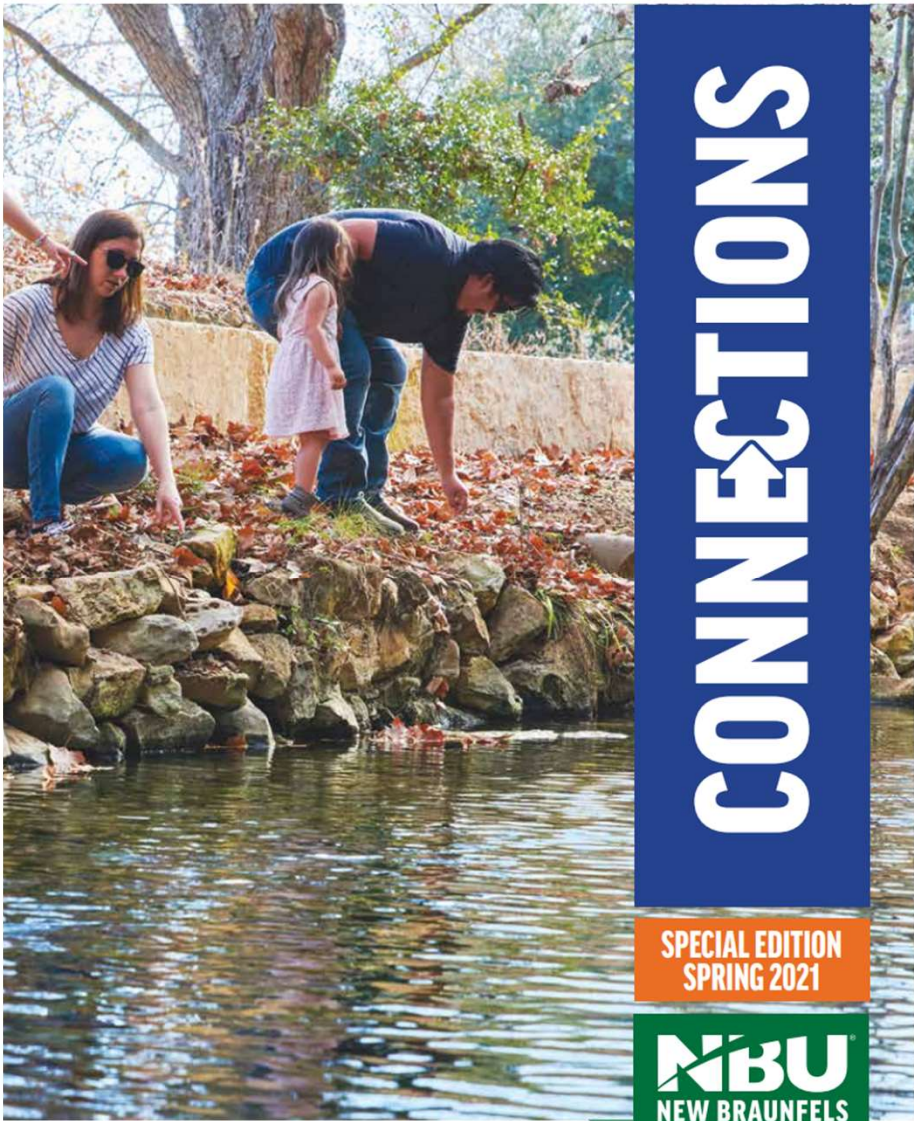
- 1 Plan and design for water conservation.
- 2 Use natural amendments, like compost, to feed and condition soil as needed.
- 3 Irrigate efficiently with a properly-designed irrigation system, including hose end equipment. Water the right amount at the right time.
- 4 Use mulches to reduce evaporation and keep the soil cool. Native Cedar Mulch from the local area is the best choice.
- 5 Create practical turf areas of manageable size. Choose the right turf for the area.

- 6 Select plants with low water requirements and group plants with similar water needs together. While indigenous plants are naturally accustomed to local climates, xeriscaping does not mean planting Texas native plants only. One could draw from many colorful, drought-tolerant plants native to Mediterranean climates such as Southern Europe, South Africa, and Australia. Using native and adapted plants reduces the need for fertilizers and pesticides.

- 7 Maintain the landscape properly by mowing, weeding, pruning, and fertilizing with slow release natural fertilizer.



Remember that xeriscaping conserves water and saves valuable landfill space.



CONNECTIONS

SPECIAL EDITION
SPRING 2021

NBU
NEW BRAUNFELS
UTILITIES



RESIDENTIAL CASE STUDY

Waller Creek Watershed
Austin, Texas

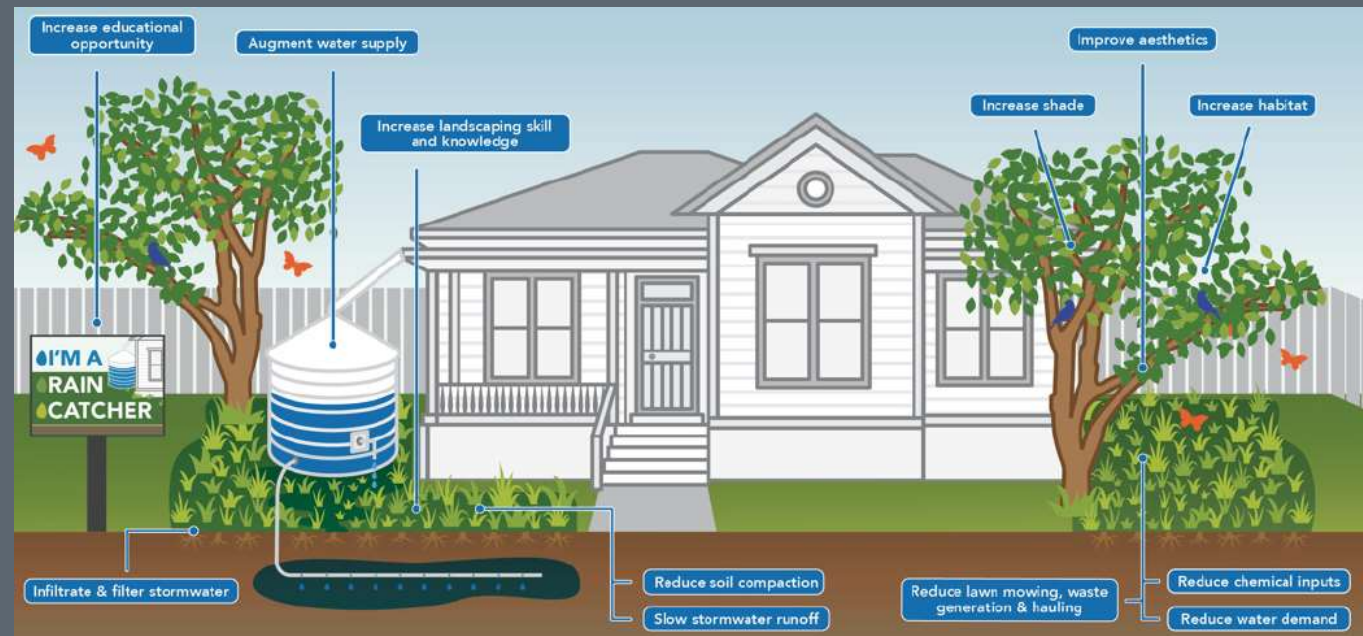


Over 25 homes participated

- Rain garden
- 1,000-gallon rain barrel
- Shade tree installations
- Native landscaping

Benefits

- Saved ~4,000 gal/year of water
- Reduced runoff
- Minimized contamination



HEADWATERS
AT THE COMAL™



LOW IMPACT DEVELOPMENT IN THE COMMUNITY



HEADWATERS
AT THE COMAL™

LID IN THE COMMUNITY OVERVIEW

LID SYSTEMS AT THE HOME LEVEL

- Green roof
- Rainwater harvesting
- Porous pavement
- Bioswales and filter strips
- Bioretention / biofiltration basin

TOPICS COVERED

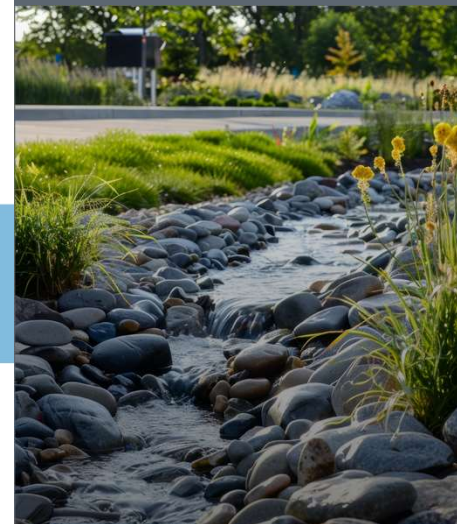
- Benefits
- Initial Investment
- Measurable Impact
- Keys to Success - “How-to steps”
- System Upkeep

INVESTMENT:
COST, SAVINGS, MAINTENANCE:

LOW

MED

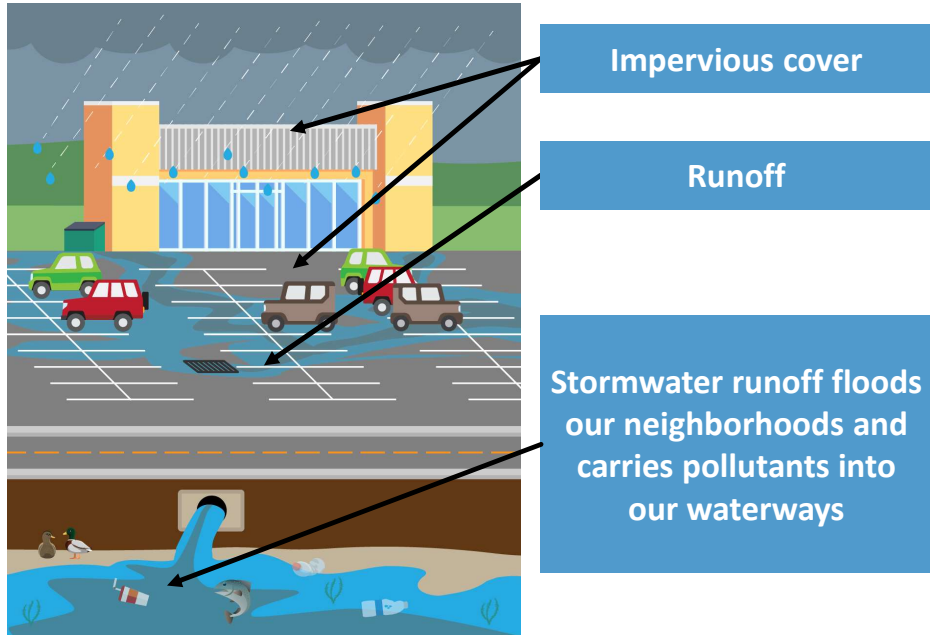
HIGH



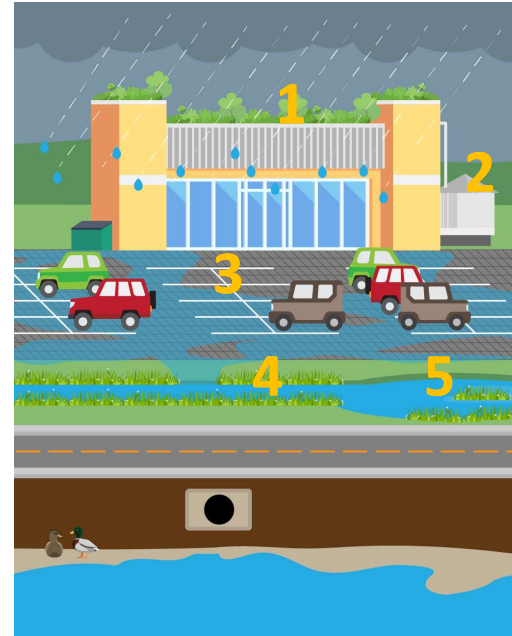
LID IN THE COMMUNITY

90,000 sq. ft. Building on a 20.6 acre Property with a 5 acre Drainage Area

Today, without LID it could look like this:



Instead, with LID it could look like this:



1. Green Roof
2. Rainwater Harvesting
3. Pervious Pavement
4. Bioswale/Filter Strip
5. Bioretention/
Biofiltration Basin

RAINWATER HARVESTING

INVESTMENT:
COST, SAVINGS, MAINTENANCE

LOW

MED

HIGH

Capture water from the roof and store it for later use (e.g., watering landscape)

BENEFITS

- Reduce runoff
- Conserve water
- Reduce water bills
- Improve water quality
- Low land/space requirement
- Provides site harvested water supply

INITIAL INVESTMENT

L

~\$20,000 per 10,000-gallon

QUANTIFIED IMPACT

M

~800,000 gal/year
stormwater runoff

~450,000 gal/year potable water or
\$5,000/year

KEYS TO SUCCESS

- Generally, installed by a contractor and requires site-specific design
- Includes pumping and conveyance equipment
- Requires an overflow system, backflow prevention, and gutter leaf screens



BRING LID TRAININGS TO YOUR COMMUNITY!

- Partner with a local utility or environmental orgs
- Identify technical expertise for LID content development
- Select passionate leaders to present at community workshops
- Focus on 3-4 groups or organizations for outreach presentations
- Provide practical next steps for engagement beyond workshop attendance
- Track workshop facilitator interest and showcase success stories online



GENERATE PARTNERSHIPS AND GATHER LOCAL EXPERTISE

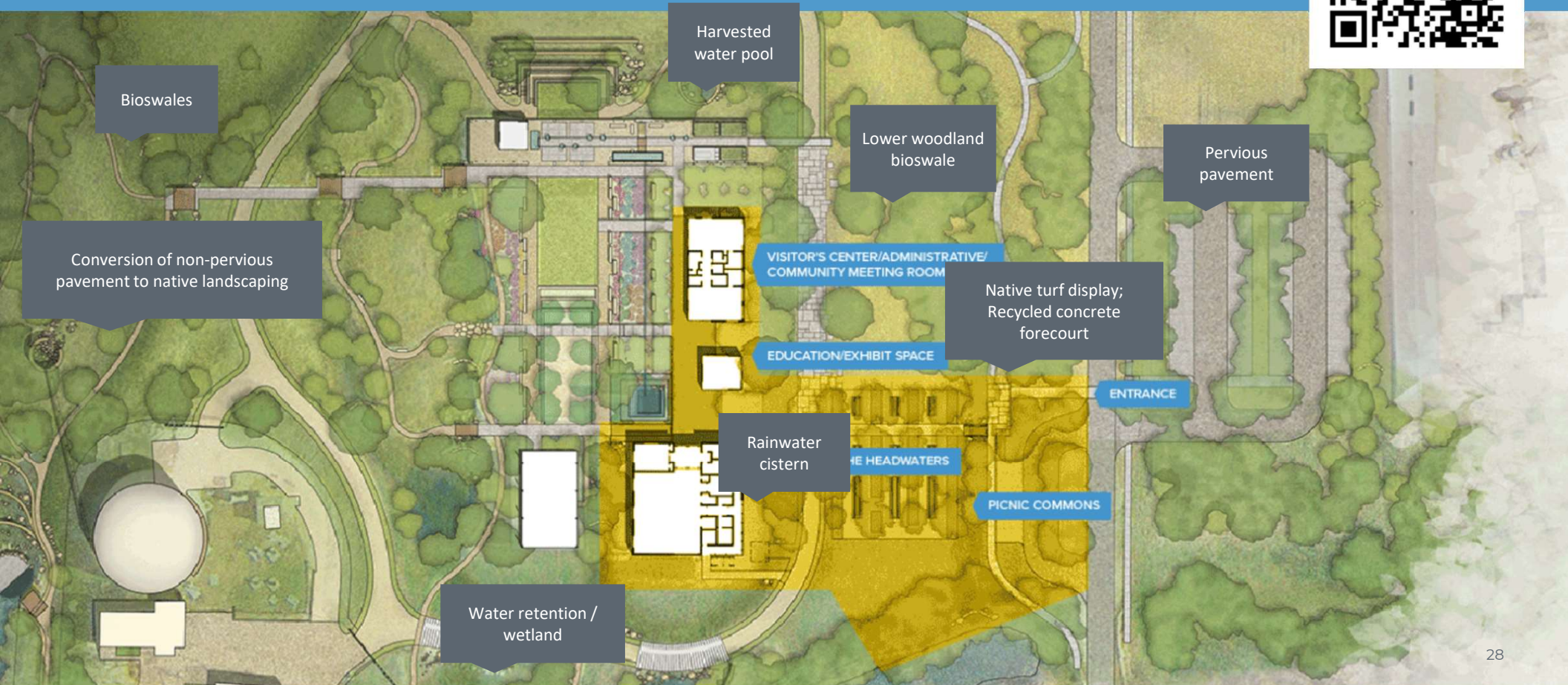




CASE STUDY

Headwaters Facility
New Braunfels, Texas

View the video:
headwatersatthecomal.com/our-vision/master-plan/



LOCAL RESOURCES AND OPPORTUNITIES TO ENGAGE



NBU REBATES AND LOCAL RESOURCES

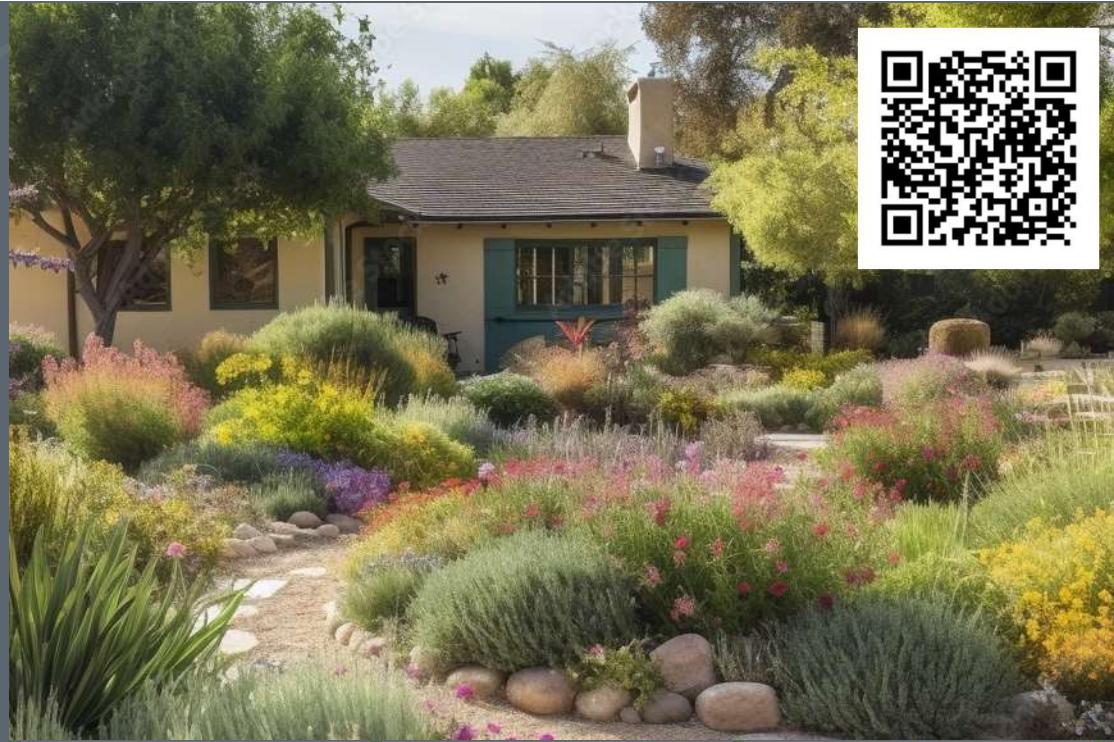
- Healthy Soil
- Grass Removal
- Irrigation Zone Removal
- Rain Barrel/Cistern
- Drought-Tolerant Trees
- Comal County Gardening Guide

Future Rebate Opportunities on the NBU Horizon

- Irrigation Assessment Rebates
- Customizable Water-Wise Landscape Rebates
- Landscape Water Transformation Program

Education on Local Resources

- Drought Ordinance
- City Regulations



Water Stage Information



Drought Planning



Watering Conservation
and Resources



Schedule a Free
Assessment



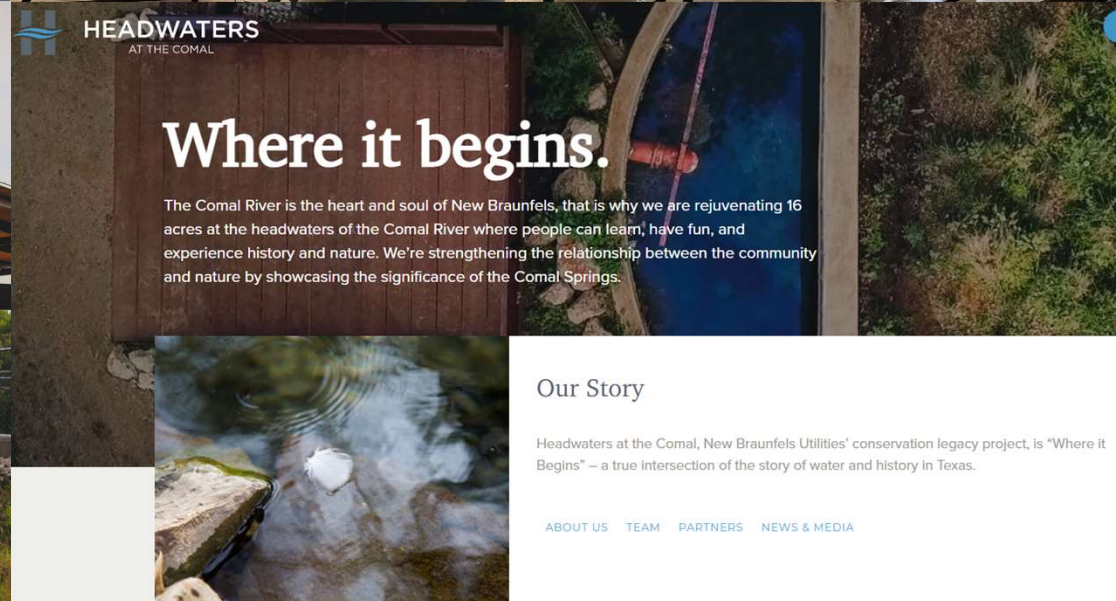
Report a Watering
Violation



Leak Detection Checklist

WAYS TO ENGAGE

- Sign up for updates
- Volunteer
- Schedule a Visit
- Become a Member
- Take a Program Workshop
 - Rain Barrel Workshop
 - Native Plant 101



IMPLEMENTATION OF LID WILL ALSO MAINTAIN NEW BRAUNFELS' POSITION AS A WATER STEWARDSHIP LEADER!

- By valuing water at all phases of the urban water cycle, One Water combines many approaches like LID to:

“ensure the treasured local waters of New Braunfels remain celebrated, sustainable, and protected features of our community for generations”



THANK YOU! ANY QUESTIONS?

Nancy Pappas

Managing Director Headwaters at the Comal
npappas@headwatersatthecomal.org | 830.608.8828

Jack Downey

Programs and Restoration Coordinator
Headwaters at the Comal
jdowney@headwatersatthecomal.org | 830.608.8927

Helen Salama Olivarez P.E., ENV SP

Project Water Engineer at Arcadis
helen.salama@arcadis.com | 512.527.6062



We Plan for a Resilient **One Water Future.**
We Implement **One Water Strategies.**
We are Visioning the **Future of One Water.**



REFERENCES

Rain Barrel

1. Town of DeWitt. (2015). A Guide To Rain Barrels. https://efc.syr.edu/wp-content/uploads/2015/11/DewittRainBarrelBrochure_6.12update.pdf
2. New Braunfels Utilities. (2021). How to Make a Rain Barrel? <https://www.youtube.com/watch?v=ivJ7fdWSwjM>
3. Southwest Florida Water Management District. Rain Barrels: A Homeowners Guide. https://www.swfwmd.state.fl.us/sites/default/files/store_products/rain_barrels_guide.pdf

Rain Garden

4. Austin Water. Earth-wise guide to Rain Gardens. Keeping Water on Land. https://www.austintexas.gov/sites/default/files/files/Watershed/growgreen/raingarden_factsheet.pdf
5. Western New York Stormwater Coalition. Rain Gardens: A How-To Guide. (2021). https://www3.erie.gov/dsm/sites/www3.erie.gov/dsm/files/2021-07/rain_garden_booklet.pdf
6. Luo, Q., Hillock, D., Holmes, M. (2017). Sustainable Landscapes: Designing a Rain Garden for Residential Property. <https://extension.okstate.edu/fact-sheets/sustainable-landscapes-designing-a-rain-garden-for-residential-property.html>
7. Jaber, F., Woodson, D., LaChance, C., York, C. (2013). Stormwater Management: Rain Gardens. https://watersmart.tamu.edu/files/2013/05/Stormwater_rain-gardens_AgriLife.pdf
8. United States Environmental Protection Agency. (2008). Using Rain Gardens to Reduce Runoff – Slow it down, spread it out, soak it in! <https://www.epa.gov/watershedacademy/using-rain-gardens-reduce-runoff-slow-it-down-spread-it-out-soak-it>
9. University of Massachusetts Amherst. (2024). Rain Gardens: A Way to Improve Water Quality. <https://ag.umass.edu/landscape/fact-sheets/rain-gardens-way-to-improve-water-quality>

REFERENCES

Xeriscaping with Native Drought-Tolerant Plants

10. New Braunfels Utilities. (2024). Drought Contingency Plan.
<https://www.nbutexas.com/drought-planning/>
11. Peterson, M. (2022). The Zen of Xeriscape.
<https://www.gardenstylesanantonio.com/garden-tips-blog/the-zen-of-a-xeriscape/>
12. New Braunfels Utilities. (2021). Fundamentals of Xeriscaping.
<https://www.nbutexas.com/wp-content/uploads/2021/03/21-15310-Connections21x925-WebResSpreads.pdf#page=3%22>

Case Study

13. Diringer, S., Shimabuku, M., Cooley, H., Gorchels, M., Walker, J., Leurig, S. (2019). Scaling Green Stormwater Infrastructure Through Multiple Benefits in Austin, Texas: Distributed Rainwater Capture on Residential Properties in the Waller Creek Watershed.
https://pacinst.org/wp-content/uploads/2020/06/Scaling-Green-Stormwater-Infrastructure-Through-Multiple-Benefits-in-Austin-Texas_Pacific-Institute_June-2020.pdf