

# **Ferguson Township Tree Commission (FTTC)**

**Date March 18, 2019**

## **Meeting Agenda**

**Time 5:30pm**

### Call to Order

### January 28<sup>th</sup> Meeting Minutes

The FTTC shall review and approve the minutes from the November meeting.

### SALDO/Zoning Update

The Arborist and the Chairman of the FTTC will provide an update on the FTTC comments on the above ordinances.

### Tree Preservation Ordinance

The FTTC shall continue this discussion.

### Ferguson Township Public Works Building

The FTTC shall discuss the comments on the land development plan and the responses provided by the Public Works Director.

### 2019 C-13 Street Tree Planting

The Arborist will provide an update on the above contract.

### Arborist report:

The Arborist will review work activities and plan reviews since the last meeting.

### Communications to Commission Members

This is an opportunity for FTTC members to report on any contact by residents regarding FTTC matters.

### Future agenda items

Arbor Day 2019, Tree Preservation Ordinance,

### Other

Next meeting date and time is April 15<sup>th</sup> at 5:30pm

**FERGUSON TOWNSHIP TREE COMMISSION  
MEETING MINUTES  
MONDAY, JANUARY 28, 2018  
5:30 PM**

**I. ATTENDANCE**

The Tree Commission held its public meeting on Monday, January 28, 2018 at the Ferguson Township Municipal Building. In attendance were:

**COMMISSION:**

Howard Fescemyer, Chairperson  
Darlene Chivers, Vice-Chairperson  
Mike Jacobson  
Marc McDill  
Scott Pflumm

**STAFF:**

Lance King, Arborist  
David Modricker, Public Works Director

Others in attendance were: Marcella Bell, Recording Secretary; and Mike Beury, Cutting Edge Tree Professionals

**II. CALL TO ORDER**

Dr. Fescemyer called the Monday, January 28, 2019 Ferguson Township Tree Commission meeting to order at 5:37 PM

**III. INTRODUCTION OF SCOTT PFLUMM**

The FTTC welcomed Mr. Scott Pflumm. He introduced himself and stated that he was very happy to serve on the Tree Commission.

**IV. ELECTION OF CHAIR AND VICE CHAIR PERSON**

Dr. Fescemyer turned the meeting over to Mr. Modricker who for nominations from the floor for the 2019 Chairperson. Ms. Chivers nominated Dr. Fescemyer to remain Chairperson in 2019. The vote was seconded by Dr. Jacobson. The vote for Mr. Fescemyer to remain Chairperson carried unanimously.

Dr. Fescemyer asked for nominations for the 2019 Vice-Chairperson. Dr. Jacobson nominated Ms. Chivers to remain Vice-Chairperson in 2019. The vote was seconded by Dr. McDill. The vote for Ms. Chivers to remain Vice-Chairperson carried unanimously.

**V. NOVEMBER 19, 2018 MEETING MINUTES**

Dr. McDill stated that he was not in attendance for the November meeting.

A motion was made by Ms. Chivers and seconded by Dr. McDill to approve the corrected November 19, 2018 meeting minutes. The motion carried unanimously.

**VI. FERGUSON TOWNSHIP ROAD STANDARDS**

Mr. Modricker stated that the Tree Commission has made comments on the Zoning and Subdivision and Land Development Ordinances (SALDO) and within

the SALDO, there are road standards as well as within the Traditional Town Development (TTD) Ordinance. Mr. Modricker referred to the agenda packet, which include pages from the SALDO regarding residential road standards. There are also road standards for arterial and collector streets. Mr. Modricker explained that most residential streets are 26 feet wide with a curb. If the street does not have a curb, it has a shoulder, which is usually the same material as the paved road, however, some neighborhoods have stone shoulders. The larger order streets are to be built according to PennDOT design standards.

Mr. Modricker then explained the road standards for the TTD. The idea for a TTD is that the development is denser, has on-street parking, has narrower roads, and incorporates elements of road diets.

In response to a question from Ms. Chivers regarding street design and stormwater flow, Mr. Modricker explained that on Havershire Drive, the Township installed depressed curbs on the side of the boulevard to allow sheet flow stormwater runoff into the center grass median. He went on to explain that the Township has had issues with motorists driving over the concrete ribbon and on the grass, which then destroys the grass and makes a mess. Then the Township tried to remedy the situation by putting stone down to replace the grass damage. In addition, the Township's Public Works department installed concrete bumper blocks on the concrete ribbon area and installed delineators. Dr. Fescemyer stated that he believes that the area in question is too narrow, which is why cars drive on the grass.

Dr. McDill added that the curbs don't have to be inverted or flat, rather they just have to have cut-outs in the curb. Mr. Modricker stated that he could look at this for the standards for a boulevard. Dr. McDill explained that cut out curbs could be used in residential neighborhoods near retention basins. The cut curbs could be next to a low area with a raised sidewalk with culverts that let the water flow underneath it. The water would then go straight into the retention basin to spread that flow out over more green space. The low area would be an area where water gets trapped before it goes into the basin, where it can infiltrate and feed the trees and surrounding vegetation. The overall goal is to have more places where water can flow, instead of trying to funnel it all into one place and then building a lot of grey infrastructure to handle it. Installing more outlets and using green infrastructure will provide more opportunities for infiltration. Dr. McDill clarified that this idea could be used for future developments, not current ones.

Dr. Fescemyer stated that he attended a seminar on this subject in December, and that most places that are practicing this are in big cities. Most of these ideas are fairly new. The city would take a place like Havershire Drive and develop points to funnel water into and plant appropriate vegetation in the points. These cities usually don't have a separate storm sewer system for stormwater run-off like the State College area does, so they are pressed to take action to fix their stormwater run-off.

Mr. Modricker added that the challenges that these places are running into is once the water gets to the soil, they have to have soil that infiltrates, which is sometimes an issue in the State College area. Dr. Fescemyer stated that these practices would help increase the tree canopy. Dr. McDill added that these practices act as a filter for pollutants as well. Dr. Fescemyer stated that he will try to find the seminar recording and send it the FTTC and staff. Ms. Chivers referred to a book on Low Impact Design that references a lot of the above ideas.

Dr. Fescemyer stated that the space between the street and the sidewalk (tree lawn) could also be increased so that there is more room for the tree to grow. Mr. Modricker stated that the bigger the right-of-way, the bigger the tree lawn is. For example, a 60-foot right-of-way has a 10-foot tree line area. The typical residential street has a 50-foot right-of-way with two 5-foot tree lawn areas with utilities easements outside of that. Dr. Fescemyer stated that he believes the tree lawn should be a minimum of six feet.

Dr. McDill stated that parking lots are way over designed. For example, the parking lots for Weis and Giant off of North Atherton Street are never full. Dr. McDill stated that he's observed, at maximum, the parking lot at Giant 70% full, but never 100% full. Mr. Modricker explained that parking lot calculations come out of the Zoning Ordinance, but sometimes depending on the development, a parking study is done, which uses localized data instead of the parking calculations.

Dr. McDill stated that bike lanes should be part of the design of every new neighborhood. Mr. Modricker stated that a bike lane can be designed different ways. It can be right on the road (connected to the pavement) as a shared lane, or it can be its own dedicated lane. It can be its own off-lane facility such as a multi-use path. Dr. McDill suggested that pervious pavement be used for the bike lane. Mr. Modricker stated that if the bike lane was constructed with pervious pavement, the soil underneath must be able to infiltrate and there must be testing done to prove the infiltration capacity. The FTTC will provide more comments on this subject at a future meeting.

Mr. King stated that Environmental Planning & Design (EPD), the Township's consultant who is rewriting the Zoning and SALDO, provided the fifth draft on Friday, January 25. Mr. King will provide the dropbox links so that the FTTC may start reviewing the draft ordinances. It is not apparent that EPD incorporated the FTTC's comments from the fourth draft.

## **VII. TREE PRESERVATION ORDINANCE**

Dr. Fescemyer stated that he requested this item to be on the agenda to begin discussion. He went on to state that he believes a tree canopy survey should be done first to assess the tree canopy coverage in the Township. Mr. Modricker stated that the survey did not make it into the 2019 budget, however, there was a discussion that someone at Penn State has a tool that could possibly measure the tree canopy coverage. Mr. King stated that currently, the Township GIS technicians have the tool from DCNR and will review to the tool to see if it can be

used to measure the tree canopy. In addition, the Township had to purchase software to be able to use the tool. The GIS department will start the survey this year. Dr. Fescemyer stated that the next steps would be to talk about the process of creating a tree preservation ordinance. Dr. Fescemyer would like to involve Bill Elmendorf with this process. Dr. McDill stated that it would be useful for Dr. Elmendorf to provide models of different tree ordinances. Dr. Fescemyer will reach out to Dr. Elmendorf for model ordinances. The FTTC would also like to invite Dr. Elmendorf to a future meeting.

#### **VIII. TREES FOR TOWNSHIP RESIDENTS**

Dr. Fescemyer provided an article to the FTTC regarding free trees for West Cape May homeowners. Dr. Fescemyer explained that the homeowner can put in a request for a tree and West Cape May will provide them a tree. The homeowner is responsible for maintaining the tree on their private property. Dr. Fescemyer stated that it is an idea the Township can consider to deal with increasing tree canopy of private trees. Dr. Fescemyer stated that instead of creating an ordinance that would not allow homeowners to cut down private trees, providing residents with free trees might be an alternative.

Dr. Fescemyer spoke to the details of the program in West Cape May. The trees come from an approved list, the tree is selected for certain areas for optimization, they plant three-inch trees that are seven to nine feet tall, and a contractor plants the trees. The program is funded by proceeds from the farmer's market tomato festival. Dr. Fescemyer stated that he feels that the funding should not come from tax payer money. Dr. McDill stated that the Township could gain interest by putting an article in the Township newsletter to inform residents that the Township is creating a fund for free trees for residents and ask for donations for the fund. The Township could then use the interest from that fund to purchase trees.

Dr. Jacobson stated that he feels the Township should focus on planting public trees. In addition, he feels that there is no incentive for home owners to maintain the tree. He went on to say that this program could be a part of the tree preservation ordinance, and in addition, the tree canopy survey will tell the Commission where to optimize the trees. Dr. Jacobson suggested that the home owner pay 50% of the cost of the tree, which could garner more interest in maintaining that tree. Mr. King stated that it would be between \$300-\$400 to purchase and plant the tree.

The FTTC will discuss this item again at a future meeting.

#### **IX. MUSSER GAP TO VALLEYLANDS CONSERVATION**

Dr. Fescemyer stated that there is a meeting regarding the Musser Gap conservation on Thursday, January 31, 2019. He encourages the FTTC members to go to this meeting to discuss the opportunity to preserve and restore forest land. Clearwater Conservancy and Penn State University have partnered to come up with a conservation plan for the land.

**X. 2319 FALCONPOINTE DRIVE**

Mr. Modricker provided pictures of the driveway that were taken that day. After a brief discussion, there was a general consensus from the Tree Commission for Mr. Modricker to send a letter to the homeowner giving him the option to leave the tree as it is or pay for the appraised value of the tree, the cost of removal, the cost of the new tree, and the cost to plant the new tree.

**XI. ARBORIST REPORT**

Mr. King provided his arborist report, included in the agenda.

**XII. COMMUNICATIONS TO COMMISSION MEMBERS**

Dr. Fescemyer stated that he received an email from a resident asking about cleaning up pods from a honey locust. He responded back to her and told her that those duties are a part of the Township's Public Works operations. Mr. Modricker stated that he did look at the tree and due to winter operations, Public Works will not be able to pick them up at this time.

**XIII. ADJOURNMENT**

With no further business, the January 28, 2019 Tree Commission meeting adjourned at 8:30 PM.

RESPECTFULLY SUBMITTED,

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David Modricker, Director of Public Works  
For the Tree Commission

## King,Lance

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**From:** Fescemyer,Howard  
**Sent:** Saturday, March 09, 2019 9:37 AM  
**To:** Schoch,Lindsay; FergTreeComm; Pribulka,David; FergBoard  
**Cc:** King,Lance; Stolin, Raymond; Modricker,David  
**Subject:** Reply to Lindsay who requested clarifications on SALDO and Zoning Comments from FTC -- also includes new comments on the latest, 5th Zoning draft  
**Attachments:** South\_etal2018Effect of Greening Vacant Land on Mental Health of Community-Dwelling Adults.pdf; EffectGreenSpaceOnMentalHealth.pdf; Leopold.pdf; Greening the Urban Landscape by Darlene&Marc.pptx

Hi Lindsay:

Sorry for not getting back to you sooner. The demands of teaching and keeping research going while in the process of moving the lab over the past two weeks has left me with little energy left for Township and Tree Commission related activities.

The presentation on “Greening the Urban Landscape” was prepared and presented by Darlene Shivers and Marc McDill to the Board of Supervisors at a working group meeting. They sent me this presentation, which was not in my possession. In this presentation, Darlene and Marc proposed a number of “Tools,” not goals, by which the greening of Ferguson Township could be augmented. One of these tools listed in slide 5, second bullet states “Revise guidelines and regulations (ordinances) for new developments, both residential and commercial.” This statement directly relates to the process of revising the SALDO and Zoning ordinance currently being undertaken by the Township. It recommends that these ordinances be revised in such a manner that they incorporate contemporary approaches of green open space development and the other tools listed in this presentation. The presentation as a whole suggests that these two ordinances and perhaps other existing interconnected ordinances be revised according to the tools listed to meet an overall vision stated in the presentation as, “To maintain and increase tree cover and create connected ribbons of green throughout the township.”

I want to emphasize that tools listed in the presentation on “Greening the Urban Landscape”

are not goals. They also were not intended by the Tree Commission to be tucked away into a comprehensive plan or other type of guiding document for future consideration. We meant them to be incorporated into the current revision of the SALDO and Zoning ordinance. Thus, the Board asked the Tree Commission to provide comments and incite toward greening these ordinances. We did this to the best of our abilities and available time by pointing out where greening, especially in regard to using trees, could be incorporated into these ordinances. Unfortunately, none of the Tree Commissioners are knowledgeable enough in the areas of architecture, landscaping and city planning to provide the necessary details and specifics on how to incorporate our greening suggestion into these ordinances. That task we left up to experts in Township staff and the consultant hired by the Township.

Presentations and discussion at the working group meeting with the Board also included ideas about creating a tree preservation ordinance, which the Township does not have. The Tree Commission was subsequently asked by the Board to prepare such an ordinance at a regular meeting of the Board. How or where a tree preservation ordinance would be fit into the Township's Code of Ordinances or even if it should be a separate ordinance is yet to be determined. Some with the Township see it being a separate chapter in the Code, some feel it should be in the SALDO chapter and one expert in urban forestry said it should be in the Zoning Ordinance to have the most effect. At a minimum, tree preservation will need to be referenced in both SALDO and Zoning chapters. Awareness of the future use of the tree preservation ordinance led those of us on the Tree Commission who reviewed revision 4 of these ordinances to point out the many circumstances where trees and associated vegetation could be used to green these two ordinances.

The first component of creating a tree preservation ordinance is performance of a GIS survey to determine the current tree canopy coverage and how this canopy has changed over the past 10, 20 or even 30 years if possible. This canopy survey would encompass the entire Township, not just the growth boundary, and the data partitioned by neighborhood or development due to past variation in land uses that occurred before many existing parts of the Township were developed. This tree canopy coverage survey will be especially useful now that about a third of the land outside the growth boundary is being zoned rural residential, which is where a tree preservation ordinance could be very effective in stabilizing or enhancing the benefits that trees provide to Township residents. The Township GIS technicians have the tool from DCNR that should help them perform the tree canopy survey.

At the Zoning Open House held on Thurs. Feb. 21, I talked with the Carolyn Yagle who was representing the consultant Environmental Planning and Design, llc. at the open house. She asked me to provide clarification on my general or overall comment on the 4<sup>th</sup> revision of the Zoning ordinance that all development types, districts, and overlays should have a minimum percentage tree canopy coverage that could vary with development type. I am not sure of the best way to pursue this idea in an ordinance, but mentioned to Carolyn that reaching a future minimum percentage tree canopy coverage in the Township was one way to approach this in an ordinance. However, I feel that this Township wide canopy coverage approach is too simple. First, it does not clearly protect existing trees on a property to be developed. The *Pine Hall Traditional Town Development* in Ferguson Township and the Patton Crossings commercial development in Patton Township are two local examples where the vast majority or all of the existing, often mature trees will be removed. Both SALDO and the Zoning ordinance need to incorporate ways to require developers to preserve existing trees for use in reaching the future canopy coverage specified for that particular type of development. Second, the aesthetic, health and economic benefits of trees could end up being disproportionately distributed between the area within the Regional Growth Boundary zone and the "rural" areas outside of this zone. I indicated in my overall comment on the 4<sup>th</sup> revision of the Zoning ordinance that each development type needs to have or reach in the future a specific minimum percentage tree canopy coverage. This approach may enable the benefits of open space containing trees and associated vegetation to reach everyone especially those living, working and shopping within the relatively dense Regional Growth Boundary zone.

A very recent study using randomized trial plots in Philadelphia found that simple greening of vacant urban land improved the self-reported mental of adult residents. Please see the attached summary article published in PennLive and the peer reviewed paper published in JAMA Network. Research over that past 10-20 years has consistently revealed that greening the urban landscape provides significant health benefits.

Incorporating open space with tree cover and creating connected ribbons of green throughout the Township would improve the health and well-being of humans who reside and work in Ferguson Township.

Now I will try to clarify comments on Section 27-104 – Community Development Objectives. My comment here regarding Land Use and Character asks that an objective for the basis upon which the regulations are established include those that support green infrastructure, natural resource protection and open space (i.e., green open space development) containing trees and associated vegetation as the principle (maybe this is too stringent a word here) path for community development in both the Regional Growth Boundary and those areas deemed rural, especially areas zoned rural residential. I really do not see any more need for clarification here. Those on the Tree commission who reviewed SALDO and Zoning ordinance pointed out where greening, especially in regard to using trees, could be incorporated into these ordinances. We do not have enough knowledge in the areas of architecture, landscaping and city planning to provide the necessary details and specifics on how to achieve this objective. As I said above, that task we left up to experts in Township staff and the consultant hired by the Township.

My comment about the emphasis on agricultural land in the Community Development Objectives section seems pretty clear to me based on the previous and especially the new Zoning Map that shows about 30% of the land outside the growth boundary being zoned rural residential. Performance of non-research agriculture is clearly a declining use of the land in both practice and in zoning where this land use appears to be about 30% of the land outside the growth boundary. I may be wrong about commercial retail being allowed outside the growth boundary, but it is not clear to me that commercial activities are prohibited. In addition, neither SALDO or the Zoning ordinance do anything to preserve existing trees or require the inclusion of trees and associated vegetation in rural residential development.

My comment on land use objective A3 is true in that much of the development in the Regional Growth Boundary has occurred on prime agricultural soils. Perhaps this objective should be clarified by saying the following; Establish municipal regulations that support agriculture as the principal use on property outside the Regional Growth Boundary that has prime agricultural soils. I should also point out that much of the area zoned rural residential probably lies on prime agricultural soils, which makes land use objective A3 problematic as property owners outside the Regional Growth Boundary develop their land.

The context of my comment regarding 27-301, Mobile Home Park (MHP) District, section G3 of Site is that no other type of development in the Zoning ordinance specifies that “grounds shall be maintained free of vegetative growth which is poisonous or which may harbor rodents, insects or other pests harmful to man.” Application of this statement only to residents of Mobile Home Parks suggests they are different from those living in other developments. This statement should be deleted or substantially revised to allow vegetative growth as specified in other types of developments. I will state again that it is uncollected garbage (i.e., organic waste) that attracts rodents and standing water that attracts and harbors mosquitoes. These situations can occur in all types of developments, not just in mobile home parks. Examples I observed in the State College area include garbage bins at apartment complexes and residents in single family home

developments placing their garbage at curbside contained only in plastic bags instead of putting the garbage bags into a bin with lid where wild animals (crows, racoons, bears, etc.) cannot easily get into the garbage and spread it all over the street.

The health and well-being of residents in Mobile Home Parks can benefit from landscape greening just like people living in other types of development where landscape greening is allowed. Please see the attached summary article the research paper I mentioned above as evidence. A good example of affordable housing with good density and trees was the mobile home park that previously existed on North Atherton where the Patton Crossings commercial development is slated to be built. Planners and landscapers just need to put away any inherent bias they may have when developing affordable housing and apply their knowledge and training to how these types of developments can be greened so that low income residents also receive the aesthetic and health benefits of trees and associated vegetation.

I have not have Marc's photos that are referenced in Darlene's comments on version 4 of SALDO. Most likely they are showing how poorly greened are parking lots of existing neighborhood shopping centers, such as Northland Center, Weis Market on Martin Street, etc.

What follows next are my comments on the 5<sup>th</sup> version of the Zoning ordinance.

A part of section 27-302, part 2.a.3 on page 8, needs refinement of the specification for what tree mass sizes need to be included in the development plan application. I think it needs to be specified in diameter at breast height (e.g., 3 inch DBH) and not in terms of only tree height or diameter. Further, I would also like to see information to be provided here on canopy coverage and species composition.

I also noticed that whole, important sections of 27-303 on the traditional town development were deleted. These deleted sections include those on transportation associated bicycling and walking, utilities associated with stormwater management, and parking. Perhaps they were moved to SALDO, but no reason is given as to why these deletions were made or moved.

The attempt to provide broad conceptual comments without providing details on how to accomplish them appears to be largely unsuccessful in influencing the revision of the zoning ordinance. I am especially disappointed, but not surprised, that no attempt was made to strengthen the environmental and ecological aspects of open space in the zoning ordinance based on the conceptual comments provided by the FTC.

One example concerning open space in developments has to with community open space in section 27-302, page 18-19. First, the ordinance still allows stormwater management facilities (up to 75%) to be included in the common open space calculation. This inclusion must be greatly reduced with lined retention ponds being remove from counting as open space.

In a second example concerning open space, the Zoning ordinance revision appears to reduce the required common open space percentage per acre of dwelling unit. A comment suggests this reduction was made because we have parks everywhere, but there is no clear mention in the ordinance how parks count as open space, and just because there are parks elsewhere in the Township does not mean they should impact open

space in that specific development plan. Open space, especially that which has trees on it, provides on-site aesthetic and health benefits to residents of a development without the need to drive to a park.

In a third example concerning open space in the 5<sup>th</sup> version of the Zoning ordinance, the overall aspect of the revision in open space suggest a possible disconnect between the strictly human structure-based focus of the zoning ordinance and the role that the FTC sees for trees (and associated vegetation) and open space containing them. It has been shown that appropriate use of trees and associated vegetation in developments of all kinds provides economic benefits in terms of energy savings, higher property values (i.e., 9%) and increased retail sales. These benefits are in addition to those that improve the and environmental and societal quality of our community.

A part of section 27-403 on the “Riparian Buffer Overlay Zoning District Requirements” was deleted, which is a very good thing. Part 5 of “Legislative Intent” was deleted and it stated the following: “Activities within the Riparian Overlay Zoning District that require a zoning and building permit, are not required to provide riparian buffer replacement or restoration. Such work is only recommended. Where there is no disturbance within the buffer, no mitigation is required.” Much thanks to whoever caught the existence of this objectionable part of the zoning ordinance.

Regarding section 27-707 on landscaping the Tree Commission would like to make the following additional recommendations largely supplied by our newest member, Scott Pflumm.

1. Propose foremost prior to this 27-707 landscaping section in the context of the township’s mission statement, philosophy and guiding principles.
2. Propose the township deliberate on adopting an ethics statement based on Aldo Leopold’s Community Concept (Sand County Almanac 1949; see attached)
  1. *“The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land.”*
  2. *“A land ethic, reflects the existence of an ecological conscience, and this in turn reflects a conviction of the land for self-renewal. Conservation is our effort to understand and preserve this capacity”*
  3. *“Examine each question [sic. policy] in terms of what is ethically and esthetically right, as well as what is economically expedient. A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.”*
  4. *“... [sic] a conservation system based wholly on economic motives is that most members of the land community have no economic value. Wildflowers and songbirds are examples. Yet these creatures are members of the biotic community, and if its stability depends on its integrity, they are entitled to continuance.”*
3. Propose the township commit itself to fostering and coordinating regular civic discourse and outreach on the township’s adopted ethics statement. If ethics guides a community’s actions, then promoting education and awareness of the township’s adopted ethics statement is a necessary community service requiring deliberate attention. To take ethics for granted and not discuss it regularly as a community is to ensure lack of awareness and common understanding for policy formulation. Panel discussion of invited guests and book club discussion are two examples of implementation.
4. The township philosophy and ethics statement provide the coherent foundation for township strategy and operational policy in all areas, including landscaping.
5. Propose items of intent #1-4 of *Section 27-707.A* be re-stated as logical objectives stemming from the adopted township philosophy.

6. Propose the township provide template landscape plots on municipal properties to educate the community about research based best practices for residential and commercial sustainable landscaping practices that support ecosystem services. Online resources accompany these templates in order to provide context for landscape choices, along with maintenance and vendor services with businesses located in the township.
7. Propose the township articulate quantitative measurable township land ethic metrics for which residents and business owners can be nominated by community peers to be recognized. Recognizing role model citizens for upholding ethical treatment towards fellow citizens and the land (biota) reinforces the township's commitment to its stated philosophy.
8. Propose the Landscape section of the zoning ordinance be reviewed and updated on five year (or approximate) intervals in order to stay current with best practices.
9. Propose tree canopy ordinances include quantitative and qualitative metrics. Canopy metrics only focusing on coverage do not account for ecological networks of trees providing habitat, food, source to native plant and animal ecosystems. Ordinances that specify canopy metrics based on coverage, number of trees, tree species diversity and their dimensions will encourage decisions devoid of ecological context for ecosystem services. The Tree commission will be devising a Tree preservation ordinance that will take all these metrics into account. But such an ordinance will have no standing unless it is integrated appropriately with SALDO and the Zoning ordinance.
10. Propose the landscape ordinance acknowledge a multi-dimensional metric that will be developed in consultation with residents and respective local non-profit and for-profit organizations. Although Penn State is unofficially represented (i.e., two standing faculty members), The Tree Commission currently has no members from local non-profit (e.g., Clearwater Conservancy, Sierra Club, etc.) and for-profit organizations (e.g., tree care companies, landscaping companies, land development engineering companies, etc.). This consultation requires further discussion and incorporation at a later date into the ordinance. Canopy cover, ecosystem services, habitat, soil, water, pollution tolerance and mitigation, disease, drought, flood tolerance are example dimensions that can be quantified for incorporation into a landscape ordinance.

I hope the information provided helps Township staff and the consultant in further revisions to advance SALDO and the zoning ordinance. On behalf of the Tree Commission, I thank you for the opportunity to serve the residents of Ferguson Township by providing constructive comments on the revision of these ordinances

Sincerely,

Howard

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**From:** Schoch,Lindsay  
**Sent:** Wednesday, February 20, 2019 2:12 PM  
**To:** Fescemyer,Howard; Chivers,Darlene  
**Cc:** King,Lance; Stolinias,Raymond  
**Subject:** Clarification Needed

Good afternoon.

I spoke with our consultant this morning regarding some of your comments. You will see below where she and I are in need of clarification. Lance has indicated I reach out to you directly for clarification.

Slide 5 of “Greening the Urban Landscape”

How do you suggest we incorporate the second bullet into a regulation? I feel this statement is a Goal that should be incorporated into a Comprehensive Plan or other type of guiding document. Getting to the neighborhood level, maybe a *recommendation* to perform an inventory of trees in developments, not just in the growth boundary, but also outside can be justified. We do have GIS Technicians on staff that can perform these types of tasks.

Could you interpret what you are trying to recommend in the following Objective, then clarify your comments regarding the proposed objective.

### **Section 27-104 – Community Development Objectives**

A. (to Land Use and Character) Add: Establish regulations that support green infrastructure, natural resource protection and open space containing trees and associated vegetation as the principle path for community development in both the Regional Growth Boundary and those areas deemed rural.

**Comment:** I (HWF) do not understand why there is so much emphasis on agricultural land because there is practically nothing here about land use and character of land to be developed both within the Regional Growth Boundary and in the rural areas where development is clearly being allowed in many ways (e.g., housing, commercial retail, etc.) much like that in the Regional Growth Boundary.

A3: **Comment:** This land use has largely been ignored as evidence of development on top of the silt loams (i.e., Hagerstown and Hublersburg) in the Regional Growth Boundary.

Is there some other context behind the Mobile Home Park Statements?

This one sticks out and thought you could put it into context for me:

The statement “may harbor rodents, insects or other pests harmful to man” is ridiculous, very bigoted and should be deleted. It is uncollected garbage (i.e., organic waste) that attracts rodents and standing water that attracts and harbors mosquitoes. These situations can occur in all types of developments, not just in mobile home parks.

Also, regarding spacing of mobile home parks, we may be spinning our wheels adding a requirement for more spacing between mobile homes to include more trees. For example, if two mobile homes are removed under a new ordinance, one may only be able to be replaced, leaving less affordable housing opportunities. It really comes down to, do we want more trees or do we want more affordable housing. Both, very important. I will leave that for you to discuss with the FTTC and with our Township Board of Supervisors.

Page 8 of Darlene’s comments refer to Marc’s Photos. Are these photos trying to demonstrate what the proposed regulations are trying to do, it would be best for our consultant to have access to those.

After speaking with our consultant today, I feel she has a better understanding of the comments from the tree commission and with these few clarifications, can move things forward.

Thank you for your consideration of these requests.

Lindsay K. Schoch  
Community Planner

Ferguson Township  
Phone: (814) 238-4651  
Fax: (814) 238-3454



**Ferguson**  
Township  
*Pennsylvania*



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## Depression-fighting plants

By Georgette Weigel

Special to PennLive

Plants' effect on depression and mental health comes from a [project in Philadelphia](#), where researchers identified 541 urban vacant lots, then divided them into three groups.

In one-third of them, the lots were cleaned of trash and debris, then grass and trees were planted and fencing was installed.

In another one-third, trash was removed, and minor maintenance was done, but nothing was planted.

And in the remaining one-third, nothing was done.

More than 400 adult residents living near the lots got mental-health assessments at the beginning of the project, then 342 of them were re-interviewed 18 months later after the work was done.

The result? Those living near the greened lots experienced a 41 percent drop in "depressive feelings" and a 51 percent drop in feelings of worthlessness compared to those where no improvements were done.

"Performing simple interventions to the neighborhood environment has an impact on health," says Dr. Eugenia South, a co-author of the study and an assistant professor of emergency medicine at the University of Pennsylvania's Perelman School of Medicine. "The fact that it's green space, and not, say, a parking lot, is important."

She adds that greening also increases social connections, relaxes mental fatigue, and helps people cope better with general life stresses.

South's team is working with the Pennsylvania Horticultural Society to green more lots.

She says other cities have expressed interest, given that it costs an average of only \$1,600 to green an abandoned lot and \$180 a year to maintain it.



# Greening the Urban Landscape Planning for Trees September 2018

Green Infrastructure for  
Ferguson Township

## Vision

To maintain and increase tree cover and create connected ribbons of green throughout the township.



# Objectives

- **Climate mitigation and adaptation**
  - Heat reduction— for streams, for people, for residences, for animals
  - Decreased cooling and heating costs
  - Carbon storage
  - Improve air and water quality
- **Stormwater management/Water Quality Issues**
  - Greater infiltration, groundwater recharge
  - Reduced flooding
  - Pollution reduction
  - Reduced water treatment cost
  - Reduced grey infrastructure needs

## **Objectives (con.)**

- **Improve/maintain desirability of Ferguson Township as an attractive, healthy place to live**
  - Urban open space for wildlife and recreation
  - Improved “liveability”
  - Aesthetics
  - Physical and mental health
- **Increased property values**
- **Promote community engagement**

# Tools

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- 1. Land-use planning which includes input from the Tree Commission to the Planning Commission**
  - Initial inventory; GIS to map green infrastructure
  - Community involvement
  - Strategic plan
- 2. Revise guidelines and regulations (ordinances) for new developments, both residential and commercial**

# More Tools

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3. Parks & greenways (increasing trees on walking and biking paths, increase connectivity between parks and neighborhoods and paths)

4. Increasing tree canopy cover (tree preservation, tree planting)

5. Replacing impervious surfaces with pervious ones

6. Green parking (redesign of parking lots and street parking; e.g., curbs, tree wells for street trees)

# Yet More Tools

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7. Retention basin (re)design, rain gardens, bioswales

8. Green roofs

9. Reflective pavements

# Guiding Principles

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- **Greater coordination** among 1) the Tree Commission, 2) the Planning Commission, 3) the Parks and Recreation Committee, and 4) the body that establishes construction standards;
- **And a mindset** that places green infrastructure as a top priority in any kind of planning (not just land use but also road work, construction, establishing standards & regulations, etc.)

# Recommendations

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- The township should take a more holistic approach in designing developments, bike paths, roads, stormwater management facilities, parking lots, etc. to include more green design elements (trees, shrubs, water, etc.)
- Adopt tree canopy cover (at the neighborhood level) as a sustainability indicator and set explicit goals for increasing tree canopy cover
- Adopt a tree preservation ordinance
- Review development ordinance, zoning ordinances, construction standards, etc. to include more green design principles

# The Land Ethic by Aldo Leopold

1949

[ This essay is excerpted from Aldo Leopold's book A Sand County Almanac. ]

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When god-like Odysseus returned from the wars in Troy, he hanged all on one rope a dozen slave-girls of his household whom he suspected of misbehavior during his absence.

This hanging involved no question of propriety. The girls were property. The disposal of property was then, as now, a matter of expediency, not of right and wrong.

Concepts of right and wrong were not lacking from Odysseus' Greece: witness the fidelity of his wife through the long years before at last his black-prowed galleys clove the wine-dark seas for home. The ethical structure of that day covered wives, but had not yet been extended to human chattels. During the three thousand years which have since elapsed, ethical criteria have been extended to many fields of conduct, with corresponding shrinkages in those judged by expediency only.

## THE ETHICAL SEQUENCE

This extension of ethics, so far studied only by philosophers, is actually a process in ecological evolution. Its sequences may be described in ecological as well as in philosophical terms. An ethic, ecologically, is a limitation on freedom of action in the struggle for existence. An ethic, philosophically, is a differentiation of social from anti-social conduct. These are two definitions of one thing. The thing has its origin in the tendency of interdependent individuals or groups to evolve modes of co-operation. The ecologist calls these symbioses. Politics and economics are advanced symbioses in which the original free-for-all competition has been replaced, in part, by co-operative mechanisms with an ethical content.

The complexity of co-operative mechanisms has increased with population density, and with the efficiency of tools. It was simpler, for example, to define the anti-social uses of sticks and stones in the days of the mastodons than of bullets and billboards in the age of motors.

The first ethics dealt with the relation between individuals; the Mosaic Decalogue is an example. Later accretions dealt with the relation between the individual and society. The Golden Rule tries to integrate the individual to society; democracy to integrate social organization to the individual.

There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it. Land, like Odysseus' slave-girls, is still property. The land-relation is still strictly economic, entailing privileges but not obligations.

The extension of ethics to this third element in human environment is, if I read the evidence correctly, an evolutionary possibility and an ecological necessity. It is the third step in a sequence. The first two have already been taken. Individual thinkers since the days of Ezekiel and Isaiah have asserted that the despoliation of land is not only inexpedient but wrong. Society, however, has not yet affirmed their belief. I regard the present conservation movement as the embryo of such an affirmation.

An ethic may be regarded as a mode of guidance for meeting ecological situations so new or intricate, or involving such deferred reactions, that the path of social expediency is not discernible to the average individual. Animal instincts are modes of guidance for the individual in meeting such situations. Ethics are possibly a kind of community instinct in-the-making.

### THE COMMUNITY CONCEPT

All ethics so far evolved rest upon a single premise that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in that community, but his ethics prompt him also to co-operate (perhaps in order that there may be a place to compete for).

The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land.

This sounds simple: do we not already sing our love for and obligation to the land of the free and the home of the brave? Yes, but just what and whom do we love? Certainly not the soil, which we are sending helter-skelter down river. Certainly not the waters, which we assume have no function except to turn turbines, float barges, and carry off sewage. Certainly not the plants, of which we exterminate whole communities without batting an eye. Certainly not the animals, of which we have already extirpated many of the largest and most beautiful species. A land ethic of course cannot prevent the alteration, management, and use of these 'resources,' but it does affirm their right to continued existence, and, at least in spots, their continued existence in a natural state

In short, a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such.

In human history, we have learned (I hope) that the conqueror role is eventually self-defeating. Why? Because it is implicit in such a role that the conqueror knows, *ex cathedra*, just what makes the community clock tick, and just what and who is valuable, and what and who is worthless, in community life. It always turns out that he knows neither, and this is why his conquests eventually defeat themselves.

In the biotic community, a parallel situation exists. Abraham knew exactly what the land was for: it was to drip milk and honey into Abraham's mouth. At the present moment, the assurance with which we regard this assumption is inverse to the degree of our education.

The ordinary citizen today assumes that science knows what makes the community clock tick; the scientist is equally sure that he does not. He knows that the biotic mechanism is so complex that its workings may never be fully understood.

That man is, in fact, only a member of a biotic team is shown by an ecological interpretation of history. Many historical events, hitherto explained solely in terms of human enterprise, were actually biotic, interactions between people and land. The characteristics of the land determined the facts quite as potently as the characteristics of the men who lived on it.

Consider, for example, the settlement of the Mississippi valley. In the years following the Revolution, three groups were contending for its control: the native Indian, the French and English traders, and the American settlers. Historians wonder what would have happened if the English at Detroit had thrown a little more weight into the Indian side of those tipsy scales which decided the outcome of the colonial migration into the cane-lands of Kentucky. It is time now to ponder the fact that the cane-lands, when subjected to the particular mixture of forces represented by the cow, plow, fire, and axe of the pioneer, became bluegrass. What if the plant succession inherent in this dark and bloody ground had, under the impact of these forces, given us some worthless sedge, shrub, or weed? Would Boone and Kenton have held out? Would there have been any overflow into Ohio, Indiana, Illinois, and Missouri? Any Louisiana Purchase? Any transcontinental union of new states? Any Civil War?

Kentucky was one sentence in the drama of history. We are commonly told what the human actors in this drama tried to do, but we are seldom told that their success, or the lack of it, hung in large degree on the reaction of particular soils to the impact of the particular forces exerted by their occupancy. In the case of Kentucky, we do not even know where the bluegrass came from -- whether it is a native species, or a stowaway from Europe.

Contrast the cane-lands with what hindsight tells us about the Southwest, where the pioneers were equally brave, resourceful, and persevering. The impact of occupancy here brought no bluegrass, or other plant fitted to withstand the bumps and buffetings of hard use. This region, when grazed by livestock, reverted through a series of more and more worthless grasses, shrubs, and weeds to a condition of unstable equilibrium. Each recession of plant types bred erosion; each increment to erosion bred a further recession of plants. The result today is a progressive and mutual deterioration, not only of plants and soils, but of the animal community subsisting thereon. The early settlers did not expect this: on the ciénegas of New Mexico some even cut ditches to hasten it. So subtle has been its progress that few residents of the region are aware of it. It is

quite invisible to the tourist who finds this wrecked landscape colorful and charming (as indeed it is, but it bears scant resemblance to what it was in 1848).

This same landscape was 'developed' once before, but with quite different results. The Pueblo Indians settled the Southwest in pre-Columbian times, but they happened *not* to be equipped with range livestock. Their civilization expired, but not because their land expired.

In India, regions devoid of any sod-forming grass have been settled, apparently without wrecking the land, by the simple expedient of carrying the grass to the cow, rather than vice versa. (Was this the result of some deep wisdom, or was it just good luck? I do not know.)

In short, the plant succession steered the course of history; the pioneer simply demonstrated, for good or ill, what successions inhered in the land. Is history taught in this spirit? It will be, once the concept of land as a community really penetrates our intellectual life.

## THE ECOLOGICAL CONSCIENCE

Conservation is a state of harmony between man and land. Despite nearly a century of propaganda, conservation still proceeds at a snail's pace; progress still consists largely of letterhead pieties and convention oratory. On the back forty we still slip two steps backward for each forward stride.

The usual answer to this dilemma is 'more conservation education.' No one will debate this, but is it certain that only the *volume* of education needs stepping up? Is something lacking in the *content* as well?

It is difficult to give a fair summary of its content in brief form, but, as I understand it, the content is substantially this: obey the law, vote right, join some organizations, and practice what conservation is profitable on your own land; the government will do the rest.

Is not this formula too easy to accomplish anything worth-while? It defines no right or wrong, assigns no obligation, calls for no sacrifice, implies no change in the current philosophy of values. In respect of land use, it urges only enlightened self-interest. Just how far will such education take us? An example will perhaps yield a partial answer.

By 1930 it had become clear to all except the ecologically blind that southwestern Wisconsin's topsoil was slipping seaward. In 1933 the farmers were told that if they would adopt certain remedial practices for five years, the public would donate CCC labor to install them, plus the necessary machinery and materials. The offer was widely accepted, but the practices were widely forgotten when the five-year contract period was up. The farmers continued only those practices that yielded an immediate and visible economic gain for themselves.

This led to the idea that maybe farmers would learn more quickly if they themselves wrote the rules. Accordingly the Wisconsin Legislature in 1937 passed the Soil Conservation District Law. This said to farmers, in effect: *We, the public, will furnish you free technical service and loan you specialized machines, if you will write your own rules for land-use. Each county may write its own rules, and these will have the force of law.* Nearly all the counties promptly organized to accept the proffered help, but after a decade of operation, *no county has yet written a single rule.* There has been visible progress in such practices as strip-cropping, pasture renovation, and soil liming, but none in fencing woodlots against grazing, and none in excluding plow and cow from steep slopes. The farmers, in short, have selected those remedial practices which were profitable anyhow, and ignored those which were profitable to the community, but not clearly profitable to themselves.

When one asks why no rules have been written, one is told that the community is not yet ready to support them; education must precede rules. But the education actually in progress makes no mention of obligations to land over and above those dictated by self-interest. The net result is that we have more education but less soil, fewer healthy woods, and as many floods as in 1937.

The puzzling aspect of such situations is that the existence of obligations over and above self-interest is taken for granted in such rural community enterprises as the betterment of roads, schools, churches, and baseball teams. Their existence is not taken for granted, nor as yet seriously discussed, in bettering the behavior of the water that falls on the land, or in the preserving of the beauty or diversity of the farm landscape. Land use ethics are still governed wholly by economic self-interest, just as social ethics were a century ago.

To sum up: we asked the farmer to do what he conveniently could to save his soil, and he has done just that, and only that. The farmer who clears the woods off a 75 per cent slope, turns his cows into the clearing, and dumps its rainfall, rocks, and soil into the community creek, is still (if otherwise decent) a respected member of society. If he puts lime on his fields and plants his crops on contour, he is still entitled to all the privileges and emoluments of his Soil Conservation District. The District is a beautiful piece of social machinery, but it is coughing along on two cylinders because we have been too timid, and too anxious for quick success, to tell the farmer the true magnitude of his obligations. Obligations have no meaning without conscience, and the problem we face is the extension of the social conscience from people to land.

No important change in ethics was ever accomplished without an internal change in our intellectual emphasis, loyalties, affections, and convictions. The proof that conservation has not yet touched these foundations of conduct lies in the fact that philosophy and religion have not yet heard of it. In our attempt to make conservation easy, we have made it trivial.

## **SUBSTITUTES FOR A LAND ETHIC**

When the logic of history hungers for bread and we hand out a stone, we are at pains to explain how much the stone resembles bread. I now describe some of the stones which serve in lieu of a land ethic.

One basic weakness in a conservation system based wholly on economic motives is that most members of the land community have no economic value. Wildflowers and songbirds are examples. Of the 22,000 higher plants and animals native to Wisconsin, it is doubtful whether more than 5 per cent can be sold, fed, eaten, or otherwise put to economic use. Yet these creatures are members of the biotic community, and if (as I believe) its stability depends on its integrity, they are entitled to continuance.

When one of these non-economic categories is threatened, and if we happen to love it, we invent subterfuges to give it economic importance. At the beginning of the century songbirds were supposed to be disappearing. Ornithologists jumped to the rescue with some distinctly shaky evidence to the effect that insects would eat us up if birds failed to control them. The evidence had to be economic in order to be valid.

It is painful to read these circumlocutions today. We have no land ethic yet, but we have at least drawn nearer the point of admitting that birds should continue as a matter of biotic right, regardless of the presence or absence of economic advantage to us.

A parallel situation exists in respect of predatory mammals, raptorial birds, and fish-eating birds. Time was when biologists somewhat overworked the evidence that these creatures preserve the health of game by killing weaklings, or that they control rodents for the farmer, or that they prey only on 'worthless' species. Here again, the evidence had to be economic in order to be valid. It is only in recent years that we hear the more honest argument that predators are members of the community, and that no special interest has the right to exterminate them for the sake of a benefit, real or fancied, to itself. Unfortunately this enlightened view is still in the talk stage. In the field the extermination of predators goes merrily on: witness the impending erasure of the timber wolf by fiat of Congress, the Conservation Bureaus, and many state legislatures.

Some species of trees have been 'read out of the party' by economics-minded foresters because they grow too slowly, or have too low a sale value to pay as timber crops: white cedar, tamarack, cypress, beech, and hemlock are examples. In Europe, where forestry is ecologically more advanced, the non-commercial tree species are recognized as members of the native forest community, to be preserved as such, within reason. Moreover some (like beech) have been found to have a valuable function in building up soil fertility. The interdependence of the forest and its constituent tree species, ground flora, and fauna is taken for granted.

Lack of economic value is sometimes a character not only of species or groups, but of entire biotic communities: marshes, bogs, dunes, and 'deserts' are examples. Our formula in such cases is to relegate their conservation to government as refuges, monuments, or parks. The difficulty is that these communities are usually interspersed with more valuable private lands; the government cannot possibly own or control such

scattered parcels. The net effect is that we have relegated some of them to ultimate extinction over large areas. If the private owner were ecologically minded, he would be proud to be the custodian of a reasonable proportion of such areas, which add diversity and beauty to his farm and to his community.

In some instances, the assumed lack of profit in these 'waste' areas has proved to be wrong, but only after most of them had been done away with. The present scramble to reflood muskrat marshes is a case in point.

There is a clear tendency in American conservation to relegate to government all necessary jobs that private landowners fail to perform. Government ownership, operation, subsidy, or regulation is now widely prevalent in forestry, range management, soil and watershed management, park and wilderness conservation, fisheries management, and migratory bird management, with more to come. Most of this growth in governmental conservation is proper and logical, some of it is inevitable. That I imply no disapproval of it is implicit in the fact that I have spent most of my life working for it. Nevertheless the question arises: What is the ultimate magnitude of the enterprise? Will the tax base carry its eventual ramifications? At what point will governmental conservation, like the mastodon, become handicapped by its own dimensions? The answer, if there is any, seems to be in a land ethic, or some other force which assigns more obligation to the private landowner.

Industrial landowners and users, especially lumbermen and stockmen, are inclined to wail long and loudly about the extension of government ownership and regulation to land, but (with notable exceptions) they show little disposition to develop the only visible alternative: the voluntary practice of conservation on their own lands.

When the private landowner is asked to perform some unprofitable act for the good of the community, he today assents only with outstretched palm. If the act costs him cash this is fair and proper, but when it costs only forethought, open-mindedness, or time, the issue is at least debatable. The overwhelming growth of land-use subsidies in recent years must be ascribed, in large part, to the government's own agencies for conservation education: the land bureaus, the agricultural colleges, and the extension services. As far as I can detect, no ethical obligation toward land is taught in these institutions.

To sum up: a system of conservation based solely on economic self-interest is hopelessly lopsided. It tends to ignore, and thus eventually to eliminate, many elements in the land community that lack commercial value, but that are (as far as we know) essential to its healthy functioning. It assumes, falsely, I think, that the economic parts of the biotic clock will function without the uneconomic parts. It tends to relegate to government many functions eventually too large, too complex, or too widely dispersed to be performed by government.

An ethical obligation on the part of the private owner is the only visible remedy for these situations.

## THE LAND PYRAMID

An ethic to supplement and guide the economic relation to land presupposes the existence of some mental image of land as a biotic mechanism. We can be ethical only in relation to something we can see, feel, understand, love, or otherwise have faith in.

The image commonly employed in conservation education is 'the balance of nature.' For reasons too lengthy to detail here, this figure of speech fails to describe accurately what little we know about the land mechanism. A much truer image is the one employed in ecology: the biotic pyramid. I shall first sketch the pyramid as a symbol of land, and later develop some of its implications in terms of land-use.

Plants absorb energy from the sun. This energy flows through a circuit called the biota, which may be represented by a pyramid consisting of layers. The bottom layer is the soil. A plant layer rests on the soil, an insect layer on the plants, a bird and rodent layer on the insects, and so on up through various animal groups to the apex layer, which consists of the large carnivores.

The species of a layer are alike not in where they came from, or in what they look like, but rather in what they eat. Each successive layer depends on those below it for food and often for other services, and each in turn furnishes food and services to those above. Proceeding upward, each successive layer decreases in numerical abundance. Thus, for every carnivore there are hundreds of his prey, thousands of their prey, millions of insects, uncountable plants. The pyramidal form of the system reflects this numerical progression from apex to base. Man shares an intermediate layer with the bears, raccoons, and squirrels which eat both meat and vegetables.

The lines of dependency for food and other services are called food chains. Thus soil-oak-deer-Indian is a chain that has now been largely converted to 'soil-corn-cow-farmer.' Each species, including ourselves, is a link in many chains. The deer eats a hundred plants other than oak, and the cow a hundred plants other than corn. Both, then, are links in a hundred chains. The pyramid is a tangle of chains so complex as to seem disorderly, yet the stability of the system proves it to be a highly organized structure. Its functioning depends on the co-operation and competition of its diverse parts.

In the beginning, the pyramid of life was low and squat; the food chains short and simple. Evolution has added layer after layer, link after link. Man is one of thousands of accretions to the height and complexity of the pyramid. Science has given us many doubts, but it has given us at least one certainty: the trend of evolution is to elaborate and diversify the biota.

Land, then, is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants, and animals. Food chains are the living channels which conduct energy upward; death and decay return it to the soil. The circuit is not closed; some energy is dissipated in decay, some is added by absorption from the air, some is stored in soils, peats, and

long-lived forests; but it is a sustained circuit, like a slowly augmented revolving fund of life. There is always a net loss by downhill wash, but this is normally small and offset by the decay of rocks. It is deposited in the ocean and, in the course of geological time, raised to form new lands and new pyramids.

The velocity and character of the upward flow of energy depend on the complex structure of the plant and animal community, much as the upward flow of sap in a tree depends on its complex cellular organization. Without this complexity, normal circulation would presumably not occur. Structure means the characteristic numbers, as well as the characteristic kinds and functions, of the component species. This interdependence between the complex structure of the land and its smooth functioning as an energy unit is one of its basic attributes.

When a change occurs in one part of the circuit, many other parts must adjust themselves to it. Change does not necessarily obstruct or divert the flow of energy; evolution is a long series of self-induced changes, the net result of which has been to elaborate the flow mechanism and to lengthen the circuit. Evolutionary changes, however, are usually slow and local. Man's invention of tools has enabled him to make changes of unprecedented violence, rapidity, and scope.

One change is in the composition of floras and faunas. The larger predators are lopped off the apex of the pyramid; food chains, for the first time in history, become shorter rather than longer. Domesticated species from other lands are substituted for wild ones, and wild ones are moved to new habitats. In this world-wide pooling of faunas and floras, some species get out of bounds as pests and diseases, others are extinguished. Such effects are seldom intended or foreseen; they represent unpredicted and often untraceable readjustments in the structure. Agricultural science is largely a race between the emergence of new pests and the emergence of new techniques for their control.

Another change touches the flow of energy through plants and animals and its return to the soil. Fertility is the ability of soil to receive, store, and release energy. Agriculture, by overdrafts on the soil, or by too radical a substitution of domestic for native species in the superstructure, may derange the channels of flow or deplete storage. Soils depleted of their storage, or of the organic matter which anchors it, wash away faster than they form. This is erosion.

Waters, like soil, are part of the energy circuit. Industry, by polluting waters or obstructing them with dams, may exclude the plants and animals necessary to keep energy in circulation.

Transportation brings about another basic change: the plants or animals grown in one region are now consumed and returned to the soil in another. Transportation taps the energy stored in rocks, and in the air, and uses it elsewhere; thus we fertilize the garden with nitrogen gleaned by the guano birds from the fishes of seas on the other side of the

Equator. Thus the formerly localized and self-contained circuits are pooled on a world-wide scale.

The process of altering the pyramid for human occupation releases stored energy, and this often gives rise, during the pioneering period, to a deceptive exuberance of plant and animal life, both wild and tame. These releases of biotic capital tend to becloud or postpone the penalties of violence.

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This thumbnail sketch of land as an energy circuit conveys three basic ideas:

- (1) That land is not merely soil.
- (2) That the native plants and animals kept the energy circuit open; others may or may not.
- (3) That man-made changes are of a different order than evolutionary changes, and have effects more comprehensive than is intended or foreseen.

These ideas, collectively, raise two basic issues: Can the land adjust itself to the new order? Can the desired alterations be accomplished with less violence?

Biotas seem to differ in their capacity to sustain violent conversion. Western Europe, for example, carries a far different pyramid than Caesar found there. Some large animals are lost; swampy forests have become meadows or plowland; many new plants and animals are introduced, some of which escape as pests; the remaining natives are greatly changed in distribution and abundance. Yet the soil is still there and, with the help of imported nutrients, still fertile; the waters flow normally; the new structure seems to function and to persist. There is no visible stoppage or derangement of the circuit.

Western Europe, then, has a resistant biota. Its inner processes are tough, elastic, resistant to strain. No matter how violent the alterations, the pyramid, so far, has developed some new *modus vivendi* which preserves its habitability for man, and for most of the other natives.

Japan seems to present another instance of radical conversion without disorganization. Most other civilized regions, and some as yet barely touched by civilization, display various stages of disorganization, varying from initial symptoms to advanced wastage. In Asia Minor and North Africa diagnosis is confused by climatic changes, which may have been either the cause or the effect of advanced wastage. In the United States the degree of disorganization varies locally; it is worst in the Southwest, the Ozarks, and parts of the South, and least in New England and the Northwest. Better land-uses may still arrest it in the less advanced regions. In parts of Mexico, South America, South Africa, and Australia a violent and accelerating wastage is in progress, but I cannot assess the prospects.

This almost world-wide display of disorganization in the land seems to be similar to disease in an animal, except that it never culminates in complete disorganization or death. The land recovers, but at some reduced level of complexity, and with a reduced carrying capacity for people, plants, and animals. Many biotas currently regarded as 'lands of opportunity' are in fact already subsisting on exploitative agriculture, i.e., they have already exceeded their sustained carrying capacity. Most of South America is overpopulated in this sense.

In and regions we attempt to offset the process of wastage by reclamation, but it is only too evident that the prospective longevity of reclamation projects is often short. In our own West, the best of them may not last a century.

The combined evidence of history and ecology seems to support one general deduction: the less violent the man-made changes, the greater the probability of successful readjustment in the pyramid. Violence, in turn, varies with human population density; a dense population requires a more violent conversion. In this respect, North America has a better chance for permanence than Europe, if she can contrive to limit her density.

This deduction runs counter to our current philosophy, which assumes that because a small increase in density enriched human life, that an indefinite increase will enrich it indefinitely. Ecology knows of no density relationship that holds for indefinitely wide limits. All gains from density are subject to a law of diminishing returns.

Whatever may be the equation for men and land, it is improbable that we as yet know all its terms. Recent discoveries in mineral and vitamin nutrition reveal unsuspected dependencies in the up-circuit: incredibly minute quantities of certain substances determine the value of soils to plants, of plants to animals. What of the down-circuit? What of the vanishing species, the preservation of which we now regard as an esthetic luxury? They helped build the soil; in what unsuspected ways may they be essential to its maintenance? Professor Weaver proposes that we use prairie flowers to reflocculate the wasting soils of the dust bowl; who knows for what purpose cranes and condors, otters and grizzlies may some day be used?

## **LAND HEALTH AND THE A-B CLEAVAGE**

A land ethic, then, reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land. Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity.

Conservationists are notorious for their dissensions. Superficially these seem to add up to mere confusion, but a more careful scrutiny reveals a single plane of cleavage common to many specialized fields. In each field one group (A) regards the land as soil, and its function as commodity-production; another group (B) regards the land as a biota,

and its function as something broader. How much broader is admittedly in a state of doubt and confusion.

In my own field, forestry, group A is quite content to grow trees like cabbages, with cellulose as the basic forest commodity. It feels no inhibition against violence; its ideology is agronomic. Group B, on the other hand, sees forestry as fundamentally different from agronomy because it employs natural species, and manages a natural environment rather than creating an artificial one. Group B prefers natural reproduction on principle. It worries on biotic as well as economic grounds about the loss of species like chestnut, and the threatened loss of the white pines. It worries about whole series of secondary forest functions: wildlife, recreation, watersheds, wilderness areas. To my mind, Group B feels the stirrings of an ecological conscience.

In the wildlife field, a parallel cleavage exists. For Group A the basic commodities are sport and meat; the yardstick of production are ciphers of take in pheasants and trout. Artificial propagation is acceptable as a permanent as well as a temporary recourse -- if its unit costs permit. Group B on the other hand, worries about a whole series of biotic side-issues. What is the cost in predators of producing a game crop? Should we have further recourse to exotics? How can management restore the shrinking species, like prairie grouse, already hopeless as shootable game? How can management restore the threatened rarities, like trumpeter swan and whooping crane? Can management principles be extended to wildflowers? Here again it is clear to me that we have the same A-B cleavage as in forestry.

In the larger field of agriculture I am less competent to speak, but there seem to be somewhat parallel cleavages. Scientific agriculture was actively developing before ecology was born, hence a slower penetration of ecological concepts might be expected. Moreover the farmer, by the very nature of his techniques, must modify the biota more radically than the forester or the wildlife manager. Nevertheless, there are many discontents in agriculture which seem to add up to a new vision of 'biotic farming.'

Perhaps the most important of these is the new evidence that poundage or tonnage is no measure of the food-value of farm crops; the products of fertile soil may be qualitatively as well as quantitatively superior. We can bolster poundage from depleted soils by pouring on imported fertility, but we are not necessarily bolstering food-value. The possible ultimate ramifications of this idea are so immense that I must leave their exposition to abler pens.

The discontent that labels itself 'organic farming,' while bearing some of the earmarks of a cult, is nevertheless biotic in its direction, particularly in its insistence on the importance of soil flora and fauna.

The ecological fundamentals of agriculture are just as poorly known to the public as in other fields of land-use. For example, few educated people realize that the marvelous advances in technique made during recent decades are improvements in the pump,

rather than the well. Acre for acre, they have barely sufficed to offset the sinking level of fertility.

In all of these cleavages, we see repeated the same basic paradoxes: man the conqueror *versus* man the biotic citizen; science the sharpener of his sword *versus* science the search-light on his universe; land the slave and servant *versus* land the collective organism. Robinson's injunction to Tristram may well be applied, at this juncture, to *Homo sapiens* as species in geological time:

Whether you will or not  
You are a King, Tristram, for you are one  
Of the time-tested few that leave the world,  
When they are gone, not the same place it was.  
Mark what you leave.

## THE OUTLOOK

It is inconceivable to me that an ethical relation to land can exist without love, respect, and admiration for land, and a high regard for its value. By value, of course, I mean something far broader than mere economic value; I mean value in the philosophical sense.

Perhaps the most serious obstacle impeding the evolution of a land ethic is the fact that our educational and economic system is headed away from, rather than toward, an intense consciousness of land. Your true modern is separated from the land by many middlemen, and by innumerable physical gadgets. He has no vital relation to it; to him it is the space between cities on which crops grow. Turn him loose for a day on the land, and if the spot does not happen to be a golf links or a 'scenic' area, he is bored stiff. If crops could be raised by hydroponics instead of farming, it would suit him very well. Synthetic substitutes for wood, leather, wool, and other natural land products suit him better than the originals. In short, land is something he has 'outgrown.'

Almost equally serious as an obstacle to a land ethic is the attitude of the farmer for whom the land is still an adversary, or a taskmaster that keeps him in slavery. Theoretically, the mechanization of farming ought to cut the farmer's chains, but whether it really does is debatable. One of the requisites for an ecological comprehension of land is an understanding of ecology, and this is by no means co-extensive with 'education'; in fact, much higher education seems deliberately to avoid ecological concepts. An understanding of ecology does not necessarily originate in courses bearing ecological labels; it is quite as likely to be labeled geography, botany, agronomy, history, or economics. This is as it should be, but whatever the label, ecological training is scarce.

The case for a land ethic would appear hopeless but for the minority which is in obvious revolt against these 'modern' trends.

The 'key-log' which must be moved to release the evolutionary process for an ethic is simply this: quit thinking about decent land-use as solely an economic problem. Examine each question in terms of what is ethically and esthetically right, as well as what is economically expedient. A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.

It of course goes without saying that economic feasibility limits the tether of what can or cannot be done for land. It always has and it always will. The fallacy the economic determinists have tied around our collective neck, and which we now need to cast off, is the belief that economics determines *all* land use. This is simply not true. An innumerable host of actions and attitudes, comprising perhaps the bulk of all land relations, is determined by the land-users' tastes and predilections, rather than by his purse. The bulk of all land relations hinges on investments of time, forethought, skill, and faith rather than on investments of cash. As a land-user thinketh, so is he.

I have purposely presented the land ethic as a product of social evolution because nothing so important as an ethic is ever 'written.' Only the most superficial student of history supposes that Moses 'wrote' the Decalogue; it evolved in the minds of a thinking community, and Moses wrote a tentative summary of it for a 'seminar.' I say tentative because evolution never stops.

The evolution of a land ethic is an intellectual as well as emotional process. Conservation is paved with good intentions which prove to be futile, or even dangerous, because they are devoid of critical understanding either of the land, or of economic land-use. I think it is a truism that as the ethical frontier advances from the individual to the community, its intellectual content increases.

The mechanism of operation is the same for any ethic: social approbation for right actions: social disapproval for wrong actions.

By and large, our present problem is one of attitudes and implements. We are remodeling the Alhambra with a steam-shovel, and we are proud of our yardage. We shall hardly relinquish the shovel, which after all has many good points, but we are in need of gentler and more objective criteria for its successful use.



Original Investigation | Public Health

# Effect of Greening Vacant Land on Mental Health of Community-Dwelling Adults

## A Cluster Randomized Trial

Eugenia C. South, MD, MS; Bernadette C. Hohl, PhD; Michelle C. Kondo, PhD; John M. MacDonald, PhD; Charles C. Branas, PhD

### Abstract

**IMPORTANCE** Neighborhood physical conditions have been associated with mental illness and may partially explain persistent socioeconomic disparities in the prevalence of poor mental health.

**OBJECTIVE** To evaluate whether interventions to green vacant urban land can improve self-reported mental health.

**DESIGN, SETTING, AND PARTICIPANTS** This citywide cluster randomized trial examined 442 community-dwelling sampled adults living in Philadelphia, Pennsylvania, within 110 vacant lot clusters randomly assigned to 3 study groups. Participants were followed up for 18 months preintervention and postintervention. This trial was conducted from October 1, 2011, to November 30, 2014. Data were analyzed from July 1, 2015, to April 16, 2017.

**INTERVENTIONS** The greening intervention involved removing trash, grading the land, planting new grass and a small number of trees, installing a low wooden perimeter fence, and performing regular monthly maintenance. The trash cleanup intervention involved removal of trash, limited grass mowing where possible, and regular monthly maintenance. The control group received no intervention.

**MAIN OUTCOMES AND MEASURES** Self-reported mental health measured by the Kessler-6 Psychological Distress Scale and the components of this scale.

**RESULTS** A total of 110 clusters containing 541 vacant lots were enrolled in the trial and randomly allocated to the following 1 of 3 study groups: the greening intervention (37 clusters [33.6%]), the trash cleanup intervention (36 clusters [32.7%]), or no intervention (37 clusters [33.6%]). Of the 442 participants, the mean (SD) age was 44.6 (15.1) years, 264 (59.7%) were female, and 194 (43.9%) had a family income less than \$25 000. A total of 342 participants (77.4%) had follow-up data and were included in the analysis. Of these, 117 (34.2%) received the greening intervention, 107 (31.3%) the trash cleanup intervention, and 118 (34.5%) no intervention. Intention-to-treat analysis of the greening intervention compared with no intervention demonstrated a significant decrease in participants who were feeling depressed (−41.5%; 95% CI, −63.6% to −5.9%;  $P = .03$ ) and worthless (−50.9%; 95% CI, −74.7% to −4.7%;  $P = .04$ ), as well as a nonsignificant reduction in overall self-reported poor mental health (−62.8%; 95% CI, −86.2% to 0.4%;  $P = .051$ ). For participants living in neighborhoods below the poverty line, the greening intervention demonstrated a significant decrease in feeling depressed (−68.7%; 95% CI, −86.5% to −27.5%;  $P = .007$ ). Intention-to-treat analysis of those living near the trash cleanup intervention compared with no intervention showed no significant changes in self-reported poor mental health.

*(continued)*

### Key Points

**Question** Does the greening of vacant urban land reduce self-reported poor mental health in community-dwelling adults?

**Findings** In this cluster randomized trial of urban greening and mental health, 110 randomly sampled vacant lot clusters were randomly assigned to 3 study groups. Among 342 participants included in the analysis, feeling depressed significantly decreased by 41.5% and self-reported poor mental health showed a reduction of 62.8% for those living near greened vacant lots compared with control participants.

**Meaning** The remediation of vacant and dilapidated physical environments, particularly in resource-limited urban settings, can be an important tool for communities to address mental health problems, alongside other patient-level treatments.

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Author affiliations and article information are listed at the end of this article.

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Abstract (continued)

**CONCLUSIONS AND RELEVANCE** Among community-dwelling adults, self-reported feelings of depression and worthlessness were significantly decreased, and self-reported poor mental health was nonsignificantly reduced for those living near greened vacant land. The treatment of blighted physical environments, particularly in resource-limited urban settings, can be an important treatment for mental health problems alongside other patient-level treatments.

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## Introduction

Almost 1 in 5 US adults report some form of mental illness. Depression is the second largest contributor to years lived with disability in the United States,<sup>1</sup> with more than 16 million adults experiencing an episode annually.<sup>2,3</sup> Yet patient mental health services only account for an estimated 5% of total medical care spending in the United States.<sup>4</sup> A broadening of treatment options to improve mental health is necessary, including interventions that fundamentally change harmful environmental surroundings that may be key contributors to mental illness.

Neighborhood physical conditions, including vacant or dilapidated spaces, trash, and lack of quality infrastructure such as sidewalks and parks, are associated with depression<sup>5-9</sup> and are factors that may explain the persistent prevalence of mental illness in resource-limited communities.<sup>10</sup> Vacant and dilapidated spaces are unavoidable neighborhood conditions that residents in low-resource communities encounter every day, making the very existence of these spaces a constant source of stress<sup>11,12</sup> and possibly mental illness.

However, neighborhood physical conditions can also positively influence mental health.<sup>13,14</sup> Spending time and living near green spaces have been associated with various improved mental health outcomes, including less depression, anxiety, and stress.<sup>15-19</sup> Several studies have demonstrated a dose-response relationship between more time spent in green spaces and lower depression rates.<sup>20,21</sup> Therefore, green space may be a potential buffer between inequitable neighborhood conditions and poor mental health outcomes.<sup>22-24</sup>

While patient-level therapies for mental illness will always be a vital aspect of treatment, changing the places where people live, work, and play may have broad population-level effects on mental health outcomes.<sup>25</sup> There have been calls for the development of urban environmental interventions to improve mental health outcomes and well-being.<sup>1,26</sup> In support of this, a number of observational studies have demonstrated the positive effect of vacant land greening interventions on urban health, crime, and stress.<sup>12,27-29</sup> However, these prior studies have not been experimental and have not tested mental health outcomes. Given this, we evaluated data from, to our knowledge, the first citywide cluster randomized trial with the objective to test the effects of inexpensive, standardized, and reproducible vacant land remediation interventions—greening and trash cleanup—on health and safety. We report here on the mental health outcomes. Analysis of crime outcomes is reported elsewhere.<sup>30</sup>

## Methods

### Study Design

This citywide cluster randomized trial of a standardized, reproducible vacant lot greening intervention and vacant lot trash cleanup intervention was conducted in Philadelphia, Pennsylvania. The University of Pennsylvania institutional review board approved this trial. All participants provided written informed consent. All sections of this article were written using the Consolidated

Standards of Reporting Trials (CONSORT) reporting guideline.<sup>31</sup>The trial protocol can be found in the [Supplement](#).

### Vacant Lot Random Sampling and Random Assignment

A master list was compiled of all vacant lots citywide available from the city administrative records throughout January 2011. Vacant lots that were authorized by municipal ordinance as blighted and eligible for the intervention were randomly sampled for the trial. Eligible lots were included if they specifically (1) had existing violations signaling blight, including illegal dumping, abandoned cars, and/or unmanaged vegetation growth; and (2) had been abandoned, as confirmed through contact with the owner of record who, within a 10-day period, either authorized the intervention or did not reply. Owners included the city itself for publicly owned lots. We excluded lots that had insufficient blight or lack of abandonment, lots that were greater than 5500 sq ft, and lots that were fully paved parking lots.

Vacant lot clusters served as the intervention unit for the study. To form these clusters, the master list of eligible vacant lots was ordered based on the assignment of random numbers within 4 sections of the city.<sup>32</sup> In each section of the city, the first vacant lot in the randomly ordered list was chosen as an index lot and a 0.25-mile radius buffer was created around that lot. All other eligible vacant lots on the master list that fell within this radius were used to form a cluster grouping of geographically proximal vacant lots that summed between 4500 to 5500 total sq ft; these lots were then removed from consideration as future index lots. This process then cycled to the next randomly ordered index lot on the list that was at least 0.25 miles away from the edge of prior clusters until all clusters were formed. This process guaranteed that no clusters overlapped, reducing potential spillover and contamination effects across trial arms.

Within each city section, clusters were randomly assigned to 1 of 3 study groups—the greening intervention, trash cleanup intervention, or no intervention (**Figure 1**). A repeated randomization procedure<sup>33</sup> was used under a predetermined protocol that permitted repeated random allocation of the 3 study groups until a statistically significant balance was achieved with a set of potential confounding variables, including the total area and mean separating distance of the study vacant lots, the total vacant lots, resident population, and number of serious crimes (part I violent and property crimes), in each cluster.

### Vacant Lot Interventions and Control Group

The vacant lot greening intervention involved the cleaning and greening of vacant lots via a standard, reproducible process of removing trash and debris, grading the land, planting new grass and a small number of trees, installing a low wooden perimeter fence with openings, and performing regular maintenance (**Figure 2**). The vacant lot trash cleanup intervention group involved removal of trash and debris, limited grass mowing on the lot where possible, and regular maintenance. The Pennsylvania Horticultural Society designed and carried out the interventions over a 2-month period, from April 1, 2013, to May 31, 2013, followed by monthly maintenance. At the end of the postintervention period, vacant lots assigned to the control condition were scheduled for cleaning and greening.

### Random Sampling of Participants

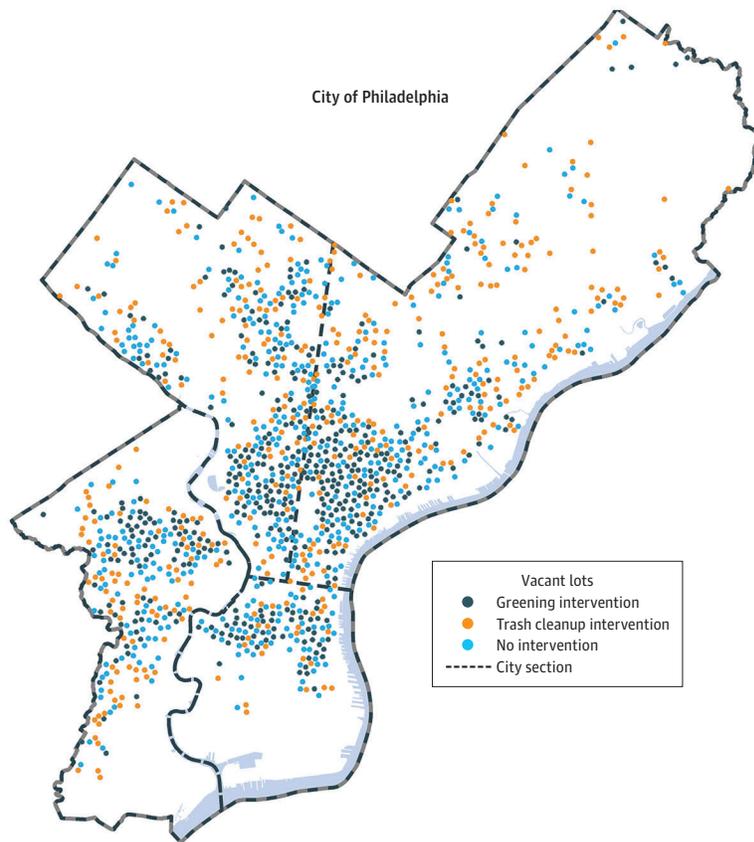
Two preintervention interview survey waves were conducted from October 1, 2011, to March 31, 2013, and 2 postintervention survey waves were conducted from June 1, 2013, to November 30, 2014, with a sample of residents from each cluster. All participants completed at least 1 preintervention survey and 1 postintervention survey. The outer-bounding polygon and its centroid were calculated for each grouping of vacant lots per cluster. This centroid represented the point location that was mathematically closest to all the study vacant lots in each cluster. The address of the closest building to this point location was then determined as the starting point for house-to-house random sampling and enrollment of survey participants. At each starting address, a 2-person

survey team walked in a predetermined random direction on the corresponding city block followed by randomly chosen adjacent city blocks within the cluster until a total of 5 participants had been identified, consented, and were interviewed. Both the survey team and participants were blinded to cluster intervention. Participants were told the study was about improving our understanding of urban health. One participant per household was chosen; in households with multiple eligible participants, the individual with the most recent birthday was chosen. All baseline interviews and most follow-up interviews were conducted in person; a handful of follow-up interviews were conducted by telephone. Both English-speaking and Spanish-speaking individuals 18 years and older were administered the survey in the language of their choice; only 2 Spanish-language surveys were administered. Each participant was compensated \$25 per interview, which took an average of 39.6 minutes to complete. Based on the American Association for Public Opinion Research response rate calculator, our survey response rate was 47.4%.<sup>34</sup> Our response rate matched or exceeded that of other surveys and was high enough to produce a reasonably representative sample of our target population.<sup>35-37</sup>

**Outcome Measures**

At each interview, participants responded to questions about their perceptions of mental health, focusing on their experiences within the past 30 days to anchor responses in time relative to the intervention period and to avoid telescoping and overestimation. We used the validated short-form Kessler-6 Psychological Distress Scale (K6), a widely used community screening tool. The K6 was designed to evaluate the prevalence of serious mental illness in the community and does not make a

Figure 1. Distribution of Study Vacant Lots Across Philadelphia, Pennsylvania



This map shows the distribution of randomly selected study vacant lots across 3 groups of the trial: the greening intervention, the trash cleanup intervention, and no intervention. The distribution of vacant lots shown is representative of those in the study, although for the purposes of confidentiality are not the locations of actual study lots.

clinical diagnosis of mental illness. Participants were asked to indicate how often they felt nervous, hopeless, restless, depressed, that everything was an effort, and worthless using the following scale: all of the time, most of the time, more than half of the time, less than half of the time, some of the time, or at no time. In keeping with the K6 order and scoring, the 2 middle categories were combined to create a score of 0 to 4 for each marker, which was then summed for a total score of 0 to 24. Using standard scoring guidelines, a score of 13 or greater indicated higher prevalence of serious mental illness or what we call *self-reported poor mental health*.<sup>38,39</sup> Participants self-reported their race and/or ethnicity.

**Statistical Analysis**

Prior to the study, sample size was determined by taking into account anticipated intracluster correlation, participant response prevalence, number of crimes reported to the police in each area, effect size, and power. The minimally detectable effect size, given 80% power and 4 time points based on the group before vs after interaction test for any pairwise comparison among the randomly allocated groups of lots, was calculated.<sup>40</sup> From this, and predicting a 25% loss-to-follow-up rate, we estimated that we would maintain more than 80% power if we randomly surveyed 3 people per cluster twice before and twice after the intervention.

Intention-to-treat analyses of participants were conducted according to the randomly assigned vacant lot cluster intervention group in which they lived. Pairwise comparisons were completed for all study outcomes between the greening intervention group and the no intervention group as well as the trash cleanup intervention group and the no intervention group. These pairwise comparisons were tested for statistical significance (all tests were 2-sided and statistical significance was defined as  $P \leq .05$ ) using unadjusted random-effects, cross-sectional time series regressions that accounted for the cluster design of the trial. Random-effects regressions were chosen because we assumed that

Figure 2. Vacant Lot Main Greening Intervention



Images show blighted preperiod conditions and remediated postperiod restorations. A, The image shows the grass seeding method used to rapidly complete the treatment process. B, The after image shows the low wooden perimeter fence. Vacant lots shown

here are representative of those in the study, although for purposes of confidentiality are not actual study lots.

unobserved lot-specific effects were correlated over time at the cluster level. All statistical analyses were conducted using Stata, version 14.1 (StataCorp LLC).

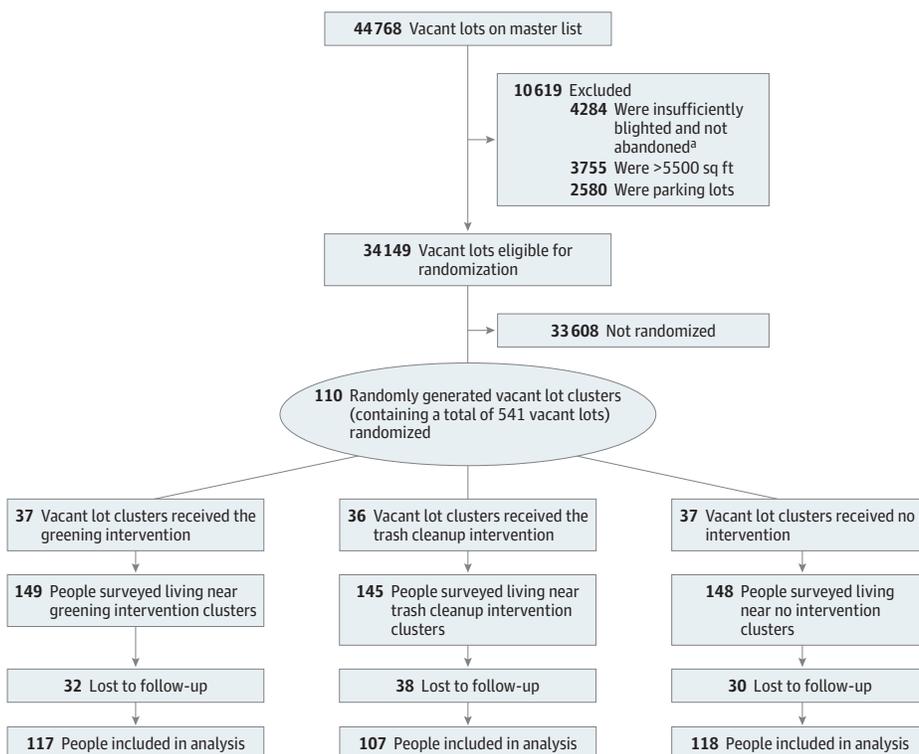
Difference-in-differences analyses were calculated as interaction terms of 1-0 intervention-control differences multiplied by 0-1 pre-post differences. These difference-in-differences interaction terms were the primary independent variables of interest interpreted as the true effect of the interventions on the outcomes studied. The estimates from the difference-in-differences analysis were then divided by the overall magnitude of occurrence for each outcome in the intervention group to obtain percentage reductions.<sup>27,29,41</sup> Additional subset analyses were also completed by neighborhood poverty levels using the census tracts within which study participants lived. The poverty threshold for 2013 was determined to be \$19 530 per the average size of persons per household in Philadelphia and the 2013 poverty guidelines from the US Census Bureau and the Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation.<sup>42</sup>

## Results

### Vacant Lots and Clusters

The master list included 44 768 vacant lots, 34 149 (76.3%) of which were deemed eligible for inclusion in the study. Ineligible lots were excluded owing to insufficient blight or not being abandoned (4284), being greater than 5500 sq ft (3755), and being existing private or commercial parking lots (2580). A total of 110 clusters containing 541 vacant lots were enrolled in the trial and randomly allocated to the following 1 of 3 study arms: the greening intervention (37 clusters [33.6%]), the trash cleanup intervention (36 clusters [32.7%]), or no intervention (37 clusters [33.6%]) (Figure 3). Of the clusters, 47 (42.7%) were included in neighborhood poverty subset analysis.

Figure 3. Flowchart of Vacant Lots and Participants Through Vacant Lot Greening Trial



<sup>a</sup> Vacant lots were classified as blighted if they (1) had existing violations signaling blight, including illegal dumping, abandoned cars, and/or unmanaged vegetation growth; and (2) had been abandoned, as confirmed through contact with the owner of record who, within a 10-day period, either authorized the intervention or did not reply. Those excluded as having insufficient blight or not confirmed as abandoned did not meet these conditions.

Balance was evident at the cluster level between the 3 intervention conditions in terms of total number of study lots per study arm (range, 161-206 lots), the mean number of study lots per cluster (range, 4.5-5.4 lots), the total square footage of study lots per cluster (range, 4844-4935 sq ft), the mean number of residents per cluster (range, 285-297 people), and the mean number of serious crimes, as reported by the Philadelphia Police Department, occurring within each cluster during the 18-month baseline period (range, 16.5-18.3 crimes) (Table 1).

### Participant Baseline Characteristics

Of the 442 participants, the mean (SD) age was 44.6 (15.1) years, 264 (59.7%) were female, and 194 (43.9%) had a family income less than \$25 000. A total of 442 participants were interviewed during the preintervention period, and 342 (77.4%) of these original participants were interviewed during

Table 1. Baseline Characteristics Demonstrating Balance Across Study Groups<sup>a</sup>

Characteristic	No. (%)		
	Greening Intervention	Trash Cleanup Intervention	No Intervention Control
<b>Vacant lot clusters</b>			
No.	37	36	37
Resident population, mean (SD), No.	287.8 (117.5)	297.0 (124.6)	284.9 (130.5)
Serious crimes, mean (SD), No. <sup>b</sup>	16.5 (6.4)	18.3 (9.6)	17.1 (8.4)
Total eligible vacant lots, mean (SD), No.	38.3 (25.2)	43.1 (28.4)	38.1 (31.1)
Prior treated lots, mean (SD), No.	6.7 (9.5)	5.3 (9.7)	5.6 (14.1)
Total study lots, No.	206	174	161
Study lots per cluster, mean, No.	5.4	4.8	4.5
Study lots total area, mean (SD), sq ft	4844 (970.2)	4935 (991.6)	4872 (1375.7)
Study lots separation, mean (SD), ft	75.6 (85.5)	71.3 (77.3)	73.5 (70.2)
<b>Participants</b>			
No.	149	145	148
Age, mean (SD), y	43.3 (14.9)	44.2 (15.7)	45.3 (14.8)
Tenure in home, mean (SD), y	12.0 (14.1)	13.7 (15.8)	12.5 (14.4)
<b>Sex</b>			
Male	57 (38.3)	54 (37.2)	67 (45.3)
Female	92 (61.7)	91 (62.8)	81 (54.7)
<b>Race/ethnicity</b>			
White	12 (8.0)	14 (9.7)	21 (14.2)
Black	118 (79.2)	117 (80.7)	102 (68.9)
Other	20 (13.4)	15 (10.7)	23 (15.2)
Hispanic	14 (9.4)	12 (8.3)	17 (11.5)
<b>Education</b>			
Less than high school	34 (22.8)	44 (30.3)	31 (20.9)
High school	71 (47.7)	64 (44.1)	72 (48.7)
Any college	42 (28.2)	36 (24.8)	44 (29.7)
<b>Employment status</b>			
Employed	95 (63.8)	99 (68.3)	104 (70.3)
Unemployed	54 (36.2)	46 (31.7)	44 (29.7)
<b>Family income, \$</b>			
<10 000	35 (23.5)	36 (24.8)	38 (25.7)
10 000 to <25 000	26 (17.5)	32 (22.1)	27 (18.2)
25 000 to <50 000	27 (18.1)	19 (13.1)	18 (12.2)
>50 000	8 (5.4)	8 (5.5)	16 (10.8)

<sup>a</sup> Percentages may not total 100% because of nonresponse on specific variables.

<sup>b</sup> Serious crimes include part I violent and property crimes.

the postintervention period and are included in this analysis. This amounted to a 22.6% loss to follow-up; of the 100 lost participants, 78% could not be found in their original cluster, and 22% refused to participate in subsequent waves. Of the 442 participants, 149 (33.7%) were assigned to the greening intervention, 145 (32.8%) to the trash cleanup intervention, and 148 (33.5%) to no intervention. Of the 342 participants included in the analysis, 117 (34.2%) received the greening intervention, 107 (31.3%) the trash cleanup intervention, and 118 (34.5%) no intervention. A total of 139 people (40.6%) were included in the neighborhood poverty subset analyses, including 45 (32.4%) receiving the greening intervention, 51 (36.7%) the trash cleanup intervention, and 43 (30.9%) no intervention. Participant demographic characteristics were balanced between the 3 study arms, including mean tenure in the home (range, 12.0-13.7 years), mean age (range, 43.3-45.3 years), and percentage with family income less than \$25 000 (range, 41.0%-46.9%) (Table 1).

**Participant-Reported Mental Health Outcomes**

Intention-to-treat analyses demonstrated significant changes in participant-reported mental health outcomes. Intention-to-treat analyses of the greening intervention compared with no intervention demonstrated a significant decrease in feeling depressed (-41.5%; 95% CI, -63.6% to -5.9%; *P* = .03) and feeling worthless (-50.9%; 95% CI, -74.7% to -4.7%; *P* = .04). Analysis also demonstrated a nonsignificant reduction in overall self-reported poor mental health (-62.8%; 95% CI, -86.2% to 0.4%; *P* = .051), as calculated by the K6 (Table 2). When looking only at neighborhoods below the poverty line, feeling depressed significantly decreased (-68.7%; 95% CI, -86.5% to -27.5%; *P* = .007). There was no significant difference in self-reported poor mental health in neighborhoods below the poverty line.

**Table 2. Intention-to-Treat Analyses of Vacant Lot Interventions and Self-reported Mental Health Outcomes**

Response <sup>a</sup>	No Intervention		Greening Intervention		Pre and Post Change vs Control, % (95% CI)	P Value	Trash Cleanup Intervention		Pre and Post Change vs Control, % (95% CI)	P Value
	Preperiod, %	Postperiod, %	Preperiod, %	Postperiod, %			Preperiod, %	Postperiod, %		
All neighborhoods										
Nervous	27.9	23.8	34.0	23.0	-16.4 (-43.1 to 22.9)	.36	29.8	20.6	-11.7 (-41.6 to 33.6)	.56
Hopeless	13.2	8.7	16.4	8.9	-17.0 (-49.2 to 35.6)	.46	15.3	12.7	12.7 (-31.1 to 84.2)	.63
Restless	22.8	20.8	30.3	17.5	-33.1 (-55.8 to 1.2)	.06	22.6	19.7	-27.8 (-51.5 to 7.5)	.11
Depressed	11.8	8.7	15.2	10.5	-41.5 (-63.6 to -5.9)	.03	14.9	14.8	-15.4 (-49.5 to 41.9)	.53
Everything an effort	33.8	26.0	41.0	31.1	-7.6 (-41.3 to 45.4)	.73	39.5	31.6	-7.7 (-36.5 to 34.2)	.68
Worthless	6.6	8.7	10.3	5.1	-50.9 (-74.7 to -4.7)	.04	9.7	9.2	-27.6 (-65.0 to 49.6)	.38
Poor mental health <sup>b</sup>	5.5	4.8	9.4	3.9	-62.8 (-86.2 to 0.4)	.051	7.3	4.8	-30.1 (-74.7 to 93.2)	.49
Neighborhoods below poverty level <sup>c</sup>										
Nervous	32.1	26.6	39.5	19.4	-39.6 (-71.9 to 30.0)	.20	27.9	22.3	-34.8 (-39.7 to 57.0)	.30
Hopeless	17.9	10.9	18.5	6.0	-45.3 (-78.5 to 39.1)	.21	22.1	13.8	-33.7 (-69.5 to 44.0)	.30
Restless	28.6	23.4	33.3	23.4	-45.1 (-77.3 to 32.7)	.18	20.9	18.4	-15.6 (-54.9 to 58.0)	.60
Depressed	11.9	7.8	22.2	8.9	-68.7 (-86.5 to -27.5)	.007	19.8	19.5	-18.7 (-60.8 to 68.6)	.58
Everything an effort	40.5	31.2	42.0	26.9	-38.4 (-73.1 to 40.8)	.25	37.2	33.3	-8.1 (-46.5 to 58.0)	.76
Worthless	7.1	9.4	13.6	4.5	-52.6 (-86.6 to 67.5)	.25	14.0	10.4	-34.4 (-79.9 to 114.1)	.49
Poor mental health <sup>b</sup>	7.1	6.3	13.6	4.5	-76.7 (-96.2 to 44.8)	.12	11.6	6.9	-45.4 (-84.4 to 91.6)	.35

<sup>a</sup> Participants focused on their experiences within the past 30 days. Possible responses were all of the time, most of the time, more than half of the time and/or less than half of the time, some of the time, or at no time; percentages are the proportion of participants responding "less than half the time" or "more often."

<sup>b</sup> Kessler-6 Psychological Distress Scale mental illness score ranged from 0 to 24, with each of the 6 components ranging from 0 to 4; scores of 13 or greater indicated poor self-reported mental health.

<sup>c</sup> Neighborhood poverty levels were determined using the census tracts within which study participants lived.

Intention-to-treat analyses of the trash cleanup intervention compared with no intervention did not show any statistically significant differences between self-reported poor mental health measured by the K6 (Table 2). There was also no difference between groups for the individual components of the K6. The analysis of neighborhoods below the poverty line also did not indicate any difference in self-reported mental health between the groups.

## Discussion

In this citywide cluster randomized trial of 2 vacant land remediation interventions, greening was associated with a significant reduction in feeling depressed and worthless as well as a nonsignificant reduction in overall self-reported poor mental health for randomly sampled residents living nearby. The trash cleanup intervention was not associated with a reduction in feeling depressed or self-reported poor mental health.

To our knowledge, this is the first citywide cluster randomized trial of actual place-based changes to urban spaces. These results add much needed experimental evidence to a growing body of literature calling for structural changes to neighborhoods as a method for improving health and safety.<sup>43,44</sup> This study extends previous work showing a clear association between green space and mental illness,<sup>13-21</sup> by demonstrating that adding green space to people's neighborhood environment can improve the trajectory of their mental health. Additionally, vacant lot greening is a relatively low-cost intervention (approximately \$1597 per vacant lot and \$180 per year to maintain) that we have previously shown to be a cost-beneficial solution to firearm violence.<sup>29</sup> For these reasons, vacant lot greening may be an extremely attractive intervention for policy makers seeking to address urban blight.

Our findings indicate that the effect of vacant lot greening on feeling depressed was slightly stronger for those living in neighborhoods below the poverty line. Urban blight is an environmental condition that disproportionately affects low-resource neighborhoods, as evidenced by the fact that almost half of our participants had yearly family incomes less than \$25 000. Making structural changes to the lowest-resource neighborhoods can make them healthier and may be an important mechanism to address persistent and entrenched socioeconomic health disparities.<sup>45</sup>

There are several possible mechanisms through which the vacant lot greening intervention but not the trash cleanup intervention improved feeling depressed and self-reported poor mental health. One significant difference between the 2 interventions was the creation of new green space. Green space, particularly in urban environments more likely to have a dearth of vegetation, has been linked to recovery from mental fatigue,<sup>46</sup> a state of inattentiveness and irritability resulting from the information-processing demands of daily life. Spending time in or near nature can combat mental fatigue because it allows engagement without paying explicit attention.<sup>46-48</sup> A related concept is the association between spending time in or near green space and stress reduction,<sup>18,49</sup> which may in turn reduce mental illness. For example, walking past green space has been associated with reduction in heart rate,<sup>12</sup> one marker of acute physiological stress.

Additionally, the presence of green space is associated with improved neighborhood social milieu, including the concepts of social cohesion, social capital, and collective efficacy.<sup>50-53</sup> The presence of grass and trees is related to use of outdoor space and increased social activity that takes place in those outdoor spaces.<sup>54</sup> Improved social conditions are, in turn, associated with better mental health.<sup>55,56</sup> For example, living in a low-income neighborhood is associated with worse mental health indicators for people with low but not high social cohesion.<sup>57</sup> Studies have found that social cohesion mediated a positive green space-mental health relationship.<sup>58-60</sup> Additionally, previous studies have demonstrated an association of vacant lot greening with increased feelings of safety and decreased violent crime, both of which may work to improve mental illness.<sup>27,28</sup> Fear of crime, for example, is associated with almost 2-fold higher likelihood of having depression.<sup>61</sup>

The other significant difference between the greening and trash cleanup interventions was the presence of a simple wooden post and rail fence. The fence delineates the newly greened space as

one that is cared for but does have openings to indicate that people can enter the space. The fence is also meant to deter illegal dumping. Previous qualitative work conducted by our team indicated that vacant land causes people to feel stigmatized and abandoned by their community and government.<sup>11</sup> Countering this with clear signs of neighborhood investment, such as a clearly marked newly greened vacant lot, may contribute to the improvements seen in feeling depressed and self-reported poor mental health.

### Limitations

There were several limitations to this study. We used the K6 to measure our outcome of interest and mental health. While this is a validated and widely used scale, it is still a single scale, and other mental illness screening and diagnosis tools and scales may produce different results. Furthermore, we did not conduct a *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*-level diagnosis of mental illness but rather used a community screening tool. Another limitation is the duration of our study and loss to follow-up. We followed up people for 18 months following the blight remediation interventions and are unable to know if the effect of the interventions on mental health outcomes persisted past the study period. We also made every effort to minimize loss to follow-up of our study participants after they were first enrolled, although differential, nonrandom dropout in our 3 study arms and across all study waves could have affected our results. Finally, we did not specifically track if and how study participants used (or did not use) study vacant lots, although prior work has demonstrated signs of use, such as barbecues or chairs on similar vacant lots.<sup>62</sup>

### Conclusions

Among community-dwelling adults, self-reported feelings of depression and worthlessness were significantly decreased and self-reported poor mental health was nonsignificantly reduced for those living near greened vacant lots compared with control lots. The treatment of dilapidated physical environments can be an important tool for communities to address persistent mental health problems. These findings provide support to health care clinicians concerned with positively transforming the often chaotic and harmful environments that affect their patients. Our findings also offer evidence to policy makers interested in increasing municipal investments in the remediation of blighted urban spaces as an inexpensive<sup>29</sup> and scalable way to improve mental health, particularly in low-resource neighborhoods.

### ARTICLE INFORMATION

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**Correction:** This article was corrected on August 17, 2018, to fix an error in Figure 2B.

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**Corresponding Author:** Eugenia C. South, MD, MS, Department of Emergency Medicine, Perelman School of Medicine, University of Pennsylvania, 423 Guardian Dr, Blockley Hall, Room 408, Philadelphia, PA 19104 ([eugenia.south@uphs.upenn.edu](mailto:eugenia.south@uphs.upenn.edu)).

**Author Affiliations:** Department of Emergency Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia (South); Center for Emergency Care Policy and Research, Perelman School of Medicine, University of Pennsylvania, Philadelphia (South); Department of Epidemiology, School of Public Health, School of Criminal Justice, Rutgers University, Newark, New Jersey (Hohl); Northern Research Station, Forest Service, US Department of Agriculture, Philadelphia, Pennsylvania (Kondo); Department of Criminology, School of Arts and Sciences, University of Pennsylvania, Philadelphia (MacDonald); Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, New York (Branas); Department of Biostatistics and Epidemiology, Perelman School of Medicine, University of Pennsylvania, Philadelphia (Branas).

**Author Contributions:** Drs MacDonald and Branas had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

**Concept and design:** South, Hohl, MacDonald, Branas.

**Acquisition, analysis, or interpretation of data:** All authors.

**Drafting of the manuscript:** South, Hohl, Branas.

**Critical revision of the manuscript for important intellectual content:** Hohl, Kondo, MacDonald, Branas.

**Statistical analysis:** MacDonald, Branas.

**Obtained funding:** Branas.

**Administrative, technical, or material support:** Hohl, Kondo, Branas.

**Supervision:** MacDonald, Branas.

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**Additional Contributions:** Philippe Bourgois, PhD (University of California, Los Angeles), contributed to the study design and execution; Keith Green (Pennsylvania Horticulture Society, Philadelphia), study intervention design and implementation; Jamillah Millner, BA (University of Pennsylvania, Philadelphia), participant recruitment, enrollment, and retention; Vicky Tam, MA (University of Pennsylvania, Philadelphia), geospatial planning and implementation; Douglas Wiebe, PhD (University of Pennsylvania, Philadelphia), study design and execution; and Jeremy Levenson, BA (University of California, Los Angeles), study execution. These individuals were affiliated with this project and key to its success. Drs Bourgois and Wiebe and Mss Millner and Tam received salary support for their contribution. Mr Green's organization received funds to perform the intervention. Mr Levenson received compensation for his field work.

## REFERENCES

1. Murray CJL, Atkinson C, Bhalla K, et al; US Burden of Disease Collaborators. The state of US health, 1990-2010: burden of diseases, injuries, and risk factors. *JAMA*. 2013;310(6):591-608. doi:10.1001/jama.2013.13805
2. US Center for Behavioral Health Statistics and Quality. Key substance use and mental health indicators in the United States: results from the 2015 National Survey on Drug Use and Health. <http://www.samhsa.gov/data/>. Accessed November 13, 2017.
3. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of *DSM-IV* disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005;62(6):593-602. doi:10.1001/archpsyc.62.6.593
4. Kamal R, Cox C, Rousseau D; Kaiser Family Foundation. Costs and outcomes of mental health and substance use disorders in the US. *JAMA*. 2017;318(5):415. doi:10.1001/jama.2017.8558
5. Mair C, Diez Roux AV, Morenoff JD. Neighborhood stressors and social support as predictors of depressive symptoms in the Chicago Community Adult Health Study. *Health Place*. 2010;16(5):811-819. doi:10.1016/j.healthplace.2010.04.006
6. Latkin CA, Curry AD. Stressful neighborhoods and depression: a prospective study of the impact of neighborhood disorder. *J Health Soc Behav*. 2003;44(1):34-44. doi:10.2307/1519814
7. Hill TD, Ross CE, Angel RJ. Neighborhood disorder, psychophysiological distress, and health. *J Health Soc Behav*. 2005;46(2):170-186. doi:10.1177/002214650504600204
8. Mair C, Diez Roux AV, Galea S. Are neighbourhood characteristics associated with depressive symptoms? a review of evidence. *J Epidemiol Community Health*. 2008;62(11):940-946.
9. Mair C, Diez Roux AV, Shen M, et al. Cross-sectional and longitudinal associations of neighborhood cohesion and stressors with depressive symptoms in the Multiethnic Study of Atherosclerosis. *Ann Epidemiol*. 2009;19(1):49-57. doi:10.1016/j.annepidem.2008.10.002
10. Hoebel J, Maske UE, Zeeb H, Lampert T. Social inequalities and depressive symptoms in adults: the role of objective and subjective socioeconomic status. *PLoS One*. 2017;12(1):e0169764. doi:10.1371/journal.pone.0169764

11. Garvin E, Branas C, Keddem S, Sellman J, Cannuscio C. More than just an eyesore: local insights and solutions on vacant land and urban health. *J Urban Health*. 2013;90(3):412-426. doi:10.1007/s11524-012-9782-7
12. South EC, Kondo MC, Cheney RA, Branas CC. Neighborhood blight, stress, and health: a walking trial of urban greening and ambulatory heart rate. *Am J Public Health*. 2015;105(5):909-913. doi:10.2105/AJPH.2014.302526
13. James P, Banay RF, Hart JE, Laden F. A review of the health benefits of greenness. *Curr Epidemiol Rep*. 2015;2(2):131-142. doi:10.1007/s40471-015-0043-7
14. Seymour V. The human-nature relationship and its impact on health: a critical review. *Front Public Health*. 2016;4:260. doi:10.3389/fpubh.2016.00260
15. Beyer KM, Kaltenbach A, Szabo A, Bogar S, Nieto FJ, Malecki KM. Exposure to neighborhood green space and mental health: evidence from the Survey of the Health of Wisconsin. *Int J Environ Res Public Health*. 2014;11(3):3453-3472. doi:10.3390/ijerph110303453
16. McEachan RRC, Prady SL, Smith G, et al The association between green space and depressive symptoms in pregnant women: moderating roles of socioeconomic status and physical activity. *J Epidemiol Community Health*. 2016;70(3):253-259. doi:10.1136/jech-2015-205954
17. Wu Y-T, Prina AM, Jones A, Matthews FE, Brayne C; The Medical Research Council Cognitive Function and Ageing Studies. Older people, the natural environment and common mental disorders: cross-sectional results from the Cognitive Function and Ageing Study. *BMJ Open*. 2015;5(9):e007936. doi:10.1136/bmjopen-2015-007936
18. Roe JJ, Thompson CW, Aspinall PA, et al. Green space and stress: evidence from cortisol measures in deprived urban communities. *Int J Environ Res Public Health*. 2013;10(9):4086-4103. doi:10.3390/ijerph10094086
19. Morita E, Fukuda S, Nagano J, et al. Psychological effects of forest environments on healthy adults: Shinrin-yoku (forest-air bathing, walking) as a possible method of stress reduction. *Public Health*. 2007;121(1):54-63. doi:10.1016/j.puhe.2006.05.024
20. Cox DTC, Shanahan DF, Hudson HL, et al. Doses of nearby nature simultaneously associated with multiple health benefits. *Int J Environ Res Public Health*. 2017;14(2):172. doi:10.3390/ijerph14020172
21. Shanahan DF, Bush R, Gaston KJ, et al. Health benefits from nature experiences depend on dose. *Sci Rep*. 2016;6:28551. doi:10.1038/srep28551
22. Mitchell R, Popham F. Effect of exposure to natural environment on health inequalities: an observational population study. *Lancet*. 2008;372(9650):1655-1660. doi:10.1016/S0140-6736(08)61689-X
23. Hartig T. Green space, psychological restoration, and health inequality. *Lancet*. 2008;372(9650):1614-1615. doi:10.1016/S0140-6736(08)61669-4
24. Mitchell RJ, Richardson EA, Shortt NK, Pearce JR. Neighborhood environments and socioeconomic inequalities in mental well-being. *Am J Prev Med*. 2015;49(1):80-84. doi:10.1016/j.amepre.2015.01.017
25. Frieden TR. A framework for public health action: the health impact pyramid. *Am J Public Health*. 2010;100(4):590-595. doi:10.2105/AJPH.2009.185652
26. Gong Y, Palmer S, Gallacher J, Marsden T, Fone D. A systematic review of the relationship between objective measurements of the urban environment and psychological distress. *Environ Int*. 2016;96:48-57. doi:10.1016/j.envint.2016.08.019
27. Branas CC, Cheney RA, MacDonald JM, Tam VW, Jackson TD, Ten Have TR. A difference-in-differences analysis of health, safety, and greening vacant urban space. *Am J Epidemiol*. 2011;174(11):1296-1306. doi:10.1093/aje/kwr273
28. Garvin EC, Cannuscio CC, Branas CC. Greening vacant lots to reduce violent crime: a randomised controlled trial. *Inj Prev*. 2013;19(3):198-203. doi:10.1136/injuryprev-2012-040439
29. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight remediation as a cost-beneficial solution to firearm violence. *Am J Public Health*. 2016;106(12):2158-2164. doi:10.2105/AJPH.2016.303434
30. Branas CC, South E, Kondo MC, et al. Citywide cluster randomized trial to restore blighted vacant land and its effects on violence, crime, and fear. *Proc Natl Acad Sci U S A*. 2018;115(12):2946-2951. doi:10.1073/pnas.1718503115
31. Campbell MK, Piaggio G, Elbourne DR, Altman DG; CONSORT Group. CONSORT 2010 statement: extension to cluster randomised trials. *BMJ*. 2012;345:e5661. doi:10.1136/bmj.e5661
32. Boruch R, May H, Turner H, et al. Estimating the effects of interventions that are deployed in many places: place-randomized trials. *Am Behav Sci*. 2004;47(5):608-633. doi:10.1177/0002764203259291
33. Schulz KF, Grimes DA. Generation of allocation sequences in randomised trials: chance, not choice. *Lancet*. 2002;359(9305):515-519. doi:10.1016/S0140-6736(02)07683-3

34. American Association for Public Opinion Research. AAPOR response rate calculator. <https://www.aapor.org/Education-Resources/For-Researchers/Poll-Survey-FAQ/Response-Rates-An-Overview.aspx>. Accessed November 27, 2017.
35. Groves RM. Nonresponse rates and nonresponse bias in household surveys. *Public Opin Q*. 2006;70(5):646-675. doi:10.1093/poq/nfl033
36. Galea S, Tracy M. Participation rates in epidemiologic studies. *Ann Epidemiol*. 2007;17(9):643-653. doi:10.1016/j.annepidem.2007.03.013
37. Keeter S, Kennedy C, Dimock M, Best J, Craighill P. Gauging the impact of growing nonresponse on estimates from a national RDD telephone survey. *Public Opin Q*. 2006;70(5):759-779. doi:10.1093/poq/nfl035
38. Kessler RC, Andrews G, Colp LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med*. 2002;32(6):959-976. doi:10.1017/S0033291702006074
39. Kessler RC, Barker PR, Colpe LJ, et al. Screening for serious mental illness in the general population. *Arch Gen Psychiatry*. 2003;60(2):184-189. doi:10.1001/archpsyc.60.2.184
40. Cohen J. *Statistical Power for the Behavioral Sciences*. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates; 1988.
41. Meyer BD. Natural and quasi-experiments in economics. *J Bus Econ Stat*. 1995;13(2):151-161. doi:10.1080/07350015.1995.10524589
42. US Department of Health and Human Services, Assistant Secretary for Planning and Evaluation. Poverty guidelines. <https://aspe.hhs.gov/2013-poverty-guidelines#thresholds>. Accessed April 20, 2018.
43. Branas CC, Macdonald JM. A simple strategy to transform health, all over the place. *J Public Health Manag Pract*. 2014;20(2):157-159. doi:10.1097/PHH.0000000000000051
44. Kondo MC, South EC, Branas CC. Nature-based strategies for improving urban health and safety. *J Urban Health*. 2015;92(5):800-814. doi:10.1007/s11524-015-9983-y
45. Woolf SH, Braveman P. Where health disparities begin: the role of social and economic determinants—and why current policies may make matters worse. *Health Aff (Millwood)*. 2011;30(10):1852-1859. doi:10.1377/hlthaff.2011.0685
46. Kuo FE, Sullivan WC. Aggression and violence in the inner city: effects of environment via mental fatigue. *Sage Journals*. 2001;33(4):543-571. doi:10.1177/00139160121973124
47. Kaplan S. The restorative benefits of nature: toward an integrative framework. *J Environ Psychol*. 1995;15(3):169-182. doi:10.1016/0272-4944(95)90001-2
48. Hartig T, Evans GW, Jamner LD, Davis DS, Gärling T. Tracking restoration in natural and urban field settings. *J Environ Psychol*. 2003;23(2):109-123. doi:10.1016/S0272-4944(02)00109-3
49. Ward Thompson C, Roe J, Aspinall P, Mitchell R, Clow A, Miller D. More green space is linked to less stress in deprived communities: evidence from salivary cortisol patterns. *Landsc Urban Plan*. 2012;105(3):221-229. doi:10.1016/j.landurbplan.2011.12.015
50. Cohen DA, Inagami S, Finch B. The built environment and collective efficacy. *Health Place*. 2008;14(2):198-208. doi:10.1016/j.healthplace.2007.06.001
51. Maas J, van Dillen SME, Verheij RA, Groenewegen PP. Social contacts as a possible mechanism behind the relation between green space and health. *Health Place*. 2009;15(2):586-595. doi:10.1016/j.healthplace.2008.09.006
52. Kweon B-S, Sullivan WC, Wiley AR. Green common spaces and the social integration of inner-city older adults. *Sage Journals*. 1998;30(6):832-858. doi:10.1177/001391659803000605
53. Kuo F, Sullivan W, Coley R, Brunson L. Fertile ground for community: inner-city neighborhood common spaces. *Am J Community Psychol*. 1998;26(6):823-851. doi:10.1023/A:1022294028903
54. Sullivan WC. The fruit of urban nature: vital neighborhood spaces. *Sage Journals*. 2004;36(5):678-700. doi:10.1177/0193841X04264945
55. Fone D, White J, Farewell D, et al. Effect of neighbourhood deprivation and social cohesion on mental health inequality: a multilevel population-based longitudinal study. *Psychol Med*. 2014;44(11):2449-2460. doi:10.1017/S0033291713003255
56. Kruger DJ, Reischl TM, Gee GC. Neighborhood social conditions mediate the association between physical deterioration and mental health. *Am J Community Psychol*. 2007;40(3-4):261-271. doi:10.1007/s10464-007-9139-7

57. Fone D, Dunstan F, Lloyd K, Williams G, Watkins J, Palmer S. Does social cohesion modify the association between area income deprivation and mental health? a multilevel analysis. *Int J Epidemiol*. 2007;36(2):338-345. doi:10.1093/ije/dym004
58. de Vries S, van Dillen SME, Groenewegen PP, Spreeuwenberg P. Streetscape greenery and health: stress, social cohesion and physical activity as mediators. *Soc Sci Med*. 2013;94:26-33. doi:10.1016/j.socscimed.2013.06.030
59. Triguero-Mas M, Dadvand P, Cirach M, et al. Natural outdoor environments and mental and physical health: relationships and mechanisms. *Environ Int*. 2015;77:35-41. doi:10.1016/j.envint.2015.01.012
60. Sugiyama T, Leslie E, Giles-Corti B, Owen N. Associations of neighbourhood greenness with physical and mental health: do walking, social coherence and local social interaction explain the relationships? *J Epidemiol Community Health*. 2008;62(5):e9. doi:10.1136/jech.2007.064287
61. Stafford M, Chandola T, Marmot M. Association between fear of crime and mental health and physical functioning. *Am J Public Health*. 2007;97(11):2076-2081. doi:10.2105/AJPH.2006.097154
62. Heckert M, Kondo M. Can "cleaned and greened" lots take on the role of public greenspace? *J Plan Educ Res*. 2017;38(2):211-221. doi:10.1177/0739456X16688766.

#### SUPPLEMENT.

##### Trial Protocol

## King,Lance

---

**From:** Long, Adam J. <along@keller-engineers.com>  
**Sent:** Wednesday, March 06, 2019 4:34 PM  
**To:** Modricker,David; Schoch,Lindsay  
**Cc:** FergTreeComm; Stolin, Raymond; Pribulka,David; King,Lance  
**Subject:** RE: Comments on the landscaping plan for new public works facility  
**Attachments:** IMG\_3151.JPG

Dave et al:

You are correct; the large rain garden is planted with native shrubs in clusters at the edges and ERNMX 180-1 in the center. The rye is just a cover crop until the other plants establish. The shrubs used are most likely on the PSU list, but I did not check every one. I just realized I did not call out the numbers in the shrub clusters on the plan; maybe that is why they were missed in review.

The Ernst mix has a variety of grasses, sedges, and rushes that can be mowed infrequently. The idea is to mow it less frequently than you do the lawn areas. Planting the rain garden completely in shrubs is ideal but is very expensive, and we are not allowed to use mulch in the basin. There is another style of rain garden planting that I sometimes do, which uses another Ernst seed mix with shrubbery whips all over the basin floor, but I chose against this style because it tends to be very wild looking. I thought the method chosen will give a nice transition from the reforestation area to lawn areas. ERNMX 126 also looks valid; I will look into it more.

Black Walnut has been removed from the plan.

The fringe is proposed to be mowed monthly as seen in the schematic on sheet C-009, and the area to be mowed weekly was existing turf grass to remain. This concept allows some turf borders, and then the height gradually steps up instead of going from short 2" turf immediately up to 3' tall grasses and wildflowers. I don't recommend killing and disturbing more grass to accomplish this task; you could just mow the turf less frequently, and then mow the fringe even less frequently.

We have done a lot of educational signs lately on different green infrastructure projects. The bases are from a company called Pannier, and the signs can be done at local design shops and slid into the bases. A sample photo is attached. Some of the local sign companies in Altoona and State College may have some of these already done. I can find out where they were done if you like.

Thank you,

Adam J. Long, ASLA, CLARB  
Landscape Architect  
**Keller Engineers, Inc.**  
420 Allegheny Street  
Hollidaysburg, PA 16648  
Tel: 814.696.7430  
[keller-engineers.com](http://keller-engineers.com)



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**From:** Modricker,David <dmodricker@twp.ferguson.pa.us>  
**Sent:** Wednesday, March 6, 2019 3:04 PM  
**To:** Schoch,Lindsay <lschoch@twp.ferguson.pa.us>  
**Cc:** FergTreeComm <FergTreeComm@twp.ferguson.pa.us>; Long, Adam J. <along@keller-engineers.com>; Schoch,Lindsay <lschoch@twp.ferguson.pa.us>; Stolin, Raymond <rstin@twp.ferguson.pa.us>; Pribulka,David <dprbulka@twp.ferguson.pa.us>; King,Lance <lking@twp.ferguson.pa.us>  
**Subject:** RE: Comments on the landscaping plan for new public works facility

Howard, thank you for your comments and trying to make this the best landscaping effort possible.

Lindsay and Adam, I am reviewing Howard's comments with Lance and offer the following in red below:

David J. Modricker P.E.  
Public Works Director  
Ferguson Township  
3147 Research Drive  
State College, PA  
814-238-4651

APWA Central Pa Chapter Past-President 2018

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**From:** Schoch,Lindsay  
**Sent:** Monday, February 25, 2019 11:37 AM  
**To:** Modricker,David <dmodricker@twp.ferguson.pa.us>  
**Subject:** FW: Comments on the landscaping plan for new public works facility

Hi Dave.

I am going through Howard's comments and thought I would share them with you. I am including them and these attachments with the information that will go to Keller.

Also, Scott is going to get me his comments by the end of the day. I just wanted to follow-up with that since we discussed briefly on Friday.

Thank you.

Lindsay K. Schoch  
Community Planner  
Ferguson Township  
3147 Research Drive  
State College, PA 16801

(814) 238-4651

(814) 238-3454 Fax

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**From:** Fescemyer,Howard <[hfescemyer@twp.ferguson.pa.us](mailto:hfescemyer@twp.ferguson.pa.us)>

**Sent:** Sunday, February 24, 2019 6:31 PM

**To:** Schoch,Lindsay <[lschoch@twp.ferguson.pa.us](mailto:lschoch@twp.ferguson.pa.us)>

**Cc:** FergTreeComm <[FergTreeComm@twp.ferguson.pa.us](mailto:FergTreeComm@twp.ferguson.pa.us)>

**Subject:** Comments on the landscaping plan for new public works facility

Dear Lindsay:

Scott Pflumm and I reviewed the landscaping component of the Land Development Plan for the New Public Works Facility of Ferguson Township. Overall, we find the landscaping component of this plan to be wonderful and commend the Township for putting together a very contemporary and environmentally satisfying plan! The primary thrust of our comments aim to encourage the Township to go further in creating a more plant diverse landscape that takes care of more stormwater on site with green stormwater infrastructures.

We would like to see the diversity of plants in rain gardens expanded. The current plan has most of the gardens planted in rye grass. **Howard - The rain gardens are planted in Ernst ERNMX-180-1 mix at 15#/AC with a cover crop of grain Rye at 30#/AC. The rye is similar to an annual rye that is put down to get an initial green and provide "cover" for the Ernst seed. In addition, there are at least a dozen varieties of border plantings shown on sheet 8. The grass mix is on the bottom and the flowers and shrubs are on the sides. It appears the PSU rain garden publications promote more woody or shrubby material on the basin bottom.** We would ideally like to see the rain gardens planted with something like what is described in the attached document titled "Rain Gardens – the Plants" from Penn State Extension. This document lists a large diversity of plants for rain gardens and groups them by zone of wetness within the garden. Perhaps the plants used in this publication could be applied at a minimum to the small rain gardens. Many of the suggested plants produce lovely flowers, grow well in growth zone 6 and will create good ground cover in winter. Many will also attract pollinators, such as swamp milkweed. **Adam – take a look at the attached document and let me know your thoughts.**

We understand that the approach described in the attached Penn State Extension publication would increase maintenance. As a lower maintenance alternative, we suggest using a seed mix that contains several grass species such as the ERNMX-126 seed mix from Ernst seeds. This low maintenance mix is designed for retention basis floors and contains eight species of grass and grass-like species. This mix could be substituted for rye grass in all rain gardens, but especially the large garden. **Howard – see note above. The rain garden basin bottoms are proposed to be planted with Ernst ERNMX-180-1 per sheet 8 Landscaping Legend. This mix contains 7 different seed types and is used for stormwater management. Adam – please confirm my observation.**

We noticed that black walnut will be planted in a few places. Black walnut is allelopathic to many plants. Please ask Lance to make sure that plants surrounding the black walnuts are tolerant of this tree (he may have already checked this out which is why black walnut is in the landscape plan). **Adam – Lance also commented that black walnuts should not be planted on site. Please refer to Lance's separate comments.**

The mowing scheme for the bioswales include a fringe to be mowed weekly. Perhaps it may be possible to plant in this fringe a grass that requires much less frequent (e.g., monthly) mowing or even no mowing. The idea here is to decrease maintenance and fossil fuels use. There are a number of low or no mow seed mixes available such as no mow carpet grass and low-mow fescues or bent grass blends that require only monthly mowing. We do not know what species or blends would work best in this growth zone and soil conditions including salinity issues that would occur along roadways. **The current plan allows a buffer of existing grass to remain. To accomplish the above, this existing grass would also need to be killed and replanted with a low mow mix. I see pros and cons to this issue. Perhaps we leave the plan as is and just mow this fringe area less frequently. Adam – do you have a recommendation?**

A concern that we had was potential contamination of the large rain garden, which lies below in grade from the salt shed, by salt or brine unintentionally spilled when loading trucks or etc. However, I now see that the possibility of salt entering this garden from the salt shed area is well buffered by a gravel area and other landscaping. Salt from the parking lot and roadways will also enter the rain garden, suggesting that plants in them may need to have some salt tolerance. **No comment.**

It appears that downspouts from the new public works building will be connected in such a way that water from the roof flows into the rain garden instead of into the storm sewer. It also appears that stormwater from the roadway above the new public works building will also be entering the large rain garden. Mitigation of this stormwater is a wonderful use of the large rain garden and we hope our interpretation of the drawings is correct. We hope that the small rain gardens just below the paver parking will be used to mitigate stormwater from this parking area and the adjacent road. **Howard, I concur.**

Downspouts from the old public works building appear to be connected directly to the storm sewer. We ask the planners to consider the possibility of using other landscaping components, such as bioswales around the old public works building, in a green stormwater infrastructure approach to handle some of the stormwater from this roof and the parking lot by that building. Other components of the landscape where vegetative infiltration beds, basins or trenches could be used include landscape area 5, bioswale area 2, etc. Possible green stormwater infrastructure that may work is similar to the Allen Street, State College rain gardens described in the attached poster. It seems that with not much more effort these other landscaping components could enable much more stormwater to be handled on site during most rain events. **Howard, I believe the current downspouts from FTPW building 1 either infiltrate via a stone sump under the parking lot and/or ultimately discharge into bioswale 5.**

Lastly, we could not determine from the plans if the residential leaf and grass composting are will remain. Please consider keeping it if it has been removed. **Howard and Adam – It will remain.**

Overall, the landscaping component of the Land Development Plan for the New Public Works Facility is going to be a wonderful template for educating the public and developers in the use of green stormwater infrastructure

and plants in the landscape to mitigate the effects of urbanization and reduce the impact on the Spring Creek watershed. Perhaps the inclusion of some educational signage may be useful once the landscaping and stormwater infrastructure is up and running. Howard – I agree. **Between Adam and Lance and Ron, we should be able to determine the appropriate signage.**

Thank you for this opportunity to assist the Township,

Howard and Scott