
Executive Summary



A trail in the UWGB Cofrin Arboretum
(<http://www.uwgb.edu/biodiversity>).



Aerial photography of urban sprawl
(Alex MacLean, Congress for the New
Urbanism website: www.cnu.org).



A residential rain garden (Wisconsin DNR
website: <http://dnr.wi.gov/org/water/wm/nps/rg/links.htm>).

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Project Introduction

Students in the Environmental Science and Policy Graduate Program's Capstone course at the University of Wisconsin – Green Bay (UWGB) were approached by Dan Madigan to serve as an advisory committee for sustainable development practices. Mr. Madigan owns substantial acreage within the Town of Scott – City of Green Bay Joint Planning Area (JPA), a planning district located along the border of the two communities.

Because of time and data limitations, the students decided to prepare guidelines that could be used to develop the JPA in an ecologically sustainable manner, rather than to create a map that delineates exact locations for particular features. This report summarizes the students' recommendations which can be applied to the project site within the limits of land use decisions that have already been made for the area. Although these recommendations have been made specifically considering the climate, soils, transportation corridors, and environmentally sensitive areas of the JPA, it is the students' hope that these guidelines will be applied to other developments beyond the borders of this project.

This document contains four chapters that address diverse issues facing rapidly developing communities. Chapter 1

provides an introduction to environmental planning and Smart Growth. Chapter 2 details recommendations on all aspects of development design and layout to protect environmental systems. Chapter 3 describes sustainable building methods and provides recommendations to incorporate these practices into new development. Chapter 4 discusses connections that can be made between the development and UWGB.

The following sections summarize the recommendations outlined in this report. Adhering to these guidelines will create a unique, liveable community that will protect environmental resources and promote economic growth.

Environmental Design

Environmental design includes a number of diverse topics with the overall goal of creating landscapes for human use while protecting or enhancing the ecological functions of natural systems. This section discusses the benefits gained through the conservation of natural areas, including upland habitats, riparian corridors, and wetlands. Next, recommendations for development and infrastructure layout are provided based on the environmental impact of different development types, commercial and industrial land uses, and

transportation networks. Consideration is then given to the high use landscapes that interface between urbanization and natural areas, including urban yards, stormwater and groundwater management zones, and community gardens. Finally, a discussion on the economic benefits of sustainable development practices is provided. Specific recommendations from each section are summarized below.

Conservation of Natural Areas

Upland Habitat Recommendations:

- Connect ecologically sensitive areas with corridors across upland areas.
- Use a wide variety of native plant species for all restorations and creations.
- Plan for a diverse age and size structure within planted communities.
- Incorporate upland filter strips into riparian and wetland buffers.
- Delay mowing, burning and other large scale disturbances of grasslands until after reproduction period of grassland wildlife species.
- Control and prevent the spread of noxious weeds and other invasive species.
- Use spot treatments for necessary chemical control of invasive species to avoid harming insects and wildlife, and plants that benefit native pollinators.
- Maintain woodland brush piles or

create brush piles to provide small mammal cover.

- Arrange roads to minimize fragmentation of existing woodlands and grasslands.

Riparian Corridor Recommendations:

- Thoroughly investigate the development area to identify any streams present, including ephemeral and intermittent channels.
- Create riparian buffer strips at least 30 meters (100 feet) wide on each side of the stream.
- Incorporate the three-zone buffer design or other multiuse models.
- Clearly identify and mark buffer areas that are to be protected.
- Restore any areas that have been degraded.
- Use native vegetation for restorations.
- Minimize road crossings of buffers.
- Incorporate 3-sided culverts at riparian crossings.

Wetland Habitat Recommendations

Incorporate Upland Management into Wetland Protection:

- Create buffers of at least 30 meters (100 feet) around all wetlands to provide for natural water purification while providing enough habitat for species that require both upland and wetland habitats.
- Use a multiple use model (MUM) for

buffer design.

Maintain and Restore Connectivity:

- Create corridors where wetlands have become isolated.
- Make corridors large enough to provide food and cover for wildlife.

Restore and Monitor Degraded Habitats:

- Develop a central goal for restoration and conservation projects.
- Provide wildlife habitat through the re-establishment of native vegetation.
- Monitor to ensure that the central restoration goal is achieved under guidance from local scientists.
- Provide the public with opportunities to use the habitat system.

Development and Infrastructure Layout

Development Layout Recommendations:

- Use a mixture of new urbanist, low-impact, and cluster development principles in site design.
- Promote flexibility of standards to meet unique site conditions.
- Prioritize design for a continuous open space network that protects environmentally sensitive areas and minimizes street crossings.
- Encourage designs that provide pedestrian-oriented neighborhoods.
- Provide a variety of housing options

centered on a mixed-use, “village center” area.

- Allow developer density bonuses of up to 10% of the total dwelling units allowed under zoning for increased protection of open space and innovative stormwater management techniques.

Lot Design:

- Single Family Residential:
 - Encourage gross densities of approximately 7 dwelling units per acre through cluster development and new urbanism.
 - Reduce front yard setbacks to a maximum of 20 feet from the right-of-way.
 - Reduce lot frontage lengths by encouraging side yard setbacks to be in the range of 5 to 8 feet.
 - Decrease housing footprint size by promoting 2-story homes instead of ranch-style designs and by providing living space over garages.
 - Consider the use of shared driveways to reduce impervious cover.
 - Provide alternate single family housing options that increase density, including owner-occupied townhouses and condominiums.
 - Ensure that all lots have easy access to permanently protected

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- open space.
- Multifamily Residential:
 - Provide higher density near transit and commercial opportunities.
 - Encourage transit and bicycle connections between the multifamily housing and UWGB to attract students.
 - Consider the use of structured parking underneath multifamily units to reduce exterior parking space requirements. Typically, 1 to 1.5 parking stalls per unit can be provided under the structure depending on building design.
- Commercial / Industrial Development:
 - Encourage the use of shared parking facilities that minimize lot area by considering peak use times at different times of day or days of the week. Locate businesses with different parking demands near each other to facilitate sharing.
 - Do not allow construction of more parking spaces than the number necessary to meet ratios required by zoning.
 - Allow provision of compact car spaces and the use of porous pavements in overflow parking areas.
 - Minimize building footprint size through multi-level structures.
 - Encourage Eco-Industrial Parks.

Design of the Open Space Network:

- Require that 30-40% of the total development be set aside as permanent open space.
- Minimize disturbance from construction activities in open space areas to maintain pre-development soil conditions.
- Guarantee that at least 70% of the total open space forms a continuous network, and is not comprised wholly of leftover, unbuildable portions of the site.
- Protect all hydrologically sensitive areas, including groundwater recharge areas and soils with high permeability.
- Ensure continued maintenance and public access of open areas through the establishment of responsible homeowner associations or land trusts.

Transportation Recommendations:

Street Design:

- Reduce residential street widths to a range of 24- to 30-feet, based on traffic volumes and realistic on-street parking goals.
- Examine alternative street layouts to select the option that serves the maximum number of homes with the shortest total street length.
- Plan an interconnected street network that disperses traffic yet minimizes the number of crossings of the open space network and trail system.

- Minimize the number of cul-de-sac streets, and restrict cul-de-sac size to a maximum radius of 30 feet. Encourage replacing cul-de-sacs with loop roads or creating pervious infiltration islands in cul-de-sac centers.

Pedestrian and Bicycle Facilities:

- Provide sidewalks on all streets to encourage walkable neighborhoods and to reduce pedestrian-car conflicts. However, reduce lower-use sidewalks to 4 feet in width.
- Emphasize connectivity between residential areas, shops, schools, and community facilities.
- Provide 'neckdowns' or 'bump-outs' at intersections in commercial areas to reduce the street distances at pedestrian crossings.
- Encourage the use of textured paving and other traffic calming devices in high pedestrian zones.
- Designate bike lanes on arterial and collector streets to promote shared roadways.
- Supply commercial districts with bike racks.
- Create a hierarchical trail system that supports multiple uses, including walking, hiking, nature observation, bicycling for recreation and commuting, and cross-country skiing.
- Provide connections to other regional

trail systems, including the UWGB Cofrin Arboretum, Bay Beach Wildlife Sanctuary, Baird Creek Greenway, and the Ahnapee State Trail.

- Design a major, multi-use trail to form a continuous loop through the development. Provide smaller side trails and interior connections to provide for a variety of uses and trip lengths.
- Provide over- or underpasses for both Highways 54 and 57 to facilitate safe pedestrian, bicycle, and animal crossings.
- Trail design and surfacing material should be sensitive to the intended use and environmental conditions. Trails should be center-crowned to promote positive drainage and reduce erosion.

Transit:

- Extend the Green Bay Metro bus service to the development area.
- Develop a central, multi-use trail (10-foot width) that provides commuter connections to the industrial / business park and to UWGB.

High Use Landscapes

Urban Landscaping Recommendations:

Conservation of Water:

- Utilize native plants that are adapted to the climatic conditions.
- Minimize watering. Lawns only require

one inch of water per week.

- Water in the evening and early morning to increase the amount of water that is available to a lawn.
- Plant trees, shrubs, and ground covers that demand less water than turf.

Fertilizer Usage:

- Utilize native plants that are adapted to the soil conditions.
- Fertilize only when necessary.
- Avoid using fertilizers with phosphorus.
- When fertilizing, follow directions on package and/or consult local horticulture agent.

Pesticide Application:

- Utilize native plants that are adapted to the native pests.
- Apply pesticides only when necessary.
- When applying pesticides, it is important to consult a local horticulturist.

Landscaping with Native Plants:

- Use plants that were historically found in the region.
- Attention should be paid to diversity, seasonality, and aesthetics.
- Do not use plant species listed as invasive or that have the potential of escaping the urban landscape.

Stormwater Management

Recommendations:

Set the following goals for stormwater management:

- Maintain groundwater recharge and quality.
- Limit stormwater runoff quantity.
- Reduce stormwater pollutant loads.
- Protect critical habitats (natural drainage channels).

Address the following pollutants of concern:

- TSS
- Nutrients
- Heavy metals
- Pesticides

Incorporate Rain Gardens:

- Direct all roof runoff in residential areas to rain gardens.
- Encourage the use of rain gardens in commercial and industrial area parking lots.
- Use plants native to the region to provide for biodiversity.

Promote Green Roofs:

- Support the installation of green roofs in commercial and industrial areas.
- Encourage the use of intensive green roof systems.

Utilize Wet Detention Ponds:

- Provide continuous emergent

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- vegetation around pond edges to discourage the overpopulation of urban geese.
- Use treatment trains to maximize treatment and detention of stormwater runoff.

Groundwater Management

Recommendations:

- Avoid infiltrating snowmelt runoff from roads and parking lots due to high chloride content.
- Implement rain gardens, buffer strips, and grass swales in residential and commercial areas, including parking lots.
- Pretreat runoff from gas stations, vehicle maintenance operations and large commercial parking lots prior to infiltration.
- Limit the use of porous pavement to low traffic areas to avoid high pollutant zones.
- Protect primary aquifer recharge areas to allow for optimal aquifer recharge.

Community Gardening Recommendations:

Start a community garden in the JPA:

- Locate the gardens along the eastern edge of the development to provide buffering of active agricultural lands.
- Position the gardens on prepared soils to ensure maximum garden productivity.
- Protect the gardens with permanent

- conservation easements that prevent future development.
- Offer gardening plots for rental first to local neighborhood residents, then to the larger Green Bay community.
- Partner with UW-Extension, the Green Bay Botanical Garden, or the Green Bay City Parks Department to provide assistance for garden administration.
- Create a set of by-laws before the garden is opened.

Provide the following garden attributes:

- For a vegetable garden, have at least 8-9 inches of topsoil.
- Understand the chemical content of the soil by having it tested.
- Enrich soil by adding compost or other organic materials to add vital nutrients and increase the soil's ability to absorb and store water.
- Terrace slopes to prevent erosion.
- Fence the garden to prevent animals and people from easily accessing vegetables. Use a tall gate to reduce vandalism.
- Place a curb cut in close proximity so supply trucks can reach the garden.
- Locate with an open south face to maximize plants' solar exposure.
- Water sources may include the following:
 - Rain barrels
 - Municipal water supply
- Locate gardens at least 100 feet from

major streets.

- Avoid long, narrow corridors of gardens for aesthetic purposes and to minimize water costs.
- Provide easy visual access from the surrounding neighborhood to prevent crime.
- Place gardens in areas that can be easily accessed by handicapped and elderly gardeners.

Sustainable Building Methods

Whole-building design views buildings as integrated systems of interacting components. This analytic approach offers opportunities for developers, builders, consumers, governments, and the general public to analyze and evaluate the relative effectiveness of various building materials, construction techniques, and operating procedures.

This section focuses on the fundamental concepts of resource efficiency and sustainable design. After a brief discussion of building standards and green building certification opportunities, energy and water efficiency and construction technologies for new buildings are detailed. Key passive and active architectural design concepts that may be appropriate for the JPA are then identified. Examples of how these

and other technologies have been applied are provided with a series of case studies, including payback potential. Finally, primary opportunities for energy efficiency are illustrated for residential and commercial applications with a computer modeling program. The list below summarizes key recommendations for sustainable construction.

Sustainable Building Recommendations:

- Use a whole-building design approach to maximize resource-efficiency benefits through synergy.
- Incorporate as many options from LEED and GBH standards as possible.
- Carefully plan construction and site design to preserve as much natural vegetation as possible.
- Install high-quality insulation and double-pane, low e windows.
- Invest in energy-efficient and water-conserving appliances, plumbing fixtures, machinery, and office equipment.
- Use a green roof or light-colored roofing materials.
- Orient buildings to maximize the southern exposure.
- Position the majority of windows on the south wall of buildings.
- Shade windows to prevent direct sunlight in the summer while maximizing direct sunlight in the winter.
- Use floor plans that have main areas

on the south side, areas that are infrequently used on the north side, and garages and store rooms on the east and west ends of the building.

- Plant native, deciduous shade trees on the east and west ends of the building.
- Include thermal mass in buildings that will be used at night.
- Incorporate a solar hot water heater in building design.
- Design efficient HVAC systems:
 - Each efficiency technique included in the design will lessen the heating and cooling load for the system.
 - Consider the use of a geothermal heat pump as part of the HVAC system to further decrease energy and maintenance costs.

University Connections

With the Joint Planning Area situated in close proximity to UWGB, assessing the campus's wishes for the proposed development benefits both the University community and developers. The University Administration, the Cofrin Center for Biodiversity, and the student body were consulted for their opinions, which were generally found to be in favor of the development. Connecting the campus to the new development not only serves the campus, but also the community as a whole. The comments provided by those interviewed will give valuable insight

to the municipalities and developers when making decisions for the Joint Planning Area.

Conclusions

The ideas presented within this document challenge the conventional form of suburban development and provide alternative strategies and technologies that can be used to lessen our impact on the environment. As the Joint Planning Area transitions to urban land use over the next 20 years, following the recommendations of this report will foster long-term community vitality by integrating social, economic, and environmental considerations into development decision making.

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