Part IV: Implementation and Management: How It Can Happen
1. Implementation Approach

As illustrated in the Restoration Concept (see Part III), the desired future condition of the Niagara gorge rim is a native forest community, with small areas of successional communities and wetlands. The goal is to establish a restored natural ecosystem that supports a diversity of native plant and wildlife species. Eradication/control of non-native invasive species, and provision of opportunities for public access to, and appreciation of, the restored gorge rim and adjacent gorge are also important goals of the restoration effort. A study commissioned by NYPA acknowledged that small-scale (pilot-level) restoration efforts are likely to succeed within the gorge and rim, while at the same time concluding that large-scale community-level restoration is not likely feasible (TRC & Riveredge, 2008). However, this conclusion focused on the restoration of rare plant species and communities within the gorge, rather than the more common communities that are proposed for restoration on the gorge rim.

Although ambitious, the goals of community-level restoration on the gorge rim are not unrealistic or without precedent. A wide variety of disturbed/developed areas around the world have been restored to functional natural ecosystems. These sites include reclaimed mines, closed landfills and abandoned industrial properties (Barnhisel & Hower, 1997; Brenner et al., 1984; Nelson, 1995; Winterhalden, 1996). These precedents provide ample evidence that such restoration can occur in more severely degraded landscapes than what is found in the Study Area. Several examples of seemingly less challenging (though no less impressive) projects may also provide guidance with respect toward establishing and following long-term, iterative, and creative restoration protocols (Allison, 2002; FPLC, 2008; Ahern et al., 1992).

In any of these settings, the first step in the restoration process is to understand current and historic conditions and define, as specifically as possible, the communities that are to be re-established. Existing conditions on the gorge rim are described in Parts I and II of this study while the overall vision of the restored rim is presented in Part III. This section of the study describes a general approach to the restoration effort, followed by a description of proposed pilot projects and general guidance on how restored communities would need to be monitored and managed in the future.

Preliminary Steps

Prior to initiating ecological restoration on the gorge rim, an extensive amount of advocacy, funding support, data collection, and planning will be necessary to support the work going forward. These preliminary steps may include, but are not limited to the following:

1. Establish a “friends group” or similar advocacy organization that could work with local agencies, municipalities and funding sources to advance the project. Ideally this group could hire a restoration ecologist to oversee and guide progress of the project during all phases of planning, design, construction and management. This individual (or other support staff) could also pursue grants, participate in public outreach, and work with other stakeholders to build a broad coalition of support for the project.

2. Work with the NYSDOT and OPRHP to achieve consensus on RMP removal, get the project into the NYSDOT “pipeline” of future projects, and establish a time frame for further study, design and construction (i.e. demolition and removal).

3. Research funding opportunities (see below) and apply for specific grants/awards to initiate detailed planning and design work (including specific pilot projects).

4. Survey agency officials, local professionals, and volunteer stewards involved in the restoration of other appropriate sites along the gorge or gorge rim to collect the best available local knowledge regarding such projects (e.g. Niagara Parks’ [Ontario] Paradise Grove oak savannah restoration).
5. Conduct a detailed site suitability analysis to determine opportunities and constraints on ecological restoration and pedestrian circulation as envisioned in the Restoration Concept included in this study.

6. Define specific pilot projects (see Section 3, below) to evaluate the feasibility of various restoration techniques. Identify specific locations for the projects and develop detailed designs and cost estimates.

7. Complete State Environmental Quality Review Act (SEQRA) review concurrent with design and implementation of RMP removal by the NYSDOT.

8. Establish baseline economic and demographic conditions for use in subsequent examinations of socioeconomic impacts of full ecological restoration and/or pilot projects.

Many of these substantive responsibilities would be identified and initiated as individual phases of work are defined and implemented.

**Phasing of Restoration**

Full removal and restoration of the RMP all at once would likely be impractical. Closing the entire parkway, physically removing it, and managing the restoration of extensive ecological systems all at once would be complicated, and require a major capital investment. A more practical and rational approach would be to phase the removal by segmenting the RMP into four phases to be removed sequentially over a five to 10 year time period. Consideration has to be given to the remaining segments of the RMP, ensuring that they remain functional until removed. Once the designated section of the RMP is removed, restoration of that area and construction of the recreational trail can take place in accordance with this Restoration Concept and implementation strategies set forth in Part IV of this Study. The following phasing plan for removal of the RMP is recommended:

- **Phase 1:** Remove the RMP from Findlay Drive north to where northbound vehicles have an option to exit onto Lewiston Road. This interchange will need to be reconfigured to allow full access to the remaining northern portion of the RMP.

- **Phase 2:** Remove the RMP from the Rainbow Bridge north to Findlay Drive. If the Discovery Center has not been improved according to the City’s Comprehensive Plan, the northern point of John B. Daily Boulevard should end with a turnabout.

- **Phase 3:** Remove the RMP from the new interchange with Lewiston Road north to Interstate 190. The remaining segment of the RMP will allow for convenient transportation from Interstate 190 to points north along the RMP.

- **Phase 4:** Remove the RMP from Interstate 190 north to Center Street in Lewiston.

**Potential Funding Sources**

Like any other improvements to our aging, obsolete infrastructure, the restoration of the RMP will require funding sources over both the short and long terms. The context of fiscal responsibility within the Study Area is complex; it includes areas owned by agencies and authorities at different levels of government, and various agreements between those administrative bodies determine which body is responsible for any particular action. Given current pressures on public-sector budgets and the continued threat of further cuts, it is unlikely that a single dedicated, long-term funding source for full ecological restoration will be
identified in the very near future, either through general or program funds.

However, this should not deter efforts to implement the vision presented within this study. Instead, the complex network of land ownership and maintenance/stewardship responsibilities could present an opportunity for leveraged funds from a number of public and private sources. As the benefits are widely distributed across the local public and private economies, the funding sources used to achieve them should be equally as diverse. Incrementally, each source may only be sufficient to cover a portion of project costs; cumulatively, especially if dedicated to a central fund, they could have a greater impact. In addition, public agencies may be able to dedicate program funds for pilot projects as needed, or continuous funds based on the economic benefits each would receive. For example:

- City of Niagara Falls- In anticipation of increased property tax receipts, it may be possible for the City of Niagara Falls to issue tax increment financing bonds for small streetscape improvements at the locations of trailheads.
- Utility companies- As the project would have measurable economic benefits regarding stormwater treatment and demand for natural gas and electricity, local utilities could subsidize project costs in proportion to their avoided expenditures.
- Federal and state- In the event that a regulatory framework for ecosystem services markets (e.g. a carbon cap-and-trade system) were ever to be implemented at the state or federal level, the sequestration and air filtration mechanisms of the restored gorge rim may be an attractive option for industrial air pollution offsets.

The following regional, state and federal programs could also be used by state or local agencies for funding assistance:

- New York State Department of Transportation (NYSDOT): Transportation Enhancement Program
- Niagara River Greenway Commission
- United States Fish and Wildlife Service (USFWS): Partners for Fish and Wildlife
- National Park Service (NPS): National Heritage Area Program
- Clean Air Act, Section 103 and 105 grant programs (EPA)
- Clean Water Act, Section 319 Nonpoint Source Management Program grants (EPA)
- Clean Water State Revolving Fund (EPA)
- Endangered Species Act, Section 6 Cooperative Endangered Species Conservation Fund (Fish & Wildlife Service [FWS])
- Community Action for a Renewed Environment (CARE) grants (EPA)
- Great Lakes Restoration Initiative (EPA)
- Healthy Watershed Initiative (EPA)
- Migratory Bird Conservation Fund (FWS)
- Partnership for Sustainable Communities’ open grant program (Housing & Urban Development [HUD], Department of Transportation [DOT], and EPA)
- Performance Partnership Grant program (EPA)
- Recreational Trails Program (Federal Highway Administration [FHWA])
• Targeted Watersheds Grant program (EPA)
• Urban and Community Forestry program (Department of Agriculture, Forest Service)

Note: as of the time of this study’s publication, the Urban and Community Forestry program and other cooperative forestry programs are being reorganized by the Forest Service.

The following private programs may also be of assistance in planning or implementing restoration initiatives, either to public agencies, non-profit organizations, or public-private partnerships:

• Parks & Trails of New York
• Alcoa Foundation Partnership for Trees
• The Conservation Alliance grant programs
• The Fund for Wild Nature
• iTreeBank (administered by TreeLink, and sponsored by the US Forest Service)
• The Kendall Foundation
• Kodak American Greenways Program (administered by The Conservation Fund)
• The Charles Stewart Mott Foundation's Freshwater Ecosystems program
• The Surdna Foundation's Sustainable Environments program
• National Association of Regional Councils’ Green Infrastructure Initiative grants
• The Trust for Public Land’s Conservation Campaign program
2. General Sequence of Restoration Activities

The following section outlines the general sequence of restoration events that would be anticipated during restoration of the gorge rim. Specific actions and guidelines to be followed during each of these events are listed in the approximate order they would be anticipated to occur. These events and specific actions describe what would need to be done for full restoration of the gorge rim, or for restoration of any discrete area along the rim. In general, restoration of native ecological communities along the Niagara gorge rim would be initiated by a detailed site evaluation that examines existing soil, drainage and vegetative conditions in the area to be restored. Results of the site evaluation would then be used to develop an actual restoration plan for the specific area under consideration. This plan and oversight of the actual restoration effort should be developed by a qualified restoration ecologist. In general, it is anticipated that this plan would outline the following sequence of events:

1. Removal of unnecessary pavement and “hardscape”.
2. Restoration of natural topography and surface drainage conditions.
3. Restoration/improvement of soil conditions.
4. Eradication/control of non-native invasive species.
5. Establishment of native ecological communities.
6. Provide improved means of pedestrian access.

Specific actions that would be necessary for implementation of each of these restoration activities are presented below:

1. Removal of Pavement/Hardscape

- Achieve consensus on where pavement and other hardscape should be removed based on Restoration Concept Plan recommendations regarding access and circulation and the approval of State Parks and other stakeholders.
- Develop a demolition and removal plan for built facilities to be removed. It is anticipated that this plan would specifically identify where built features are to be removed, and specific excavation/demolition/removal techniques and specifications.
- Utilize appropriate heavy equipment to break up, excavate, and transport pavement and other hardscape debris to be removed. It is anticipated that backhoes with jackhammer attachments, bucket loaders, and dump trucks would be required to accomplish this work.
- Utilize a bulldozer with a deep ripping attachment to decompact soils as necessary in areas where pavement has been removed.
- Determine where removed material would be disposed. It is anticipated that most of this material would either be transported to an appropriate off-site location for disposal (e.g., a construction and demolition land fill), or used as millings or clean fill for other construction projects in the region. Some material may also be used as fill to reestablish natural contour/topography or achieve desired drainage conditions within the RMP corridor. Granular material used as road base could also be recycled for use as trail surfacing.

2. Restoration of Natural Topography and Drainage

- Prepare a topographic survey showing existing contours at one-foot contour intervals.
Prepare a grading plan and specifications for the gorge rim that reestablish more natural contours and obliterate evidence of former road corridors and other paved areas. Use evidence of cut and fill along the edge of the gorge rim to provide guidance regarding the proposed grading. Use historic reports, drawings, and photos to identify former drainage courses and depressions that could be recreated to capture surface water runoff and create wetland conditions. Investigate the potential for daylighting original drainage courses that have since become contaminated.

Develop a stormwater pollution prevention plan (SWPPP) as part of the State Pollution Discharge Elimination System (SPDES) general permit that would be required for this activity, since it would disturb greater than one acre of land.

Utilize heavy equipment to excavate and fill as necessary to achieve the proposed grades indicated on the grading plan. Where adequate topsoil exists such soil should be removed and stockpiled for later use before establishing desired subgrade elevations.

Amend topsoil as necessary (see next set of actions).

Redistribute stockpiled topsoil, and bring in additional topsoil from off-site as necessary to reestablish final grades. All topsoil (from both on-site and off-site sources) should be free of seeds and rootstock from non-native invasive species.

Implement the SWPPP. Install, maintain, and monitor all necessary sediment and erosion control measures in accordance with the requirements of the SWPPP. Installation of temporary stabilization/sediment and erosion control devices in any areas where grading is used to concentrate surface water runoff.

3. Restore/Improve Soil Conditions

Collect soil samples from all areas to be restored and send out for laboratory analysis. Use results of this analysis to identify soil amendment needs.

Decompress soils in all areas where pavement has been removed or where off-pavement pedestrian or vehicular traffic has resulted in soil compaction (as evidence by worn paths/lack of vegetation, or as indicated by penetrometer testing).

Amend soil as necessary to achieve appropriate levels of organic matter and nutrients necessary to support native vegetation. Any organic soil amendments should be sterilized or otherwise guaranteed to be free of any seeds or rootstock from non-native invasive species.

Redistribute topsoil over regraded subgrade. A minimum of 6 inches of topsoil would be required in all locations where restoration activities are proposed, except under overstory trees that are being left in place.

Install sediment and erosion control measures in accordance with the SWPPP.

4. Eradication/Control of Non-native Invasive Species

Prior to initiation of restoration in any given area, conduct an inventory of non-native invasive species in the area. Determine which species are present, where they are located, their size and density.

Based on the results of the non-native invasive species inventory, identify appropriate species-specific eradication/control measures. Mechanical, chemical, and/or biological control techniques.
should all be considered.

- If chemical control measures (herbicides) are to be used, prepare specifications for chemical selection and application technique. Chemical selection should be based on its efficacy for the species in question and other considerations, including effect on non-target plant species, movement within the environment, and potential impacts on fish and wildlife. Choice of application technique should be based on the size/density of plants to be treated and the potential for impacts to non-target species. In general, the most selective technique should be used. For trees, this would typically involve direct application of herbicides to the exposed cambium (e.g., frilled bark or cut stump). For larger shrubs, a basal stem treatment might be appropriate, while for small shrubs, seedlings, and herbaceous species, a foliar application would generally be the best approach. In all cases, any herbicides used to eradicate or control non-native invasive species should be applied by NYSDEC–certified applicators in accordance with all label restrictions.

- Mechanical removal (cutting, girdling, grubbing, etc.) will often be the best approach for removing large trees or extensive stands of shrubs. However, a combination of mechanical and chemical treatment may be required to prevent resprouting/reseeding. A combination of girdling and application of herbicide to the frilled bark of standing trees can be used to kill these trees without necessarily removing them. Standing deadwood is an important element of forest habitat that can be created in this way. Similarly, it may be desirable to cut trees, chemically treat the cut stump to prevent resprouting, and leave fallen deadwood in place. Fallen deadwood is also an important habitat component of mature forest ecosystems.

- Biological controls are limited in their applicability, especially for the species in question along the Niagara gorge rim. Use of the Galerucella beetle could be appropriate to control stands of purple loosestrife that may develop in wetlands and drainage corridors during restoration of the gorge rim.

5. Establishment of Native Ecological Communities

- Develop planting plans and specifications for the establishment of native plant communities. These plans should be developed by a landscape architect and/or restoration ecologist, experienced in the establishment of native plant communities.

- For forest communities, these plans would generally involve planting whips or small container-grown saplings at irregular spacing throughout the area to be restored. In general, the larger the trees that are planted, the higher the survival rate and the greater the cost. Plants should be obtained from the most local source available to assure that the genetic makeup of the plants is appropriate to the location. If local sources are not available, consider growing nursery stock utilizing on-site seed sources. Another possible option is the New York State Tree Nursery, which sells tree and shrub seedlings grown from New York seed sources. Species that make up the composition of the desired overstory community should be planted in the appropriate percentages. Specific placement should be guided by species-specific sunshine and moisture preferences (e.g., plant oaks and cherries on drier, sunnier sites, while maples and basswood prefer more moisture and shadier sites). Once the desired overstory tree species have successfully established, understory shrubs and herbaceous plants would be planted to create a multi-story forest.

- For successional communities, reestablishment of native species would typically involve application of a native seed mix. Standard native seed mixes are available from commercial nurseries, and can be used to develop upland meadows and shrubland, as well as wet meadows and scrub shrub
swamps. In addition, custom mixtures can be prepared using seeds available from commercial nurseries. Again, the most local source available is the most desirable.

- Tree and shrub planting specifications should include details on planting pit preparation, staking and watering. Trees and shrubs should be warrantied by the installer for at least one year (i.e., any dying during the first year would be replaced at no cost).

### 6. Provide Improved Means of Pedestrian Access

- Map all existing paved and unpaved pedestrian walks/trails and evaluate their condition. Compliance with standard trail recommendations for maximum grade, cross slope, surface material, and compliance with the Americans with Disabilities Act (ADA) should be part of this evaluation.

- Map all existing fences and railings and document their materials, condition, and the need for their occurrence in the locations where they have been installed. Compliance with ADA requirements should also be noted.

- In routing the proposed multi-use trail, give maximum consideration to the principal goals of restoration. Trails should not encroach on highly sensitive habitats. Trail redundancy and interference with restored hydrologic regimes should be minimized.

- Develop a set of trail and fence specifications for the proposed pedestrian access system along the Niagara gorge rim. These specifications should address maximum grades, cross slopes, appropriate materials, and construction/installation techniques. Preference should be given to materials that are durable, sustainable/low-maintenance, and consistent in aesthetic character with the natural communities being restored along the gorge rim. Compacted stone dust should be the preferred trail surface in most instances, while railings and fencing should generally be made of wood or recycled plastic material resembling wood.
3. Pilot (Demonstration) Projects

Due to the technical and financial challenges of undertaking ecological restoration on the entire gorge rim at one time, it is anticipated that this work would be initiated in phases. However, initiation of the first phase should be preceded by pilot projects designed to test the feasibility of various restoration and management techniques before implementing them on a large scale basis. Because of its central location within the study area and its status as an easily accessed tourist destination, Whirlpool State Park has been identified as an appropriate location for these pilot restoration projects. Whirlpool State Park is envisioned in the Restoration Concept as having direct vehicle access from Route 104 (via Findlay Drive) with visitor parking and pedestrian access to the proposed trail system. This area also has the added advantage of being accessible to adjacent neighborhoods to the west, and of having the existing DeVeaux Woods as a core area of primarily native vegetation that the restoration can build off of, and be compared to as a reference community.

Three specific types of pilot projects are recommended. These would include the following:

1. Management of existing woodlands,
2. Restoration of disturbed/developed areas to natural communities, and
3. Establishment of vegetation on paved surfaces.

Details regarding these proposed projects are presented below.

1. Management of Existing Woodlands

As mentioned in Part I of this study, DeVeaux Woods has some of the attributes of native old growth forest, but lacks, or is deficient in, certain features that would be expected in undisturbed native forest. Restoration and maintenance of a functional forest ecosystem is a major objective of the overall Restoration Concept for the gorge rim. To evaluate potential means of enhancing the ecological condition of forest stands on the rim, it is recommended that a pilot project be undertaken to evaluate the existing seed bank which could hold potential of seedling recruitment as volunteers and cost effectiveness of various forest management techniques. It is proposed that a discrete area of DeVeaux Woods, perhaps 0.5 acre in size, be managed to recreate more natural forest conditions. This project would involve removal of non-native species from the overstory and understory, improvement of foliage height diversity and structural complexity, and increasing the presence of standing and fallen deadwood. The preferred approach would be to accomplish several of these goals through the identification of non-native or unhealthy trees in the overstory and selectively killing or removing these trees to create small openings in the overstory canopy. Girdling these trees would create standing deadwood, while felling the trees would increase the fallen deadwood component of the forest. The increased penetration of sunlight that results from either treatment would enhance the growth of understory trees and shrubs. This would increase the foliage height diversity and structural complexity of the forest, thus enhancing its wildlife habitat value. It would also facilitate natural regeneration of trees and maintenance of a healthy understory in the forest.

If the selected area for the pilot project is either lacking understory vegetation, or has an understory dominated by non-native species, planting of native understory shrubs and saplings could also be included in the project. Understory planting should occur after the creation of openings in the overstory and/or removal of non-native species from the understory. As mentioned previously, planted vegetation should be exclusively native species obtained from local sources.

The effectiveness of the forest management techniques applied to the pilot area should be monitored over time. Different means of creating openings in the canopy (girdling vs. felling) and different approaches...
to the eradication of non-native species (physical removal vs. chemical control) should be evaluated to determine their relative costs and benefits. Changes in plant species dominance, diversity, and density should also be measured, along with changes in the diversity or abundance of wildlife within the pilot area.

2. Restoration of Disturbed/Developed Areas

Restoration of the majority of the study area will involve conversion of disturbed and developed land into natural communities. The disturbed/developed areas to be restored include open mowed lawn, lawn areas under trees, and areas where pavement (primarily the RMP) has been removed. In most of these areas, the restored community is proposed to be mixed deciduous forest, although some areas of meadow, successional shrubland, and wetland are also anticipated. To evaluate the feasibility of restoring various disturbed/developed areas to natural communities, it is recommended that an area between Whirlpool State Park and DeVeaux Woods (where the RMP and the DeVeaux Woods trail intersect) be identified that includes the three disturbed conditions described above. The pilot project in this area (perhaps an acre in size) would involve removal of pavement, soil restoration, and planting with native species, as described in the previous section. In the area where pavement is removed, the primary effort to be evaluated would be the creation of soil and drainage conditions suitable for growth and development of native plant communities.

Different types and amounts of topsoil and subsoil/base material should be evaluated, along with different site preparation techniques (decompaction, etc.). In other areas, less significant soil amendment, aeration, and/or top dressing may be effective in restoring more natural soil conditions and facilitating plant growth. Once soils have been restored, a variety of grasses should be seeded across all bare soils that are not sodded. A combination of seeding, planting of bare-root seedlings, and planting of larger container-grown stock should be used to evaluate differential costs and rates of survival and growth. Again, preference should be given to locally-grown native species, consistent with the species composition of the desired forest community. The same general approach should be taken in reestablishing non-forested native communities, except the trees would be replaced with native shrubs and/or herbaceous plant species.

The replanted communities would be monitored to determine which soil restoration/improvement techniques are most effective in promoting healthy plant growth. Monitoring would also determine which plant species and planting technique results in the best rates of survival and growth over time. This effort would also indicate where replanting and/or control of non-native species is required. The effectiveness of various techniques for the control or eradication of non-native species from the restored areas should also be evaluated as part of the monitoring effort.

3. Establishment of Vegetation on Paved Surfaces

As indicated in Part III of this study, the restored gorge rim is anticipated to include an elevated portion of the RMP to allow views of the Niagara River and gorge, provide a dynamic pedestrian experience, and avoid the expense and logistical difficulties associated with removal of the elevated highway and restoration of the developed areas beneath it (several of which are anticipated to remain in operation over the long term). The Restoration Concept envisions the conversion of the elevated portion of the RMP into a vegetated corridor featuring a pedestrian walkway surrounded by native herbaceous and shrub species. To establish this vegetation on top of the existing infrastructure, techniques similar to those used to create “green roofs” would be utilized.

To test the feasibility of this restoration technique on site, it is proposed that a pilot project be undertaken...
on an area of currently unused or under-used pavement, either a parking lot or a portion of the closed lanes of the RMP that runs between Whirlpool and DeVeaux Woods State Parks. The pilot project would involve conversion of a relatively small area of pavement (perhaps 0.25 acre) to natural meadow and shrub vegetation. The vegetation would be established in a layer of soil, placed over drainage and waterproof layers. A minimum of 6-12 inches of local topsoil would be placed on top of a drainage course, which depending on the slope of the area, could consist of troughs, porous mats, or coarse materials such as gravel, pumice, or shale. The drainage layer would be placed on a waterproof layer to protect the existing pavement from water damage and root penetration (as would be required on elevated sections of the RMP where existing developed areas would remain underneath). The topsoil would then be seeded with a native seed mix featuring species that prefer full sunlight, and are tolerant of shallow soils and drought conditions. Test plantings of different native shrubs could also be included in the pilot plot. After planting, seed germination and plant growth will be dependent on scheduled watering and natural precipitation. Consequently, seeding should be conducted during favorable planting seasons, such as early spring and fall when cooler temperatures and regular rainfall facilitate seed germination and plant establishment.

Once established, the pilot area should be monitored to evaluate the successful germination, survival, and growth of different plant species, and to document invasion by non-native species. Should non-native species begin to dominate, various means of controlling or eradicating these species should be evaluated as part of the monitoring effort.
It is important to understand that after initiating restoration of natural communities on the gorge rim, long-term monitoring and active management of these communities will be required. The basic approach to short-term monitoring was outlined in the discussion of pilot projects in the previous section. However, long-term monitoring will also be required to evaluate development of these communities over time. Given the anticipated use of the area, the plant communities that exist in the adjacent gorge and residential neighborhoods, and the results of restoration efforts elsewhere, it is anticipated that this monitoring will indicate the need for on-going management/human intervention to assure the establishment and persistence of these communities. This section outlines anticipated future management activities in the following categories:

- Forest Management
- Maintenance of Successional Shrubland
- Maintenance of Meadows/Grasslands
- Management of Wetlands
- Trail Maintenance
- Management of Public Use Areas

Examples of management recommendations in each of these categories are presented below.

1. **Forest Management**
   - Gradually remove all large non-native trees (such as Norway maple) from forest stands. The increased light and growing space provided by tree removal will stimulate the growth of thick understory vegetation and will encourage fruit and seed production. Along with improving structural diversity and wildlife food and cover availability, thick understory vegetation will also discourage off-trail travel. Overstory removal can be accomplished by cutting or girdling selected trees. The latter may be preferable in that it increases the snag component in these areas.
   - Do not remove trees with active wildlife dens, nests, or cavities.
   - Only remove standing deadwood (trees and branches) in areas where it is necessary from the standpoint of safety.
   - Protect and manage exceptionally large trees. Such trees typically produce large quantities of seed and have abundant deadwood and cavities, all of which benefit wildlife. Selective removal of adjacent vegetation will reduce competition and increase vigor, while at the same time providing improved views of these impressive trees.
   - Protect and maintain an adequate supply of snags and den trees. In general, within mature forested areas there should be a minimum of two living trees with cavities suitable for use by wildlife, and an equal number of large snags per acre. Girdling can be used to create snags where adequate numbers are lacking. Girdled trees should be at least 20 feet tall and have a minimum diameter of 8 inches. Only common or non-native species should be girdled, and an attempt should be made to select unhealthy or over-crowded individuals. The snags should be uniformly distributed to assure maximum use, as many cavity nesters have strict territorially requirements. Snag management should be given preference over the provision of artificial nest boxes.
   - Monitor forested areas adjacent to private yards to document evidence of encroachment or dumping of yard waste on public land.
2. **Maintenance of Successional Shrubland**

- Establish and maintain brushy edges around open meadows and forested stands. This can be accomplished through the encouragement of native shrubs and by planting. Mowing should be used to create an undulating irregular edge rather than an abrupt border.
- Maintain successional shrub communities by mowing with a brush hog once every 5-10 years. Mowing should be done in the late fall, after the nesting season and fall migration.

3. **Maintenance of Meadows and Grasslands**

- Monitor meadow areas for invasion by non-native species and/or woody vegetation, and control the proliferation of these species through various control mechanisms, including physical removal and selective chemical control.
- Maintain a dominance of herbaceous species by mowing meadows once every 1-2 years. Mowing should be conducted during the late summer or fall to avoid impacting nesting grassland birds and juvenile mammals.
- Monitor the use of open areas by uncommon bird species such as Henslow's sparrow, grasshopper sparrow and eastern bluebird.
- Maintain scattered clumps of shrubs and standing trees (both alive and dead) along meadow edges to provide singing and foraging perches for birds and to improve bird watching opportunities.
- Active recreation (ball playing, Frisbee throwing, etc.) should not be allowed in restored meadow areas, unless this use occurs exclusively in winter (e.g., cross country skiing) when damage to native plants and disturbance of wildlife can be avoided.
- In selected open field/meadow areas, consider planting and/or encouraging herbaceous species that are attractive to butterflies. Common milkweed, Joe-Pye weed, butterflyweed, field thistle, and wild geranium provide food and cover for butterflies and/or caterpillars.
- Plant and/or preserve small patches of native conifers in the corners of along the edges of open fields and shrub thickets. If thinned to a 10 by 10 foot spacing, lower branches will live longer and herbaceous vegetation will grow between the trees. This will provide good wildlife cover.

4. **Management of Wetlands**

- Monitor existing and restored wetland communities on a regular basis to confirm the establishment and maintenance of wetland hydrology and a dominance of native hydrophytic plant species. Document the presence of invasive non-native plant species such as European buckthorn, honeysuckles, common reed, purple loosestrife, and reed canary grass.
- To the extent that wetland hydrology requires enhancement, identify potential new sources of surface water run-off and means of directing this water to the wetlands and holding it there.
- If invasive non-native species are documented in the wetlands, immediately implement various control measures to discourage the growth of these species.
- Encourage a buffer of trees and shrubs to develop along wetland edges to minimize human disturbance and provide foraging and nesting cover for songbirds.
5. Trail Maintenance

- Provide a trail map and marking system that allows users to easily navigate the gorge rim and access trails that lead into the gorge and down to the Niagara River.
- Provide signage at trail heads that describes allowable and prohibited trail uses.
- Maintain surface condition and drainage on the main multi-use trail to assure safe passage by all user groups.
- Spurs (secondary trails) off the main train should be surfaced with natural materials (stone dust or shredded bark) that prevent soil erosion and facilitate use during all seasons.
- Monitor the trail system for evidence of unauthorized (e.g., motorized vehicle) use.
- Use plantings or felled trees to block access to gorge trails that are highly eroded, unsafe, or located in ecologically sensitive areas.
- Provide wildlife viewing opportunities by maintaining scattered small openings along the trails.

6. Management of Public Use Areas

- Provide signature signage for way finding purposes. Describe access and connections to trails in the gorge and inform visitors of safe activities.
- Regular mowing (to maintain lawn) should be restricted to the margins of access driveway, parking areas, shoulders of the Niagara Rim Trail, and trail heads.
- Develop and maintain interpretive signage highlighting the restoration efforts that have been undertaken, and the goals of such practices. Interpretive displays should be placed at appropriate locations along various trails and public use areas along the rim.
- Except for the selective use of herbicides to control invasive non-native species, refrain from the use of pesticides, as these chemicals may be toxic to fish and wildlife, or indirectly harmful through the elimination or contamination of insects and other invertebrates that serve as pollinators and/or a food source for other wildlife species.
- Refrain from using chemical fertilizers, as these could elevate nutrient input to adjacent wetlands and the Niagara River.
- Any landscape plantings in public use areas should utilize only native trees and shrubs. Ideally, these plantings should enhance vegetative diversity and provide wildlife food and cover.
- Any picnic facilities or seating areas should be conveniently located near trailheads and selected overlook areas along the multi-use trail.

Following the management recommendations outlined above would allow the restored gorge rim to develop and persist as a sustainable natural ecosystem. If monitoring indicates that this management is effective, the required level of active management should decrease over time. However, because of the significant past disturbance this area has received, along with the existing plant communities and adjacent land uses that occur in the area, it is anticipated that some level of active management/intervention will be required over the long-term. While this represents a significant commitment of financial and human resources, the results have the potential to more than off-set this commitment and provide tangible, long-term environmental and economic benefits to the Niagara region.
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