Ecosystems

N15. Promote sustainable landscaping practices for residential, commercial, and industrial properties

A15. Develop guidelines on application of fertilizers, herbicides, pesticides, and animal waste

A16. Collaborate with landscaping and fertilizer companies to improve products and their application

A17. Implement educational campaign for landowners to promote responsible use of fertilizers, herbicides, and pesticides

A18. Collaborate with organizations, agencies, and private landowners to identify and create additional green space, urban tree canopy, and urban farms

Ecosystems refer to all of the living organisms in an area and the non-living things with which they interact, such as the soil, rivers and streams, and/or the atmosphere. Biological and physical environments provide numerous benefits to our communities, called ecosystem goods and services. They influence human health and well-being, help regulate the climate, and contribute to the local economy. Some of these services are direct and tangible, such as the presence of fresh water available for consumption and food sources derived from crops and fisheries. Others, however, are more abstract; it is difficult to quantify the amount of CO_2 sequestered by a grove of trees, or to calculate the aesthetic and recreational value of a forest preserve. Recent efforts have provided a detailed look at the full costs and benefits of trees located in major Ohio cities, with the trees providing benefits that are up to five times greater than costs.[1] Due to their ubiquitous and often intangible nature, it can be challenging to notice changes to ecosystem services before they are seriously threatened.

In Columbus, we have a variety of important ecosystems that benefit us on a day-to-day basis. The obvious ones include our major rivers and the reservoirs into which they feed, the more than 12,000 acres of parks and 14 nature preserves, and the nearby farms and fields that sustain local agriculture. However, it is the smaller, less obvious ones that we tend to interact with every day, ranging from residential lawns to the urban tree canopy. No matter the size, it is important to understand how each of these ecosystems are threatened by climate change so that we may take actions to ensure that the goods and services they provide do not disappear in the future.

Climate change affects all ecosystems and can disrupt many of their benefits, reducing the well-being of our communities. Extended droughts can lead to a reduced water supply. Invasive plants adapted to longer growing seasons (e.g., purple loosestrife and bush honeysuckles) can choke out native species. Increased extreme precipitation produces more stormwater runoff, introducing more nutrients and pollutants into our streams and rivers. Fortunately, we can combat many of these changes through increased awareness and simple actions; this is the main focus of the proposed actions in this section. Of the six proposed actions, four highlight the effectiveness of sustainable landscaping practices, whether it

[1] "Urban Forestry: Tree Evaluation." *The Ohio State University. Ohio Agricultural Research Development Center.* http://www.oardc.ohio-state.edu/urbanforestry/t08_pageview/Tree_Evaluation.htm. Accessed Jan. 2018.

is on residential lawns or large industrial properties. These practices include limiting the use of fertilizers, herbicides, and pesticides, growing native plants, and mitigating runoff through rain barrels or rain gardens, among others. They can be adopted by residents, businesses, and the city in general, and citizens can already take advantage of several existing programs with cost-sharing incentives. The other proposed actions look to promote ecosystem health through education and increase the amount of urban greenspace throughout the city. Through all of these actions, we can make Columbus' varied ecosystems more resilient to climate change so that we can continue to benefit from their invaluable goods and services.

N15. PROMOTE SUSTAINABLE LANDSCAPING PRACTICES FOR RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL PROPERTIES

Sustainable landscapes are those that maintain themselves (without undue labor, costs, or need for significant water, fertilizer, herbicides, and pesticides) while not having a detrimental impact on surrounding natural ecosystems. Native species, adapted to the climate and pests of Central Ohio, are prime candidates to plant for sustainability. Since they require little to no treatment of fertilizers and pesticides, there are fewer costs associated with landscaping inputs. Likewise, these species serve as habitat and food sources for wildlife, are often drought tolerant, reduce erosion, and absorb stormwater. Landscaping can have additional benefits to a property owners beyond aesthetic value, including reduced heating and cooling costs. To maximize benefits, these plants should be appropriately grouped and planted consistently according to site conditions.

In implementing an educational campaign, attention should be paid to prior research or additional local surveying done to determine what motivates home and business owners to select landscapes that promote holistic, long-term ecosystem health. While many landowners might be willing and able to change their practices, obstacles could include the accepted sense of aesthetic beauty, expectations of neighbors and customers, lack of awareness or knowledge, or costs associated with transitioning. Promotion of sustainable landscaping practices should continue with the Columbus GreenSpot program but also extended to a larger network of agencies with similar missions (including the FCSWCD, Franklin Park Conservatory, Columbus Franklin County Metro Parks, National Wildlife Federation, Audubon Center, and Franklin County Master Gardeners) and businesses selling related products and services (including engineers, architects, landscape architects, nurseries, garden centers, and landscaping companies). For instance, promotion of sustainable landscaping practices is reinforced by the sale of native plants by the FCSWCD, a program which both educates the public and results in tangible actions. In January 2018, the ODA made it illegal to sell 38 species of invasive plants in Ohio and stated that it will formulate a 5-person committee to review the inclusion of additional plants in the future.[2] Trusted agencies, such as the FCSWCD, OSU Extension, and Franklin Park Conservatory, can offer landowners independent advice based on sound scientific research rather than financial gain. The Chesapeake Bay Region and cities in the Western U.S. are examples of places working to transition their landscaping practices to embrace species adapted to local conditions, reflect a better stewardship of

[2] Marion Renault. "38 species of invasive plants now illegal to sell in Ohio." *The Columbus Dispatch.* Jan. 7, 2018. http://www.dispatch.com/news/20180107/38-species-of-invasive-plants-now-illegal-to-sell-in-ohio. Accessed Jan. 2018.

natural resources, and reduce deleterious environmental impacts.[3,4] Successes and challenges implementing programs in these communities could serve as valuable lessons for Columbus.

It is sensible for city programs already in existence, such as *Branch Out* Columbus, to explicitly include sustainable landscaping practices within their mission.[5] While the list of species promoted by Branch Out already includes urban tolerant and a number of native species, the list does not weigh heavily on climate impacts. These impacts are critical to consider when tree plantings throughout the city occur, especially with trees having long life expectancies that could survive to see the turn of the next century. Failure to consider future changes to our growing zone and the impacts to insect species could result in premature mortality of many of the trees that are currently being planted. To mitigate widespread damage to the tree canopy due to invasive species, greater awareness needs to be fostered for tree diversity and efforts made to avoid monocultures within neighborhoods.

Often, landscaping is an afterthought of development, consisting of a few low cost, low ecological value shrubs and trees sprinkled amongst a lawn that requires regular maintenance. Development of new construction and redevelopment of older sites offer opportunities to promote sustainable landscapes within the city. These projects can result in immediate, tangible ecological benefits and opportunities to showcase landscaping practices in ways that educate the larger community. City ordinances, city zoning codes, and city policies should be reviewed to ensure that they promote, or at least do not dissuade property owners from installing, sustainable landscaping. For instance, in 2017 the City removed the milkweed plant from the noxious weeds list. Rights of way, such as those along roads, could be considered for wildflower planting so long as they do not block visibility or contribute to a safety issue; a similar program is being conducted by the ODOT, which has approximately 19,000 miles of right of way in the state of Ohio.[6] The Department of Building and Zoning Services and the Department of Development are critical stakeholders that can shed light and direction on this issue. Incentives could be used to promote and scale sustainable practices; the City of Columbus and other local jurisdictions contract with FCSWCD to deploy an incentive programs such as the Community Backyards which offers rebates on rain barrels, native trees and plants.[7]

A15. DEVELOP GUIDELINES ON APPLICATION OF FERTILIZERS, HERBICIDES, PESTICIDES, AND ANIMAL WASTE

Unfortunately, improper use of fertilizers, herbicides, and pesticides and failure to clean up animal waste results in pollution to waterways, both contaminating drinking water supplies and damaging ecosystems. Poorly designed landscaping often favors intensive use of fertilizers, herbicides, and pesticides. Landowners might not be aware of the downstream damage of the misuse of these

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[3] "Development." *Chesapeake Bay Program*. https://www.chesapeakebay.net/issues/development. Accessed Jan. 2018.

[4] "Xeriscaping." National Geographic. https://www.nationalgeographic.org/encyclopedia/xeriscaping. Accessed Jan. 2018.

[5] "Branch Out Columbus." *City of Columbus, Office of Sustainability.* https://www.columbus.gov/branch-out/. Accessed Jan. 2018.

[6] "ODOT asking Ohioans to help with pollinator program." *Ohio Department of Transportation.* https://www.dot.state.oh.us/news/Pages/ODOT-asking-Ohioans-to-help-with-pollinator-program.aspx. Accessed Jan. 2018.

[7] "Community Backyards Program." *Franklin Soil and Water Conservation District.* https://www.franklinswcd.org/community-backyards-program. Accessed Jan. 2018.

products, fail to heed product directions or warnings, and/or realize the ineffectiveness of these products if misused (for example, intense rainfalls after use can wash away materials, both wasting money and causing pollution).

The City does have educational programs like GreenSpot and PUP that encourage residents to plant native plants and pick up pet waste respectively.[8,9] Columbus currently does not have regulations on application of fertilizers, herbicides, pesticides, and animal waste beyond that determined by federal and state laws. In fact, the State of Ohio, except in cases of applicators (those individuals paid to apply chemicals on property owned by someone else), defers to instructions provided on the product label and federal regulations. Although there are city ordinances prohibiting disposal of litter (including animal waste) on public property, private property not owned by the individual, and waters of the city, there are no restrictions on application of chemicals or requirements for homeowners to remove animal waste from their personal property.

Therefore, city departments should model practices that are desired of property owners and businesses and clearly communicate this information. For example, Columbus Recreation and Parks has policies on applications of herbicides and pesticides, and they have recently reviewed these policies to consider changes to application method, type of applications and amounts of application. The deliberations made by the department include organic products and consideration of reducing areas that have applications. The City of Columbus Golf Courses are already implementing some changes to the types and amounts of chemicals used. These guidelines will be followed by city agencies with the hope that associated educational campaigns can also result in changes in individual resident behavior. While there would be no legal recourse for following these guidelines, this is necessary as the state only follows federal mandates and product labels. Given the opportunity, most citizens would take action to improve ecosystem health.

A16. COLLABORATE WITH LANDSCAPING AND FERTILIZER COMPANIES TO IMPROVE PRODUCTS AND THEIR APPLICATION.

There is an increasing demand for landscaping companies to use practices that minimize damage to the larger, regional ecosystem. Landscaping companies, as a group, work with a significant amount of property. The scale of land under their care creates a significant opportunity for tangible ecological benefits with the added bonus of indirectly educating individual property owners. Since property owners may not know details of actions taken by their landscaping company, or the consequences of these actions, the city has a vested interest in promoting responsible practices. Under Ohio Law, anyone who is hired to apply fertilizer, herbicides, and/or pesticides is considered an "applicator" and must be certified by the state. The certification involves both training and passage of an examination. While large companies are likely to be aware of this law and abide by it, smaller operators might not know about it. An educational campaign could be conducted targeting landscaping companies. Likewise, the city should be aware of state regulations and, when necessary, refer companies that, through investigation, are shown not to be certified, not to abide by product labels, and/or not follow federal regulations.

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[8] "Greenspot." *City of Columbus, Office of Environmental Stewardship.* https://www.columbus.gov/greenspot/. Accessed Jan. 2018.

[9] "Pick Up Poop (PUP)." *City of Columbus, Water Protection.* https://www.columbus.gov/PUP/. Accessed Jan. 2018.

Additional options could be added to GreenSpot to promote practices that reduce inappropriate application of lawn and garden products. For instance, GreenSpot participants could be given a list of key questions to ask or practices to avoid when hiring a landscaping company or purchasing a fertilizer product. Conversely, an informational flyer could be included in each resident's water bill to educate property owners across the city. The purpose of educating property owners is to increase the likelihood that some of these individuals request more ecologically beneficial practices from landscaping and fertilizer companies. Landscaping companies are likely to respond to an increased demand for a service by increasing their capacity to deliver it, resulting in a virtuous cycle. Some service review companies, such as Angie's List, offer green certifications that could be leveraged in collaboration with the City of Columbus.

Lastly, companies have an incentive to appear as good corporate citizens as consumers are placing more emphasis on environmental sustainability. This is creating significant economic incentives to work collaboratively with government agencies, nonprofits, and retailers to reformulate products, refine instructions, and educate the public on their use. Scotts Miracle-Gro, is an example of a company that has taken steps to reduce the environmental impact of their lawn fertilizer.[10] Scotts Miracle-Gro removed phosphorus from its lawn fertilizers, provided educational displays with its products, and introduced technology to its spreaders to reduce application on impervious surfaces. For some companies, transitioning to more ecologically sustainable practices might involve offering services rather than products (e.g., lawns might need soil testing and aeration rather than sales of seed and fertilizer). To grow the market for these products and services, the City of Columbus could lead the way by providing preferential procurement for products and services that are ecologically beneficial versus ones that are less so.

A17. IMPLEMENT EDUCATIONAL CAMPAIGN FOR LANDOWNERS TO PROMOTE RESPONSIBLE USE OF FERTILIZERS, HERBICIDES, AND PESTICIDES.

With the expectation that most landowners will make good decisions if given accurate, timely information, an educational campaign should be developed. While the campaign can include community and environmental benefits of individual actions, it will likely result in greater results if focused on benefits to the individual property owner (such as time saved, lower cost, long-term soil health, increased wildlife). Collaborations should continue between environmental and outdoors organizations and city departments. Likewise, information should be shared about programs like City of Columbus GreenSpot, FCSWCD Community Backyards, National Audubon Society's Audubon At Home, and the National Wildlife Federation's Certified Wildlife Habitat. Any educational campaign should take into account past studies that acknowledge individuals applying chemicals to their lawns are more likely than those who do not apply chemicals to believe that lawn care practices have a negative impact on local water quality.[11] These studies suggest that efforts employed to educate individuals have generally not been sufficient to cause behavioral changes and that novel approaches should be attempted.

[10] Mary Vanac. "Scotts drops phosphorus from lawn fertilizer." *The Columbus Dispatch.* May 10, 2013. http://www.dispatch.com/content/stories/business/2013/05/10/scotts-drops-phosphorus-from-lawn-fertilizer.html. Accessed Jan. 2018.

[11] Paul Robbins. "Lawn People." (Philadelphia: Temple University Press, 2007).

A18. COLLABORATE WITH ORGANIZATIONS, AGENCIES, AND PRIVATE LANDOWNERS TO IDENTIFY AND CREATE ADDITIONAL GREEN SPACE, URBAN TREE CANOPY, AND URBAN FARMS.

Access to green spaces in all portions of the city should be prioritized as both new construction and redevelopment occurs. Green space has been shown to improve quality of life, and research suggests that there are public health consequences to how we design and develop our urban environments. Studies over the past decade have shown that office workers with access to plants and windows show greater satisfaction in their work and that there are mental health benefits to moving to neighborhoods with greater green space.[12,13,14] Attention should be paid to the distribution of these spaces within the city and their proximity to where individuals live and work. For instance, Columbus Recreation and Parks already has a goal to provide green space within a 10-minute walk of all residences.

CRPD, Columbus and Franklin County Metro Parks, and schools districts within the city have significant land holdings that can serve as models of how to manage green spaces with sustainable practices that promote healthy ecosystems and protect our waterways. For instance, fertilizer and herbicide application should be carefully tailored to the particular land use, and lawns that are unused for athletic fields may be considered for prairie plantings (urban meadows) that do not require lawn care. As a majority of property within the city is privately held, working to educate and incentivize the establishment and preservation of green spaces is critical to success. Legal tools, such as conservations easements, are an example of such an incentive. These easements are agreements that can be entered into between private property owners and conservation organizations, such as The Nature Conservancy, or Soil and Water Conservation Districts.

With regard to the tree canopy, Branch Out Columbus is an initiative to plant 300,000 trees in Columbus by 2020.[15] The impetus for the program was a study that identified some portions of the city having less than 15% tree canopy cover. As was mentioned in other portions of this report, the lack of trees exacerbates the urban heat island, diminishes air quality, diminishes beneficial wildlife, and reduces aesthetic appeal of neighborhoods. For vulnerable populations, cooling that results from trees is especially important for residents' quality of life as their homes might not have air conditioning on which to depend for summer cooling.

Additionally, urban farming is a growing phenomenon in the United States that repurposes abandon and underutilized land within cities for food production while creating employment and volunteer opportunities for residents. By locating a greater percentage of the food system in close proximity to residents, there are opportunities for individuals to better understand and appreciate the

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[12] A. Dravigne, T. M. Waliczek, R. D. Lineberger, and J. M. Zajicek. "The effect of live plants and window views of green spaces on employee perceptions of job satisfaction." *HortScience* 43, no. 1 (2008): 183-187. http://hortsci.ashspublications.org/content/43/1/183.abstract.

[13] K. M. Beyer, A. Kaltenbach, A. Szabo, S. Bogar, F. J. Nieto, and K. M. Malecki. "Exposure to neighborhood green space and mental health: Evidence from the survey of the health of Wisconsin." *Int J Environ Res Public Health* 11, no. 3 (2014): 3453–3472. http://www.mdpi.com/1660-4601/11/3/3453.

[14] I. Alcock, M. P. White, B. W. Wheeler, L. E. Fleming, and M. H. Depledge. "Longitudinal effects on mental health of moving to greener and less green urban areas." *Environ. Sci. & Tech.* 48, no. 2 (2014): 1247-1255. http://pubs.acs.org/doi/full/10.1021/es403688w.

[15] "Branch Out Columbus." *City of Columbus, Office of Sustainability.* https://www.columbus.gov/branch-out/. Accessed Jan. 2018. REPEATED.

complexity of growing and distributing food.[16] Columbus has farms that are managed as businesses, those that are run as non-profit organizations, and some landowners who grow food crops in their yards for distribution to the general public.[17] These farms support the local economy, provide income to entrepreneurs, offer food to vulnerable populations, and create additional green spaces. The City of Columbus should continue to monitor and promote innovative food-production trends such as these that benefit the community in myriad ways.

[16] Terry McLean. "The Urban Agriculture trend continues in 2017." *Michigan State University Extension*. http://msue.anr.msu.edu/news/the_urban_agriculture_trend_continues_in_2017. Accessed Jan. 2018.
[17] "Urban Agriculture." *OSU Extension: Franklin County.* https://franklin.osu.edu/program-areas/agriculture-and-natural-resources/urban-agriculture. Accessed Jan. 2018.