ADVOCATING AND IMPLEMENTING URBAN FORESTRY AS A METHOD TO REDUCE STORMWATER POLLUTION OF NEARBY WATER BODIES

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ABSTRACT

Cities and urban areas are not only ecologically active, but ecologically productive. This type of "novel ecosystem" can provide important services, particularly when planning and design efforts include the consideration of trees, greenspace, and habitat as an essential part of our built infrastructure. This is frequently termed "green infrastructure" (GI). Stormwater pollution, an urgent environmental problem in many cities, can be effectively and inexpensively mitigated by taking advantage of GI as a provider of ecosystem services. In particular, the GI practice of urban forestry has grown due to the historic and present ubiquity of trees in many cities, and the myriad benefits offered by the urban forest. Atlantic States Legal Foundation (ASLF) is active advocating and implementing urban forestry as a community-level method for stormwater mitigation, among other uses. The work of ASLF in New York, USA has and continues to utilize this practice to reduce pollution in the Great Lakes watershed. This unique advocacy and implementation model being developed is potentially useful in other geographic locales.

Keywords: Urban Forestry, Green Infrastructure, Advocacy, Implementation, NGO

1 INTRODUCTION

The effects of global urbanization on the natural and built environment make urgent the need for "adaptive" innovative responses from communities (Ahern et.al. 2014). In 2014 54% of the planet's population was living in urban areas, and this is expected to grow to 66% by 2050 (United Nations 2014). The city is now humanity's habitat, with bygone forest and savannah having ceded to impermeable surface. Drastic changes to landscapes, biodiversity, and ecosystem services accompany this transformation (Kowarik 2011). In particular there are implications for stormwater management (Ashley et. al. 2011).

Despite the worrisome impacts from an expanding impervious world, opportunity exists in rethinking the city as a viable provider of ecosystem services. Cities can and do contribute in this manner, and can be thought of as *novel ecosystems* (Boland and Hundhammer 1999) (Kowarik 2011). These novel ecosystems require however "pedagogical strategies to align with the realities of a rapidly changing world under increased awareness of uncertainty" (Dooling 2015). This concept can be carried over to planning as well. Urban forests continue to be an integral provider of vital ecosystem services such as stormwater abatement and habitat (Nowak et. al.), and need to be considered when thinking of the city as a novel ecosystem.
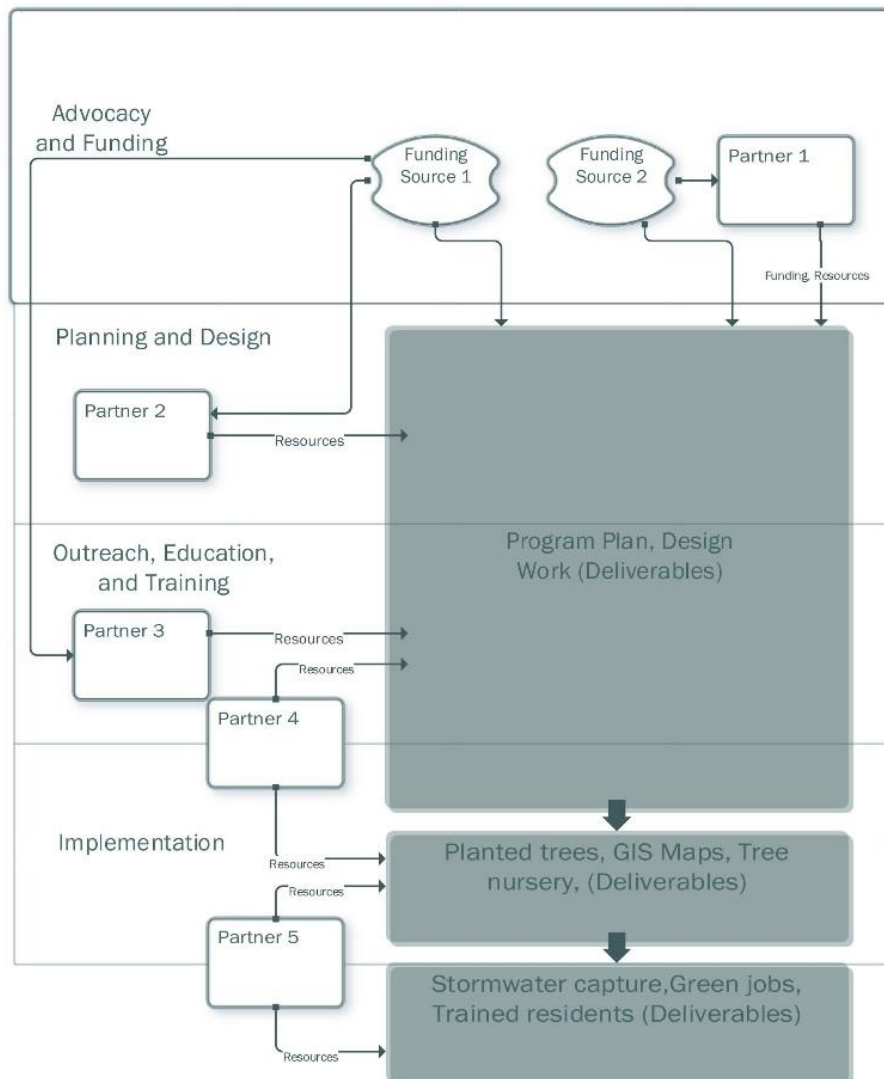
In the West, particularly North America, post-industrial cities are rethinking land use in other ways through *adaptive governance* planning (Green et. al. 2015). This paradigm encourages flexible and resilient planning frameworks as a response to uncertainty and the reality of shared resources (Chaffin 2014). The Atlantic States Legal Foundation (ASLF), an NGO located in Syracuse, NY, USA, has been working to shape the conversation on urban greening based on the principles of adaptive governance through the pioneering of community-level advocacy and implementation strategies. In particular, the "bottom-up" urban forestry program of ASLF is successful in utilizing the adaptive approach through the entire process of funding, partnerships, design, outreach, and implementation.

The urban forestry program indirectly stems from a lineage originating in citizen-enforcement of the US Clean Water Act. ASLF brought litigation against the municipality of Onondaga County, New York in 1988 for violation of this important federal law due to dumping of storm-event related sewage effluent into nearby Onondaga Lake (Idrisi et. al. 2014). This sparked the process of the Onondaga Lake cleanup, which continues today in various forms. ASLF advocated for the Amended Consent Judgment (ACJ) of 1997, an update to the original 1989 court mandate, which stipulated that green infrastructure (GI) should be used as a partial solution to the stormwater effluent discharge issue (Idrisi et al 2014). While ASLF's current urban forestry projects are not part of the ACJ mandate, they do contribute to reducing stormwater runoff in the Onondaga Lake and Great Lakes watersheds, and fit appropriately in the context of the growing GI movement in New York and the US.

2 THE ASLF METHOD: A PROCESS FOR COMMUNITY-LEVEL URBAN FORESTRY

Describing the ASLF urban forestry program as a "process" is appropriate in the context of the adaptive governance and management theory outlined in the first section. Being receptive to changing situations, willing to work with a variety of stakeholders, and able to compromise and leverage time and resources have proven to be keys to progressing with an urban forestry project in the New York context. The concept of organizational "receptivity" has been demonstrated as a useful attribute for urban stormwater management initiatives, and ASLF's position as a community environmental advocate allows for this valuable perspective (Cettner 2014).

Figure 1 conceptually outlines the process of advocating and implementing, from a community-based NGO perspective, an urban forestry project in the New York context. This chart presents various options for the flow of funding and resources. It is not exhaustive, and should serve as a basic starting point for a creatively designed and administered urban forestry project. Nations, cultures, and localities vary, so this method can be adapted and altered easily to fit the context.

Figure 1. A conceptual flow of funding and resources for a community-level urban forestry project. The method and process start at advocacy and continue to implementation

2.1 Advocacy and Funding

The role of community environmental advocate has been useful for promoting urban forestry and other GI practices to government agencies. ASLF has the unique position however as both "advocacy agent"

and "delivery agent", in being both promoter and implementer (Mell 2014). This more versatile state may prove useful for NGOs aiming to push GI practices and policies further.

ASLF has thus far partnered with government agencies to secure funding for urban forestry projects. While the funding has originated from the federal government in all cases (USDA Forest Service), the funding structure has varied. In three cases funding has been secured indirectly through municipal (County) governments who were the recipients of USDA Forest Service grants, and in one case ASLF was a direct recipient of a grant from the same source.

2.2 Partnerships

Project partners come in many shapes, sizes, and identities, and could include government agencies, NGOs, universities, and even for-profit corporations. Being adaptive and receptive means the ability to work and collaborate with an array of diverse potential partners. The role of a partner may also be versatile, in that they can provide a key support resource while also providing direct funding as the official applicant for a government grant.

A key partner, if such an entity exists in a particular locale, is a land banking organization or institution. In Syracuse, New York the Greater Syracuse Land Bank has worked with ASLF on urban forestry projects. Land banks are frequently founded, in the US context, to manage vacant land with the eventual goal of finding new ownership or a repurposed use.

2.3 Planning and Design

Design work is required for a successful program. For this purpose access to the expertise of a landscape architect or planner should be a part of the process. ASLF produces designs in-house and then (in the case of GLRI) has this work approved by the grantor. During this phase many factors should be taken into consideration such as site inventory and analysis, site history, drainage, and stormwater capture calculations. Consulting with a forester may also be helpful depending on the project.

2.4 Outreach and Education

A cornerstone of a successful urban forestry program is public and community buy-in. For this reason it is essential to have community support from the beginning through to the end. Partners are particularly useful during this part of the process, as oftentimes the most effective way to reach specific populations is through pre-existing trusted channels. Public opinions vary on the presence of trees in cities, but it is important to make clear the benefits while conducting outreach.

2.5 Implementation

As a versatile agent ASLF usually sees projects through to implementation in some form. Therefore, it is important to discuss the concept of deliverables. In a world where project success and future funding is increasingly determined by quantifiable impacts, clearly identifying the "end products" of a project in a measurable way will be helpful if not required (although debate certainly exists on this issue in the social innovation world). This section outlines more tangible deliverables that ASLF has produced from its urban forestry program, and which may prove useful end goals for a budding program elsewhere.

2.5.1 Urban Tree Nursery

A useful component of an urban forestry program is an urban tree nursery. This facility should be located preferably in the target city or urban project area. In the US the glut of vacant land in many cities makes the siting of a nursery relatively easy, but in other countries alternative siting may be required with a periurban location being more appropriate. The tree nursery provides symbolic value as much as it does utilitarian. It serves as a locus and staging area for a tree planting program, but also as a visual signifier of the program's presence and permanence. The ASLF tree nursery was constructed on a repurposed vacant lot (Figure 2).

Figure 2. ASLF urban tree nursery in Syracuse, NY, USA

2.5.2 Mapping

As a standard best practice ASLF maps the locations of all trees planted. This information is geolocated with a GPS device, and input into a GIS database. Other pertinent information such as species and street location is also recorded. These maps are then made available to the public via the internet. The company ESRI provides a free mapping service for users of their ArcMap software, and these maps are web-based and can be embedded in any website. Another free alternative is to use the map feature provided by Google. Mapping is also one of the best ways to showcase deliverables (planted trees) in a quantitative way.

2.5.3 Maintenance, Training, Labor, and Land Trusts

ASLF has come to the conclusion that, at least in the New York and US context, urban green spaces that provide ecosystem services should in many cases be maintained as such in perpetuity. With various stakeholders and multiple landowners this can often be a very difficult feat. A *land trust* may be the solution in many cases. Depending on local, regional, and national legal contexts, a land trust can tie up many loose ends when it comes to the future ownership and maintenance of GI and urban forest.
A land trust can take on ownership, and all the related responsibilities. These include: insurance and liability, maintenance for continued GI function, contracting with outside parties, community outreach and partnership-building, green jobs training, fundraising, and the development of programs associated with the land.

3. THE GREAT LAKES RESTORATION INITIATIVE AND URBAN FORESTRY IN NEW YORK, USA

The Great Lakes Restoration Initiative (GLRI), launched in 2010, is an interagency coordination that involves 11 federal agencies, led by the US EPA, "to accelerate efforts to protect and restore the largest system of fresh surface water in the world — the Great Lakes" (GLRI, https://www.glri.us/index.html).

As one of the initiative's task force members, the USDA Forest Service uses GLRI resources to strategically target the biggest threats to the Great Lakes ecosystem and accelerate progress toward long-term restoration goals for this important ecosystem. The USDA Forest Service's GLRI program, in addition to addressing the Emerald Ash Borer crisis in the Great Lakes region, is tailored to promote use of trees for

their benefits, as green infrastructure, in reducing stormwater runoff, filtering toxic materials and pollution, improving water quality, as well as restoring the ecosystem health and performance.

ASLF's agenda of advocating urban forestry for stormwater management and its role in assisting Onondaga County in implementing GI to mitigate combined sewer overflows fits naturally within the scope and mission of the GLRI. Working with other non-profit partners, ASLF and Onondaga County submitted two applications and were awarded two grants through the GLRI program in 2010. One of the grants focused on investigation of the parcels in the city that can be potentially used for stormwater related urban forestry projects, while the other funded the planting of over 500 trees on publicly owned (by City of Syracuse or Greater Syracuse Land Bank) degraded urban lots to help reduce contaminated stormwater runoff from entering streams and lakes. The former laid the foundation for the success of the subsequent GLRI application funded in 2013, which, taking advantage of the result of the previous investigation and working with partners in the private sector, planted over 200 trees on privately owned properties with a primary purpose of managing stormwater runoff. All plantings for the grants mentioned above were done by either volunteers or non-profit partners, and the training and education were an integral part of the implementation process.

The USDA Forest Service estimates that each mature mid-sized tree can prevent about 4,300 liters of stormwater runoff each year, which translates ASLF's planting of 700 trees in the City of Syracuse into approximately 3,010,000 liters of runoff reduction annually. ASLF's GLRI-funded urban forestry partnership with Oswego County and the City of Oswego will add 400 more trees to the Great Lakes watershed by 2016. Within 15 years, the trees planted by these GLRI funded partnerships will reduce more than 4,730,000 liters of stormwater runoff from entering the Great Lakes.

We attribute the success of the above GLRI projects to: 1) being able to find common ground between partner interests and urban forestry advocacy; 2) flexibility and creativity in terms of collaboration and partnership; 3) an integrated implementation approach that delivers educational, training and public outreach opportunities 4) keeping costs down.

CONCLUSION

Urban forestry pulls together many aspects of city reality. This includes stormwater management, heat island mitigation, climate change, habitat creation, public safety, and economic development. In the US context, and possibly elsewhere, NGOs are well positioned to take the lead in bringing these benefits to cities. This is because NGOs can: advocate for the environment, provide training, take on ownership and maintenance of land, and take into consideration an array of additional benefits such as habitat, recreation, and urban agriculture, with less bureaucratic, political, and jurisdictional constraints. With this process an NGO can rapidly acquire funds and get to work.

Trees and tree cover provide many benefits to urban areas. As populations grow it becomes more urgent to find solutions to urban problems, and building a healthy local forest can and should be part of that solution. Environmental NGOs should consider urban greening and forestry while figuring out how best to make our expanding impervious communities more resilient.

REFERENCES

Ahern, J., Cilliers, S., and Niemelä, J. (2014). The concept of ecosystem services in adaptive urban planning and design: A framework for supporting innovation, *Landscape and Urban Planning*, 125, 254-259

Ashley, R. M., Nowell, R., Gersonius, B., and L. Walker. (2011). *Surface Water Management and Urban Green Infrastructure: A review of potential benefits and UK and international practices,* Edit. T. D. Evans, Foundation for Water Research, 74p.

Boland, P. and Hunhammer, S. (1999). Ecosystems services in urban areas, *Ecological Economics*, 29, 293-301

Cettner, A., Ashley, R., Hedstrom, A., and Viklander, M. (2014). Assessing receptivity for change in urban stormwater management and contexts for action, *Journal of Environmental Management,* 146, 29-41

Chaffin, B. C., Gosnell, H., and Cosens, B. (2014). A decade of adaptive governance scholarship: synthesis and future directions, *Ecology and Society,* 19(3): 56

Dooling, S. E. (2015). Novel Landscapes: Challenges and Opportunities for Educating Future Ecological Designers and Restoration Practitioners, *Ecological Restoration,* 33, 96-110

Great Lakes Restoration Initiative, https://www.glri.us/index.html

Green, O. O., Garmestani, A. S., Albro, S., Ban, N. C., Berland, A., Berkman, C. E., Gardiner, M. M., Gunderson, L., Hopton, M. E., Schoon, M. L., and Shuster, W. D. (2015). Adaptive governance to promote ecosystem services in urban green spaces, *Urban Ecosystems,* 19, 77-93

Idrisi, N., Sage, S. H., and Gao, H. (2014), Managing the Onondaga Lake Watershed in New York, USA, through Science-based Policy: A Case Study, pp. 517-24. In: Gastescu, P., Marszelewski, W., Bretcan, P. (Eds.) *Conference Proceedings Water resources and wetlands, 11-13 September 2014, Tulcea Romania*, 583p.

Kowarik, Ingo. (2011). Novel urban ecosystems, biodiversity, and conservation, *Environmental Pollution,* 159, 1974-1983

Mell, Ian C. (2014). Aligning fragmented planning structures through a green infrastructure approach to development in the UK and USA, *Urban Forestry & Urban Greening,* 13(4), 612-620

Nowak, D. J., Stein, S. M., Randler, P. B., Greenfield, E. J., Comas, S. J., Carr, M. A., and Alig, R. J. 2010. Sustaining America's Urban Trees and Forests. USDA Forest Service General Technical Report NRS-62. Washington, D.C.

United Nations, (2014). *World Urbanization Prospects*. Retrieved from the United Nations Population Division website: https://esa.un.org/unpd/wup/. Accessed June 1, 2016.