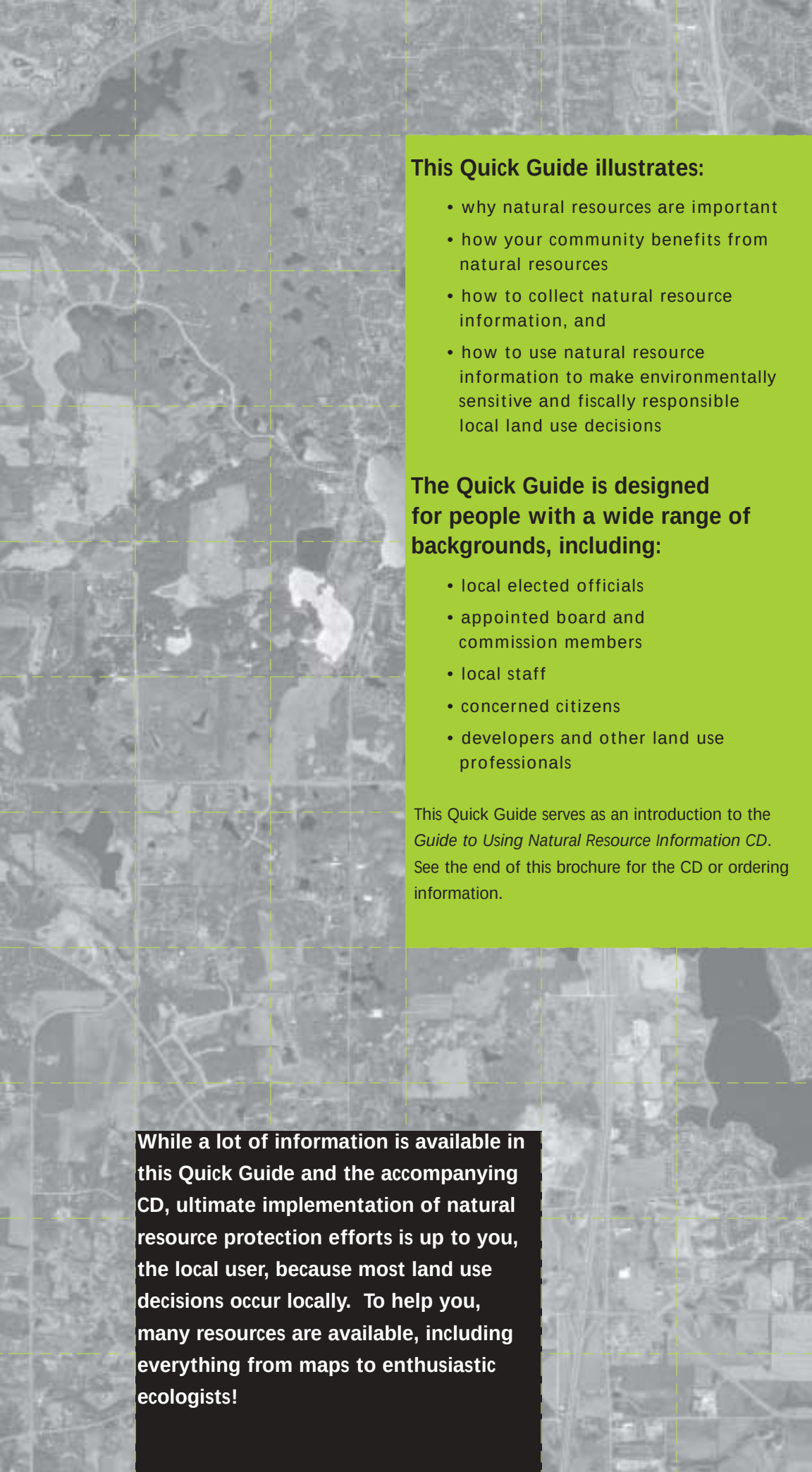
Protecting the Future

A Quick Guide to Using Natural Resource Information

Minnesota Department of Natural Resources, 2004



This Quick Guide illustrates:

- why natural resources are important
- how your community benefits from natural resources
- how to collect natural resource information, and
- how to use natural resource information to make environmentally sensitive and fiscally responsible local land use decisions

The Quick Guide is designed for people with a wide range of backgrounds, including:

- local elected officials
- appointed board and commission members
- local staff
- concerned citizens
- developers and other land use professionals

This Quick Guide serves as an introduction to the *Guide to Using Natural Resource Information CD*. See the end of this brochure for the CD or ordering information.

While a lot of information is available in this Quick Guide and the accompanying CD, ultimate implementation of natural resource protection efforts is up to you, the local user, because most land use decisions occur locally. To help you, many resources are available, including everything from maps to enthusiastic ecologists!

Natural Resource-Based Planning

Inventory

Assessment

Plan

Implementation

Planning, when done well, is among the most powerful tools available to communities. A solid plan, based on good natural resource information, guides rational land use decisions, and allows the community to consider innovative tools for resource protection with fewer chances for legal challenges to their planning authority. The plan also sends a clear message as to what the community values and wishes to preserve, and if well crafted, results in few surprises to developers, local officials, or residents.

Natural resource-based planning is a process that puts the community's natural resource base at the forefront. By identifying natural resources at the beginning of the planning process, your community can determine where development is most appropriate. This way, communities can avoid the unintended consequences of the typical planning process, such as open space becoming the 'leftover' pieces, water resources being degraded, and compromising community character.

THE KEY STEPS IN ***NATURAL RESOURCE-BASED PLANNING*** ARE:

1. Identify natural resource issues of importance to your community, such as water quality and wildlife habitat.
2. Conduct a natural resource inventory (NRI).
3. Develop a natural resource assessment (NRA) to identify priority natural resources for conservation and areas suitable for development. (The accompanying CD provides step-by-step information on how to complete steps 2 and 3.)
4. Develop a comprehensive plan, which outlines your community's priorities for conservation and growth.
5. Implement the plan. Be sure your community commits adequate funding to implement the strategies identified in the plan.
6. Monitor your community's progress.

Of course, community involvement at all phases is a key part of the natural resource-based planning process to ensure your planning investment has good support.

WHAT ABOUT ENVIRONMENTAL REVIEW?

While environmental review is an important tool at the site level, it needs to be used in combination with good ***natural resource-based planning***. Too often, the environmental review process is considered a 'firewall' against natural resource destruction by development. But many communities find that once a development proposal has gotten to the point of environmental review, it's too late to protect the vital assets they value most. Instead, a solid plan and an integrated set of strategies based on a natural resource inventory and assessment is a much better, more proactive way for a community to direct their future.

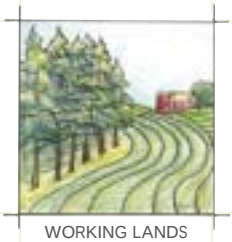
The Environmental Review Process is required under Minnesota Rules Chapter 4410. For more information visit the Environmental Quality Board website: *www.eqb.state.mn.us*

Functions of Open Space

Every open space or green space can serve a number of functions in your community, and falls within one or more of the following functional categories:

NATURAL RESOURCE PROTECTION

- Natural Resource Protection: protecting habitat, plant and animal communities, and environmental amenities like water and soil. Includes natural areas, rare & endangered habitats, riparian buffers, and aquifer recharge areas.
- Working Lands: providing natural resource-based commodities. Includes areas like farms, timber stands, and mining areas that are actively managed and critical to local economies.
- Outdoor Recreation: providing places for active and passive recreation. Includes parks, trails, athletic fields, water features, and nature areas used for activities like sports, picnicking, fishing, swimming, boating, hiking, or birdwatching.
- Public Health & Safety: protecting people and property from natural hazards like flooding, water supply contamination, and property loss. Includes flood prone areas, wellhead protection areas, water supply reservoirs, steep slopes and unsuitable soils.
- Community Character: giving your community a sense of itself. Includes historic sites, town squares, scenic vistas and other places treasured by local people.



WORKING LANDS

Green Infrastructure

Natural resources are a fundamental building block of every city, township, and county. Just as each community has a "gray infrastructure" of streets and utilities, communities also have a "green infrastructure" of the natural systems in and around them.

It's very important that communities are clear about the intended use and management of their existing and planned open spaces or green spaces. By thinking in these functional terms, your community can effectively define and plan for all its natural resource related needs, now and in the future.

OUTDOOR RECREATION

COMMUNITY CHARACTER

PUBLIC HEALTH & SAFETY

Changes to the Land

A natural landscape is essentially a continuous mosaic of natural habitats. Human land uses have consumed habitat and drastically changed the vegetation and hydrology of the landscape. In Minnesota, the native prairie in the southern and western parts of the state has been largely replaced by agriculture; logging has resulted in younger and less diverse northern forests. As people use the land, the natural landscape is divided into ever-smaller pieces by elements like railways, utility lines, roads, houses, warehouses, and parking lots. The remaining natural areas, or fragments, are reduced in size and degraded in quality, resulting in a decline in plant and animal populations, and the disappearance of some sensitive animal species, plant species, and plant communities.

FIGURE 1: RAPID CHANGE - THESE AERIAL PHOTOS SHOW HOW ROADS AND RESIDENTIAL DEVELOPMENT CREATES BARRIERS BETWEEN WETLANDS AND BISECTS WOODED AREAS – ALL IN LESS THAN A DECADE. IMAGES FROM 1991 AND 2002.

HOW DOES FRAGMENTATION IMPACT THE ENVIRONMENT?

- **Fragmentation results in a dramatic increase in 'edge' habitat**, which provides increased access to the more protected interior habitats by predators, including domestic animals.
- **Fragmentation creates barriers to wildlife movement**, and is especially harmful to reptiles and amphibians that depend on the ability to move between their aquatic habitats and upland areas.
- **Fragmentation creates opportunities for harmful exotic plant species to invade.** Many exotics can out-compete native plant communities and often provide little or no habitat value.
- Because it's associated with human activity, **fragmentation often brings pollutants and other disturbances (lights, noise)** that can profoundly impact wildlife habitat and degrade water quality.

While many development features like roads and power lines are essentially permanent, the effects of fragmentation can be reduced by:

- Placing very high priority on protecting existing large tracts of habitat
- Restoring land and water connections between existing habitats, creating wildlife corridors
- Managing conservation lands to maximize native habitat diversity and maintain critical ecosystem functions

Natural Resources and Your Community

Green infrastructure provides environmental benefits like supporting wildlife, improving the quality of air and water, and providing places for people to interact with nature. Natural resources also provide many other benefits for your community, such as:

- Improving human health, well being, and quality of life
- Minimizing the effects of floods
- Increasing property values
- Reducing energy costs
- Reducing infrastructure costs
- Supporting economic development and tourism

Impacts to natural resources are also closely linked to your community issues such as land use, housing, economic development, transportation, utilities, and community services.

Consider:

- Will development harm the resources that draw people to my community?
- How will land use changes increase the risk of flooding or affect water quality?
- What is the community's risk for loss of life and property due to wildfire?
- How effectively are industrial wastes cleaned up before being released into the environment?
- How does the construction and operation of roads impact wildlife and water quality?
- Are individual sewage treatment systems properly maintained to prevent pollution of groundwater and nearby lakes and rivers?
- Are new impervious areas such as roads and parking lots cutting off groundwater recharge thus impacting water supplies and streams, lakes and wetlands?

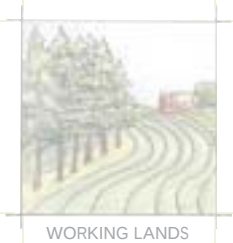
Damaging green infrastructure can have unforeseen consequences and profound negative impacts on your community. More importantly, the benefits of properly preserving and managing the natural resources within your community can be tremendous.

Did you know?

Owners of small companies ranked recreation/parks/open space as the HIGHEST priority in choosing a new location for their business.

Source: The Conservation Fund, 2002. Green Infrastructure: A Strategic Approach to Green Space Planning and Conservation.

PUBLIC HEALTH & SAFETY



WORKING LANDS

PUBLIC OPINION SAYS:

- Natural areas such as lakes, wetlands and forests are important – 96% agree
- Purchasing and maintaining natural areas plays a very important role in preserving the quality of life in my area – 88% agree
- My county should have an ongoing program to purchase, restore and maintain natural areas – 83% agree

Reference: American Viewpoint, Inc., 2000. Twin Cities Metropolitan Natural Areas Survey.

How to do a Natural Resource Inventory

A Natural Resource Inventory (NRI) is the information collected to identify the location and character of natural resources. A Natural Resource Assessment (NRA) is an analysis of the NRI to aid in decision-making and management efforts.

A NRI is simply a collection of data represented by descriptive maps. It can include anything from a simple hand-drawn map to comprehensive GIS-based land cover maps.

YOU NEED SEVERAL PIECES OF CORE INFORMATION TO CONDUCT A NRI:

- base map (political boundaries and roads)
- aerial photos
- topography
- plant communities and wildlife
- soils
- water features (lakes, wetlands, and watercourses)
- floodplains
- natural areas/open space
- other community specific information (gravel resources, failing septic systems, etc.)

Most of this core information is available statewide for free or at low cost. Much is already on the internet.

What is generally missing is detailed information about natural areas and open space. The rest of this section will focus on collecting and organizing those details for your inventory. Call your local Department of Natural Resources Office, County, Soil and Water Conservation District, and Natural Resources Conservation Service District offices to find out what information is already available.

Keep in mind the NRI is an important step in the Natural Resource-based Planning process and will be used as the basis for many of your community's decisions. Because it is such a critical component in the planning process, take some time to think about what approach you want to take. Two possible NRI approaches are: Hand-drawn and GIS-based.

If you use a GIS-Based approach, your NRI will be updatable, modifiable, sharable, comparable, and contain powerful analysis features. Although much GIS data are available for free, keep in mind that creating new and detailed information requires a higher level of expertise and equipment. Hand drawn mapping and GIS are only as good as the data used. Great care must be taken to ensure the information generated will be useful and accurate.

What is GIS?

A Geographic Information System, better known as a GIS, is a powerful computer-based mapping program that allows for the creation, manipulation, and analysis of a wide variety of information. With a GIS you can overlay soils, topography, roads and natural resource information to identify and prioritize natural resource protection and management. The GIS also allows you to easily create and update maps to communicate this information to a diverse audience.

OUTDOOR RECREATION

Steps to assembling a NRI– A NRI should be done in the broader context of the natural resource-based planning process.

THE KEY STEPS IN **NATURAL RESOURCE-BASED PLANNING** ARE:

1. Identify community issues and goals.
2. ***Conduct a natural resource inventory.***
   - *– Identify and gather existing information*
   - *– Determine NRI Approach– Hand-drawn or GIS-based*
   - *– Gather new information and record it*
   - *– Review mapping with community*
   - *– Refine mapping if necessary*
3. Conduct an assessment of your NRI.
4. Develop a plan.
5. Implement the plan.
6. Monitor your community's progress.

Hand-Drawn NRI– Although many communities are taking advantage of the power of GIS, others may not have access to computers or GIS programs. For generations, hand-drawn maps have been used to visualize communities and landscapes, and many very good plans have been made with this approach. Any community can create a valuable NRI, regardless of the technology available.

This process can be done for a wide variety of natural resource information that a community needs to collect in order to make local decisions. Figure 2 shows how a hand-drawn NRI could look.

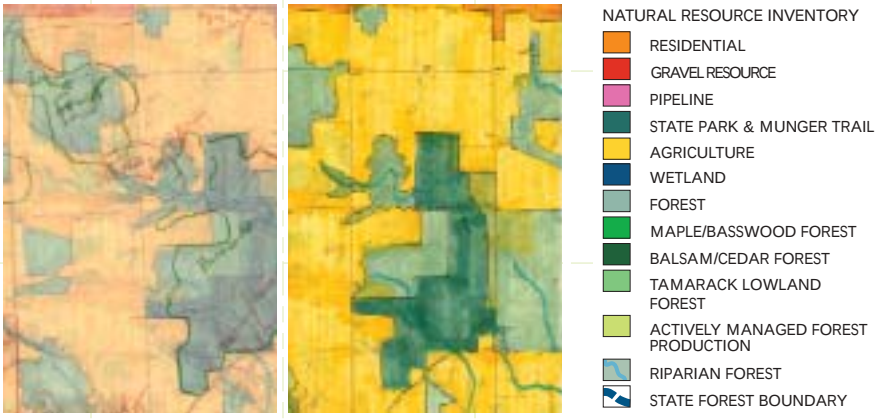


FIGURE 2: HAND-DRAWN NRI EXAMPLE FROM CARLTON COUNTY.

GIS-Based NRI– As noted above, many advantages exist to using a GIS to complete a NRI. Much of the core information you need may already be available. The GIS-based approach is similar to the hand-drawn approach except maps are generated on a computer. (See Figures 3, 4 and 5)

THE NATURAL RESOURCE GUIDE CD PROVIDES DETAILED INFORMATION ABOUT HOW TO USE NATURAL RESOURCE INFORMATION.
TO OBTAIN A COPY, SEE THE INSIDE BACK COVER OF THIS BROCHURE.

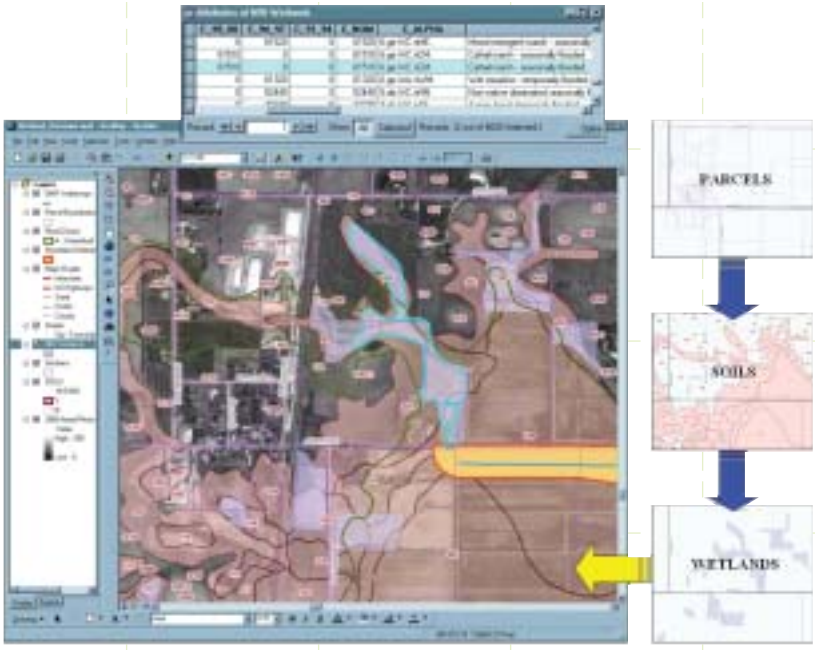


FIGURE 3: MAPS IN A GIS CAN BE OVERLAPPED AND LINKED TO A DATABASE.

FIGURE 4: GIS-BASED NRI PROCESS– MAPPING, INTERPRETATION, FIELD-CHECKING, AND DIGITIZING

Combination NRI– Hand-drawn and GIS-based approaches can be combined to meet the needs and capabilities of your community.

As you begin the process of assessing your NRI, the community may come to the realization that more detail is needed to answer critical questions. Don't let this derail your process. Continue to move forward while finding funding and/or partners to conduct a more detailed inventory.

What is the MLCCS?

The Minnesota Land Cover Classification System (MLCCS) is a method of GIS land cover mapping that describes what is on the ground based on the type of vegetation (or lack of it) and the amount of impervious surface (such as pavement and buildings). MLCCS was developed specifically for Minnesota, and classifies urban, suburban, agricultural areas, and vegetated areas. With the MLCCS you can:

- identify lands and natural corridors to conserve
- model impacts of impervious areas on water resources
- and much more

MLCCS data are already available for portions of Minnesota, especially in the greater Twin Cities metropolitan area. Contact the Central Region GIS Analyst at the DNR for availability and training information at 651-772-6150.

FIGURE 5: GIS-BASED NRI – LAND COVER USING THE MINNESOTA LAND COVER CLASSIFICATION SYSTEM (MLCCS)

PARTIAL LEGEND ILLUSTRATES MAPPING OF ARTIFICIAL SURFACES WITH TREES AS THE DOMINANT VEGETATION COVER

How to do a Natural Resource Assessment

The Natural Resource Assessment is the third step in Natural Resource-based Planning process. In this step, information collected in the inventory is used to rank and prioritize areas for open space protection or investigation of other local natural resource issues.

THE KEY STEPS IN **NATURAL RESOURCE-BASED PLANNING** ARE:

1. Identify community issues and goals.
2. Conduct a natural resource inventory.
3. ***Conduct an assessment of your NRI.***
4. Develop a plan.
5. Implement the plan.
6. Monitor your community's progress.

The assessment process will vary depending upon community goals, issues, and features identified during the NRI.

A NRA can range from a simple visual analysis to detect patterns on a map to a complex rain water runoff model (this generally requires GIS).

A Visual NRA is a qualitative approach that works well with a Hand-Drawn NRI, but can also be used with a GIS-Based NRI.

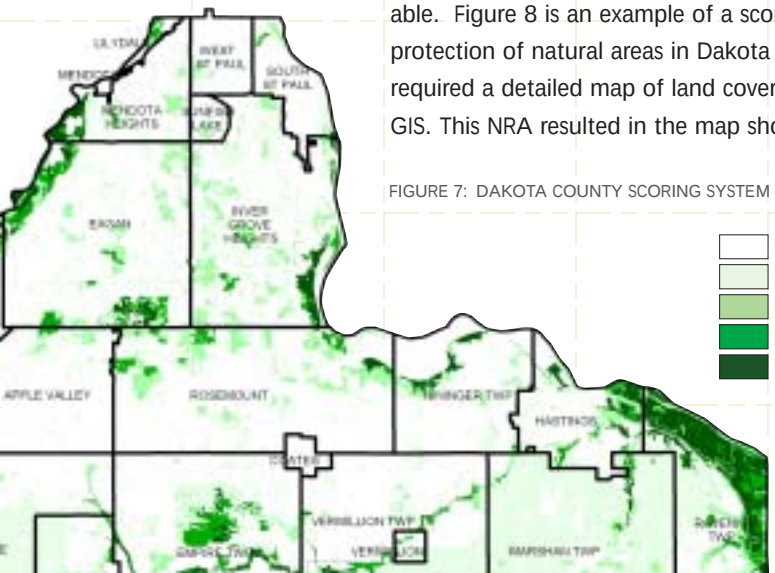
NATURAL RESOURCE ASSESSMENT

- RESIDENTIAL EXISTING & FUTURE EXPANSION
- GRAVEL RESOURCE
- PIPELINE/HAZARD BUFFER
- PARK & TRAIL BUFFER
- AG PRESERVATION
- FOREST PRESERVATION PROTECT & ENHANCE EXISTING HIGH QUALITY FOREST
- RIPARIAN BUFFERS
  - PROTECTS WATER QUALITY
  - PROTECTS STEEP SLOPES
- WETLAND/FOREST COMPLEX
  - PROTECTS WATER QUALITY
  - SOILS NOT SUITABLE FOR DEVELOPMENT
  - LOW DENSITY RESIDENTIAL

FIGURE 6:
IMAGE OF EXAMPLE VISUAL NRA
EXAMPLE FROM CARLTON COUNTY

An Advanced NRA can be used if your community requires a more quantitative approach and a number of model assessments are available. Figure 8 is an example of a scoring system used to prioritize protection of natural areas in Dakota County. Using this type of NRA required a detailed map of land cover and the use of a sophisticated GIS. This NRA resulted in the map shown here in Figure 7.

FIGURE 7: DAKOTA COUNTY SCORING SYSTEM



ECOLOGICAL CRITERIA FOR SCORING LAND COVER	VALUE (1-100)
Habitat Size	
Large	100
Medium	70
Small	40
Rare Natural Community	100
Rare Plant Species Present	100
Rare Animal Species Present	100
Agricultural Land	40
Urban Green Space	30
Vegetated Stream Corridors (300 ft. buffer)	50
Trout Stream Areas	100
Undeveloped Lake Shore (300 ft. buffer)	
Vegetated	80
Agriculture	40
Patches of Natural and Semi-Natural Vegetation	100
Corridors of Natural and Semi-Natural Vegetation	70

FIGURE 8: CRITERIA FOR SCORING NATURAL AREAS IN DAKOTA COUNTY

"Firewise: Minnesota" is a DNR program that uses a NRA to determine wildfire risk. Communities growing into landscapes of forest and wetlands are at increasing risk of catastrophic loss of life and property to wildfire. Such losses are readily preventable if the community adopts and implements a "firewise" community plan, including surrounding homes with defensible space free of fire-prone vegetation. Communities who do not know where their wildland fire risk exists can undertake a quick, broad survey of their risk based on the amount of defensible space surrounding individual homes. Here, aerial photographs are used to give a defensible space rating on a scale of 1 to 5 based on vegetative clearance around the home. Using a GIS, ratings are then accumulated into a risk density map where the areas of greatest risk are shown in yellow and orange. With this information, the local fire department can efficiently target their risk mitigation strategies and work with the landowners to reduce the danger. The project shown was done by trained high school students. (See Figure 9)

The next steps in the Natural Resource-Based Planning Process are to use the NRA to develop and implement your plan using a variety of tools.

COMMUNITY CHARACTER

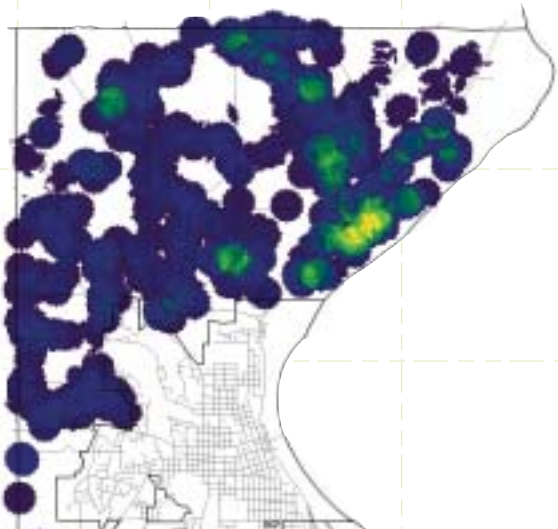


FIGURE 9:
FIREWISE RISK ASSESSMENT IN A PORTION OF WASHINGTON COUNTY

Planning and Implementation

THE KEY STEPS IN **NATURAL RESOURCE-BASED PLANNING** ARE:

1. Identify community issues and goals.
2. Conduct a natural resource inventory.
3. Conduct an assessment of your NRI.
4. ***Develop a plan.***
5. ***Implement the plan.***
6. ***Monitor your community's progress.***

Once the NRA is completed, it's time to create or modify your community's plan for conservation and development. As a local decision maker, you will rely on many tools for its implementation. Some of them include:

- land use regulations
- zoning and ordinances
- land and easement acquisition
- voluntary approaches

See the resource list on the CD or website to find out where to get more information about tools available to you.

You can increase the effectiveness and efficiency of these tools when you combine their use with natural resource information. Here is an example from one Minnesota Community:

LAND USE REGULATIONS AND ZONING – MORATORIUM & AUAR IN HUGO

Through the 1990's, the City of Hugo still functioned like a mostly agricultural township with homes on 5-10 acre lots plus a handful of businesses and a few small subdivisions. Then, substantial growth pressure came with several large landowners wishing to sell and develop their land. So, in 1999, the city put a moratorium on development in order to improve their water system, hire staff, update their comprehensive plan and zoning ordinance, and develop plans for their primary growth areas. The community used the Alternative Urban Areawide Review (AUAR) tool to address the future of a 1200-acre area where development pressure was greatest. Through the AUAR process, MLCCS land cover mapping was used to identify significant habitat and the city adopted new land use and park and open space plans that featured interconnected wildlife and greenway corridors (Figure 10). The moratorium and AUAR cooperatively involved the city, landowners, residents, and developers who were pleased with the results – rather than "changing the rules as you go." The community now has an agreed-upon direction for the future.

The AUAR is another form of environmental review. To learn more see the contact information on page 1 of this brochure.

FIGURE 10:
PARK & OPEN SPACE PLAN
HUGO

Natural Resource Data Sources

SCALE	DATA	BASIC ANALYSIS	ADVANCED ANALYSIS	WHERE TO GET IT
REGIONAL	LandSat-Based Land Use/ Land Cover/GAP	Land Cover/Land Use	Forest Resources, Developed Land, Habitat Connectivity and Types, Land-scape Patterns, Conservation Priority	Available Statewide – DNR Data Deli – *http://deli.dnr.state.mn.us*
	"Improved" Land Use/Cover	Good metrowide data for identifying natural areas	Habitat Connectivity and Types, regional Greenway analysis	Available for the Metro Area – Contact the DNR or visit the Metropolitan Council's Metro-GIS website *http://gis.metc.state.mn.us/*
	Water Features	Lakes, Rivers, and Streams	Buffers, Corridors	Available Statewide – DNR Data Deli – *http://deli.dnr.state.mn.us*
LOCAL	Significant Native Plant Communities and Rare Species	Native Plant Communities, Rare Species	Ecological Quality, Priority Natural Areas, Animal Habitats	Available for many counties across the state – Contact the DNR (rare species data requires signed data use agreement)
	Minnesota Land Cover Classification System	Land Cover	Impervious Surfaces, Habitat Connectivity and Types, Species Dominance, Invasive Species	Available Locally – Contact DNR's Central Region GIS Analyst at 651-772-6150 for availability
	Forest Inventory	Forests	Forest Stand Evaluations	Available for all state forest lands and some other public lands – DNR Data Deli – *http://deli.dnr.state.mn.us*
	National Wetland Inventory	Wetlands	Wetland connectivity and hydrology	Available Statewide – DNR Data Deli – *http://deli.dnr.state.mn.us*
	Digital Aerial Photo	Aerial Photo. Interpretation	Aerial Photo. Interpretation	Available Statewide – DNR Data Deli – *http://deli.dnr.state.mn.us*
	Street Tree Inventory	Trees	Street Tree Management	Available Locally – Contact your local municipality
BOTH	General information, scanned maps, USGS quads	Place natural resources in surrounding context	Find incapable land uses, spatial statistics, etc.	DNR GIS Analyst – call 651-772-6150 DNR Data Deli – *http://deli.dnr.state.mn.us* Minnesota Geological survey – call 612-627-4780

Try contacting your County or Soil and Water Conservation District for assistance with getting information to conduct a NRI and NRA.

Want to do a NRI in the seven-county Minneapolis-St. Paul (Minnesota) metropolitan area? Visit the MetroGIS website - *www.metrogis.org* – to obtain data.

The Minnesota Environmental Atlas is an electronic textbook that delivers the best of Minnesota's statewide GIS data. The atlas contains more than 250 digital maps along with the software to retrieve and analyze the information. The Atlas is fast, easy-to-use and requires no formal GIS training. For more information, contact Jim Ramstrom at jim.ramstrom@state.mn.us or 651-296-2559.

Where do we go next?

The Natural Resource Guide CD is a great place to go next. It provides much more detailed information about how to use natural resource information and who can help. If the CD is not inserted in this brochure, contact the Minnesota DNR to obtain a copy or learn who you should contact locally.

References

Better Site Design: A Handbook for Changing Development Rules in Your Community. Center for Watershed Protection, 1998.

Green Infrastructure: A Strategic Approach to Green Space Planning and Conservation. The Conservation Fund, 2002.

Land Protection Options: A Handbook for Minnesota Landowners (second edition). MnDNR and The Nature Conservancy, 2000.

Conserving Wooded Areas in Developing Communities: Best Management Practices in Minnesota. MnDNR, 2000.

Natural Areas: Protecting a Vital Community Asset - A Sourcebook for Minnesota Local Governments and Citizens. MnDNR, 1997.

Guide to Minnesota Environmental Review Rules. Minnesota Planning, Environmental Quality Board, 1998.

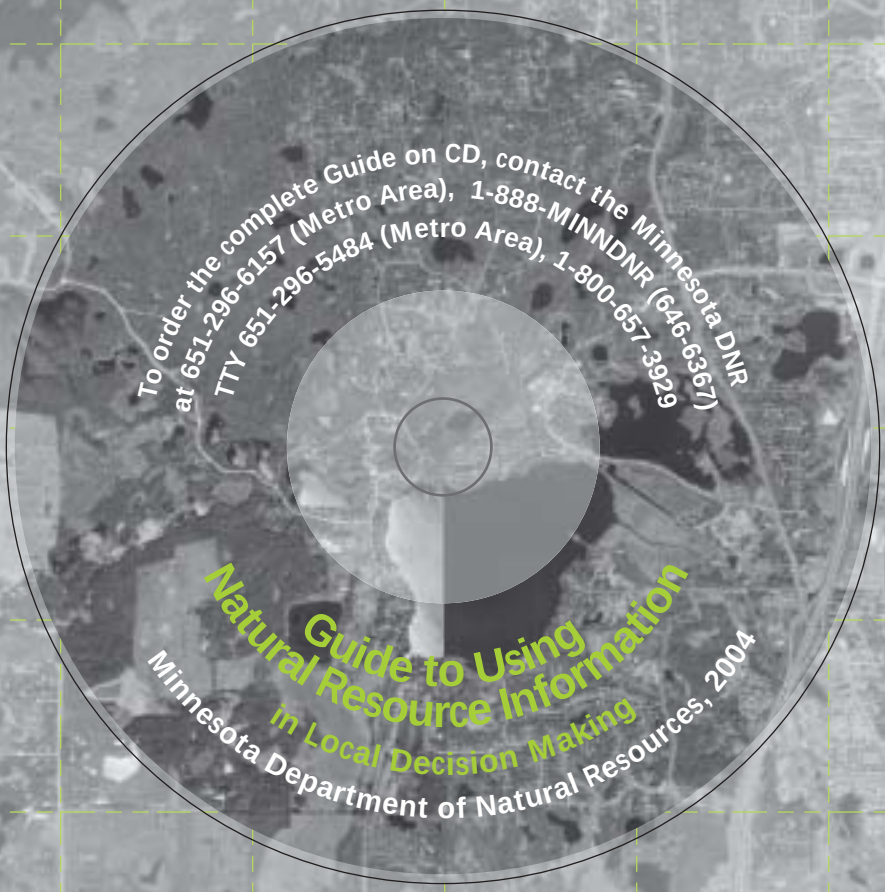
Project NEMO. University of Connecticut Extension. www.nemo.uconn.edu, 2003.

Acknowledgements

Produced by Minnesota DNR and
Dakota County Soil and Water Conservation District

Minnesota Department of Natural Resources
For More Information Contact:
DNR Information Center
500 Lafayette Road
St. Paul, MN 55155 - 4040
651-296-6157 (Metro Area)
1-888-MINNDNR (646-6367)
TTY 651-296-5484 (Metro Area)
1-800-657-3929
www.dnr.state.mn.us

Dakota County Soil and Water Conservation District
4100 220th St. West, Suite 102
Farmington, MN 55024
651-480-7777
www.dakotacountyswcd.org



Printed on recycled paper containing a minimum of 30% post-consumer waste and soy-based ink.

Dakota County Soil and Water
Conservation District
4100 220th St. West, Suite 102
Farmington, MN 55024