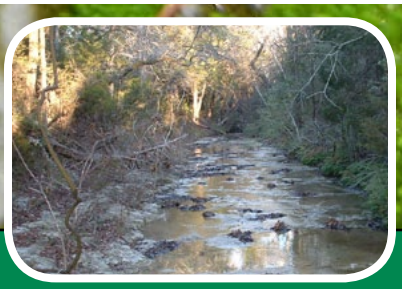

The City of Austin

State of Our Environment

Report

Photo by David Johns

2012

Prepared for

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June 2013

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Sustainability Portal
www.austintexas.gov/sustainability

What is Sustainability?

Sustainability means finding a balance among three sets of goals:

1. Prosperity and jobs
2. Conservation and the environment
3. Community health, equity, and cultural vitality.

It means taking positive, proactive steps to protect quality of life now, and for future generations.

Foreword

Welcome to Austin's State of Our Environment Report for 2012. It was another active year on the environmental front in Austin, again dominated by lack of rainfall. I think the following pages reflect the significant activity by the City to preserve and protect Austin. This past year the City adopted Imagine Austin, a new comprehensive plan for Austin that defines where we are today and paints a picture of where we want to go in the future. The plan outlines a vision of Austin as natural and sustainable: "Austin is a green city. We are environmentally aware and ensure the long-term health and quality of our community through responsible resource use as citizens at the local, regional, and global level." As we move forward with implementation of the plan, the State of Our Environment report will help to track key indicators related to water quality, air quality, and green infrastructure.

I hope you enjoy this year's report,

As Austin's quality of life and thriving economy continue to attract new population, we must find creative ways to balance competing demands. While growth brings economic prosperity and a strong tax base, it also creates a burden on sensitive water and land resources. From the information assembled in this report, we can begin to see that continuing pressure from drought and population growth can negatively impact sensitive water and air quality, as well as ecological systems that include urban forests and critical habitat.

Austin's investment in protecting our environment helps to assure that our residents continue to enjoy a high quality of life. This in turn helps to attract new businesses and jobs. I would like to express my admiration and appreciation to the many staff who contributed to this report. The City of Austin is proud to have an impressive array of scientists and subject matter experts who help us to deepen our knowledge of the resources of which we are the stewards.

Creeks

Importance

Creeks flow into our drinking water reservoirs, are critical habitat for aquatic life and provide recreational opportunities for people. The health of Austin's creeks and riparian areas adjacent to creeks is a direct measure of our success in managing land resources and protecting the environmental health of our community.

Goals

One of the City's broad environmental goals is to protect and improve the quality of water in our creeks. A specific goal of the Watershed Protection Department is to maintain Environmental Integrity Index scores of "good" or better in all monitored creeks.

Challenges and Responses

Ongoing

Encroachment by development, loss of bank vegetation, increased impervious cover (with associated increases in stormwater runoff), leaking wastewater infrastructure, uncollected pet waste, and improper fertilizer use all result in degradation of water quality. These threats can result in creeks that are not safe for human contact, are choked with nuisance aquatic plants, have unstable, eroding stream banks, and have low dissolved oxygen levels that impact fish. The Watershed Protection Department addresses these problems through a combination of solutions, including public education, regulations, programs, restoring riparian areas, controlling invasive plant species, and capital improvement projects. Learn more at www.austintexas.gov/watershed

This Year

Specific challenges to creek health and City actions in 2012 included:

- In January 2011, City Council requested that staff develop a new ordinance to improve creek and floodplain protection; prevent unsustainable public expense on drainage systems; simplify development regulations where possible; and minimize the impact on the ability to develop land. The effort is the first of its kind since the City's Comprehensive Watershed Ordinance was enacted in 1986. Staff met with both external and internal stakeholders from August 2011 to April 2012 to discuss potential code changes stemming from an analysis of current code deficiencies and needs prepared in 2011. From the input received in these meetings, staff worked with the Law Department to develop draft ordinance revisions. These revisions will be presented to the stakeholder community in 2013 and will ultimately be presented to boards, commissions, and Council for adoption. Learn more at www.austintexas.gov/page/watershed-protection-ordinance-0

- In 2012, Austin became one of only two cities in the nation to adopt an Invasive Species Management Plan. Non-native, invasive plants have significant negative economic and ecological impacts, including reduction of native biodiversity; interference with ecosystem functions like fire, nutrient flow and flooding; and reduction of the value of streams, lakes, and reservoirs for recreation, wildlife, and public water supply. The goal of the plan is to reduce and, where possible, eradicate invasive species on city-managed properties. The plan establishes a set of minimum standards for all city departments involved in vegetation management. View the plan at www.austintexas.gov/invasive

- The Texas Commission on Environmental Quality (TCEQ) regularly assesses the health of water bodies across Texas as required by the federal Clean Water Act. In the 2012 assessment, TCEQ identified three water bodies in Austin with improved fecal bacteria levels. However, four water bodies in Austin continue to have elevated fecal bacteria levels that do not support safe human water contact: Walnut Creek, Taylor Slough South, the Spicewood Tributary to Shoal Creek, and Waller Creek. The City will be working with TCEQ to address these problems during 2013. For more information visit www.utexas.edu/law/centers/cppdr/training/tmdl.php

- Watershed Protection Department biologists completed five important scientific studies of riparian areas adjacent to creeks during 2012. The studies included a comparison of degraded and least-disturbed riparian areas to evaluate what parameters should be monitored to determine the ecological success of vegetative restoration projects; an evaluation of the ecological benefits of riparian areas; a methodology for prioritizing areas where restoration resources should be allocated; and two assessments of the effectiveness of different tree planting methods. For more information, see the Annual Focus section or visit www.austintexas.gov/watershed/creekside

- The City released a report in 2012 assessing PAH concentrations in sediments from monitoring data collected by the City of Austin to determine the impact of the ban on coal-tar based pavement sealants. Polycyclic Aromatic Hydrocarbons (PAH) are toxic contaminants resulting from combustion of petroleum and organic matter. In 2006, the City of Austin enacted a ban on coal-tar pavement sealants, which are high in PAH. The 2012 report analyzed PAH levels in sediment from 50 watersheds around Austin and found decreasing trends over time, including at Barton Creek above Barton Springs Pool. Although the majority of PAHs are less than concentrations likely to adversely impact aquatic life, there are still some locations above urban background levels that

are being investigated further. Learn more at assets.austintexas.gov/watershed/publications/files/sr-12-06%20pah_monitoring_report.pdf

- Environmental monitoring staff with the Watershed Protection Department published 21 scientific reports in 2012, including reports on riparian zone restoration, the Barton Springs Salamander, and the Edwards Aquifer. Visit our publications webpage to read more about Austin's water resources: www.ci.austin.tx.us/watershed/publications/default.cfm

Status and Trends

Despite constantly increasing pressure from Austin's growing population, the quality of Austin's creeks has not markedly declined since the inception of Austin's protective water quality ordinances. The City monitors creek health using the Environmental Integrity Index (EII). The EII assesses water quality, sediment toxicity, contact recreation, aquatic life, physical integrity and aesthetics by direct field sampling. Using the EII, the City monitors 50 watersheds across Austin on a rotating two-year cycle. EII information is used to track the long-term health of creeks and prioritize areas for specific projects. More information on the EII is available austintexas.gov/department/environmental-integrity-index

The overall EII score is a comprehensive reflection of the health of Austin's creeks. It can be used to identify where problems occur (Figure 1) and may be used to track the success of Austin's water quality protection efforts over time (Figure 2). Approximately 49% of the watersheds assessed in 2011/2012 maintained "good" or better overall EII scores. The continuing extreme drought of 2011 and 2012 resulted in the majority of Austin's creeks going dry, and severely depressed EII scores.

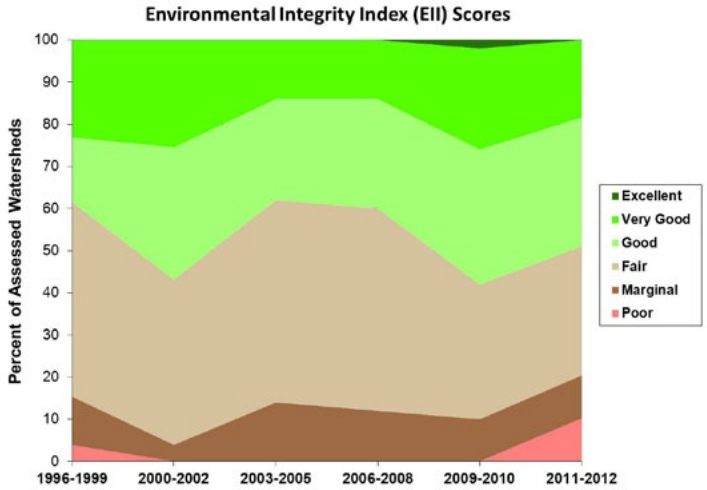


Figure 2. *Change in Environmental Integrity Index Scores citywide over time*

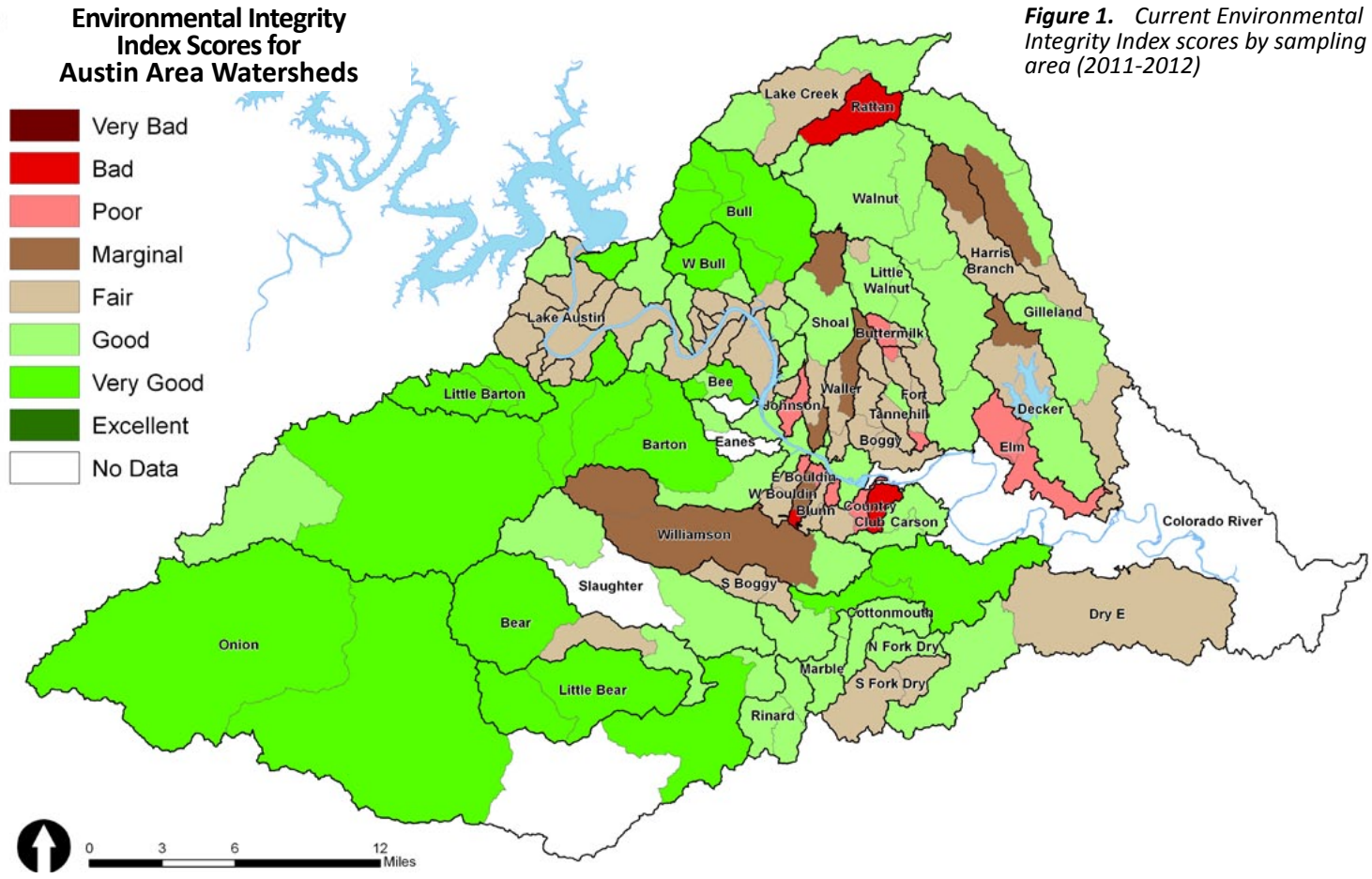
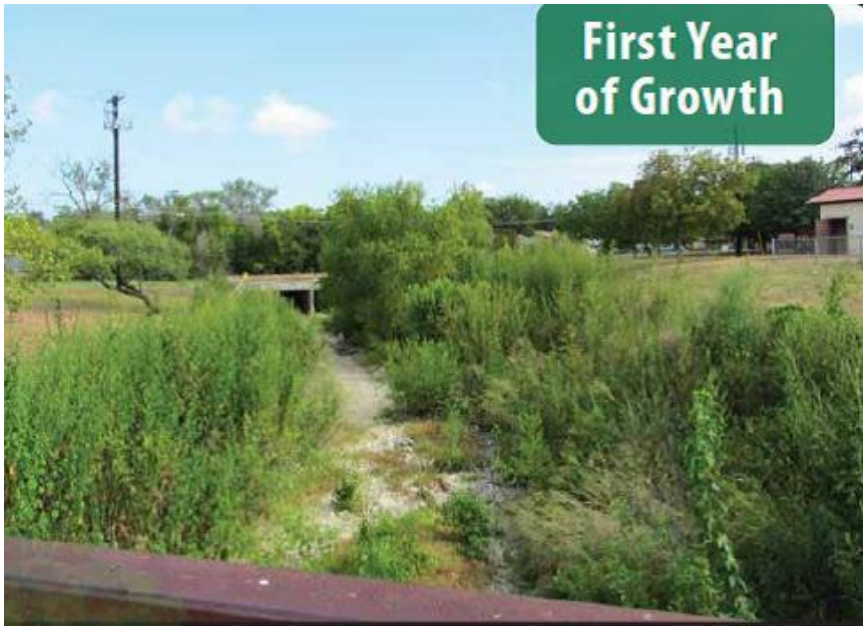
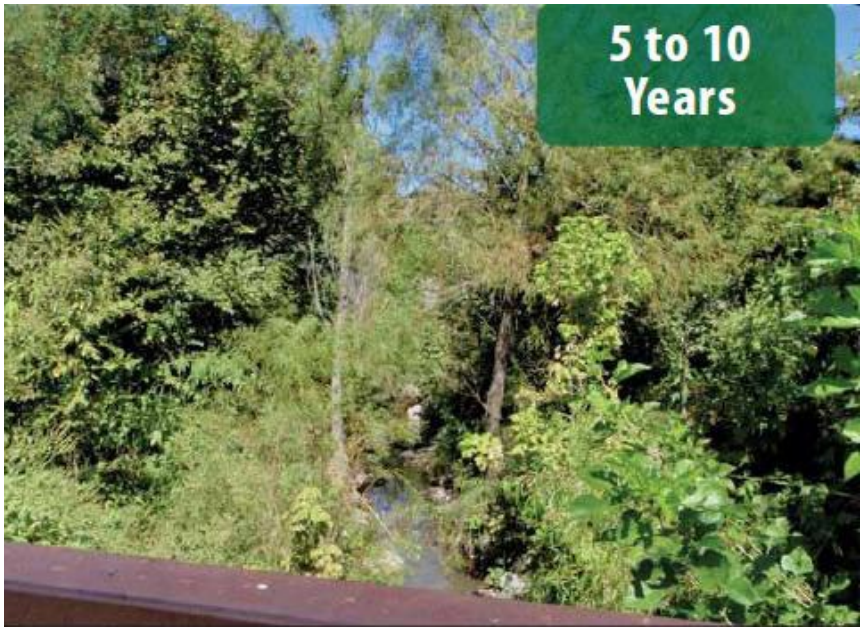


Figure 1. *Current Environmental Integrity Index scores by sampling area (2011-2012)*





Annual Focus

The City of Austin is working to restore the native forests that used to flourish beside creeks by creating "grow zones" in city parks. Through a joint effort between the Parks and Recreation and Watershed Protection departments, a total of 19 riparian grow zones adjacent to creeks have been established within parks across Austin. A healthy riparian zone prevents stream bank erosion, filters pollutants out of stormwater runoff, provides habitat for a diverse group of animals, reduces the City's carbon footprint, improves floodplain functions, and reduces grounds maintenance needs so park staff can focus on activities other than mowing. As riparian zones are mowed or removed by urban development, the ecological functions they provide are reduced. The "Grow Zone" management approach is to leave a buffer approximately 25 feet wide adjacent to creeks to allow for a passive restoration of a more natural state. City staff are monitoring the grow zones not only to apply adaptive management changes when needed, but also to determine if restoration efforts are successfully improving ecological function. Periodic trash removal, weed and invasive plant management, and planting of native plants are the strategies used when necessary to keep restoration efforts on track. The goal of the Grow Zone effort is to improve degraded riparian areas (Figure 3) into functional areas passively over several years (Figure 4, Figure 5).

Figure 3. *(top) Example of a degraded riparian area frequently mowed so that vegetation is spare and not diverse.*

Figure 4. *(middle) Example of a riparian area that has been left undisturbed for one year to allow for improved vegetation growth.*

Figure 5. *(bottom) Example of a fully functional riparian area left alone for a long period of time.*

Lakes and Rivers

Importance

Austin has four lakes—Lake Austin, Lady Bird Lake, Lake Travis and Lake Walter E. Long. Lake Austin, on the main stem of the Colorado River, is currently the City's sole source of drinking water, although a new water treatment plant is under construction that will draw water from Lake Travis. All of the lakes in the Austin area are regionally important recreation resources and provide critical habitat for fish and wildlife. Lake Long also provides cooling water for an Austin Energy power plant. The lakes are the primary receiving water for stormwater runoff, and pollutants can collect in lake sediments for long periods of time.

Goals

The Watershed Protection Department's three main goals for lakes are to maintain water quality, manage invasive plants, and control the amount of trash. Specifically, Austin's Lake Index scores should be "good" (64) or higher, invasive plants should not impair recreation, and Visual Index of Pollution scores should be 2 or less. Lower Visual Index of Pollution scores indicate less trash.

Challenges and Responses

Ongoing

Increasing nutrient concentrations change the composition and quantity of nuisance algae. As algae increase, lakes become less clear and dissolved oxygen can be reduced. This places stress on aquatic life and can increase water treatment costs. In Lake Long, treated wastewater effluent from the Austin Water Utility may also increase algae because the intake to fill the lake from the Colorado River is 2.5 miles downstream of the wastewater treatment plant outfall.

In addition to algae, invasive aquatic plants, toxic pollutants, and trash are ongoing problems. Invasive vegetation alters natural habitat and reduces recreational opportunities. Toxic pollutants can accumulate in sediments at the bottom of the lakes. Hundreds of tons of trash and debris are collected each year by the City from Lady Bird Lake. Drought negatively impacts the lakes, reducing the flow through the lake and increasing temperatures. Drought may result in increased aquatic plant growth and negatively impact recreation.

This Year

- In 2012, the Austin City Council created a citizen advisory task force to address concerns about environmental quality, recreation, and urban development in Lake Austin. The Lake Austin Task Force has identified several issues that they will address in collaboration with City staff from multiple departments over the next few years. The Task Force is expected to make recommendations in June 2013. For more information or to contact the Lake Austin Task Force, visit www.austintexas.gov/latf

- Under the new State-approved Water Management Plan for the Colorado River, the Lower Colorado River Authority severely curtailed the amount of water released from Austin's lakes for downstream agricultural uses because of the ongoing extreme drought. The low flow through Lake Austin and Lady Bird Lake in summer 2012 led to an increase in the frequency of blooms of microscopic algae, and increased the growth of both beneficial plants like Cabomba (see Annual Focus) and nuisance aquatic plants like Hydrilla.

- In 2012, Hydrilla reached a historic high, covering more than 580 acres on Lake Austin. Hydrilla is a rapidly growing invasive aquatic plant that is managed with lake drawdowns and stocking of sterile Asian grass carp, which preferentially eat Hydrilla. The increase in this invasive plant may be related

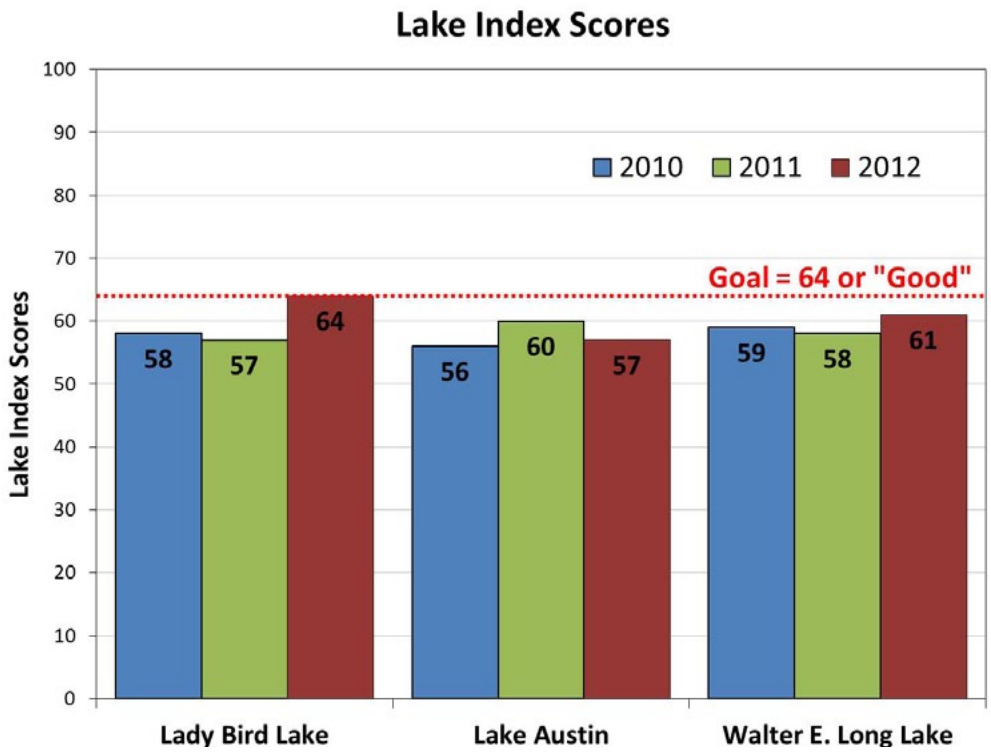


Figure 1. *Overall lake index scores for Lake Austin, Lake Long, and Lady Bird Lake from year 2010 and 2011. 100 is the best score and 0 is the worst.*

to the ongoing drought, which has increased lake water temperatures and resulted in severely limited flow through the lake due to LCRA's curtailing releases. Watershed Protection worked with LCRA and the citizen group Friends of Lake Austin to release more than 17,000 sterile grass carp into Lake Austin in 2012. This brought the fish numbers up to 50 fish per acre of Hydrilla, which has worked in the past to control the plants, and acreage did decrease slightly from July to September 2012. For more information on the Hydrilla infestation on Lake Austin visit www.austintexas.gov/department/hydrilla

- The Watershed Protection Department is improving the riparian area around Lady Bird Lake, starting with efforts to remove the invasive giant cane, Arundo donax. Covering 3.5 acres of the lake's five-mile shoreline, this plant grows up to 20 feet tall, creating dense stands that eventually shade out other plants. High temperatures and lack of rain limited the active plant growth required for effective herbicide control in 2011, so the plants were treated with the same EPA-approved herbicide again in 2012. Once under control, areas will be re-vegetated with native plants.

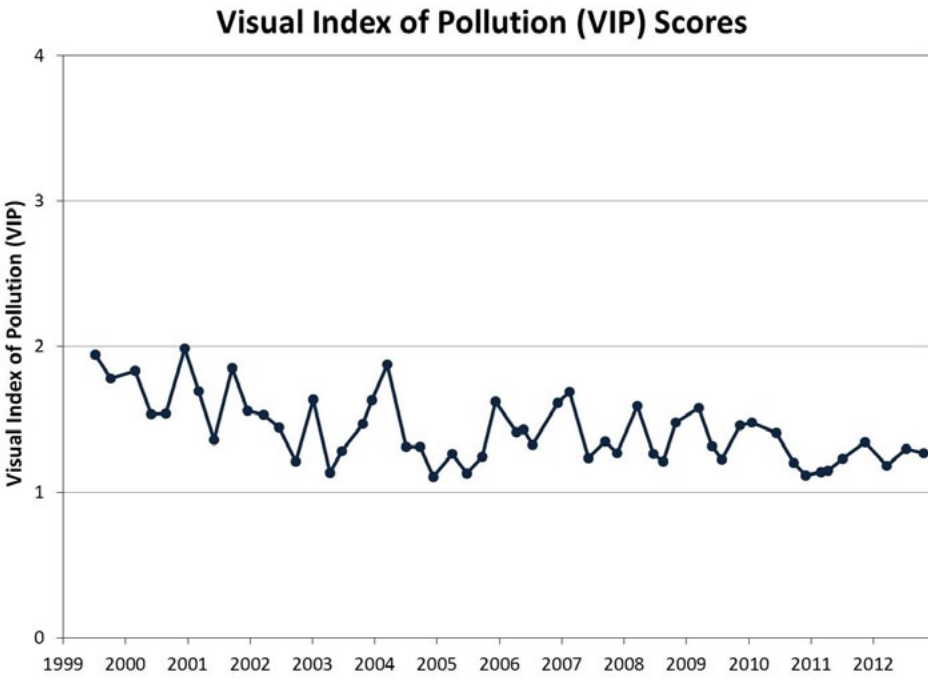
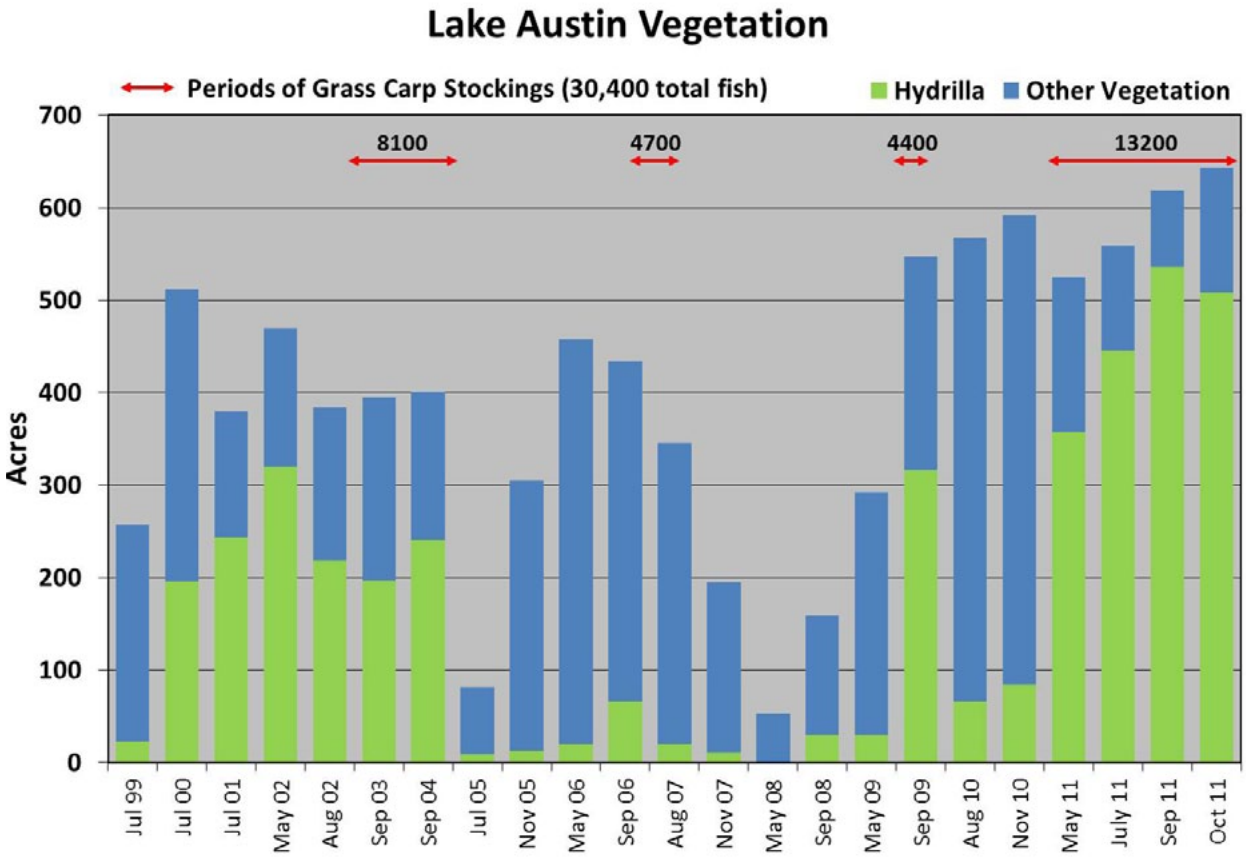


Figure 2. Visual Index of Pollution scores for Lady Bird Lake over time. Higher numbers indicate increased trash and debris.

Status and Trends

Since 2010, three area lakes have been monitored as part of Austin's Lake Index (ALI). The ALI includes annual monitoring and assessment of aquatic habitat, insects, water quality, sediment quality, invasive vegetation, and floating algae. Higher ALI scores indicate better water quality. As shown in Figure 1 (previous page), Lake Austin and Lake Long yielded scores of "fair" in 2012 while Lady Bird Lake yielded a score of "good." Read more about the specific water quality issues affecting the ALI score for Austin lakes at www.austintexas.gov/austinlakes



Additionally, trash and aesthetic impacts to Lady Bird Lake are assessed using the Visual Index of Pollution (VIP). The VIP has been ongoing with consistent methods since 1999. Higher scores indicate more trash and debris. Scores have continued to improve over time (Figure 2).

Figure 3. Chart showing acres covered by *Hydrilla* and other vegetation over time in Lake Austin (left);

Annual Focus

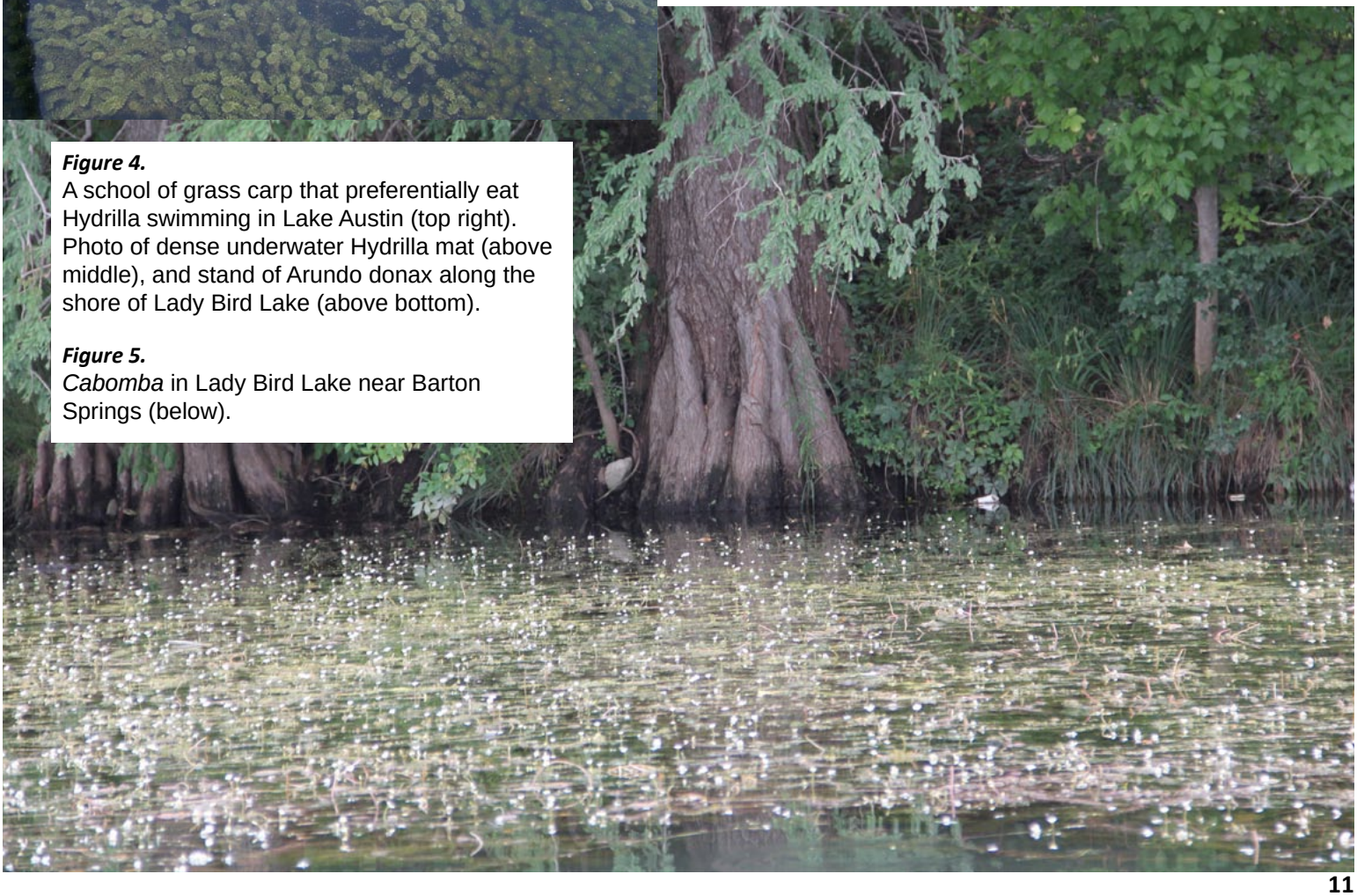
Cabomba, or fanwort, is a beneficial native aquatic plant that exhibited an exceptional amount of growth in the summer of 2012 along both north and south shores of Lady Bird Lake between Barton Creek and the Lamar Bridge. Cabomba spread into Lady Bird Lake from Barton Springs Pool and Barton Creek, possibly aided by the increase in clear, warm water resulting from the decreased release of water through the lakes for downstream agricultural users. Fanwort is a native aquatic plant with delicate white flowers that often bloom underwater. While the fanwort plants may reach the surface, it does not form dense mats like Hydrilla in Lake Austin, but can still be a nuisance to recreational use of Lady Bird Lake.

Prior to the increase in Cabomba, Lady Bird Lake had plants growing in less than 3 percent of the total lake area, which is much less than is needed for a healthy ecosystem. Cabomba is a good addition to the lake ecosystem because it provides oxygen, food, and shelter for aquatic life and waterfowl in addition to trapping sediments and improving lake clarity. The woody debris caught in the plants is also natural and environmentally beneficial. As the wood decomposes, it helps remove excess nitrogen from the water, reducing the availability of nutrients for nuisance microscopic algae. For more information on Cabomba on Lady Bird Lake, see the link:

www.austintexas.gov/article/whats-green-stuff-all-over-lady-bird-lake

Figure 4.
A school of grass carp that preferentially eat Hydrilla swimming in Lake Austin (top right). Photo of dense underwater Hydrilla mat (above middle), and stand of Arundo donax along the shore of Lady Bird Lake (above bottom).

Figure 5.
Cabomba in Lady Bird Lake near Barton Springs (below).



Aquifers

Importance

The Barton Springs Segment of the Edwards Aquifer is the sole source of drinking water for approximately 60,000 Central Texans. It also provides flows at Barton Springs, which is critical to the habitat of the endangered Barton Springs Salamander and the Austin Blind Salamander, a candidate species for endangered status. Barton Springs is also an iconic recreational resource for Austin, drawing hundreds of thousands of visitors annually and providing more than $1.5 million in revenue for the Austin Parks and Recreation Department. In northern Austin, small springs discharging from the Northern Edwards Aquifer provide critical habitat for the Jollyville Plateau Salamander, also a candidate species for endangered status.

Goals

The principal goal of the Watershed Protection Department for the Edwards Aquifer is to preserve the integrity of the contributing and recharge zones in order to protect water quality and aquifer recharge and to maintain habitat for endangered salamander populations.

Challenges and Responses

Ongoing

Aquatic salamanders require adequate levels of dissolved oxygen to survive and thrive. Pumping from the aquifer reduces flow and dissolved oxygen in Barton Springs, especially during drought. Development over the aquifer's recharge and contributing zones threatens the quality of water recharging the aquifer, which may in turn negatively affect salamanders.

Barton Springs flow and dissolved oxygen directly affect the habitat and populations of the Barton Springs Salamander and the Austin Blind Salamander. Dissolved oxygen concentrations less than 5 milligrams per liter (mg/L) are of particular concern. When Barton Springs flow is less than 40 cubic feet per second, significant water quality changes become evident. When flow is below 30 cubic feet per second, Barton Springs salamanders are negatively affected by the decrease in dissolved oxygen (Figure 1).

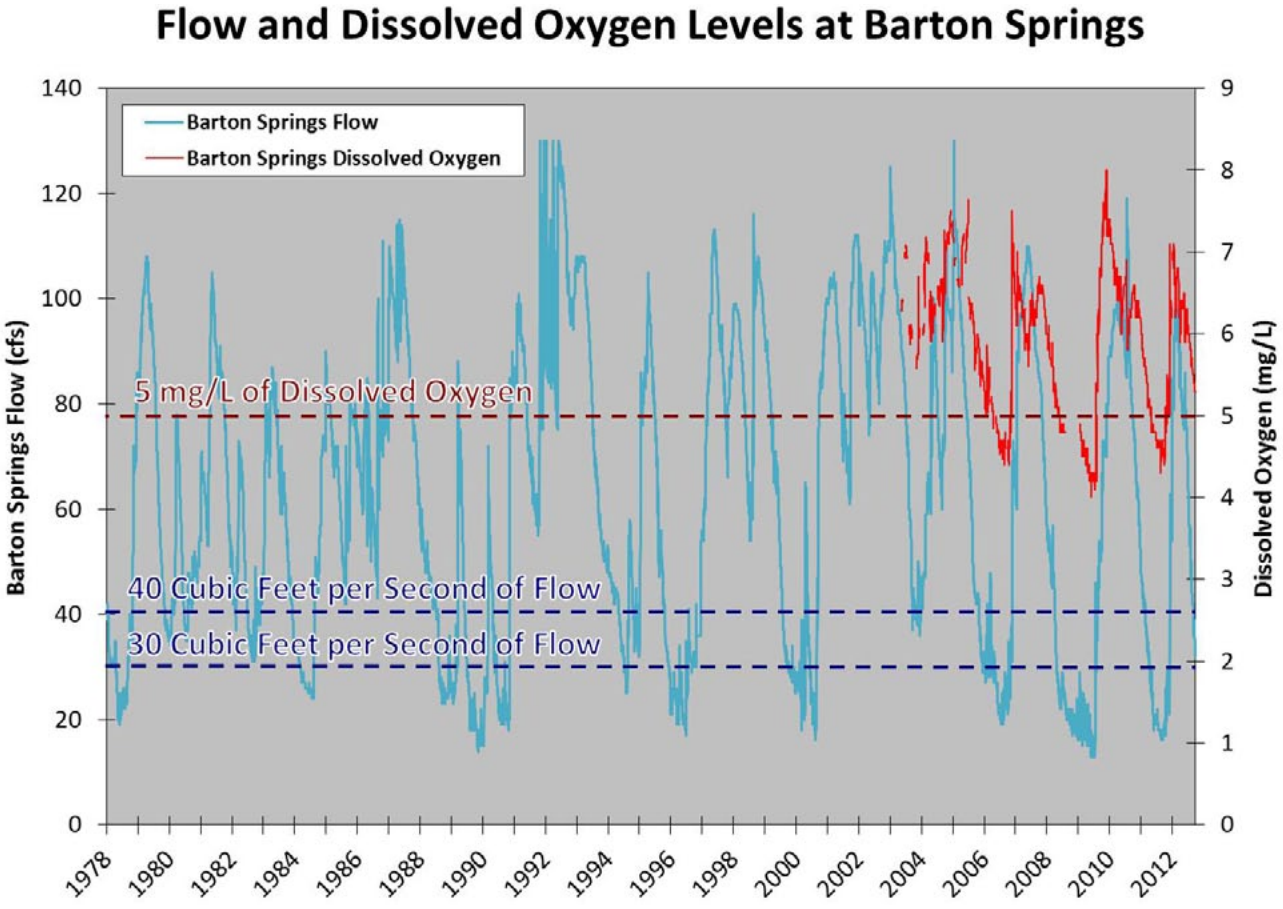


Figure 1. *Barton Springs flow and dissolved oxygen over time.*

This Year

- The U.S. Fish and Wildlife Service proposed to list four species of aquatic Central Texas salamanders as endangered species in 2012. Two of the salamander species are found in the Austin area: the Austin Blind Salamander, which is occasionally found above ground at Barton Springs and two other springs in Zilker Park, and the Jollyville Plateau Salamander, which is found in springs in North Austin (Figure 2). More information on the federal rule-making process is at www.fws.gov/southwest/es/AustinTexas/ESA_Sp_Salamanders.html
- Watershed Protection scientists recently documented reductions in body length of Jollyville Plateau salamanders due to extreme environmental stress from the 2008–2009 drought. While salamanders are able to retreat with the water table as it recedes underground to avoid desiccation and survive when springs run dry, they are forced to endure long periods without food. The long-term consequences of body length shrinkage are currently unknown, in part because this phenomenon has rarely been documented in vertebrate animals. These findings are set to appear in an upcoming issue of the *Journal of Zoology*.
- Austin is building a new water treatment plant to draw water from Lake Travis. A major new transmission main is being constructed beneath the Bull Creek Watershed. Extensive monitoring of Bull Creek surface water and groundwater is being conducted to verify that no negative impacts occur. See Annual Focus for more information about groundwater analyses conducted in 2012. Learn more at www.austintexas.gov/department/water-treatment-plant-4
- Watershed Protection staff performed a mass balance analysis of nitrogen in the Barton Springs Segment of the Edwards Aquifer, which compared all of the known inputs of nitrogen to the Edwards Aquifer from streams, rainfall infiltration, septic tanks and fertilizer application to the output of nitrogen from the Edwards Aquifer at Barton Springs. This study is an important step in determining the cause of increasing concentrations of nitrogen at Barton Springs observed from Watershed Protection monitoring. Estimates of fertilizer application over the recharge zone indicate that it is a substantial source of nitrogen loading to the aquifer, which was not previously documented. The estimated incoming nitrogen load is still less than the observed outflow of nitrogen from the Barton Springs segment of the Edwards Aquifer, indicating missing sources or inaccurate estimates of load from the known sources. Learn more at assets.austintexas.gov/watershed/publications/files/DR-12-04_Edwards_Aquifer_Nitrogen_Balance.pdf
- City hydrogeologists investigated the water source of the two wells that are used to fill the Deep Eddy Swimming Pool near Lady Bird Lake. Preliminary source water assessments indicate that one of the wells is withdrawing shallow groundwater from alluvial deposits that are recharged by water from Lady Bird Lake. The groundwater from the second well originates not from Lady Bird Lake, but from a different shallow alluvial deposit potentially recharged by the Northern Edwards Aquifer. Learn more at assets.austintexas.gov/watershed/publications/files/SR-12-04%20Deep%20Eddy%20Report.pdf
- City staff published a report in 2012 that investigated the source of fluctuating leachate volumes from the closed landfill at Mabel Davis Park. Chemical analyses and statistical comparison with rainfall and well water levels indicate that natural groundwater from the St. Elmo Terrace Deposit is responsible for the variation in leachate volume. The leachate is collected and treated by the Austin Water Utility. Learn more at assets.austintexas.gov/watershed/publications/files/SR-12-03%20Mabel%20Davis%20Groundwater%20Investigation_12212011.pdf

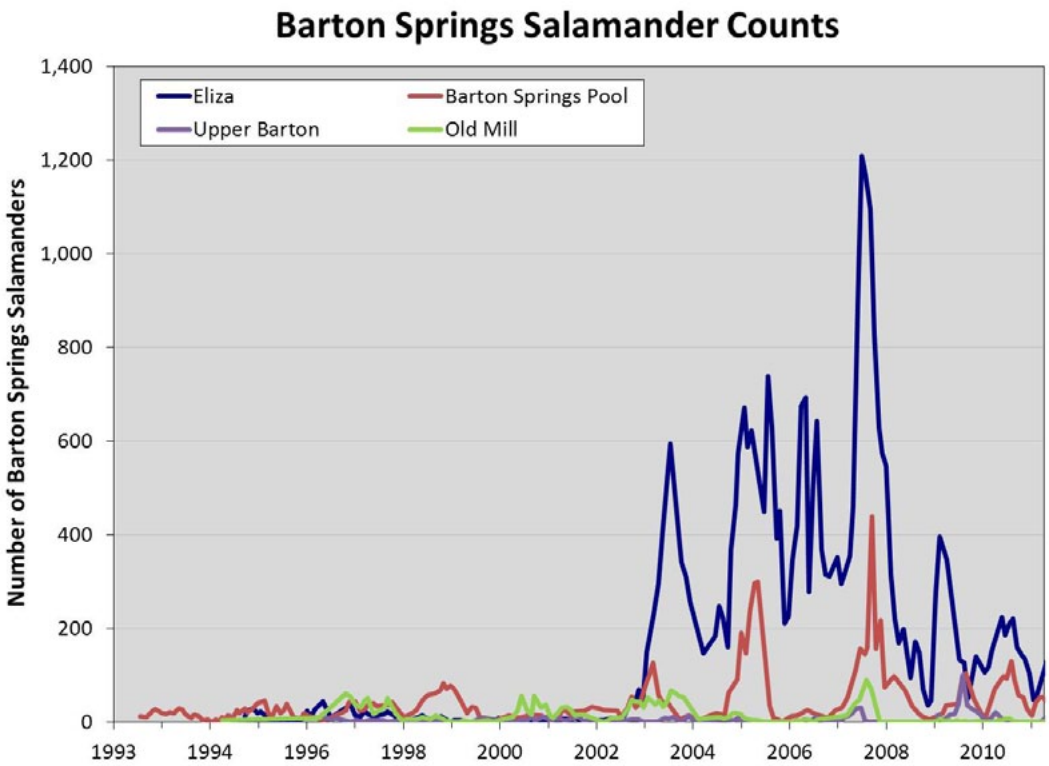


Figure 2. *Barton Springs Salamander counts from Barton Springs Pool, Eliza Spring, Old Mill Spring and Upper Barton Springs.*

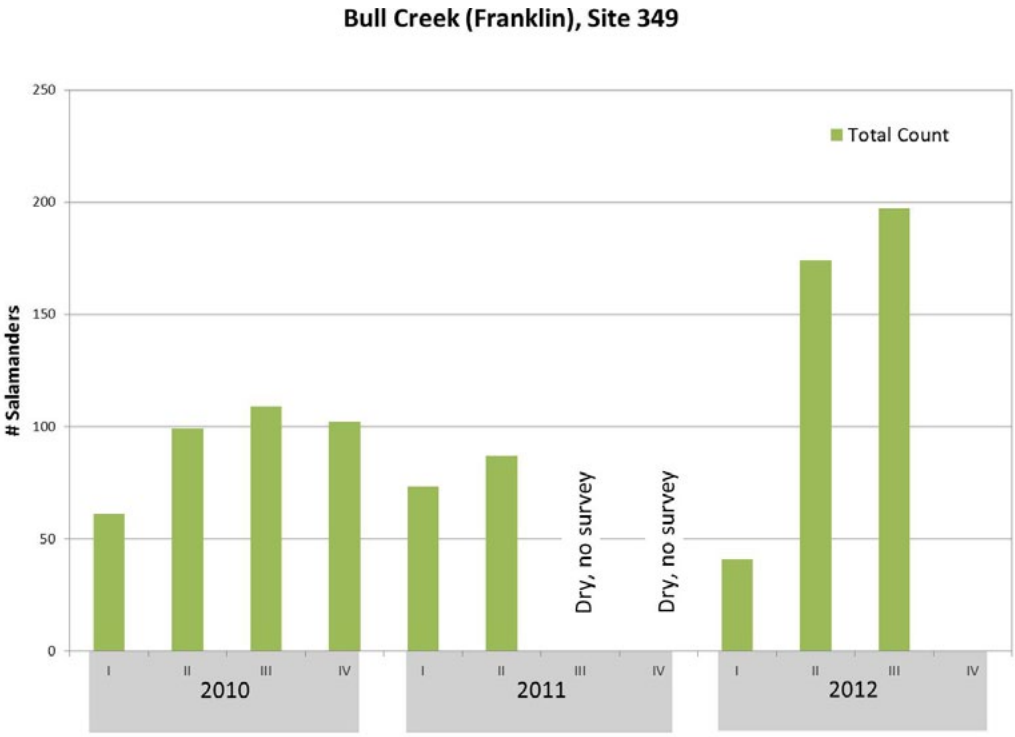


Figure 3. *Jollyville Plateau Salamander population counts at one representative Bull Creek monitoring site. Some surveys could not be completed in 2011 because the drought caused springs to go dry.*

Status and Trends

The City, in cooperation with the United States Geological Survey (USGS), monitors the flow of Barton Springs using automated instruments that record measurements every 15 minutes. Flows at Barton Springs are still driven primarily by rainfall, but pumping of water from the aquifer negatively impacts Barton Springs flows. Access data from the USGS at waterdata.usgs.gov/tx/nwis/inventory/?site_no=08155500&agency_cd=USGS&

The City also closely monitors the water quality of Barton Springs, as well as habitat conditions and populations of the Barton Springs Salamander and the Austin Blind Salamander. Due to City efforts to protect and improve habitat, the population of the Barton Springs Salamander has significantly improved since it was listed as an endangered species in 1997. Low counts of Barton Springs Salamanders in surface habitats were observed again in 2012 despite a return to average spring flow conditions for part of 2012, as recharge from normal rainfall was unable to fully overcome the effects of the 2011 drought (Figure 2, previous page).

Jollyville Plateau Salamander population counts at the surface springs in North Austin are a direct representation of the health of the species and are strongly affected by the flow of the springs in which they live. Many springs in the Bull Creek watershed stopped flowing in 2011 because of the extreme drought. Salamander populations at some of the sites not impacted by urbanization rebounded with the return of spring flow in 2012 (Figure 3). Learn more about salamander protection efforts at austintexas.gov/department/salamanders

Annual Focus

Assessment of the Northern Edwards Aquifer was performed by City staff as part of monitoring potential impacts of the construction of both the new Water Treatment Plant 4 in North Austin and a drinking water transmission main that will run deep underneath Bull Creek and Jollyville Plateau Salamander habitat. Water level monitoring, groundwater dye tracing, water chemistry analyses, and use of tritium radioactive dating were used to characterize groundwater in the environmentally sensitive Jollyville Plateau area in Northwest Austin. Water levels from monitoring wells suggest that a shallow groundwater system only tens of feet thick actually feeds the springs of Bull Creek while a deeper groundwater system more than 100 feet further underground exists but is poorly connected to the shallow system.

To confirm this conceptual model of the Northern Edwards Aquifer, a study was conducted by the City to determine the geochemical characteristics and the relative age of water in each system. Tritium was released into the global atmosphere by the testing of nuclear weapons in the 20th century. Because the rate of radioactive decay of tritium is known, tritium may be used to determine the age of groundwater. Based on the hypothesized model of the Northern Edwards, the shallow groundwater system should have younger water than the deep system.

City staff collected water samples from four surface water sites, 11 different springs and 17 wells ranging in depth from less than 30 feet to more than 200 feet deep in North Austin. Tritium results indicate that the creeks and springs contain primarily recent or “post-bomb” water originating from precipitation occurring since 1954. The shallow groundwater system, including the Northern Edwards Aquifer, contains some locations with a mix of recent and “pre-bomb” water and some locations with only pre-bomb water. The deeper system contains mostly pre-bomb water originating as rainfall that recharged the aquifer before 1954, although some post-bomb water is also present. It is very surprising for the Northern Edwards Aquifer, a limestone formation known for caves and other karst features that carry water rapidly, to have areas containing water more than 58 years old. Future work will further clarify the significance of this data.

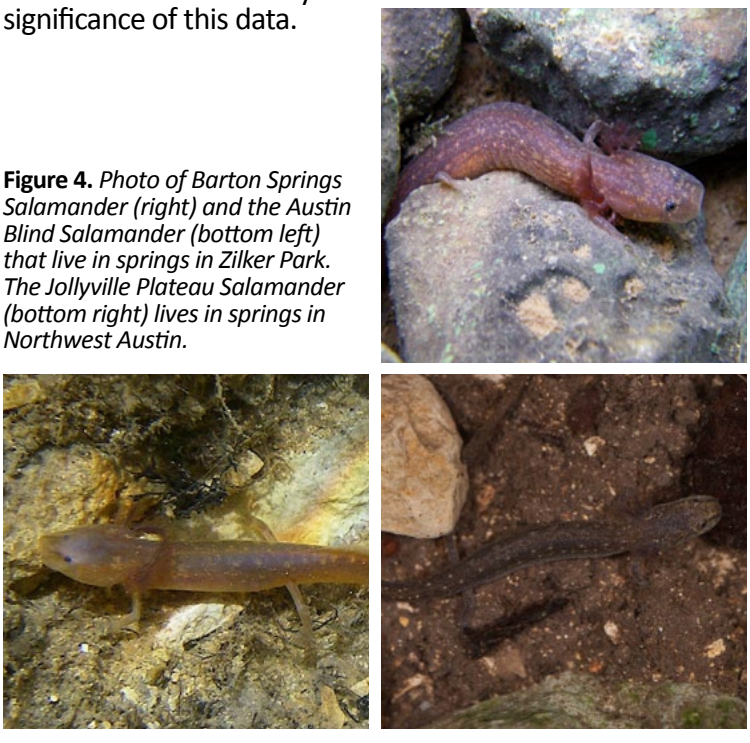


Figure 4. *Photo of Barton Springs Salamander (right) and the Austin Blind Salamander (bottom left) that live in springs in Zilker Park. The Jollyville Plateau Salamander (bottom right) lives in springs in Northwest Austin.*

Urban Forest

Importance

Austin's urban forest provides social, ecological and economic benefits to the community and enhances the quality of life for Austin residents. Recognizing it as an asset and an important part of the City's infrastructure, City policies and practices aim to preserve, maintain, and replace individual trees and the urban forest as a whole. A thriving, healthy urban forest is a reflection of the City's ability to preserve individual trees and vegetation communities, restore or repair degraded lands, protect lands for environmental services, encourage the removal of non-native, invasive species, and replant trees and vegetation.

Goals

The primary goals for the City's urban forest management are to:

1. Ensure public well-being and safety; and
2. Enhance the benefits of the urban forest through preservation, care and maintenance, and replenishment of the urban forest.

These goals are pursued by preserving trees and vegetation communities impacted by development activities, encouraging the removal of non-native invasive trees, addressing tree risk and tree maintenance, managing oak wilt, replenishing the urban forest through planting, and promoting conservation and replenishment programs that benefit Austin's urban forest.

Two tree-specific City programs manage the urban forest: the City Arborist Program protects and regulates trees on public and private property and the Urban Forestry Program manages public trees.

City Arborist Office website:
http://www.austintexas.gov/department/city-arborist
Urban Forestry Program website:
www.austinurbanforestry.org

Challenges and Responses

Ongoing

Austin's urban forest is increasingly challenged by development pressure and changing land use patterns as well as urban stressors such as soil compaction, invasive species, and competition for space. The added impact of prolonged drought is another significant contributor to tree stress and mortality. Interdepartmental coordination, comprehensive planning, and communication with the development community regarding tree regulation and management are areas for continuous improvement.

Figure 1. *Newly planted trees at West Austin Park. The structure in the background, built by UT School of Architecture students, surrounds a tank holding reclaimed water for irrigation.*

This Year

In 2012, the City Arborist Office and the Urban Forestry Program performed the following.

City Arborist

- Hired a GIS analyst to develop geodatabases for tree permit data and for the implementation of the Invasive Species Management Plan.
- As part of Land Use Review, staff reviewed more than 200 commercial site plans and subdivisions, nearly 2,800 tree permits, and averaged more than 100 tree inspections per month.
- Staff reviewed more than 800 tree permits for heritage trees and more than 100 site plans and subdivision plans for compliance with the Heritage Tree Ordinance. Greater than 95 percent of all healthy heritage trees were preserved in the development review process.
- Contributed to an Austin American-Statesman article on the benefits of collaboration between private development and City Arborist tree review staff that preserved protected trees and heritage trees in a suburban, commercial development.
- The City Arborist grant program issued $43,000 for tree replenishment and conservation projects.

Urban Forestry

- A Standard of Care for trees and plants on public property was adopted by the Urban Forestry Board. The Comprehensive Urban Forest Plan is in development and progressing toward a 2013 completion goal.
- The Urban Forestry Program completed more than 2,500 tree maintenance work orders; planted more than 5,500 bare root seedlings in conjunction with nonprofit partners and supported by more than 1,300 volunteer hours; and reviewed 220 commercial and parkland site plans for impacts to public trees.
- The Urban Forestry Program facilitated more than $200,000 worth of leveraged funding, donations and contributions for outreach and education, volunteer work days, and community partnerships and programs, including $49,000 generated by Public Tree Care Permits.
- Significantly reduced potable water use by adjusting tree irrigation and planting methods and by utilizing reclaimed and recycled water for tree irrigation.

Interdepartmental

- The Urban Forestry and City Arborist Programs continued to support tree education and recognition programs including Austin Community Trees, Tree of the Year, Urban Forest Stewards Workshop, an urban forest

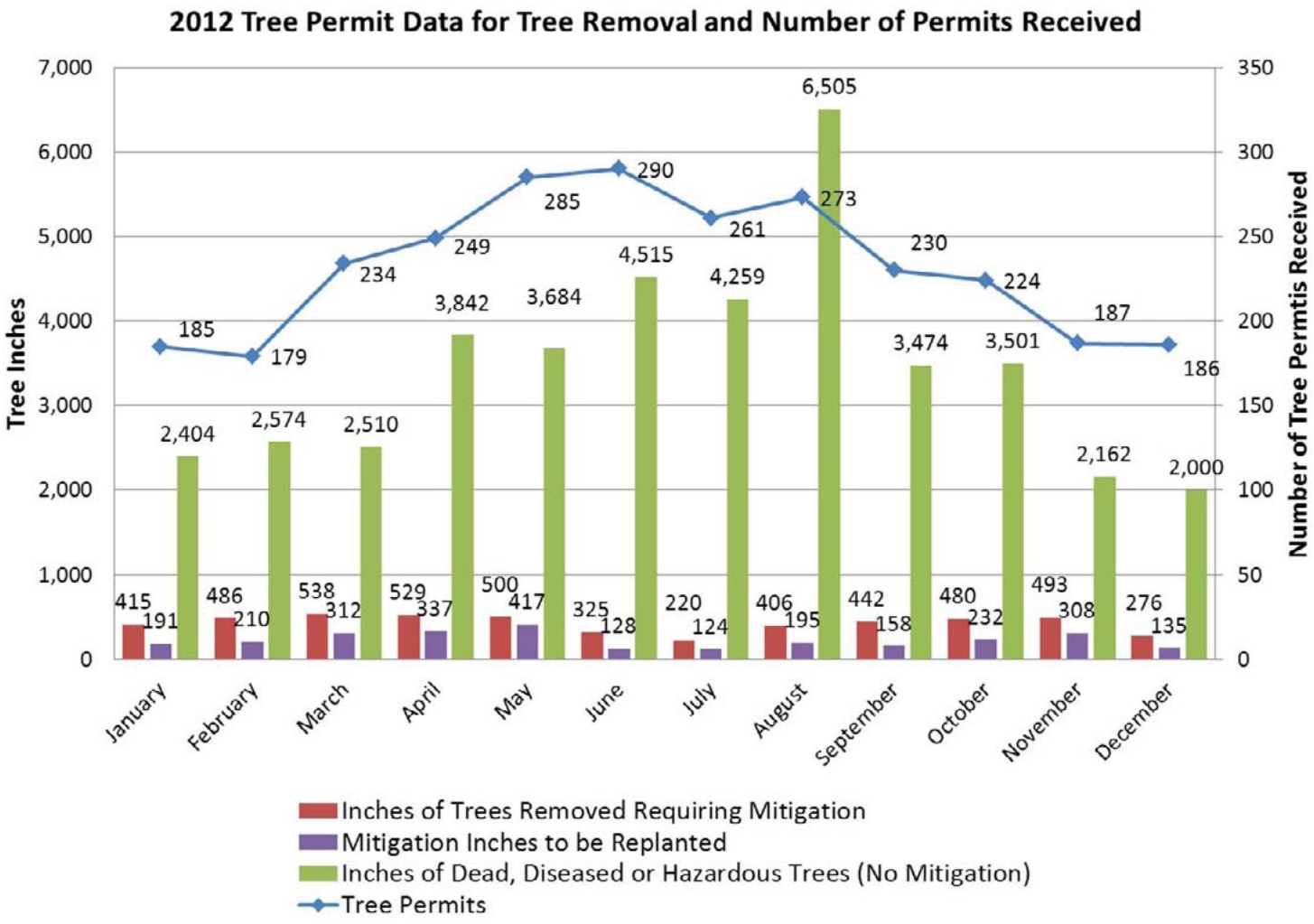


Figure 2. *Tree permit data for 2012.*

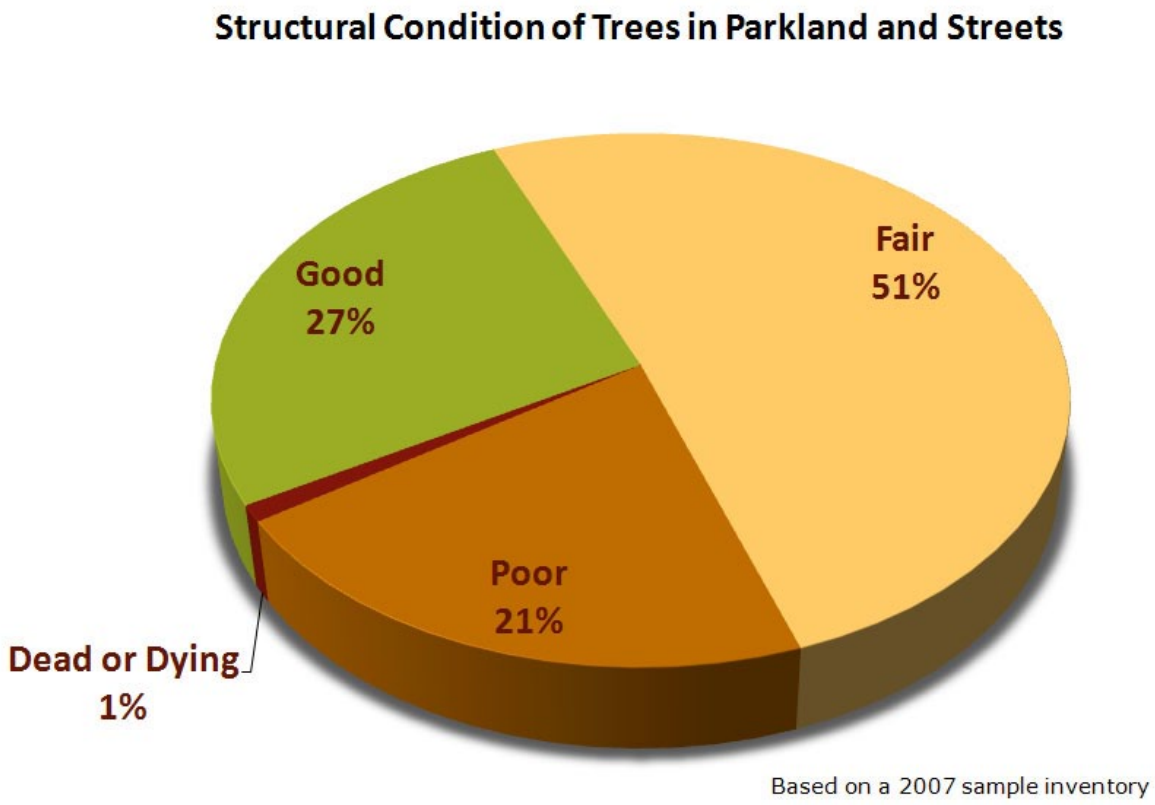


Figure 3. *Structural health condition of public trees based on sample inventory*

newsletter, training 29 Urban Forest Stewards, Arbor Day, Green City Fest, and a Grow Green informational video series on tree care and maintenance.

- A downtown tree survey was performed to capture all heritage tree species 19 inches or greater in diameter on private and public property and all right-of-way trees. The survey was concluded in December 2012 and the report will be delivered in early 2013.
- Completed a comprehensive street tree shade index and creek shade canopy index.
- Received recognition in the fall 2012 edition of American Forests magazine for Austin tree regulations and public programs.

Status and Trends

A 2012 Texas A&M Forest Service survey suggested 301 million trees were killed statewide as a result of the devastating 2011 drought. Another 5.6 million trees in urban areas also died as a result of the drought, according to a separate Texas A&M Forest Service study. The news release for the studies can be found here: texasforestservice.tamu.edu/main/popup.aspx?id=16509.

The number of tree permits received in 2012 was a 30% increase over permits received in 2011 (Figure 2) and has increased 18% since 2003 when tree permits were first recorded. Urban environmental conditions, coupled with development activities and increased awareness of permitting requirements, have likely resulted in a perennial increase in tree permits and demand for tree maintenance and removal. 2012 private and public tree permitting data appear consistent with the statewide tree mortality studies, as suggested by the permitting of more than 39,000 inches of private trees to be removed for dead, diseased, or hazardous conditions. Tree mortality likely exacerbated by drought conditions continues to be an ever-present urban forest challenge.

The demand for public tree maintenance has continued to increase over the past 10 years, with an average annual increase of 42 percent. In addition, the proportion of tree maintenance performed on an emergency basis, in response to the blocking of a transportation corridor, has increased by an average 20 percent per year for the past 10 years. Based on a sample inventory, 72 percent of public trees are in “Fair” or “Poor” structural health condition (Figure 3).

Annual Focus

The drought of 2011 halted containerized tree plantings. Determined to continue planting trees while reducing potable water use, the Urban Forestry Program created the Ready, Set, Plant initiative. More than 5,000 tree seedlings were planted in greenbelts and preserves throughout the City of Austin involving partner organizations, staff, and volunteers (Figure 1). In 2012, in coordination with the Watershed Protection Department’s riparian restoration efforts, more than 6,000 tree seedlings were planted within riparian Grow Zones. Small seedlings have small needs and thus water conservation goals are met while continuing to replenish the City of Austin’s urban forest. In addition to planting smaller trees, the Urban Forestry Program will continue to expand its utilization of reclaimed water and water conservation practices for tree irrigation.

Open Space and Habitat

Importance

Austin Water's Wildlands Division (referred to as Wildlands) manages open space and habitat to improve Austin water quantity and quality, endangered species habitat, and quality of life. Currently, the City's Wildlands manages more than 26,000 acres for water quality protection and more than 13,000 acres for endangered species habitat protection.

Goals

Austin's Wildlands is an internationally recognized urban conservation program that has developed and exported best management practices for its primary goals of endangered species and water quality management. Wildlands collaborates locally and regionally to ensure the sustainability of the local communities and landscapes by balancing community development and conservation goals. Wildlands encompasses two programs: Balcones Canyonlands Preserve (BCP) and Water Quality Protection Lands (WQPL). The primary goal of the BCP is to protect and enhance the habitat of endangered and rare species as mitigation for land development in western Travis County. The BCP is not one single tract of land, but a system of preserves that exists as a multi-agency conservation effort. Managing partners include Travis County and the Lower Colorado River Authority (LCRA). WQPL's goal is to produce the optimal level of high quality water to recharge the Barton Springs segment of the Edwards Aquifer by managing protected land to restore prairie-savanna ecosystems and healthy riparian corridors.

Challenges and Responses

Ongoing

The very appeal of living close to Wildlands spurs some of the program's greatest challenges. The wildland urban interface is the area where the natural environment meets the built environment. Including conservation easements and dual-managed tracts, Wildlands manages property with 270 miles of perimeter, much of it within the wildland urban interface. As our area population grows, the challenges associated with the wildland urban interface grow. Trespassing, encroachment, vandalism, invasive non-native plant and animal species, artificial concentrations of native species, oak wilt, and threat of wildfire remain ongoing challenges. Wildlands staff continues to communicate with neighbors in an effort to reduce these challenges.

Wildland Conservation Division Status*

270 perimeter miles
40,177 total acres
26,573 acres of Water Quality Protection Lands (WQPL)
13,604 acres of Balcones Canyonlands Preserve (BCP)

** including conservation easements and dual managed tracts*

This Year

- In 2012, Wildlands staff worked closely with the Joint Wildfire Task Force to move Austin toward becoming a Fire Adapted Community. Efforts in 2012 led to hiring a contractor to develop a Community Wildfire Prevention Plan for the Austin area. To help reduce wildfire risks, Wildlands maintains approximately three linear miles of mowed fuel breaks along WQPL's boundary. Additional efforts to reduce wildfire risks include partnering with neighborhoods to offer boundary cleanups to remove downed and dead material along the fence line.
- WQPL continues to follow up ecosytem restoration with specific karst management activities that allow additional water to recharge through caves. Such

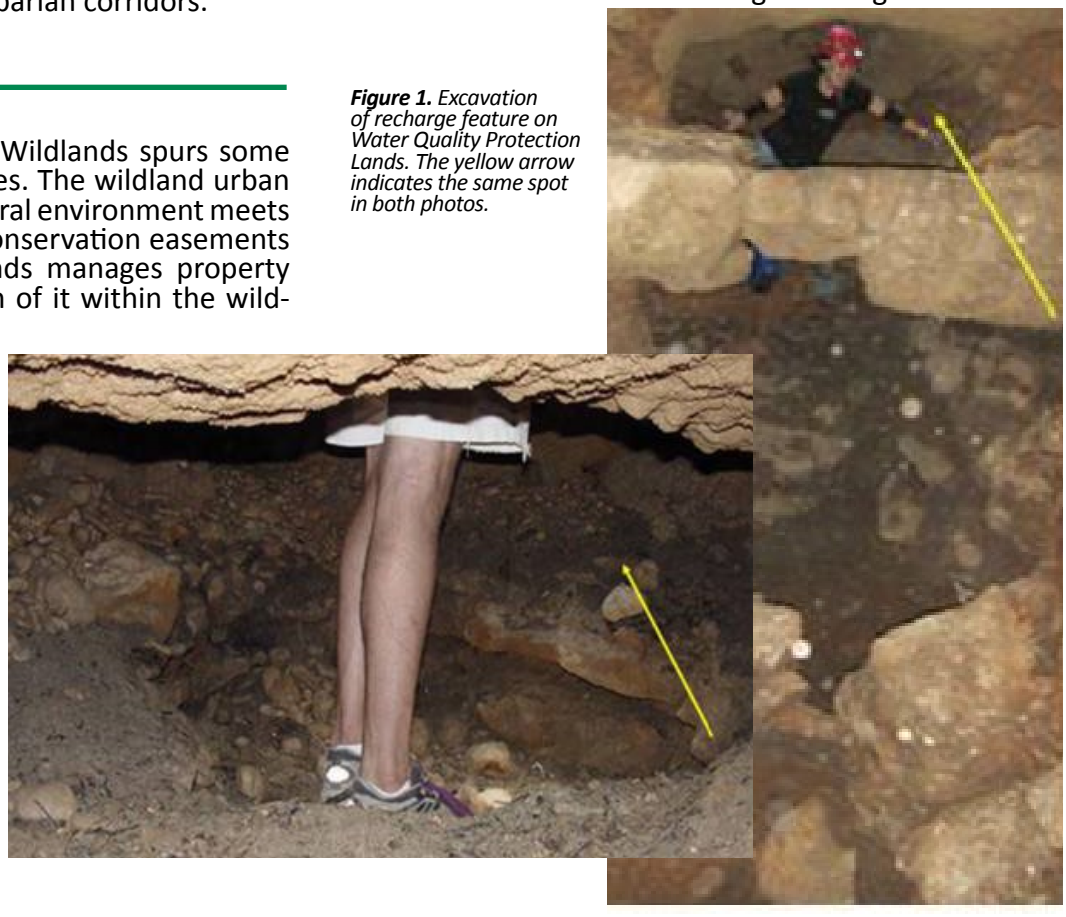


Figure 1. *Excavation of recharge feature on Water Quality Protection Lands. The yellow arrow indicates the same spot in both photos.*

activities include excavating old sediment and preventing the accumulation of new sediment in recharge features (Figure 1). In one feature, more than 50 cubic yards (four dumptruck loads) of sediment have been removed by staff, volunteers, American Youth Works Environmental Corps, and a contractor since 2003.

- Wildlands staff took steps to learn about and watch for the newest invasive, non-native animal to appear in Travis County. Called Rasberry crazy ants, the species has yet to be classified by entomologists. Staff visited the first known infestation site in the county and then prepared collection kits for use by staff and volunteers while patrolling property boundaries.
- Encroachment continues to be a challenge. In 2012, a trail constructed illegally on BCP property was closed in an effort to comply with the City and County's U.S. Fish and Wildlife Service permit.
- As a result of continued vandalism, Airmen's Cave was gated in 2012. Volunteers host open houses that allow individuals to explore the cave. Eight Airmen's Cave open houses were hosted in 2012, allowing 53 people to explore the cave.
- A few individual warblers and a northern mockingbird exhibited symptoms of avian pox during the 2012 field season. Avian pox is an infectious viral disease characterized by wart-like nodules or lesions on featherless areas of the body. There is no known effective treatment for wild birds, although birds can recover if the pox lesion(s) does not impair their ability to obtain food and water, seek shelter, or evade predators. BCP staff will continue to monitor birds for these symptoms and have developed preventative measures to ensure that staff is not contributing to the spread of avian pox.
- As part of an intensive effort to study the golden-cheeked warbler, Wildlands' BCP scientists banded a total of 104 warblers, 94 males and 10 females, in 2012 (Figure 2).

Figure 2. *Fledgling and banded golden-cheeked warblers.*

- BCP staff and volunteers devoted hundreds of hours to removing invasive plant species through hand pulling and herbicide treatment to prevent future growth. Particularly troublesome were Tree-of-Heaven, Chinaberry, Chinese Privet, Waxleaf Ligustrum, Heavenly-bamboo, and Malta Star-Thistle.

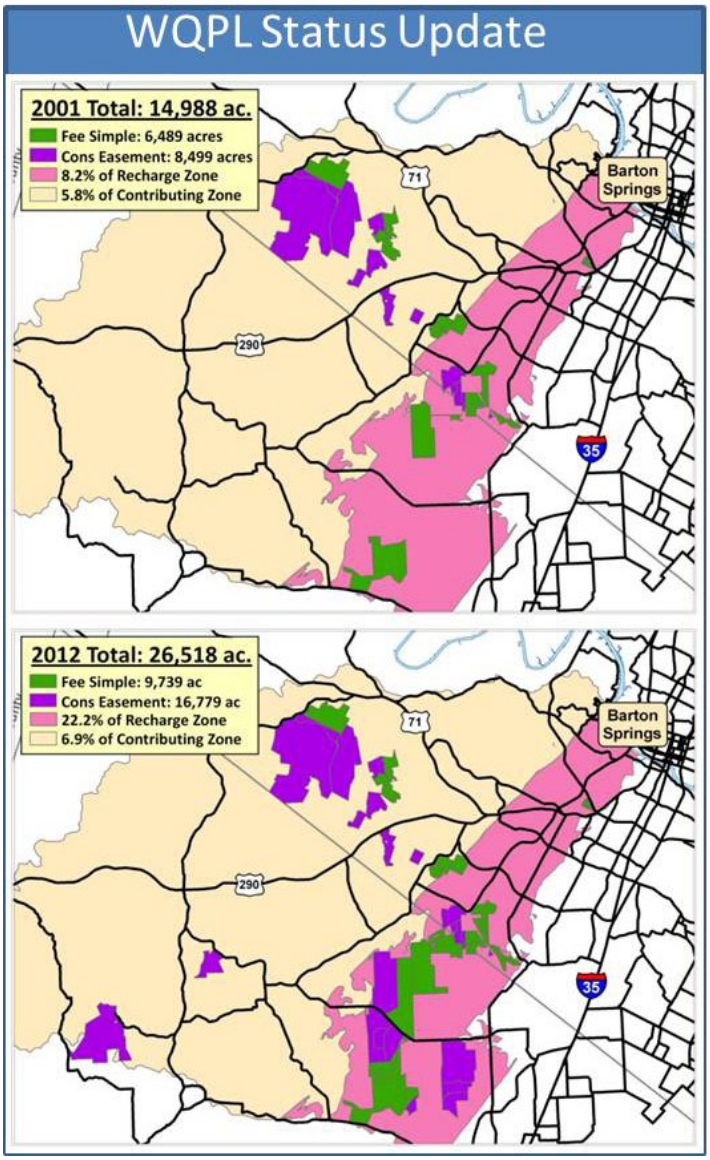


Figure 3. *Comparison of Water Quality Protection Lands in 2001 and 2012.*

Status and Trends

WQPL now protects 22% of the recharge zone compared with 5.8% in 2001 (Figure 3). Over the past 10 years WQPL has conducted thinning of more than 2,900 acres, seeding of native grass on more than 1,800 acres, and prescribed burning of more than 4,800 acres. Wildlands conducted prescribed burns on 561 acres in 2012 to meet ecological restoration goals and reduce fuels for unintentional fires. Partners, including the Austin Fire Department, Texas Forest Service, and U.S. Fish and Wildlife Service, took part in the prescribed burn. To learn more about this program visit www.austintexas.gov/rxfire

Volunteers donated more than 3,700 hours, a value of almost $70,000. Approximately 550 people attended the 32 hikes offered on Wildlands. Wildlands guided hikes continue to be a popular way to explore areas typically not open to the public. www.austintexas.gov/department/wildland-conservation-division

Annual Focus

The BCP is not a single tract of land, but a partnership between the City and County that creates a system of preserves in Western Travis County containing prime habitat for eight endangered species and 27 species of concern. The Habitat Conservation Plan for the BCP was the first multispecies, multipartner plan approved by the U.S. Fish and Wildlife Service. To ensure that the habitat is managed to suit the needs of the endangered species, BCP is conducting landmark scientific research. In 2012, BCP concluded its second year of a five-year study with the U.S. Forest Service to provide population viability and habitat suitability modeling for the golden-cheeked warbler populations within the BCP. This research will determine:

- How many golden-cheeked warblers are there on the BCP?
- How are they doing? For example, what is their density, productivity, and survival rate? And how do these vary with landscape and habitat factors?
- How do various land management scenarios influence the golden-cheeked warbler's survival and recovery?

Staff began field testing and investigating how banding birds might work in 2009 and 2010. The 2012 field season continued the data collecting collaboration initiated in 2011. BCP staff banded and monitored warblers in 18 intensive study areas (Table 1). In addition to the 100-acre monitoring plots established in prime habitat 15 years ago, several new study areas of varying sizes have been created within less-than-optimal habitat. In selecting locations for the new plots, an effort was made to represent a wider range of vegetation types (i.e., evergreen, deciduous, and mixed evergreen-deciduous forests), stand ages, slope and aspect, habitat patch sizes, proximity to urban development, and land management activities.

Year	GCW Males banded	GCW Females banded	Total GCW banded
2012	94	10	104
2011	162	8	170
2010	91	3	94
2009	101	3	104
Totals	**448**	**24**	**472**

Table 1. *Banded Golden-cheeked Warblers (GCW).*

The vast majority of monitoring is done by staff, with volunteers providing support. In 2012, volunteers contributed more than 570 hours of personal time to help monitor Golden-cheeked warblers. The 2012 monitoring season continued to build data for this research:

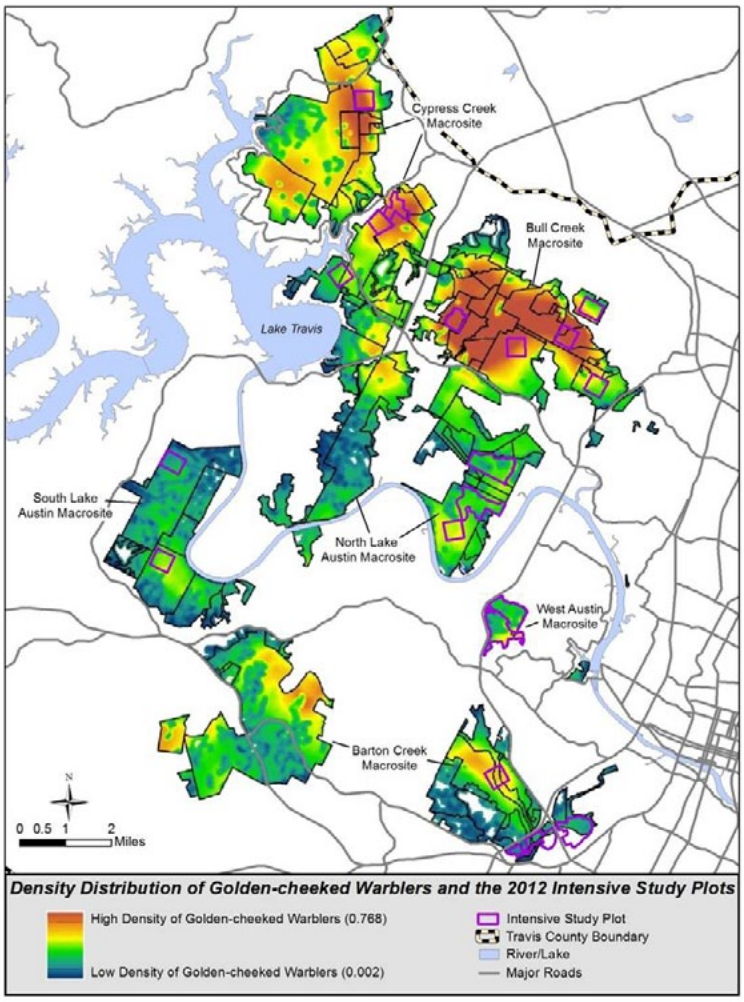
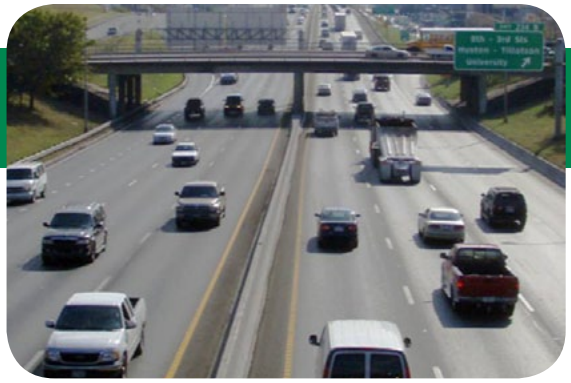


Figure 4. *Density distribution of Golden-cheeked Warblers.*

- A total of 235 territories were identified. Territory densities were highest in closed canopy woodlands of the largest habitat patches, and lowest in the small habitat patches surrounded by urban development (Figure 4).
- At least 57% percent of the warbler males banded in 2011 returned in 2012. In addition, 24 percent of males banded in 2010, and 7 percent of males banded in 2009, were found again in 2012. Over 93% of all 122 returning males were observed on or near the plot where they had been seen the previous year.
- BCP staff found and monitored a total of 151 active warbler nests during the 2012 field season. Ninety nests fledged one or more fledglings, 56 nests failed, and five had an unknown fate.
- Study plots in closed canopy woodlands of the largest habitat patches produced the greatest number of fledglings, while study plots in smaller habitat patches, and within woodlands that are young or more open, had the lowest reproductive output.

To see how BCP staff band and monitor Golden-cheeked warblers check out this Channel 6 video, www.youtube.com/watch?v=foGY78tvVjQ, or visit www.balconescanyonlands.org

Air Quality



Importance

The primary air quality concern in Austin is ground-level ozone, which is the main component of smog. Unhealthy levels of ozone can lead to increased respiratory ailments, especially in young children, the elderly and asthma sufferers. This in turn leads to missed school and work days. Elevated levels of ozone can also damage vegetation.

Goals

The City's goal is to promote healthy outdoor air for all citizens. The City of Austin Air Quality Program addresses the impact of City operations on air quality. The program also participates in regional efforts to improve air quality throughout Central Texas.

Challenges and Responses

Ongoing

The Austin region ended the 2012 ozone season in attainment of the existing federal health-based ozone standard, with an ozone design value of 74 parts per billion (ppb) (Figure 1). The design value is a statistic that reflects the region's average ozone level. It is compared to the health-based standard to determine attainment status. Research suggests that most ozone is imported to Austin from upwind areas, meaning most of the sources that create high ozone levels are beyond local control. In addition, the area's growing population challenges the region's ability to reduce local ozone-forming emissions (Figure 3, next page). Sources include vehicles, power plants, and industry.

Central Texas has a history of proactive air quality initiatives. The City of Austin will continue to support regional partners in reducing ozone-forming emissions; review and comment on new EPA ozone standards; and evaluate existing and new measures to improve air quality. As our region's population continues to grow at a rapid pace, air quality issues will become increasingly important. The development of regional public awareness and education campaigns to encourage voluntary action to improve air quality is critical.

The City of Austin has committed to implement several measures to reduce ozone-forming emissions. The 8-Hour O3 Flex Plan, the latest in a series of regional initiatives supported by the City of Austin, is a voluntary agreement between the Texas Commission on Environmental Quality, the Environmental Protection Agency and local governments within the Austin-Round Rock Metropolitan Statistical Area. It allows local governments to implement measures to reduce ozone emissions and maintain compliance with the 1997 Ozone National Ambient Air Quality Standards. Voluntary initiatives such as those outlined in the 8-Hour O3 Flex Plan have allowed the region to address ozone problems proactively rather than waiting to address them through the federal nonattainment process. Learn more at www.capcog.org/documents/airquality/reports/8o3flex/Austin-RoundRock8-HourOzoneFlex.pdf

Figure 1. *Austin area ozone trends 1999-2012. The graph shows the annual design value since 1999 for the Austin-Round Rock Metropolitan Statistical Area (MSA). The design value is a statistic that reflects the region's average ozone level. The figure shows the current health-based ozone standard of 75 ppb, finalized in 2008*

The City is committed to reducing the negative impacts associated with the Urban Heat Island effect. This effort is key in the challenge to cool Austin. Learn more at www.austintexas.gov/coolspaces

Recognizing the regional nature of air quality, the City of Austin takes an active role in the following area initiatives:

Clean Air Coalition, www.capcog.org/divisions/regional-services/clean-air-coalition

Clean Air Force of Central Texas, www.cleanairforce.org

Commute Solutions Coalition, www.commutesolutions.com

This Year

- The City of Austin and its regional air quality partners are preparing for the end of the 8-Hour O3 Flex Plan. The Clean Air Coalition will soon be rolling out a public information campaign soliciting public input and focusing on what we can do next to maintain our EPA attainment status. Learn more at www.capcog.org/divisions/regional-services/clean-air-coalition
- The majority of Austin's ground-level ozone problem can be attributed to on-road sources, and many of the City's employees drive alone to work. To address this, the Air Quality program coordinated with other City departments to implement a parking cash-out pilot to test the idea of incentivizing alternate commutes (see Annual Focus).

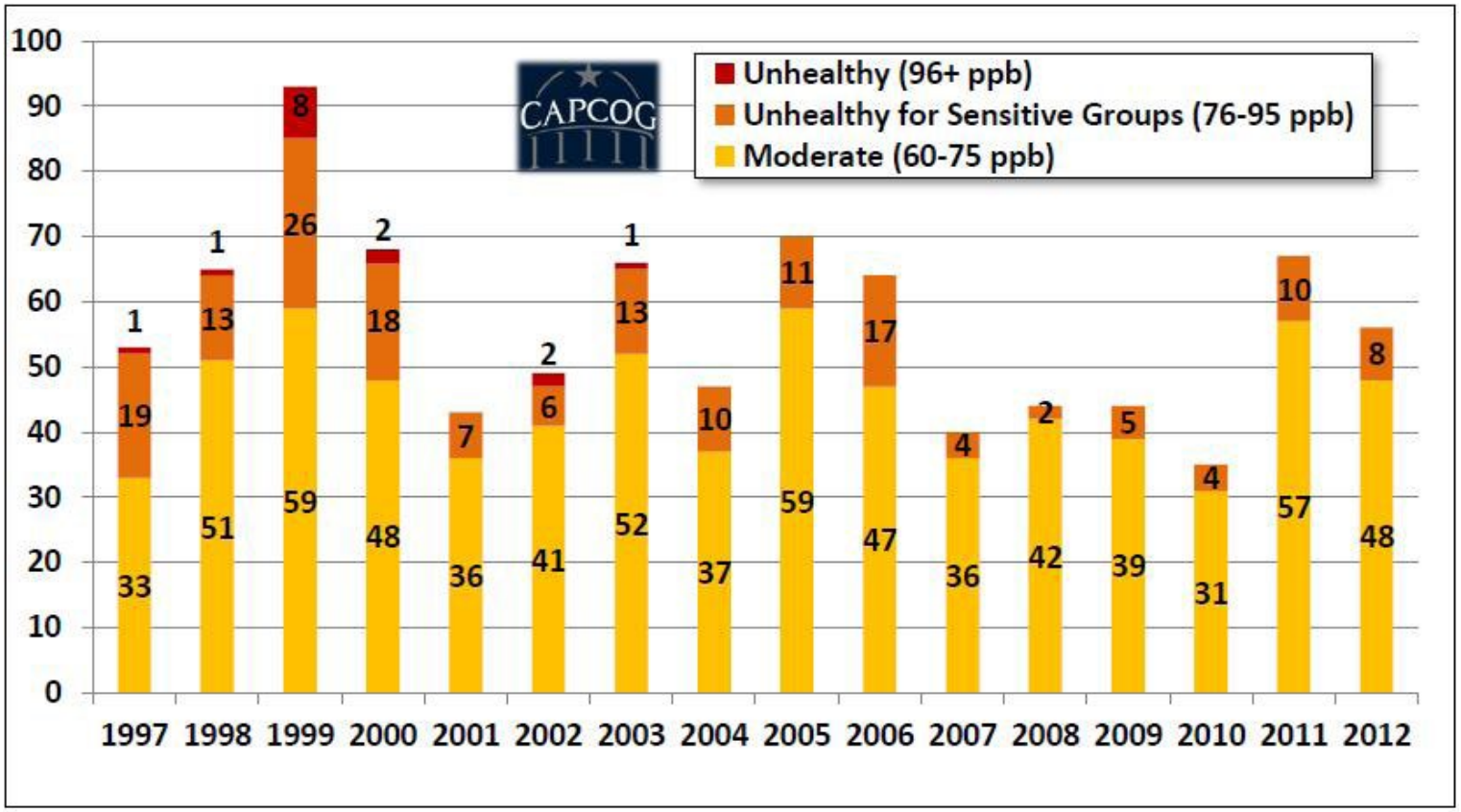
Status and Trends

Average ozone levels in the Austin area have been decreasing for more than a decade (Figure 1, previous page). The downward trend is probably caused by cleaner emission sources such as cars and trucks, both in Austin and in upwind areas. However, a growing population also leads to increases in emissions. Austin's ozone season runs from April through October. High ozone levels historically occurred most frequently between August and September, with a secondary period of frequent high ozone days between May and June. In recent years the frequency of high ozone days in a given year has both decreased and become equally distributed between the May-June and August-September periods.[2]

The 2012 ozone season was bad throughout the state of Texas. Although our region was able to avoid a non-attainment designation, the region is still in a precarious position regarding attainment status and clean air for our residents. Although 2012 had fewer days with moderate and unhealthy air than 2011, there were still more than in the years between 2007 and 2010 (Figure 2).

We know voluntary efforts by individuals and companies to improve air quality can be successful. The primary focus this year continued to be programs that achieved quantifiable emission reductions in City operations and encouraging other companies to explore opportunities to reduce their negative impact on air quality. The next ozone season will begin an important new phase in our air quality stewardship as our region revises the 8-Hour O3 Flex Plan in anticipation of a 2013 EPA revision to the health-based ozone standard.

Figure 2. *Days with unhealthy levels of ozone in the Austin MSA 1997-2012*[1]



[1] Capital Area Council of Governments (CAPCOG) November 2012 Ozone Season Update

[2] Conceptual Model for Ozone for the Austin Area, The University of Texas at Austin, July 2010.

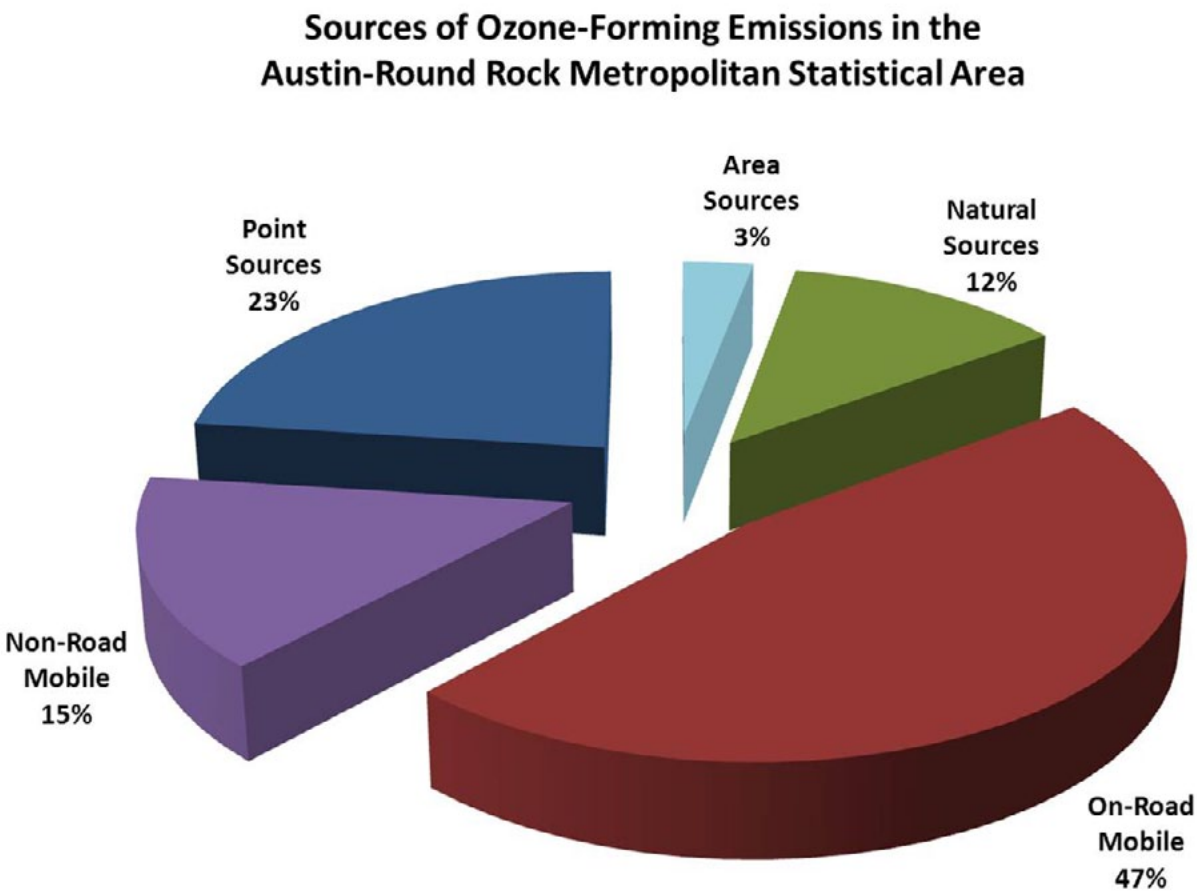


Figure 3. (left) *Austin-Round Rock Metropolitan Statistical Area emissions pie chart. Combined mobile source emissions account for more than 50% of ozone-forming emissions in Central Texas. The on-road mobile category comprises the vehicles (e.g., cars, trucks, buses) traveling the regional roads and highways. Non-road mobile sources account for the emissions of mobile equipment operated in areas other than public thoroughfares. The non-road category includes farm vehicles, lawn and garden equipment, construction, mining, and industrial equipment, railroad locomotives, aircrafts, and others. Point sources include industrial and nonindustrial stationary equipment or processes. Area source emissions come from of a variety of anthropogenic (created by humans) sources that are too small, too abundant, or too dispersed geographically to inventory individually. Natural sources include trees and other vegetation. Data Sources: On-Road Mobile–TTI, Point Source–TCEQ 2006 EI, Non-Road Mobile–NMIM.*

Annual Focus

Employee parking cash-out programs create incentives for employees to find an alternative to driving to work alone. In a cash-out program, employees are paid a subsidy or stipend to give up their dedicated or assigned parking space. Cash-out programs may be voluntary in nature or they may be prescriptive. The City's parking cash-out pilot program was a package of incentives available to employees at City Hall, the central library, and the Austin History Center.

Commute Mode	Greenhouse Gases (GHG)	Nitrogen Oxides (NOx)	Carbon Monoxide (CO)	Volatile Organic Compounds (VOC)	Vehicle Miles Travelled (VMT)	Trips
	Lbs.	Lbs.	Lbs.	Lbs.	Miles	No. Trips
Carpool	454	0.36	4.57	1.52	2,526	168
Transit	18,244	15.57	182.78	60.15	15,330	1022
Bicycle	2,106	1.69	21.17	7.06	2,286	418
Walk	49	0.04	0.5	0.17	54	10
Telework	227	0.18	2.29	0.76	240	16
Total	**21,238**	**17.84**	**211.31**	**69.66**	**20,436**	**1634**

Table 1. *Reduction of emissions, vehicle miles travelled (VMT), and trips by mode of commute.*

The parking cash-out concept was presented to stakeholders representing all of the affected City departments, including Austin Transportation Department, the Human Resources Department, the Office of Sustainability, Parking Enforcement, City Hall, the Public Works Department, and the Capital Area Metropolitan Planning Organization.

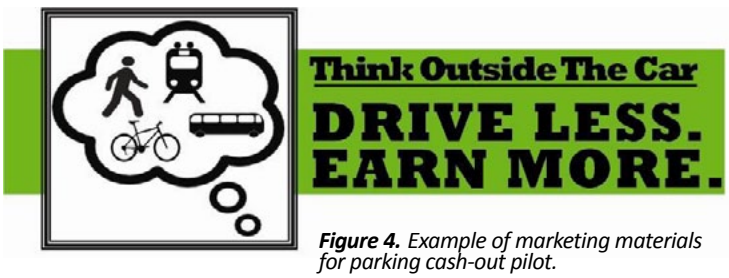


Figure 4. *Example of marketing materials for parking cash-out pilot.*

Because the majority of Austin's ground-level ozone comes from on-road sources and the majority of the City's employees drive to work alone, the parking cash-out pilot attempted to achieve the goal of furthering the Air Quality program's strategies of curbing the City's emissions through voluntary trip reduction.

Calculations based on employees' commuting logs revealed a significant reduction in emissions among participating employees. Employees participating in the pilot program drove more than 20,000 fewer miles than they would have otherwise. The air pollution prevented in Table 1 is the result of City employees burning about 1,000 less gallons of gasoline than they would have by driving to work during the eight-month period of the pilot.

100% Recycled

2012