



Virginia Master Naturalist Program Basic Training: Urban and Developed Systems Ecology Management Presentation Handout

Authored by Michelle Prysby, Senior Extension Specialist and Virginia Master Naturalist Program Director, Department of Forest Resources and Environmental Conservation, Virginia Tech

What is urbanization?

Urbanization, in the broad sense, is the conversion of rural and undeveloped lands into built, developed environments. Urbanization occurs all over Virginia, not just in the most populated areas (Figure 1).

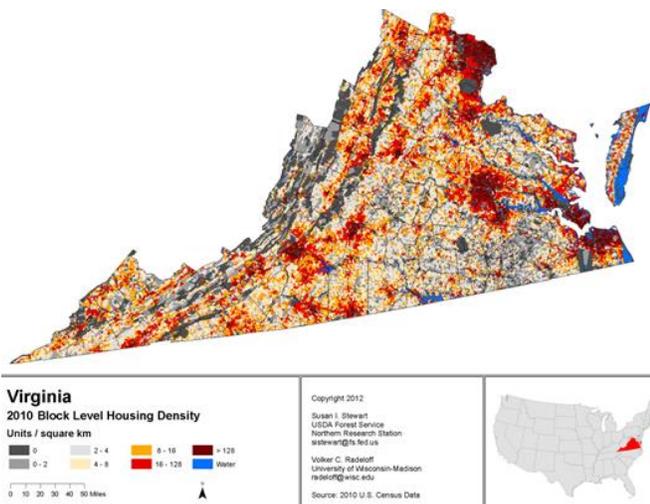


Figure 1. 2010 block level housing density in Virginia. Source: Susan I. Stewart (USDA Forest Service) and Volker C. Radeloff (University of Wisconsin – Madison). http://silvis.forest.wisc.edu/maps/blk_pla/2010/download. Used with permission.

Ecological characteristics of urban and developed areas

Soils

- Development typically begins with removing the vegetation, scraping off the topsoil, grading and

compacting the subsoil, and either putting the topsoil back or replacing it with imported soil, soil blends, or another fill such as gravel.

- Typical results of this process include missing or altered soil horizons (layers), decreased topsoil, addition of gravel and debris, and significant soil compaction, affecting its ability to hold water, oxygen, and nutrients.

Microclimate and air quality

- Large increases in impermeable surfaces result in urban heat islands, areas with hotter temperatures than the surrounding undeveloped landscape.
- Urbanized areas typically also have higher levels of air pollutants.

Hydrology and water quality

- Development results in increases of *impermeable surfaces* across the landscape. (Figure 2).

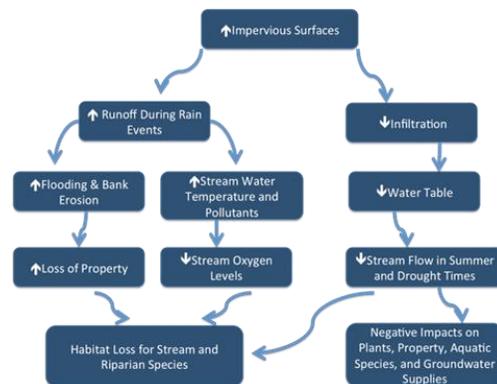


Figure 2. The cascade of consequences resulting from increases in impervious surfaces.

Flora

- Vegetation in developed areas is simplified in structure and diversity, with a lot of turf grass and non-native plants.
- Many commonly used landscaping plants are actually *invasive species* that can escape into natural areas, outcompete native species, and cause both environmental and economic harm.
- Non-native plants do not support as large a diversity of wildlife as do native plants. (Figure 3).

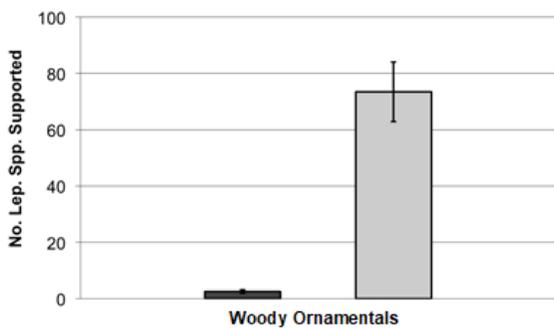


Figure 3. Doug Tallamy, author of “Bringing Nature Home” studied the number of butterfly and moth caterpillars that eat native woody ornamental plant species versus non-natives. Tallamy found that native woody ornamental species supported far greater numbers of lepidopterans. On average, the 101 native species he studied (right column) supported more than 70 lepidopteran species, while the non-native plants (left column) supported fewer than 10 on average. Source: Doug Tallamy. Used with permission.

Fauna

- *Parcelization* is frequently a precursor to development. When different parcels of land are managed differently, that results in *habitat fragmentation*.
- Development can have positive effects on habitat generalists, species that are adaptable to a wide variety of habitats and food sources, and species that thrive in edge habitat (e.g., white-tailed deer, raccoons.)
- Development has negative effects on habitat specialists, species that depend on a narrow range of habitat parameters (e.g., cavity nesting birds.)



Figure 4. Development often includes parcelization of land. When these different owners each develop their properties, or even just choose to manage the land in different ways, it can result in habitat fragmentation. The fragmented land has less forest overall, but it also has a much higher ratio of edge habitat to interior forest habitat. Source: University of Connecticut Center for Land Use Education and Research (CLEAR). Used with permission.

Improving ecosystem function in developed areas

- There are many activities that are within the sphere of influence of an individual property owner that can help mitigate the impacts of development and improve ecosystem function.
 - Redirecting downspouts
 - Installing rain barrels and rain gardens
 - Installing *riparian buffers* along waterways
 - Using trees and plants to shade house and other hard surfaces
 - Using *conservation landscaping* to create aesthetically-pleasing landscapes that provide ecosystem functions, including *habitat* for wildlife
- Urban forests provide many ecosystem services: improving air quality, reduced stormwater runoff and water pollution, natural cooling, storage of carbon to mitigate climate change, habitat for wildlife, increased property values, and aesthetics.
- Individual citizens can participate in decision-making that impacts natural resources in their communities. They can share their thoughts with planning commissions and zoning boards and offer input into the Comprehensive Plan. Every county and independent city in Virginia is required to have a Comprehensive Plan, usually developed with community input and guided by the planning commission for the locality. The

planning process enables a community to develop a vision for its future and define strategies for how to achieve its aspirations, including goals related to natural resources.

Related volunteer projects for Virginia Master Naturalists

- Urban tree canopy assessments
- Organizing tree and riparian buffer planting events
- Removing invasives and planting natives on public lands
- Virginia Big Tree program, <http://bigtree.cnre.vt.edu>
- Installing rain gardens and wildlife habitat on public lands
- Assisting with rain barrel building workshops
- Educating the public in any venue about actions they can take to improve ecosystem function in developed areas.
- Good agency resources for many of these activities include:
 - VDWR Habitat Education - <https://dwr.virginia.gov/wildlife/habitat/>
 - Virginia Wildlife Conflict Helpline – 1-855-571-9003
 - VDOF Urban and Community Forestry - <https://dof.virginia.gov/urban-community-forestry/>
 - VCE local offices - <http://www.ext.vt.edu/offices/index.html>
 - VDEQ stormwater management program (<https://www.deq.virginia.gov/our-programs/water/stormwater>) and water quality information (<https://www.deq.virginia.gov/our-programs/water/water-quality>)
 - Soil and Water Conservation Districts - <http://vaswcd.org/>
 - Virginia Tech Urban Forestry - <https://uf.frec.vt.edu>

Glossary of key terms

- **Conservation landscaping** – The use of native plants to create aesthetically-pleasing, low maintenance landscapes that provide ecosystem functions, including habitat for wildlife.
- **Green infrastructure** – Patchwork of natural areas providing habitat and other ecosystem services within a developed area

- **Habitat** – The combination of food, water, shelter, and adequately arranged space for a given species.
- **Habitat fragmentation** – The division of larger tracts of continuous forest or other habitat into smaller, isolated tracts surrounded by human modified environments.
- **Impervious surface** – Any surface such as pavement, structures, or highly impacted soil that impedes or prevents water infiltration.
- **Invasive species** – Non-native plants, animals, and pathogens that can harm ecosystems and human health
- **Parcelization** – The division of larger tracts of land into smaller parcels
- **Riparian buffers** – Planted or naturally occurring vegetated areas along waterways that help to slow down, spread out, and filter runoff.
- **Sedimentation** – Pollution of waterways due to the introduction of loose soil particles, mainly from erosion.
- **Stormwater runoff** – Water that is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground.
- **Urban forestry** – Management of forests in urban settings for the purposes of improving ecosystem functioning in the urban environment.
- **Urbanization** – The conversion of rural and undeveloped lands into built, developed environments.
- **Wildland-Urban Interface** – The area where structures and other human development meet or intermingle with undeveloped wildland

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**Virginia Master
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