

Conservation Subdivision: Post-construction Phase—Engaging Residents¹

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Introduction



Figure 1. A white ibis on the University of Florida campus in Gainesville.

Credit: Daniel Feinberg

As urban communities grow, design and management strategies for new developments become critical factors that determine impacts on natural resources. How can we accommodate growth yet conserve natural resources, such as biodiversity, water, and energy? In this document, we focus on conserving biodiversity when land is subdivided, constructed, and occupied.

The term biological diversity or *biodiversity* refers to the variety of life and its processes. Biodiversity includes

species diversity, habitat diversity, and genetic diversity. For the purposes of this article, we focus on biodiversity conservation of *native* species. Native species are plants and animals that were present within a specific region before Europeans made first contact. Non-native (or exotic) plants or animals are defined as those species that were not present in the region before European contact. Florida crossed this time threshold approximately 500 years ago.

Clustered/Conservation Development

Recently, a popular concept called *clustered development* or *conservation subdivision* has gained traction in many planning and design fields. Conservation subdivision is intended to accommodate growth while simultaneously managing for biodiversity conservation. Conservation subdivisions typically cluster homes on small lots and conserve the remaining land areas as open space.

The goals for conservation subdivisions are twofold: 1) to improve biodiversity within a designated subdivision; and 2) to minimize development-related impacts on surrounding habitats. Often, though, most of the effort is on the design of the entire site. To conserve and improve biodiversity within urban environments effectively, one must consider all three major phases of development: design, construction, and post-construction. Overall, these three phases must be addressed in order to create and maintain biodiversity within residential subdivisions. The "Conservation Subdivision" series of EDIS documents discusses biodiversity conservation pertaining to all three phases of development.

The design phase typically involves, among other aspects, lot size and open space designation and road distribution throughout the site. Goals for the development project are discussed and prioritized. In this phase, homes and lots are placed across the site and the remaining area designated as natural open space. Basically, everything is laid out on paper and vertical structures (buildings) and horizontal structures (roads, lots, conserved areas, and shared spaces) are given specific spaces within the development,

while remaining areas are designated as natural open space and other non-urbanized land uses.

Next, during the construction phase, built environment professionals including architects, contractors, and subcontractors take whatever is on paper and implement it on the ground, constructing homes, streets, waste treatment systems, and landscaped areas such as lots and parks. In the absence of fully trained or engaged contractors or landscapers, many things can happen during this phase that could destroy or decrease the viability of onsite and nearby natural habitat. For example, even if the most important large trees are planned to be preserved across the subdivision with built areas designed around them, the placement of topsoil and routes used by heavy construction vehicles could impair the survival of these trees. If heavy construction vehicles continually run over the root zones of trees or if topsoil is placed against their trunks, the roots may not be able to acquire nutrients, water, and oxygen and the trees may ultimately die.

In the final phase, post-construction, buyers purchase the homes and move into the community. It is now the responsibility of residents individually and collectively to manage their homes, yards, neighborhoods, and common areas in ways that do not compromise the original intent of the community. Additional problems can arise if residents are not fully engaged—imagine residents moving in and planting invasive exotic plants in each of their yards. Residents could also improperly apply fertilizers and pesticides. The spread of invasive plants and polluted stormwater runoff could then severely reduce, or destroy, the diversity of animals and plants found in the conserved areas.

Again, all three phases, design, construction, and post-construction, must be addressed in order to create and maintain biodiversity within residential subdivisions. This fact sheet focuses on the post-construction phase. Once a neighborhood has been designed and built with ecological goals in mind, how can it be maintained in a way that is consistent with these goals?

Simply designating open space is not enough to provide long-term protection for a variety of wildlife (McElfish 2004; Hostetler & Drake 2009; Hostetler 2010). Rather, landscapers and ecologists agree that in order for a conservation subdivision to maintain long-term biodiversity, it needs to have a management plan that assigns stewardship responsibilities to stakeholders (Arendt 1996; Pejchar et al. 2007). Many problems can arise in the absence of proper stewardship. For instance, Pimentel et al. (2001) noted that invasive exotic plants can spread from yards to nearby open spaces without ongoing management.

Studies suggest that some existing conservation subdivisions fail to provide better wildlife habitat than

more common, low-density subdivisions (Milder et al. 2008; Lentz et al. 2006). This shortcoming might be due to impacts stemming from built areas and a lack of management within any conserved, natural open space. Along these lines, Wald and Hostetler (2010) found that most Land Development Regulations addressing open space in the state of Florida did not sufficiently address management within the open space or methods to engage nearby residents.

Residents of conservation subdivisions can harm native plant and animal communities within and adjacent to their neighborhoods. In the remaining sections, we discuss actions and strategies that homeowners, developers, and city/county planners can implement to promote the long-term conservation of biodiversity in subdivision development.

Conservation Strategies for Homeowners

First, homeowners must recognize that their ways of managing their yards and neighborhoods are critical factors to restoring and conserving biodiversity within the built areas. Many opportunities for environmental stewardship exist in the homeowner's yard and right around the house. The yard, for example, can be landscaped and maintained with mostly native species of plants, providing habitat for a variety of animals (for Florida residents, see [Landscaping for Wildlife](#)). Native plants provide food and habitat for a variety of butterflies found in a region. These plants can serve as larval food plants or as nectar plants for adult butterflies (e.g., [Butterfly Gardening in Florida](#)). For a given yard, 75% of the landscaped area can be reserved for native plants. Furthermore, if homeowners landscape with several different vertical layers (trees, shrubs, etc.) and keep snags (standing dead trees), these structures will allow a diversity of animals, including birds, to visit yards for food and shelter (see [Top Ten Tips for Success](#)).

Homeowners must also be conscious of how yard maintenance and choices of plants can negatively impact nearby natural areas in conservation subdivisions. Homeowners should become familiar with invasive exotic plants and remove these plants from their yards ([See IFAS Assessment of Non-native Plants](#)). If homeowners choose to landscape their lawns using turf-grass, they can minimize the negative impacts on nearby natural areas by eliminating or reducing fertilizer use. This helps to reduce the amount of nitrate and phosphorus pollution that enters nearby waterways through runoff and groundwater. Nitrate and phosphorus pollution is dangerous because it can cause algal blooms that [kill fish](#) and other animals.

Homeowners can also improve water quality by using low-impact development (LID) features, such as swales and rain gardens, if applicable. Such bioretention features help

retain water where it falls and allow longer soil-to-water contact time. This longer contact time helps remove pollutants from stormwater before it enters nearby water bodies (see also [Conservation Subdivision: Construction Phase—Low Impact Development \(LID\) and Stormwater Treatment](#)). The practicality of these features depends on the geographic region, the soil conditions, and the amount of rainfall. While they are especially pertinent to climates with frequent rainfall, such as the state of Florida, the soil infiltration rate and water storage capacity will affect their suitability and performance.

Other homeowner actions can contribute to biodiversity conservation. For instance, homeowners can protect wildlife populations by not building fences that impede movement; many species require landscape connectivity to move from one habitat patch to another. Additionally, homeowners can keep cats indoors and dogs on leashes to prevent these pets from killing or harassing wildlife.

Homeowners can also minimize light and noise pollution. Excessive light pollution, for instance, can lure hatchling sea turtles away from the sea. Even inland wildlife corridors are affected by lights because certain wildlife species tend to avoid corridors exposed to excessive light (Rich and Loncore 2005). Light pollution can be reduced, for instance, by installing [dark-sky lighting](#) fixtures that direct light downward and minimize the amount of light that shines outward and upward.

In addition to adopting ecologically sound practices in their yards and neighborhood common spaces, homeowners can adopt similar practices in conserved natural areas. These practices can include removing invasive exotics and restoring natives, as well as staying on designated trails to avoid disturbing off-trail plants and animals. In particular, all-terrain vehicles (ATVs) should be strictly prohibited in areas of critical wildlife habitat. If pets enter the natural areas, homeowners should keep them on leashes and clean up after them.

Conservation Strategies for Developers

Homeowners need to be informed about the intent of a conservation subdivision. As a developer, it is important to establish an onsite educational program for the community. Houses are sold all the time, experienced owners leave, and new owners arrive who are unfamiliar with the community "green culture." All residents must be on board in terms of understanding the goals of the community and actions that help conserve natural resources. One way to get the word out is for the developer to set up an educational program that consists of a brochure, a website, and kiosks. These three complementary elements help inform residents in the following ways:

- **Educational kiosks:** Place highly visible interpretive kiosks/signs on a trail system and in other public areas where people traffic is high. Include informative displays that discuss relevant topics, such as water, energy, or wildlife. Keep kiosks dynamic, and keep interest by inserting different informative panels at strategic seasonal points throughout the year. These kiosks are not only informative, but they provide a place for neighbors to interact and can serve as a catalyst for people to obtain more information in the other complementary formats (see Figure 2).



Figure 2. An example of an educational sign in the Madera green community in Gainesville, FL.
Credit: Daniel Feinberg

- **Website:** Because the kiosks/signs can give only limited information, create an associated website to give more detailed environmental information and management strategies pertinent to a community.
- **Brochure:** Provide each new homeowner with a brochure highlighting local natural resource features and issues. Use the welcome brochure to invite new homeowners to view the kiosks in their neighborhood and to visit the website. As an alternative to the brochure, developers could provide each homeowner with a refrigerator magnet that would cover the same information.

For master planned communities, developers can set up a homeowners' association (HOA) to address biodiversity conservation across the development. Foremost, it can collect dues from homeowners to fund management of the

open space and also maintain the educational signage. The funds should be used to hire an environmental professional, such as a county Extension agent from a university, to annually inspect the natural and built areas. Upkeep of the kiosks will cost money, as will any management actions that have to occur in the natural areas (e.g., removal of invasive exotics).

The Town of Harmony in Florida has implemented an [onsite educational program](#), which is currently managed by an environmental professional. Research suggests that this educational program did improve residents' environmental knowledge and attitudes as they indicated that they were more capable of implementing conservation practices when compared to residents from a nearby community that did not have an educational program (Hostetler et al. 2008).

Another means of informing residents about ways to manage their homes, yards, and neighborhoods for biodiversity is through Community Covenants and Restrictions (CC&Rs). CC&Rs are associated with the deed of the house, and regulations with a CC&R are enforced by the HOA. A developer can draft a CC&R that addresses environmental management of built areas and appropriate behaviors when people enter conserved natural areas. Some of the topics that the covenants address can include the examples in Table 1.

Every site is different, and the CC&Rs need to be tailored to a location and address natural resource issues specific to that site. The Town of Harmony has included [environmental language in their CC&Rs](#), and this document provides a backdrop on the intent of the community and appropriate actions regarding biodiversity conservation.

In some exceptionally forward-thinking cases, developers contract with environmental professionals to create ongoing programs that make it easier for homeowners to maintain native landscaping. For example, the High Plains neighborhood in Loveland, Colorado, has a [native plant nursery](#) that sells plants to its residents. In addition to making the native species accessible to homeowners, this program generates revenue that supports additional environmental programs. In the High Plains neighborhood, funds are used to conduct restoration projects where residents help plant hundreds of native plants in semi-natural areas within the development.

Any protected areas in a conservation development will need a management plan in order to conserve biodiversity. In most instances, invasive exotic plants and animals will be a problem due to the influence of nearby built lots. In some cases, restoration is necessary and native plants need to be planted and nurtured over subsequent years. A developer should collaborate with environmental professionals to create a management plan and link this plan to a permanent funding mechanism that pays for

materials and an environmental professional to annually take care of the natural areas. As mentioned above, one funding source could be HOA dues, but other sources include a property tax assessment and the designation of a portion of lot sales and re-sales that would go towards management.

Conservation Strategies for City/County Planners

City and county planners can provide the enabling conditions, in terms of policies that encourage developers to adopt practices promoting the long-term stewardship of a conservation subdivision. Florida and several other states have open space policies that require a certain percentage of land to be conserved. However, post-construction conservation strategies mentioned within this fact sheet are not currently addressed in most city and county policies.

Incentive-based policies could offer density bonuses or fast-tracking status to developers that agree to practices that address long-term stewardship. In the case of density bonuses, a portion of the bonus lot sales would go towards hiring an environmental professional to initially set up the educational program, create environmental CC&Rs, and develop a management plan for the conserved areas. In addition, a critical part is to require developers to set up a funding mechanism either through HOA dues or property tax assessments or some other mechanism. A density bonus would be awarded only if developers establish a funding mechanism to manage the subdivision for biodiversity conservation. The developer would provide documentation of where the funds would come from and identify an environmental professional hired for the specific purpose of inspecting and maintaining the built and natural areas.

Moving Forward

Stakeholders can learn about the strengths and weaknesses of management plans by examining model neighborhoods that already exist. For example, the Town of Harmony underwent a program evaluation (based on its first two years of environmental education) that revealed that educational signage had served as a top source of environmental information for homeowners. With this in mind, other communities could make signage a priority, making sure that some entity (e.g., the homeowners' association) keeps the signs up to date. One way to do this is to use a type of sign that is easy to replace (e.g., printing the content on a removable sheet that is placed behind a durable cover, rather than printing directly on a permanent surface).

Successful conservation in subdivisions will require all residents within a community to understand and adopt environmental practices that reduce impacts to plant and

animal communities in nearby open space and other natural areas. Further, a management plan must be in place and fully funded to implement practices that benefit native plant and animal communities. Planners can create incentive-based policies to encourage developers to create a funded, long-term management plan. Ultimately, homeowners must take responsibility for gaining knowledge from the educational tools and then adopting and maintaining the appropriate behaviors in both the built and conserved spaces.

Additional Resources

For additional information on conservation subdivisions and conserving urban biodiversity, a variety of online guides, books and other publications exist.

Books and Scientific Publications

- Arendt, R. 1996. *Conservation design for subdivisions: A practical guide to creating open space networks*. Washington, DC: Island Press.
- Hostetler, M., and D. Drake. 2009. "Conservation subdivisions: A wildlife perspective." *Landscape and Urban Planning* 90: 95–101.
- Hostetler, M.E. 2010. "Beyond design: the importance of construction and post-construction phases in green developments." *Sustainability* 2:1128–1137.
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- Hostetler, M., E. Swiman, A. Prizzia, and K. Noiseux. 2008. Reaching residents of green communities: Evaluation of a unique environmental education program. *Applied Environmental Education & Communication* 7(3):114–124.
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- McElfish, J. M. 2004. *Nature-Friendly Ordinances: Local Measures to Conserve Biodiversity*. Washington, DC: Environmental Law Institute.
- Milder, J. C., J. P. Lassoie, and B. L. Bedford. 2008. "Conserving biodiversity and ecosystem function through limited development: An empirical evaluation." *Conservation Biology* 22(1): 70–79.

Pejchar, L., P. M. Morgan, M. R. Caldwell, C. Palmer, and G. C. Daily. 2007. "Evaluating the potential for conservation development: Biophysical, economic, and institutional perspectives." *Conservation Biology* 21(1): 69–78.

Rich, C. and T. Longcore (editors). 2005. *Ecological Consequences of Artificial Night Lighting*. Island Press, Washington D.C.

Wald, D. M., and M. E. Hostetler. 2010. "Conservation value of residential open space: Designation and management language of Florida's land development regulations." *Sustainability* 2(6): 1536–1552.

Online

Conservation Subdivision: Construction Phase—Dark Sky Lighting <https://edis.ifas.ufl.edu/uw328>

Conservation Subdivision: Construction Phase—Low Impact Development (LID) and Stormwater Treatment <https://edis.ifas.ufl.edu/uw364>

Conservation Subdivision: Construction Phase—Native Landscaping Palette <https://edis.ifas.ufl.edu/uw329>

Conservation Subdivision: Design Phase—Wildlife-friendly Transportation Network <https://edis.ifas.ufl.edu/uw325>

Conservation Subdivision: Post-construction Phase—Urban Trees Can Reduce Household Carbon Footprint <https://edis.ifas.ufl.edu/uw366>

Covenants, Codes, and Restrictions that Address Environmental Issues in Residential Communities <https://edis.ifas.ufl.edu/uw248>

EPA Low-Impact Development (LID) <http://water.epa.gov/polwaste/green/index.cfm>

Florida Friendly Landscaping™ Program. <https://ffl.ifas.ufl.edu/>

Table 1.

Wildlife & Habitat Topic	Typical CC&R Directive
Wildlife to human conflicts (e.g., raccoons, armadillos, etc.)	Prohibit feeding from humans
Waste disposal	Only in appropriate designated containers
Landscape management	Reduce fertilizer and pesticide application; use efficient irrigation
Natural area access and use	Stay on trails; keep pets on leashes; prohibit use of motorized vehicles

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