

Town & Village of Northfield, Vermont

Green Infrastructure/Low-Impact Development Review

November 2013

Low-Impact Development (LID) an innovative land planning and engineering design approach which seeks to maintain a sites pre-development ecological and hydrologic function through the protection, enhancement, or mimicry of natural processes." LID is considered a non-structural practice used predominantly to guide new development. At its core, LID focuses on minimizing the impacts of development. In doing so, LID mitigates problems before they start. There are generally eight principles of LID (outlined at right). When incorporated as part of the planning process, the result is wetland and riparian habitat protection, reduction of peak runoff flow and rate through the reduction of impervious surfaces, reduced risk of flooding, improved community value and aesthetics, and long-term cost savings from reduced water infrastructure maintenance.



Infiltrate

Evaporate

Recycle

When the impacts of development on a site cannot be fully mitigated through LID due to site constraints or existing infrastructure, **Green Stormwater Infrastructure (GSI)** is often used. GSI is a suite of "systems and practices that restore and maintain natural hydrologic processes in order to reduce the volume and water quality impacts of the built environment while providing multiple societal benefits." GSI relies heavily on infiltration, evapotranspiration, storage and reuse. These functions are utilized in a decentralized way throughout the landscape to manage stormwater as close to the source as possible.

Summary of Review & Findings: Town & Village of Northfield, VT

This review provides a general analysis of the extent to which the Town of Northfield supports the use and implementation of LID and GSI. Northfield has four historic villages, South Village (home to N, Center Village, Northfield Falls and Factory Village, the largest of the settlements that serves as the civic and commercial core. As a former rail and industrial hub, these villages lie adjacent to a critical body of water, the Dog River. Though Northfield has not felt

LID Components:

- Conservation Development
- Minimize Soil Compaction
- Minimize Total Disturbance
- Protect Natural Flow Patterns
- Protect Riparian Buffers
- Protect Sensitive Areas
- Reduce Impervious Surfaces
- Stormwater Disconnection

Documents Reviewed:

Town & Village of Northfield, Vermont Municipal Plan (2009)

Bylaws for the Regulation of Land Use in the Town & Village of Northfield, Vermont (2011)

- Zoning Districts & District Standards
- General Regulations
- Development Review#

intense development pressure in recent decades, low density-residential has been increasingly occurring in upland forested areas (*Municipal Plan*, 2009). These characteristics, along with risks of unpermitted incremental development below the state stormwater regulatory threshold, erosion and sedimentation in the road drainage network, loss of riparian buffers, impacts to headwaters and climate change vulnerability provide ample reason to seek ways in which to capture, slow and infiltrate stormwater wherever possible.

Northfield's 2009 Municipal Plan and 2011 Bylaws for the Regulation of Land use ("the Bylaws") incorporate various standards that support the principles of green infrastructure and LID. These include inventories and background discussion on significant physical elements and water resources, a Conservation and Forestry zoning district intended to limit development in upland areas, provisions in development review that generally require preservation of environmentally sensitive areas, and Planned Unit Development provisions that allow for flexibility in subdivision design to protect sensitive resources. Notable are the inclusion of Fluvial Erosion Hazard regulations along the Dog River corridor and a required setback from streams above 1,500 ft.

Next steps the Town & Village of Northfield could take to reduce barriers to green infrastructure implementation and further address protection for the Dog River watershed include incorporation of:

- Specific standards regarding woodland protection; Standards for maximum turf grass areas;
- Surface Water Protection or Riparian Buffer regulations that limit clearing, impervious cover and/or structures within a buffer area and setback along all waterways.
- Specific standards for development on steep slopes (> 15%) that limit disturbance and/or apply sediment and erosion control standards during and after construction.
- Inclusion of road and driveway standards that provide for reduced pavement widths and driveway lengths in low-density residential developments. Inclusion of standards for vegetation or landscaping within traffic calming features (landscaped islands, etc.) and parking areas.
- General use regulations that apply sediment and erosion control standards and guidelines for stormwater management to all development; specifically that not already requiring a state stormwater permit.
- Further discussion in the Town Plan on existing urban drainage issues and opportunities for green stormwater infrastructure and Low-Impact Development practices.

Municipal Review:

- **Part 1:** General Plan Sections and Language
Score: 8 out of 10
- **Part 2:** Vegetation and Landscaping
Score: 4 out of 16
- **Part 3:** Minimizing Land Disturbance
Score: 3 out of 12
- **Part 4:** Impervious Area Management
Score: 2 out of 26

Total Score:
17 out of 64

If you have any questions about this review or have interest in sample ordinance language, please contact Kim McKee at mckee@cvregion.com.

Part 1. General Plan Sections and Language

Is there background discussion on (0-5 points):

Score: 4

- Yes No Low-Impact Development and/or Green Stormwater Infrastructure concepts
- Yes No Mention of physical setting, i.e. surface waters and watersheds in the town and region and what are the quality and threats to these resources
- Yes No Steep slopes
- Yes No Protecting shorelines and wetlands
- Yes No Urban ecosystems - rainwater travel through streets, trees, rooftops, gardens etc.

Comments:

There is no background discussion on LID or Green Stormwater Infrastructure specifically; however there is apt discussion of the physical elements significant to the Town and Village. These include topography and drainage, surface waters, wetlands, floodplains, wildlife habitat and other ecologically significant natural features. Particular mention is made of significant cold-water fisheries and scenic and recreational resources on the Dog River and that most waters in town are rated "Class B" by the state. It is also noted that headwaters are important to maintain water quality, though often do not show up on maps.

Threats to surface water quality are listed on p14, and include: failed septic systems, storm water runoff, encroaching development, explosive growth in invasive species of plants, and sedimentation from construction sites, roads, and other impervious surfaces. The plan notes that these can be reduced through the use of surface water setbacks, undisturbed buffer zones, and the application of best management practices for storm water management and erosion control. Other policies referenced include avoiding development on slopes in excess of 25% and carefully managing site preparation and development on slopes of 15% or more, particularly in areas with shallow soils.

Urban ecosystems are only broadly mentioned in reference to storm water run-off with the exception of Rt 12 north of the Village, which is particularly raised as a concern regarding storm water drainage.

Recommended tasks include reviewing the findings of the Dog River Corridor Plan and considering implementation of recommendations regarding FEH zone development and storm water management. No specific goals or tasks are listed pertaining to wetland protection and the plan notes that the town is required under state and local regulations to notify the state wetlands office whenever development is being proposed within or adjacent to mapped wetland areas. "The town may also opt, through local regulations, to protect wetlands that do not trigger state review."

Have inventories been done? (0-5 points)

Score: 4

- Yes No Basins, watersheds, surface water resources
- Yes No Roads, bridges and culverts

- Yes No Impaired and threatened waters
- Yes No Topography, including steep slopes
- Yes No Soils - infiltration rates

Comments:

Soil surveys are referenced in a description of nearly 4,500 acres of sand and gravel deposits, though it is unclear if soil infiltration rates have been recorded (p13). Prime agricultural soils of federal and statewide importance are described and mapped. Roads, bridges and culverts were inventoried and mapped by CVRPC in 2009 though this is not mentioned in the plan. No particular impaired waters are discussed and it is noted that most waters in town are rated "Class B" by the state. Threatened waters include the "mixing zone" on the Dog River, extending downstream from the wastewater treatment plant outflow. It is noted that recent upgrades to the treatment plant in 2002 should have substantially improved water quality (p14). Topography, including areas of steep slopes, are mentioned throughout the Natural and Cultural Resources section of the Plan.

Part 2. Vegetation and Landscaping

A. Preservation of Natural Areas (0-5 points)

Score: 2

Municipal regulations should include requirements to preserve existing vegetated areas, minimize turf grass lawn areas, and use native vegetation.

- Yes No Are applicants required to provide a layout of the existing vegetated areas, and a description of the conditions in those areas?
- Yes No Does the municipality have maximum as well as minimum yard sizing ordinances?
- Yes No Are residents restricted from enlarging existing turf lawn areas?
- Yes No Do the ordinances provide incentives for the use of vegetation as filters for stormwater runoff?
- Yes No Do the ordinances require a specific percentage of permanently preserved open space as part of the evaluation of cluster development?

Comments:

There are no specific regulations in the Northfield Plan or Bylaws requiring the preservation of existing vegetated areas, minimizing turf grass lawn areas nor the use of native vegetation. Bylaws do exist for PRD/PUD's that require maximizing open space and preserving important natural features. The bylaws require that "the development plan makes appropriate provision for preservation of streams, stream banks, steep slopes, wet areas, soils unsuitable for development, forested areas and unique natural and manmade features." There are no incentives (density bonuses, etc.) for use of PRD/PUD, however. PRD requires a maximum of 50% total acreage be usable open space in specific standards; and PUD requires that the area occupied by buildings and structures shall not exceed 30% of total acreage while requiring not less than 50% total acreage be open space.

B. Tree and Forest Protection Ordinances (0-3points) Score: 1

Municipalities should consider enhancing tree ordinances to a forest ordinance that would also maintain the benefits of forested areas (not just individual trees and their removal and replacement)

Yes No Does the municipality have a tree protection ordinance?

Yes No Can the municipality include a forest protection ordinance?

Yes No If forested areas are present at development sites, is there a required percentage of the stand to be preserved?

Comments:

Northfield's Plan and Bylaws do not include a tree protection or forest protection ordinance; nor does it require an exact percentage of a stand to be preserved on development sites.

C. Landscaping Island and Screening Ordinances (0-3 points) Score: 3

Landscaping islands can provide ideal opportunities for the infiltration and disconnection of runoff, or the placement of GSI systems. Hardy, low maintenance vegetation should be used for successful, low-cost systems.

Yes No Do the ordinances require landscaping islands in parking lots, or between the roadway and the sidewalk?

Yes No Can the ordinance be adjusted to require vegetation that is more beneficial for stormwater quality, groundwater recharge, or stormwater quantity, but that does not interfere with driver vision at the intersections?

Yes No Is the use of bioretention islands and other stormwater practices within landscaped areas or setbacks allowed and/or encouraged?

Yes No Do the ordinances require screening from adjoining properties? Can the screening criteria require the use of vegetation to the maximum extent practical before the use of walls or berms?

Comments:

There are no ordinances in Northfield requiring landscaped islands in parking lots, or between roadway and sidewalks at this time, and no mention of bioretention islands and other storm water practices within landscaped areas or setbacks.

Site Plan Review requires visibility of parking areas to be minimized through location, landscaping and screening. Conditions can be imposed by the Planning Commission related to landscaping and screening but no specific requirements are noted beyond minimizing visibility of parking areas. The bylaw generally notes that "Landscaping shall enhance the features and conditions unique to each site and should include a combination of shade and street trees, shrubs, planting beds and ground cover." (p14)

D. Riparian Areas (0-5 points)

Score: 4

Municipalities may have existing buffer floodplain ordinances that require the protection of vegetation adjacent to streams. The municipality should consider conservation restrictions and allowable maintenance to ensure the preservation of these areas.

- Yes No Are there measures beyond Floodplain Districts to provide streamside buffers in the community? If so, how strong is this buffer and does it apply in areas zoned for higher density residential and commercial development?
- Yes No Has the municipality also adopted FEH overlay districts or equivalent on a significant portion of its streams in areas zoned for higher density residential and commercial development?
- Yes No Do the ordinances require a conservation easement, or other permanent restrictions on buffer areas?
- Yes No Do the ordinances identify or limit when stormwater outfall structures can cross the buffer?
- Yes No Do the ordinances restrict development activities that increase impervious cover?

Comments:

Northfield's bylaws contain floodplain zoning regulations which support LID principles that apply to both the special flood hazard area and fluvial erosion hazard zone. The Conservation and Forestry District, largely consisting of lands above 1,800 ft, prohibits buildings within 100 feet of any brook or river, but riparian buffers are not regulated within the remaining zoning districts. A task identified in the municipal plan references development of an overlay zone, or other zoning tool, to improve riparian buffer protection and the Conservation Commission is currently exploring implementing said regulations.

Part 3. Minimizing Land Disturbance

The minimization of disturbance can be used at different phases of a development projects. The goal is to limit clearing, grading, and other disturbance associated with development to protect existing features that provide stormwater benefits. Zoning ordinances typically limit the amount of impervious surfaces on building lots, but do not limit the amount of area that can be disturbed during construction. This strategy helps preserve the site's existing hydrologic character, as well as limiting the occurrence of soil compaction.

A. Limits of Disturbance (0-7points)

Score: 1

Designing with the terrain, or site fingerprinting, requires an assessment of the characteristics of the site and the selection of areas for development that would minimize the impact. This can be incorporated into the requirements for existing site conditions and the environmental impact statement. Limits of

disturbance should be incorporated into construction plans reviewed and approved by the municipality. Setbacks should be evaluated to determine whether they can be reduced.

- Yes** **No** As part of the depiction of existing conditions, are environmentally critical and environmentally constrained areas identified? (Environmentally critical areas are areas or features with significant environmental value, such as steep slopes, stream corridors, natural heritage priority sites, and habitats of threatened and endangered species. Environmentally constrained areas are those with development restrictions, such as wetlands, floodplains, and sites of endangered species.)
- Yes** **No** Can any of the existing setbacks be reduced?
- Yes** **No** Are there maximum turf grass or impervious cover limits in any of the setbacks?
- Yes** **No** Do the ordinances inhibit or prohibit the clear-cutting of the project site as part of the construction?
- Yes** **No** Is the traffic of heavy construction vehicles limited to specific areas, such as areas of proposed roadway? Are these areas required to be identified on the plans and marked in the field?
- Yes** **No** Do the ordinances require the identification of specific areas that provide significant hydrologic functions, such as existing surface storage areas, forested areas, riparian corridors, and areas with high groundwater recharge capabilities?
- Yes** **No** Does the municipality require an as-built inspection before issuing a certificate of occupancy? If so, does the inspection include identification of compacted areas, if they exist within the site?
- Yes** **No** Does the municipality require the restoration to compacted areas in accordance with the Soil Erosion and Sediment Control Standards?

Comments:

The Site Plan Approval and PRD sections of the Bylaws speak generally to environmentally critical and environmentally constrained areas. Mention is specifically made inclusion of watercourses, wetlands or other existing natural features on or adjacent to the property in Site Plan Review and making appropriate provision for preservation of streams, and stream banks, steep slopes, wet areas, soils unsuitable for development, forested areas and unique natural and manmade features in the site plan for Planned Residential Development.

Requirements for as-built inspection or restoration to compacted areas are not included in the By-laws, nor any specific restrictions on clear-cutting or impervious cover.

Constraints have been put on certain of these areas mainly through Floodplain regulations and a building setback from surface waters in the Conservation and Forestry District. Provisions for preservation of the above mentioned resources in site review are only general in nature.

B. Open Space and Cluster Development (0-5 points)

Score: 2

Open space areas are restricted land that may be set aside for conservation, recreation, or agricultural use, and are often associated with cluster development requirements. Since open space can have a

variety of uses, the municipality should evaluate its open space ordinances to determine whether amendments are necessary to provide improved stormwater benefits.

- Yes** **No** Are open space or cluster development designs allowed in the municipality?
- Yes** **No** Are flexible site design incentives available for developers that utilize open space or cluster design options?
- Yes** **No** Are there limitations on the allowable disturbance of existing vegetated areas in open space?
- Yes** **No** Are the requirements to re-establish vegetation in disturbed areas dedicated for open space?
- Yes** **No** Is there a maximum allowable impervious cover in open space areas?

Comments:

Northfield allows Planned Residential Development subject to Site Plan Review in a number of zoning districts including Agricultural, Conservation and Forestry, Urban Residential, Rural Residential and Low Density Residential. Planned Unit Development standards are included in the bylaws, but not currently permitted in any zoning district. These policies have an intended purpose of encouraging flexibility of design and development of land in such a manner as to preserve the natural and scenic qualities of open land, but no density bonuses or incentives to utilize PRD or PUD are provided. There are no specifications for limits on disturbance of existing vegetated areas, re-establishing vegetation in disturbed areas or maximum allowable impervious cover, though general reference is made to making appropriate provision for preservation of natural resources on site.

Part 4. Impervious Area Management

The amount of impervious area, and its relationship to adjacent vegetated areas, can significantly change the amount of runoff that needs to be addressed by BMPs. Most of a site’s impervious surfaces are typically located in the streets, sidewalks, driveway, and parking areas. These areas are further hampered by requirements for continuous curbing that prevent discharge from impervious surfaces into adjacent vegetated areas.

A. Streets and Driveways (0-8 points)

Score: 0

Street widths of 18 to 22 feet are recommended for low impact development designs in low density residential developments. Minimum driveway widths of 9 and 18 feet for one lane and two lanes, respectively, are also recommended. The minimum widths of all streets and driveways should be evaluated to demonstrate that the proposed width is the narrowest possible consistent with safety and traffic concerns and requirements. Municipalities should evaluate which traffic calming features, such as circles, rotaries, medians, and islands, can be vegetated or landscaped. Cul-de-sacs can also be evaluated to reduce the radius area, or to provide a landscape island in the center.

- Yes** **No** Are the street widths the minimum necessary for traffic density, emergency vehicle movement, and roadside parking?

- Yes No Are street features, such as circles, rotaries, or landscaped islands allowed to or required to receive runoff?
- Yes No Are curb cuts or flush curbs with curb stops an allowable alternative to raised curbs?
- Yes No Can the minimum cul-de-sac radius be reduced or is a landscaped island required in the center of the cul-de-sac?
- Yes No Are alternative turn-arounds such as "hammerheads" allowed on short streets in low density residential developments?
- Yes No Can the minimum driveway width be reduced?
- Yes No Are shared driveways permitted in residential developments?
- Yes No Can you reduce total length by considering alternative street layouts?

Comments:

No specific street or driveway standards are included in the Bylaws. The Plan contains a section on Highway Access Management which notes that "the frequency, location and design of highway accesses and curb cuts for driveways and parking lots have a direct bearing on the safety and efficiency of both town roads and state highways." The Plan also notes several techniques may be applied through land use regulations and though LID and GSI are not referenced, many of these techniques could support BMPS. These include: maximum number of driveways per lot, mandatory shared driveways, maximum driveway lengths, and maximum on-site parking, shared-parking and parking design (p54). The Plan also briefly references the design of curb cuts and its significance to storm water management.

B. Parking Areas and Sidewalks (0-13 points)

Score: 2

A mix of uses at a development site can allow for shared parking areas, reducing the total parking area. Municipalities require minimum parking areas, but seldom limit the total number of parking spaces.

- Yes No Can the parking ratios be reduced?
- Yes No Are the parking requirements set as maximum or median rather than minimum requirements?
- Yes No Is the use of shared parking arrangements allowed to reduce the parking area?
- Yes No Are model shared parking agreements provided?
- Yes No Does the presence of mass transit allow for reduced parking ratios?
- Yes No Is a minimum stall width of 9 feet allowed?
- Yes No Is a minimum stall length of 18 feet allowed?
- Yes No Can the stall lengths be reduced to allow vehicle overhang into a vegetated area?
- Yes No Do ordinances allow for permeable material to be used in overflow parking areas?
- Yes No Do ordinances allow for multi-level parking?
- Yes No Are there incentives to provide parking that reduces impervious cover, rather than providing only surface parking lots?

Sidewalks can be made of pervious material or disconnected from the drainage system to allow runoff to re-infiltrate into the adjacent pervious areas.

Yes No Do ordinances allow for sidewalks constructed with pervious material?

Yes No Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

Comments:

Residential and non-residential parking requirements are included within each zoning district – generally requiring 2 parking spaces per residential unit and 1 parking space per 300 sq ft floor area for non-residential. Northfield defines a parking space as at least 8 feet wide which is smaller than the recommended minimum defined above. Other than parking flexibility included in the PUD review (spaces shall be provided at a level set by the Planning Commission in consultation with the developer), there are no provisions or incentives for shared parking, multi-level parking, use of permeable material in sidewalks or parking areas, alternate pedestrian networks, or other flexible parking standards in Northfield’s ordinances. The above questions can be used to guide further parking/street standards for decision-makers.

C. Unconnected Impervious Areas (0-3 points)

Score: 3

Disconnection of impervious areas can occur in both low density development and high density commercial development, provided sufficient vegetated area is available to accept dispersed stormwater flows. Areas for disconnection include parking lot or cul-de-sac islands, lawn areas, and other vegetated areas.

Yes No Are developers required to disconnect impervious surfaces to promote pollutant removal and groundwater recharge?

Yes No Do ordinances allow the reduction of the runoff volume when runoff from impervious areas is re-infiltrated into vegetated areas?

Yes No Do ordinances allow flush curb and/or curb cuts to allow for runoff to discharge into adjacent vegetated areas as sheet flow?

Comments:

At this time, Northfield uses conventional measures to drain impervious surfaces.

D. Vegetated Open Channels (0-2 points)

Score: 0

The use of vegetated channels, rather than the standard concrete curb and gutter configuration, can decrease flow velocity, and allow for stormwater filtration and re-infiltration. One design option is for vegetated channels that convey smaller storm events, such as the water quality design storm, and provide an overflow into a storm sewer system for larger storm events.

Yes No Do ordinances allow or require vegetated open channel conveyance instead of the standard curb and gutter designs?

Yes No Are there established design criteria for vegetated channels?

Comments:

At this time, Northfield uses conventional measures to drain impervious surfaces.

SUMMARY OF QUANTITATIVE ANALYSIS

GI / LID Municipal Plan and Bylaw Review:	
Name of Municipality	Town & Village of Northfield, VT
County	Washington
Month and Year of Review	Feb. 2014
Name of RPC performing review	Central Vermont RPC
Part 1. General Plan Sections and Language	
Is there background discussion (0-5 points)	4
Have inventories been done (0-5 points)	4
Part 2: Vegetation and Landscaping	
A. Preservation of Natural Areas (0-5 points)	2
B. Tree and Forest Protection Ordinances (0-3 points)	0
C. Landscaping Island and Screening Ordinances (0-3 points)	0
D. Riparian Areas (0-5 points)	2
Part 3: Minimizing Land Disturbance	
A. Limits of Disturbance (0-7 points)	1
B. Open Space and Cluster Development (0-5 points)	2
Part 4: Impervious Area Management	
A. Streets and Driveways (0-8 points)	0
B. Parking Areas and Sidewalks (0-13 points)	2
C. Unconnected Impervious Areas (0-3 points)	0
D. Vegetated Open Channels (0-2 points)	0
TOTAL SCORE	17
MAXIMUM SCORE	64