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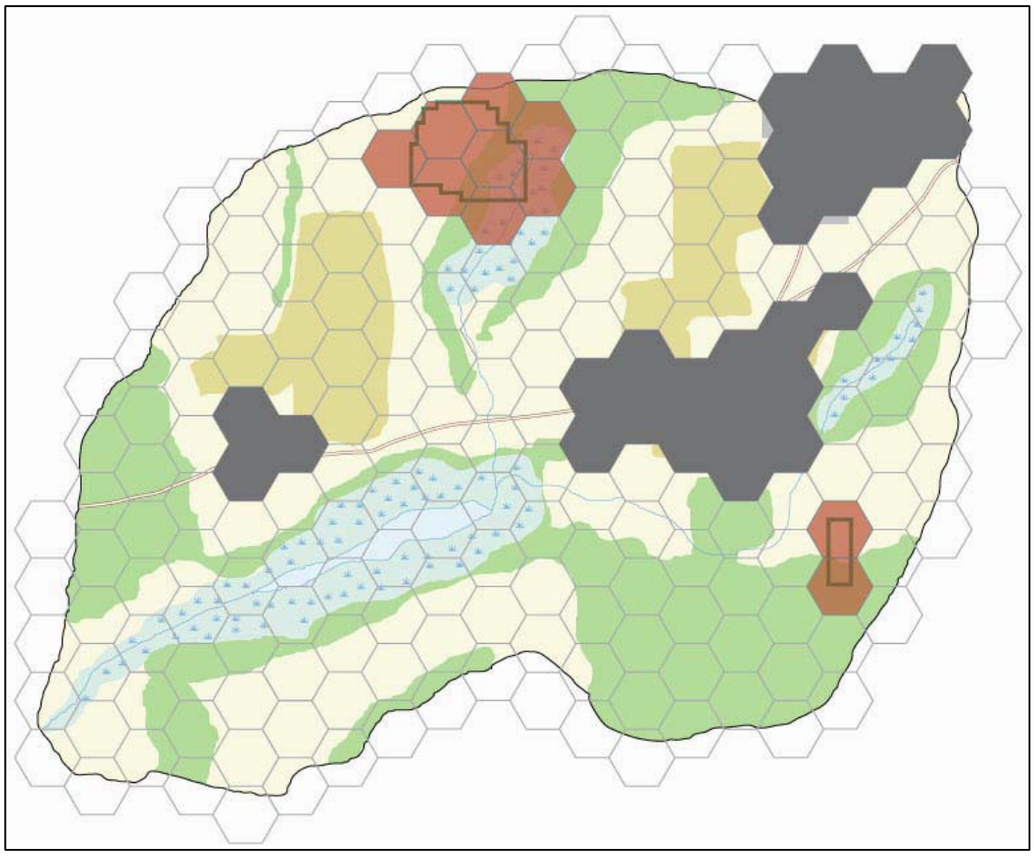
NATURAL HERITAGE SYSTEMS PLANNING MANUAL

INFORMATION FOR NIAGARA'S NHS SCENARIO DEVELOPMENT TEAM



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Niagara Region

NIAGARA PENINSULA CONSERVATION AUTHORITY

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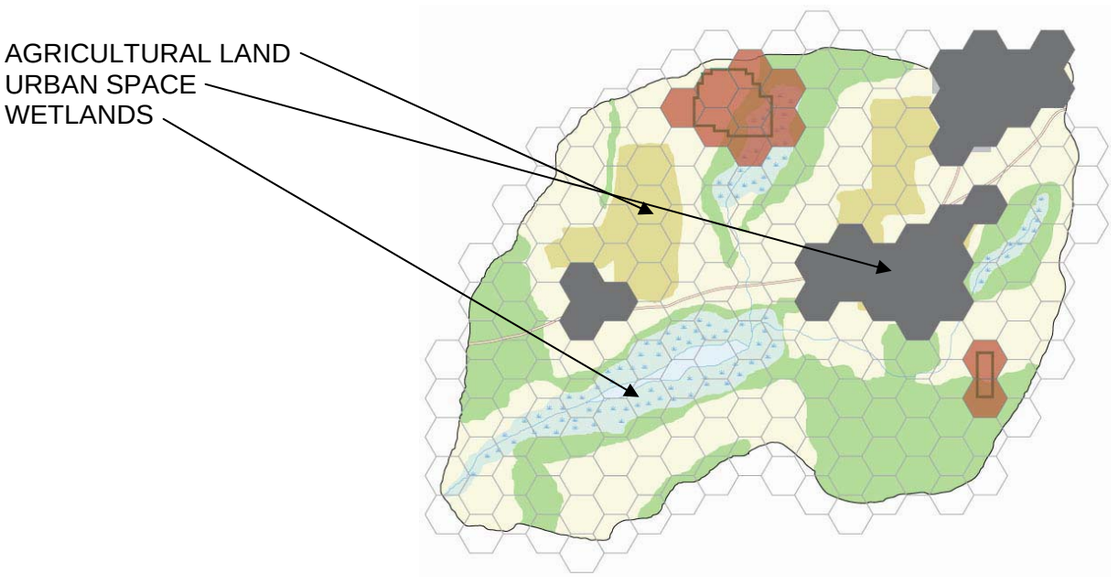
Introduction

This document provides information and assistance for Niagara's Natural Heritage System (NHS) Scenario Development Team (SDT) members as we work through this collaborative approach for developing plans for a natural heritage system (NHS) in the watershed. Stakeholders are engaged in the process from the start to the finish, developing through consensus, the plan that best fits our collective needs. This differs substantially from previous planning approaches where experts and planners decide what the values/issues are; what the objectives should be; and what the resulting plan should look like; and then try "to sell" their plan to stakeholders.

Niagara's NHS Project Team will use a modeling program called MARXAN (an acronym, fusing MARine, and SPEXAN, itself an acronym for SPatially EXplicit ANnealing). MARXAN supports decision-making and was initially designed to assist with selection of new conservation areas at minimal "cost" as well as, to help explore trade-offs between conservation and socio-economic objectives. MARXAN solutions can form the basis of discussions for natural heritage system planning that incorporates additional political, socio-economic and cultural factors.

The MARXAN model divides a defined area (in our case, the Niagara watershed) into numerous hexagons (each one representing 5 hectares) to which multiple data sets can be attached. Data is organized in terms of specific layers or filters so that a great deal of highly detailed information is compiled and available for analysis, and mapping.

An example of what MARXAN hexagons look like is illustrated below. Shading denotes different categories of land use within a specified area.



Our Scenario Development Team will work through three separate but related stages:

1. data gathering and analysis;
2. developing multiple scenarios;
3. deciding on preferred scenarios.

All the discussions and decisions are recorded on spreadsheets so that the technical analysts can determine the specific data needed to run the model, generate maps, and produce related resource material. See Appendix A for a sample of the spreadsheet.

NOTE: it is ideal to have the same participants present for each of the meetings because the knowledge accumulates. Having new/different people attend each meeting can slow down the process while they catch up with what has previously been discussed.

Following the NHS Planning Steps

OMNR has broken down this collaborative approach into the following ten steps:

Step 1 *– Identify the landscape for which an NHS is to be developed (i.e: Niagara watershed);*

Step 2 *– Determine who needs to sit at the table and participate in developing the NHS plan for the landscape;*

Step 3 *– Prepare the rule book (Terms of Reference) for the NHS planning project;*

Step 4 *– Stakeholder meetings to discuss what needs to be included within an NHS across the landscape;*

Step 5 *– Gathering information, building the maps, and reporting;*

Step 6 *– Stakeholder meetings to discuss how much of each natural feature should be included in an NHS and to come up with some "what-ifs";*

Step 7 *– Produce maps and reports to show the NHS options across the landscape under the various scenarios;*

Step 8 *– Stakeholder meetings to review results and develop a final NHS scenario for the landscape (both the Steering Committee and Scenario Development Team, and possibly public consultation);*

Step 9 *– Produce the maps and reports of the final NHS for the landscape;*

Step 10 *– Making the final NHS a reality and keeping it up-to-date.*

NPCA technical staff are available to help the SDT with its work going through these ten steps. Some of them (for instance, Steps 1-3) are fairly straightforward and need little detailed explanation. However, others such as Steps 4-8 involve substantial input from the SDT, requiring participants to understand a number of terms and processes. The following sections of this document provide some explanation and detail about what to expect from steps 4-8.

Step 4 – Stakeholder meetings to discuss what needs to be included within an NHS across the landscape

The Scenario Development Team will have several workshop style meetings to determine what to include in the scenarios for Niagara's NHS based on:

Socio-Political Constraints;
Targets;

Socio-Political Constraints
The term **"**socio-political" describes the relationship between social and political factors. It is used in this context because the labeling of some areas within the NHS is based on laws, conventions, and/or restrictions associated with levels of protection from international, federal, provincial, municipal and/or private institutions.

The idea of "constraints" reflects the fact that areas vary in their availability for inclusion and/or modification in a natural heritage system.

There are four different levels of "constraint status":
- *excluded;*
- *preferred;*
- *available;*
- *included (formerly referred to as conserved).*

For example, the group may consider that because prime agricultural land, built- up urban areas, and/or lands zoned for industrial development cannot be used for any other purpose, they should be labeled "*excluded*".

Some areas might be "*available"* (or "*preferred"*) for ecological restoration or other uses and would be identified as such. For example, land covered by the Conservation Land Tax Incentive Program (CLTIP), could be considered a good area to increase tree planting since the landowners have indicated support of conservation activity. Land under the CLTIP might therefore be "preferred" over non-CLTIP land that would be labeled "available".

The designation "*conserved*" means that the area in question must always be included in the natural heritage system (as would be the case for areas under a conservation easement).

Targets
Targets are defined as the minimum requirement for a given ecological objective within the NHS.

Establishing targets once again requires substantial input from the SDT who will define how much of a specific resource value (at a very minimum) needs to be included in the NHS.

For example, the SDT may decide that under the Biodiversity Target, 35% deciduous forest cover is a reasonable target for the Niagara watershed.

The resource values for the NHS are categorized into six different groups:

- Biodiversity Representation
- Ecological Function (Coarse Scale)
- Ecological Function (Fine Scale)

• Hydrologic Function
• Agricultural Value
• Cultural Value

These resource values are summarized in Table 1, along with examples of related targets.

Table 1: Resource Values in Natural Heritage Systems

Resource Value	Example of possible Target
Biodiversity Representation -represents unique vegetation communities, the foundation of ecosystems that contribute to biodiversity in Ontario.	To ensure that the natural heritage system includes the full variety of native wooded area ecosystems by ecodistrict soil landscape combinations, baseline targets should be set based on minimum 5% total wooded composition by type.
Ecological Function/ Coarse Scale wildlife Habitat -represents landscape features that contribute to ecological functions such as the movement of species.	To provide habitat for species with a range of resource requirements in riparian environments, baseline targets should be set at 10% of streams, rivers, lakes associated with natural vegetation to at least 300m.
Ecological Function/ Fine Filter Species -represents habitat planning for individual species and their specific habitat needs; -requires a finer level of detail.	To ensure a range of species (including those at risk, in decline, etc.) are supported, the SDT will have to determine a baseline target
Hydrologic functions -represents features that affect the quality and quantity of water needed to maintain healthy watersheds	To ensure that the NHS includes the minimum wetland cover by Tertiary and Quaternary Watershed requires a target of 10% wetland habitat in each major watershed with a suggested 6% wetland habitat in each subwatershed to ensure distribution.
Agriculture	TBDetermined
Cultural/Historical	TBDetermined

When **setting targets**, it will be important to consider not only how much should be included but also if different targets are necessary for the same feature, depending on how they are currently spread across the landscape. In all cases outside sources reflecting “expert opinion” and best available science at the time will be available to assist the SDT with their decisions.

Step 4 then is a comprehensive **FIRST** round of assessment for NHS planning. Once Step 4 is completed, technical analysts are responsible for **Step 5**, namely **"*Gathering information, building the maps, and reporting*".**

They will work with technical staff in stakeholder organizations to find data that reflect results from Step 4. When **data preparation** is complete, they can build the necessary maps and produce the reports that will show how the natural areas of interest and the values and issues associated with them are spread across the landscape. It may not be possible to map some of the natural features based on the criteria identified because the information is not available. If and when this happens, the technical team will note which natural features, constraints and/or costs are affected and suggest, where possible, alternatives that may still address what stakeholders would like to see.

Step 6 involves considering different **scenarios** that are generated by altering the baseline datasets for targets. These scenarios are designed to help answer specific "what-if" questions the SDT members might have which then are used to develop alternate scenarios.

For example, current scientific opinion indicates that we should have at least 30% forest cover by watershed to maintain hydrologic function. If this is the case then 30% would be the baseline target. But "what-if" we set it to 50% or 20%, what would that do? How would it affect the other targets? How much of the land base would need to be included in this type of NHS? Could we afford 50%? Could we live with 20%? The consequences of each vision can be determined by running the Model, thereby providing valuable information for landuse decision making.

The MARXAN Model explores millions of possible solutions and produces some that achieve the targets best under each scenario. This provides ample opportunity for all stakeholders to express their interest/concerns because they can quickly see the consequences of specific choices.

In essence, the model is used to rapidly provide the necessary feedback to the "What-If" questions posed by the SDT. Such feedback is generated during **Step 7** where the analysts will produce maps and reports to show the NHS options across the landscape under the various scenarios.

Steps 8, 9 and 10 are all concerned with reviewing results from different scenarios and then refining constraints, targets and costs so that eventually some clear choices emerge. During these steps, the SDT and technical analysts meet as often as needed to review and revise different options until individual stakeholders are as satisfied as possible with the results.

Because knowledge about the natural environment and the economic and social conditions across the landscape is guaranteed to change over time, data for the MARXAN Model will have to be regularly updated. Stakeholders may have to get together again to review the objectives, targets, constraints and costs to reflect these changes and those in the economic and social conditions across the landscape. But, because the MARXAN Model has been employed, the process would not have to begin at square one. Instead, not only the technical information base but also the collective experience, understanding and trust developed during the NHS planning exercise will serve stakeholders as they work on future plans and visions.

History of Marxan Modeling

A graduate student at the University of Adelaide, Australia (2000) developed the original product which has been modified and improved over the years. MARXAN has been used extensively by The Nature Conservancy (e.g. their Carolinian Marine Ecosystem Assessment), and is a major part of the systematic planning tools being used in the Global Marine Initiative. The World Wildlife Fund relied on MARXAN to define a Global set of Marine Protected Areas, the Roadmap to Recovery, which they employed to petition the UN about the creation of open ocean marine reserve networks.

The software is also found in terrestrial applications, such as: the North American Wildlands Project; Selecting priority areas for Global Mammal Assemblages; and the Great Sand Hills of Saskatchewan Regional Environmental Study.

MARXAN information is available through http://www.uq.edu.au/marxan/

Appendix A – Sample Spreadsheet

Category	***Definition***	***Example***
Value/Issue	*Specific resource value or issue identified by SDT - can be quantified and mapped*	*World Biosphere Reserves: Niagara Escarpment*
Value/Issue Type	*Is this value/issue a Target, or Constraint (or a Cost parameter)*	*Constraint*
Identified By	*Identifies the member of the SDT who raised the values/issue*	*Initial Recommendation by Lee-Ann Hamilton*
Date	*Date value issue was identified*	*15-Feb-10*
Mapping Criteria	*Description of the criteria necessary to map this values/issue*	*n/a*
Baseline Target(s), Constraint(s) or Cost(s)	*Identify the baseline target, constraint or cost for this value*	*Set constraint to PREFERRED - because it's an internationally recognized designation*
Comments	*General comments, supporting notes or background information rated to this value/issue*	
What-ifs	*Describe possible alternative parameters for this value/issue*	
Questions / Action Items		
Responses		

Glossary of Important Terms

MARXAN - an acronym, fusing MARine, and SPEXAN, itself an acronym for SPatially EXplicit Annealing

Resource value - is synonymous with the term ecological objective and refers to the categories of what we value for inclusion within the NHS.

Target - the minimum requirement for a given resource value within the NHS.

Costs - Besides identifying constraints and targets, the SDT also has to consider the costs (economic or opportunity) of including specific features within the NHS. Cost is usually assigned to a resource value or its related issue where the intent/objective is to maximize or minimize the amount of something within the system.

For example how can a community achieve all the ecological targets while minimizing the effect on prime agricultural or aggregate resource area. Subject to available information, cost can be based on land value or opportunity, cost can be based on the next best alternative land use or simply area (ha/acres) or a combination of factors. Some discretion and judgment is involved here, based on what makes most sense relative to the issue/value at hand. The goal is for the SDT to achieve consensus on decisions about the best way to assess optimal trade-offs between achieving targets and the lowest possible cost.

Excluded – areas that have a defined purpose that is not compatible with inclusion in the NHS and thus they must be excluded from the NHS 100% of the time.

Preferred – areas that have been identified as possessing characteristics that make them compatible with ecological objectives and thus they are more suitable than other areas for inclusion in the NHS.

Available – areas that possess no predetermined purpose and therefore are open to inclusion in the NHS.

Conserved – areas that have a designation ensuring their protection and thus they must be included in the NHS 100% of the time.

Socio-political constraint – refers to the way land is currently being used and refers to its availability for inclusion in the NHS based on laws, conventions, and/or restrictions associated with levels of protection from international, federal, provincial, municipal and/or private institutions.