Exploring Conservation Authority Operations in Sudbury, Northern Ontario: Constraints and opportunities

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Abstract

This research explores how the Nickel District Conservation Authority (NDCA), in Sudbury, northern Ontario was affected by provincial restructuring through a survey of budget data and programs from the period of existing data (1980-2002). Previously identified hinterland characteristics are considered in relation to the NDCA to explore how land base and socio-economic attributes influence operations. Since provincial reforms began in 1992, results show a general decline in NDCA revenues, with a steep decrease in provincial funding by 78.5%, while municipal funding has increased by 22%. Mean annual resource and conservation program spending have decreased 57% and 77% respectively. Conservation, education, and recreation programs accounted for 5% of total program spending from 1996 to 2002. Taken together, existing policy and context challenge the NDCA as an agent of environmental conservation, and highlight the need to develop strategies to address regional issues. The Conservation Authority (CA) founding principles are used to frame the discussion of results and implications for the NDCA. The conclusion provides a brief summary and outlines key areas for further research. Research

addressing 1) resident perceptions of and support for CAs, 2) cost-sharing and service alliance assessments, 3) feasibility assessments for user fee generating recreation facilities, and 4) regional quantitative analyses of contextual land base and socio-economic factors affecting CA performance are needed. Satisfying these research needs, among others, will broaden local and regional understanding of Ontario CAs and advance provincial conservation initiatives.

Les auteurs de cette recherche analysent la manière dont le Office de protection de la nature du District du Nickel (OPNDN) de Sudbury, dans le nord de l'Ontario, a été touché par la réorganisation provinciale, en faisant un relevé des programmes et des données budgétaires de 1980 à 2002. Les caractéristiques de l'arrière-pays dégagées précédemment y sont examinées afin d'étudier la manière dont les caractéristiques du territoire et les caractéristiques socioéconomiques influent sur le fonctionnement de l'OPNDN. Depuis le début des réformes provinciales en 1992, les résultats indiquent un déclin général des revenus de l'OPNDN, avec une importante diminution du financement provincial de l'ordre de 78,5 p. 100, alors que le financement municipal a augmenté de 22 p. 100. Les ressources et les dépenses annuelles moyennes ont augmenté de 57 p. 100 et 77 p. 100 respectivement. Les programmes de conservation, de sensibilisation et de loisirs ont compté pour 5 p. 100 des dépenses totales de 1996 à 2002. Ensemble, la politique et le contexte actuels mettent l'OPNDN au défi à titre d'agent de conservation environnementale et mettent en lumière le besoin d'élaborer des stratégies visant à traiter des problèmes régionaux. On utilise les principes fondateurs des offices de protection de la nature pour encadrer l'analyse des résultats et des conséquences pour l'OPNDN. La conclusion présente un bref sommaire et donne un aperçu des principales questions nécessitant des recherches plus approfondies. Il faut effectuer des recherches sur les sujets suivants : 1) la perception des résidents des offices de protection de la nature et le soutien qu'ils leur offrent; 2) des évaluations sur le partage des coûts et sur l'alliance de services; 3) des études de faisabilité d'installations récréatives générant des frais d'utilisation; 4) des analyses quantitatives générales des facteurs liés au territoire et des facteurs socioéconomiques influant sur le rendement des offices de protection de la nature. Répondre à ces besoins en matière de recherche permettra, entre autres, de mieux comprendre, aux échelles locale et régionale, les offices de protection de la nature de l'Ontario et de faire progresser les initiatives provinciales de conservation.

Keywords
Conservation Authorities, funding, Nickel District Conservation Authority, northern Ontario, Sudbury

Introduction

Pioneers of the Ontario conservation movement realized that managing the natural environment required the sound organization of human activities. In turn, Conservation Authorities (CAs) were established to deal with the mismanagement of land use activities resulting in deforestation, flooding, and soil erosion (Richardson 1960). The 1946 *Conservation Authorities Act* permitted the for-

mation of local management agencies, each supported by a broad mandate to "establish and undertake, in the area over which it has jurisdiction, a program designed to further the conservation, restoration, development, and management of natural resources other than gas, oil, and minerals" (R.S.O. 1990, c C.27, s. 20). Consideration for relevant economic, institutional, and ecological factors was embodied in founding principles providing flexibility and stability (Table 1). These principles are believed to have foreshadowed sustainable development and the ecosystem approach and are considered crucial to the success of CAs (Mitchell and Shrubsole 1992).

Despite great success, Ontario CAs endured provincial policy and funding changes during the 1990s that significantly constrained agency operations and programming. Considerable variation in function, form, and context across CAs (Mitchell and Shrubsole 1992) suggests that each may have responded differently according to local conditions. Previous discussion of the implications of restructuring has focused on urban and rural CAs in southern Ontario (e.g. Shrubsole 1996, OWPIPMC 1997, Fehl 1997, Krause *et al.* 2001, Ivey *et al.* 2002). This underscores an ongoing disparity between CA research focused on southern Ontario (e.g. Richardson 1960, 1974, Powell 1981, Hale 1988, Thomson and Powell 1992, Shrubsole 1990, Mitchell and Shrubsole 1992, Shrubsole 1996, Fehl 1997, Krause *et al.* 2001, Ivey *et al.* 2002) versus northern Ontario. There is agreement that regional land base and socio-economic attributes influence the viability of CAs (OSCCA 1967, Thomson and Powell 1992, Mitchell and Shrubsole 1992). Thus, gaining an understanding of how CAs in outlying jurisdictions (e.g. northern Ontario and non-core rural areas in southern Ontario) have responded to the mid-1990s reforms is necessary.

This exploratory research describes how the Nickel District Conservation Authority (NDCA) in Sudbury, northern Ontario responded to provincial policy and funding changes during the mid-1990s. It is a step towards future compara-

Table 1. Ontario CA Founding Principles and Predicted Implications

Local Initiative	watershed municipalities must work together; grassroots involvement in local resource management
Provincial-Municipal Partnership	cost-sharing; top-down technical advice coupled with local knowledge
Watershed Management Unit	political boundaries do not always match those of natural systems; whole systems must be addressed
Healthy Environment/Healthy Economy	conserving natural resources supports socio-economic development
Comprehensive Approach	address land and water issues in urban and rural settings
Coordination and Cooperation	interagency collaboration to benefit public and private interests

(Adapted from Mitchell and Shrubsole 1992)

tive research on contextual influences and CA operations throughout Ontario. The study investigates the dynamics of NDCA funding and programming for the period of available data (1980-2002) to profile temporal differences in funding and program diversity. Previously identified hinterland characteristics are considered in relation to the NDCA to explore how land base and socio-economic attributes influence operations. The CA founding principles are used to frame the discussion of the changes and implications for the NDCA (see Shrubsole 1996).

Context

Key Funding and Policy Changes

CAs receive funding from local taxes levied from watershed municipalities, provincial transfer payments through the Ontario Ministry of Natural Resources (OMNR), federal grants, and "other" monies gathered mainly through recreation user fees, consultation and permit fees, land sales and leasing, private partnerships, and charitable donations. The importance of each revenue source has varied over time according to shifting provincial policies, individual CA initiatives, and external factors. Focusing on the 1990s, this section outlines key funding, policy, and geographic issues to contextualize the current research.[1]

The 1987 *Review of the Conservation Authorities Program* was followed by major changes that seriously affected CA operations and programs. At the time of the 1987 *Review*, 13 CAs were receiving full grants totalling 80% to 85% of annual revenues; thus, provincial reforms were meant, in part, to change the balance of the provincial-municipal partnership.

1) In 1991, the OMNR announced the introduction of core and non-core programming to focus CA funding and responsibilities. Flood and erosion control, conservation areas, and conservation information were retained as funded core programs, while outdoor education and awareness programs were considered non-core.
2) Cost-sharing partnerships were also adjusted. Provincial supplemental grants (once 5% to 30% of annual revenues) were phased out and new standard grant rates were set for capital programs (50%) and operating programs (50% to 70% based on watershed populations and assessments). CAs in northern Ontario were to receive enhanced grant rates for capital (60%) and operating programs (75%).
3) In 1992 the provincial government introduced sweeping funding cuts due to economic recession in Ontario (Shrubsole 1996). Total provincial funding to CAs decreased by about $10 million from 1992 to 1993 (OMNR 1997).
4) In 1995 a new provincial government and budget imposed further substantial cuts. From 1995 to 1998 the OMNR experienced a 42% budget reduction (Winfield and Jenish 1999). Since CAs are based in the OMNR, total provincial funding to CAs dropped from $38 million in 1995 to $10 million in 1997 (OMNR 1997, cited in Fehl 1997). The

[1] Earlier work on the Ontario CA program comprehensively reviews its history, shifting policy climate, and operational issues up to the mid-1990s (e.g. Richardson 1974, Mitchell and Shrubsole 1992, Shrubsole 1990, 1996).

provincial changes outlined above combined for an 87% reduction in total provincial funding to CAs from 1992 to 2004 (Conservation Ontario 2004a).

5) Finally, reduced transfer payments to municipal partners, rising insurance rates, and tax increases during this same period caused additional pressure (Shrubsole 1996, OMNR 1987). These events caused an overall reduction and reorganization of Ontario CA operations.

Fehl's (1997) analysis of revenue source data (1990-1997) for 20 CAs found a three-tiered hierarchy of CAs in southern Ontario based on population size, density of development, initial dependence on provincial funding, and opportunities for revenue replacement and diversity. Further review of 5 CAs in southern Ontario indicated less dense rural CAs with a high initial dependence on provincial funding (>50% annual revenue) experienced the largest reduction of funding, staffing, and service provision. Urban CAs responded better due to lower initial dependence on provincial funding (25% average) and greater opportunities for revenue diversification and park income.

Difficulties maintaining and expanding programming, internal restructuring, reduced local capacity, and integration barriers are commonly cited challenges for CAs in southern Ontario (Shrubsole 1996, Fehl 1997, OWPIPMC 1997, Krause *et al.* 2001, Ivey *et al.* 2002). Many CAs had to drop "non-core" programs and close conservation areas. Watershed strategies, environmental education, outdoor recreation, soil conservation, environmental land use planning, habitat protection and restoration, rural landowner assistance, and wetland management programs became ineligible for provincial support – although many CAs considered them core (Ivey *et al.* 2002).

To combat these challenges, increasing charitable donations, property sales and rental/leasing, and user fees for parks and technical services have become common tactics (Shrubsole 1996, Fehl 1997). Funding/service partnerships with public and private groups have also emerged as proven alternatives. For example, Upper Thames Region CA's Progress Through Partnerships program helped increase other revenues by 1.6 million between 1996 and 1998 (Ivey *et al.* 2002). Raisin Region and Long Point Region CAs sought stream remediation funding from Environment Canada's Great Lakes 2000 Cleanup Fund (Watelet and Johnson 1999, Fehl 1997). Since 1995, CAs in southern Ontario have built "service alliances" with neighbouring CAs and member municipalities to share technical and administrative resources (Fehl 1997). For example, Lower Thames Valley, St. Clair Region, and Essex Region CAs formed a cost/service alliance for wetland construction and protection. The Metro Toronto Region CA (MTRCA) entered a 6-way alliance with neighbouring CAs to create strategies for increasing efficiency and resource sharing.

While all CAs were affected by provincial reforms, the extent of impacts and responses of individual authorities varied across jurisdictions due to variable capacity, local contexts, and available recovery options. The next section presents some issues for CAs in northern Ontario to set the stage for analysis of changes within the NDCA.

CAs in Northern Ontario

Several factors known to limit the distribution and viability of CAs in northern

Ontario are inherently linked to the region's hinterland geography. The vast size of the region and isolation of its populated watersheds limit the sharing of staff, technical, and physical resources (OSCCA 1967, Powell 1981, OMNR 1987). Low populations are associated with modest local economies that determine the municipal tax base on which CAs depend (Powell 1981). Also, large watersheds and dispersed settlement patterns create distance decay issues that can affect the sense of community and awareness that is vital to strong local support (OSCCA 1967, Mitchell and Shrubsole 1992). The preponderance of Crown land and unorganized territory in northern Ontario limits CAs to areas with more private land ownership (OSCCA 1967, OMNR 1987). However, large tracts of Crown land within and around some northern CA watersheds, and the traditional dominance of the OMNR, can complicate jurisdictional responsibilities and power relationships between government agencies (OMNR 1987, Mitchell and Shrubsole 1992). These factors have implications for CAs operating in northern Ontario and some outlying CAs in southern Ontario.

The NDCA and the Notion of Conservation in a Mining Hinterland

The NDCA provides an interesting case to consider the CA model in northern Ontario (Figure 1). Sudbury is a prime example of an extractive resource-based community with a legacy of industrial exploitation and environmental degradation. Its location and history as a mining town present a setting that contrasts with previous CA research.

The first CA in Sudbury was established in 1957 (NDCA 1980). A series of costly floods prompted municipal representatives to form the Junction Creek Conservation Authority (JCCA). As neighbouring municipalities had formed the Whitson Valley Conservation Authority, two CAs were operating in the area by 1959. These CAs later joined to become the NDCA when regional government was introduced in 1973. Amalgamation created the second largest jurisdiction among CAs, delineated by the drainage divides of the Vermilion, Onaping, and Wanapitei watersheds.

The state of Sudbury's environment was extremely poor when the JCCA assumed management responsibilities. A preliminary JCCA land use report (Revell 1959) indicated that the soils, vegetation, and aquatic environment were all severely degraded from unchecked resource exploitation and industrial pollution. Eroded and contaminated soils minimized land-based resource management for economic development. The general lack of vegetation exacerbated flooding. Primary recommendations were to focus on flood control and forming conservation areas as initial steps towards advancing conservation and resource management.

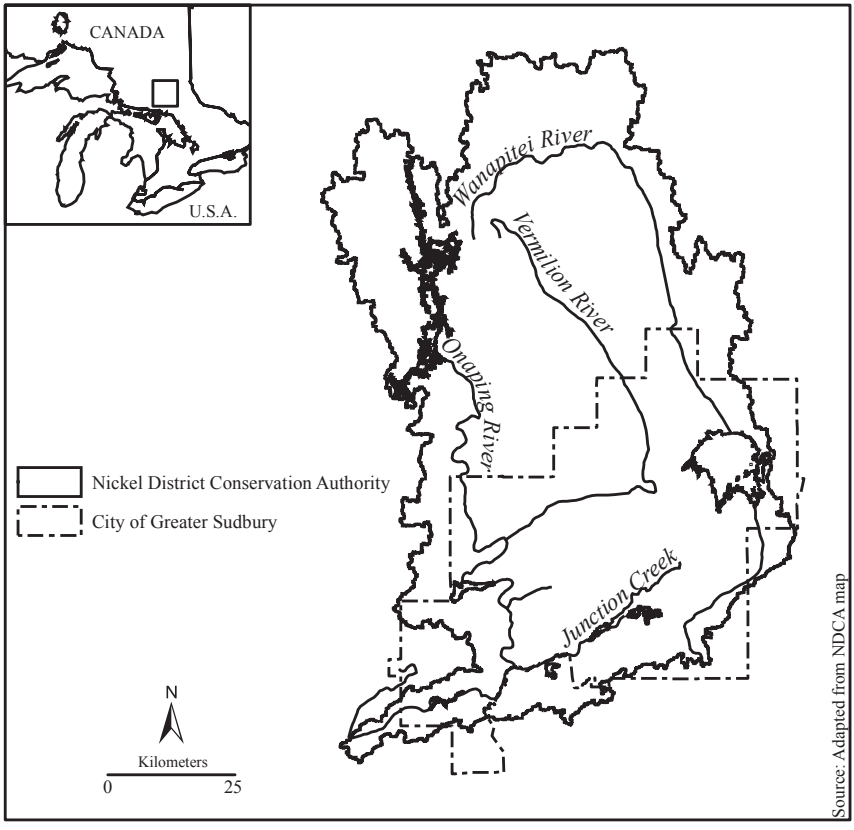
Large-scale efforts to regreen Sudbury have been ongoing since 1978. The city-led Land Reclamation Program – a partnership of, among others, governments, local mining companies, and the NDCA – has made progress towards a slow recovery. Of 20,000 ha of barren land and 65,000 ha of semi-barren land (mainly stunted birch), only 3,100 ha (3.6%) in main viewscapes have been limed, fertilized, and seeded (VETAC 2005) despite the fact that more than 8 million trees have been planted (VETAC 2004). Significant environmental concerns remain: "the lack of soil and thriving vegetation beyond this 'wall' of trees is of major concern when considering watershed health and long-term sustain-

ability of forest ecosystems in the Sudbury area" (VETAC 2005: 5). Lack of floral diversity limits greater faunal diversity and increases vulnerability to disturbance threats. Elevated levels of heavy metals (nickel, copper, cobalt, selenium) and arsenic in soils and vegetation raise concern for human and ecological health (MOE 2001). These persistent environmental problems indicate that there is scope and justification for further conservation and restoration.

Assessing Budget and Programming Temporal Dynamics

The NDCA budget analysis involves a temporal assessment of revenues and expenditures for the period of available data (1980-2002). Data were extracted from NDCA audited financial statements and annual reports and financial data have been adjusted for inflation relative to 2002 based on Bank of Canada (2005) consumer price index data. This investigation allows assessing temporal trends and variations in total revenues and expenditures, the allotment of funding and identification of various sources of revenue, and illustrates the nature of funding arrangements between municipal and provincial bodies.

Figure 1. Location and Jurisdiction of the NDCA in Northern Ontario



An inventory of programs for the corresponding period is extracted from NDCA annual reports. Programs are grouped according to NDCA categories: 1) land and water resource management, and; 2) conservation, education, and recreation. Each category is also sub-classified under capital or non-capital programs. This establishes the range of NDCA programs and changes; changes in program diversity and focus that occurred in parallel with provincial reform during the 1990s are identified. Discussions with CA, OMNR, and Ministry of the Environment (MOE) officials further informed and confirmed the accuracy of this review.

Furthermore, land base and population attributes are presented to describe the hinterland character of the NDCA. The discussion section of this paper then considers the results of NDCA budget and program data analyses in relation to its hinterland characteristics and discusses implications for NDCA programming.

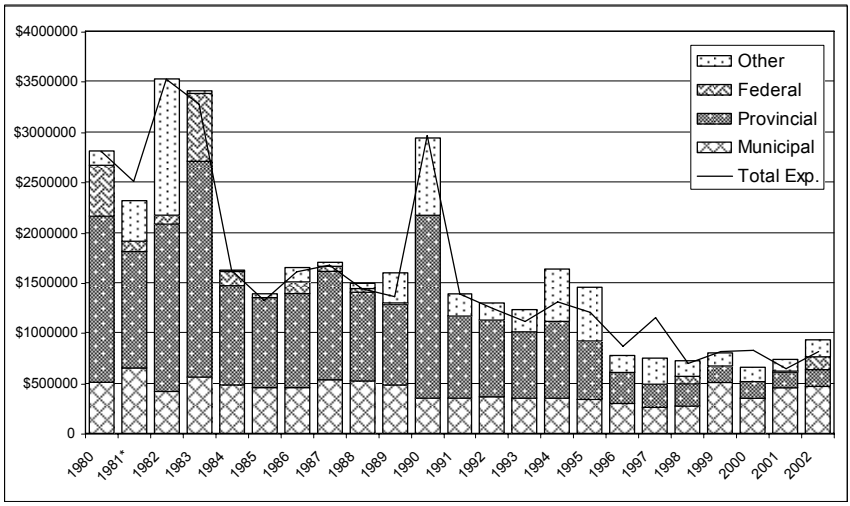
Results

NDCA Budget, 1980 to 2002

Budget data for the period 1980 to 2002 indicate an overall decline in total revenues (-66%) and expenditures (-71%), with some important interannual variations (Figure 2). In 1980, revenues were slightly more than expenditures at $2,813,182 and $2,812,976 respectively. Revenues reached a minimum for the study period in 2000 at $664,496, and were exceeded by expenditures in that year of $831,727 (a deficit of -$167,231). Revenues and expenditures rise slightly again to $943,280 and $821,833 in 2002. Mean annual revenues are $1,607,404.

Despite the downward trend, there are three exceptions, 1982, 1983, and

Figure 2. Variation in NDCA Revenues and Expenditures, 1980 to 2002



*Based on 1981 annual report budget estimations, not actual spending.

1990. In 1982 and 1983, revenues climbed to approximately $3,500,000, peaking again at $2,943,313 in 1990. These peaks are attributable to supplemental provincial funding for capital works projects. For example, in 1990 $1,436,189 was allotted to land and water resource management programs to pay for the construction of large capital projects for erosion control (P. Sajatovic, pers. comm., January 2004). Following this isolated infusion of funds, annual revenues and expenditures decline.

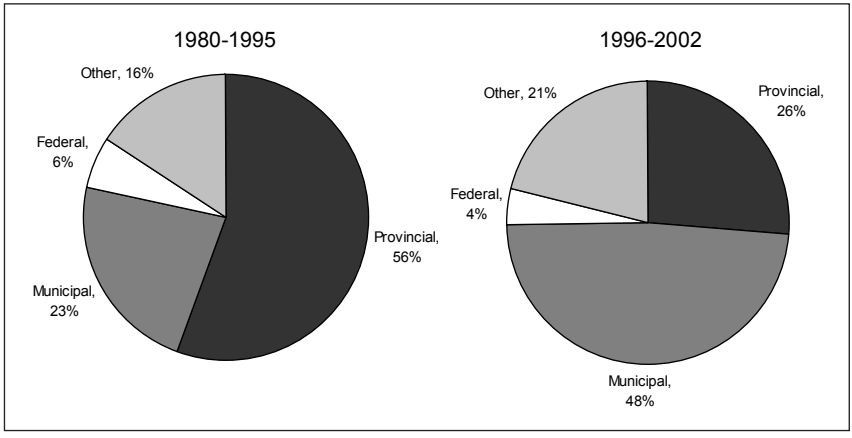
From 1980 to 2002, NDCA revenues were provided by all levels of government and by other sources as noted above. As experienced in other CA jurisdictions, the relative importance of each funding source has changed recently. Provincial funding to the NDCA has decreased sharply, dropping 78.5% between 1992 (start of provincial reforms) and 2002, while municipal funding has increased by 22%, closer to levels typical during the 1980s. In 2002, provincial funding accounted for 17% of NDCA revenues.

A historical comparison of mean revenues by source, before (1980-1995) and after (1996-2002) OMNR cutbacks, shows that municipal contributions accounted for almost one half of NDCA total funding (Figure 3). In turn, the average provincial share has decreased from 56% to 26%. Other sources of NDCA revenue have increased from 16% to 21%. This was mainly accomplished by raising permit fees, increasing land lease payments, and through the sale of conservation lands (NDCA 1994, 1995, Vaillancourt 2003, P. Sajatovic, pers. comm., January 2004). At time of writing, user fees and local partnerships were not significant sources of other revenues.

NDCA Programs, 1980 to 2002

Results show an overall trend of decline in total program operations from the overall maximum of $2,208,109 in 1980 to $460,073 in 2002 (-79%) (Figure 4). Program spending hit its lowest point at $399,246 during the funding transition period in 1996. A comparison of mean program spending indicates that annual program spending for 1980 to 1995 was $1,179,368, compared to $630,916 for

Figure 3. Total NDCA Funding by Source

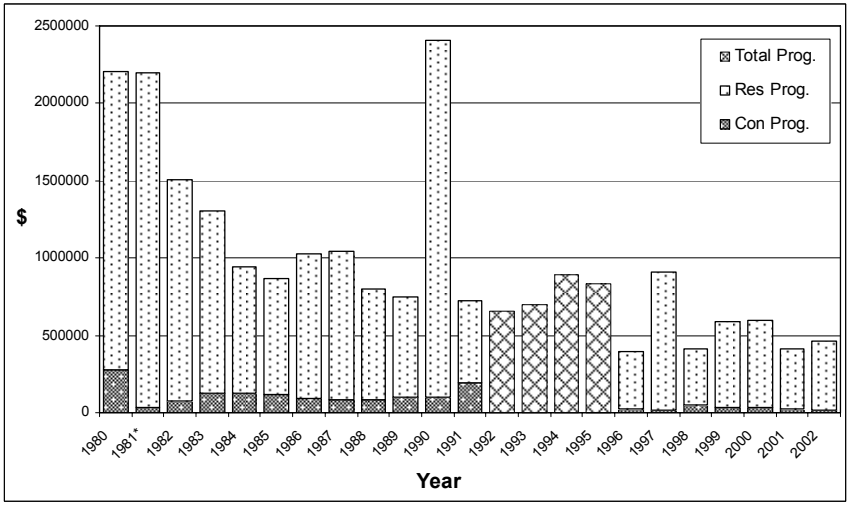


1996 to 2002. This difference represents a 47% decline in mean annual program spending.

Resource program spending has historically been more significant than conservation program spending. There is no program spending separation available for the period 1992 to 1995, so data for the existing years are used to illustrate differences in program spending before and after provincial reforms. Mean annual conservation spending for the period 1980 to 1991 was $118,280, while mean annual resource program spending was $1,197,483. However, for the period 1996 to 2002 mean annual conservation and resource spending was reduced to $27,324 and $513,461 respectively. This represents a 77% decrease for conservation programs and 57% decrease for resource programs. Although expenditures in both categories have decreased over time, conservation spending has also decreased in relative importance to total program spending. From 1980 to 1991, mean conservation program spending accounted for 9% of total program spending, which diminished to 5% for the period 1996 to 2002. It should be noted that spending reductions were spread across all NDCA categories including administration, job creation programs and miscellaneous expenses (e.g. travel and equipment costs).

An inventory of programs indicates the large range of programs offered as reported by NDCA from 1980 to 2002 (Table 2). Since 1980, initiatives have focused on water management. During the first 25 years of operation the NDCA completed 20 major flood control projects (NDCA 1982). By 1998, this number had grown to 36 (NDCA 1998a). From 1982 to 1998, the NDCA completed one major flood control project per year. Alterations to stream channels and banks have been ongoing to control flow and the NDCA has developed an automated system for flood monitoring, forecasting and warning. Flood plain mapping, risk assessments and flood damage reduction surveys accompanied these projects.

Figure 4. Variation in NDCA Program Spending, 1980 to 2002



*Based on 1981 annual report budget estimations, not actual spending.

Table 2. NDCA Inventory of Programs, 1980 to 2002

Land and Water Resource Management		Conservation Education and Recreation	
Capital	**Non-Capital**	**Capital**	Non-Capital
Water and Erosion Control: Building and Maintaining Dams, Berms, Dykes, Culverts Channel Improvements Channel Diversion Reservoirs Stabilizing Banks Sediment Control Shoreline Stabilization Tree Planting Flood Monitoring Equipment Installation	**Flood Plain Management:** Flood Monitoring Flood Warning Flood Forecasting Flood Plain Enforcement Flood Plain Mapping Flood Damage Reduction Survey Public Flood Risk Maps Snow Course Survey Fill Regulation Field Inspections Permits Flood Plain Inquiries Engineering Studies Watershed Management Planning & Studies Input Official Plans and Zoning By-laws Community Relations Program/Publicity Consult Private Landowners **Other:** Source Protection Water Quality Land Acquisition Land Leasing Spring Water Awareness Experience '80 Program Federal Work Program Administration	**Conservation Areas Maintenance and Development:** Tree Planting Picnic Areas/Shelters Beach Development Viewing Platforms Trail Work Board Walk Construction Landscaping **Wildlife Habitat Improvement:** Nest Boxes Watercourse Clean-up Wetlands Rehabilitation and Creation	**Environmental Education and Recreation:** Interpretive Centre Outdoor Participation Initiatives Nature Teaching Summer Day Camp Conference Participation and Organization Information Distribution i.e. *The Informer* and *The Conservationist* Derelict Clean-up Administration

(Source: NDCA 1980 to 2002)

Flood plain regulation and enforcement has been very important. Consultation with citizens and businesses has also been a major task. By 1990 the NDCA was processing 450 to 500 flood plain inquiries monthly (NDCA 1990).

The ability to undertake capital works projects for flood management has decreased since the mid-1990s. The cost of building dams, dykes and culverts once required large provincial contributions. Currently, NDCA focuses on non-capital flood management activities (e.g. flood monitoring) and maintaining existing infrastructure, which requires less funding (P. Sajatovic, pers. comm., November 2003).

NDCA conservation programs include conservation area maintenance and development, wildlife habitat improvement, environmental education and recreation. Such programs have been very limited and now consist of activities held at the 950 ha Lake Laurentian Conservation Area. Originally acquired for headwater source protection in the mid-1960s (P. Sajatovic, pers. comm., November 2003), the importance of this conservation area to NDCA conservation programming was recognized in 1984 when the Nickel District Conservation Foundation (NDCF) was established for its support (NDCA 1984). Outdoor education and awareness programs have been particularly affected by the provincial introduction of core/non-core programming. In 1996 two full-time naturalist positions were eliminated when environmental education programs were categorized as non-core (P. Sajatovic, pers. comm., January 2004). Consequently, remaining programs at Lake Laurentian are now offered on a seasonal basis. The Lake Laurentian nature centre and a children's summer day camp are maintained by contributions from the NDCF.

As a more recent example, the NDCA rejected participation in the Provincial Water Quality Monitoring Network coordinated by the MOE (A. Todd, pers. comm., February 2004). Of the 36 Ontario CAs, 30 had joined the program. At time of writing none of the northern CAs were participating due to resource constraints. For the NDCA, the decision not to participate was dictated by a lack of resources to support this non-core program (P. Sajatovic, pers. comm., March 2004).

Hinterland Character of the NDCA

The NDCA exhibits several land base and population attributes linked to the hinterland geography of northern Ontario. Although the NDCA is very large by total land area, its low population density, annual revenue and staffing reflect the small size of operations (Table 3). Bureaucratic impediments might be reduced with only one municipal member, yet local funding and expertise must be supplied by a single lower-tier government and community. The City of Greater Sudbury is the largest municipality in Ontario by total land area (3,354 km²) and its communities are very spread out (Wuksinic 2004). It is over five times the size of the City of Toronto with one-sixteenth of the population (Saarinen 2004). In addition, several small communities are interspersed with 330 lakes and large tracts of undeveloped land within municipal boundaries (City of Greater Sudbury 2004). Whereas ample public space is accessible in the vast Crown lands that surround all northern centres, there is also considerable open green space in Sudbury and the outlying NDCA jurisdiction. Approximately 56% of the NDCA jurisdiction is Crown land extending north of Sudbury.

Table 3. The Range of Resources and Characteristics among CAs.*

	Smallest	NDCA	Largest
Area of Jurisdiction (km²)	215	**7547**	10,933
Population Density (persons per km²)	4	**19**	1197
1998 Revenue	355,893	**469,574**	30,942,636
Full-time Permanent Staff (1999)	3	**4**	205
Participating Municipalities	1	**1**	42

*Values for smallest and largest CAs represent the highest and lowest values among all Ontario CAs for each item, and may not all come from a single CA.

(Ivey *et al*., 2002; Conservation Ontario, 2000; NDCA, 1998b)

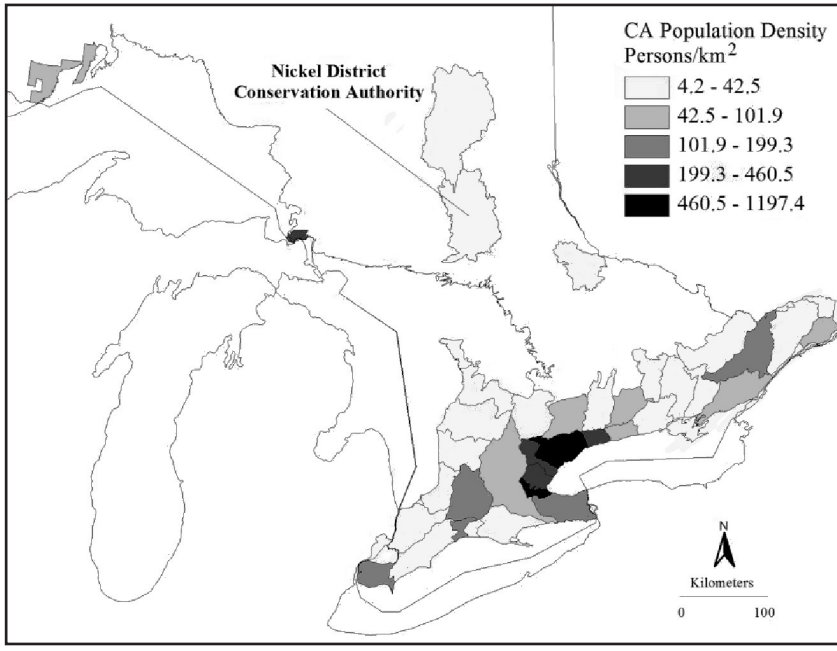
A comparison of all CAs in Ontario illustrates the large extent of the NDCA (7547 km²), its isolation, and low population density (19 persons per km²) (Figure 5). These are limiting factors known to reduce opportunities to generate user fees from recreation facilities (OSCCA 1967, Fehl 1997). To illustrate, Baldin (2003) found that some southern CAs generated very high revenues from campgrounds (e.g. $5,131,918 for Grand River CA [GRCA] in 2000), while all northern CAs reported no revenues from user fees because they do not operate campgrounds. Of the five CAs accounting for 70% (4,670,017) of annual conservation area visitors, two were heavily populated, densely developed settings (MTRCA, Hamilton Region CA), two were centrally located along highway 401 and close to large population centres (GRCA, Upper Thames River CA) and one was sparsely populated but located at a major Canada-US border crossing near a major city (St. Clair Region CA). When surrounding populations are considered in relation to the NDCA, its isolation becomes clear. Large unpopulated expanses between urban centres in northern Ontario create distance decay issues, whereas CAs near core areas of southern Ontario have access to very high populations by proximity. Conversely, the unorganized territories that surround the NDCA are sparsely populated and so do not hold significant revenue potential. It stands to reason that low populations, easy/free access to green space and isolation make it difficult to operate profitable recreation facilities.

Another factor contributing to watershed isolation is spatial discontiguity. Contiguity is defined as “the spatial relationship of adjacency, i.e. elements that touch each other are adjacent” (Aronoff 1993: 178). Where proximity facilitates the transfer of resources, high contiguity increases the number of potential partner organizations. The NDCA shares a small section of its northern boundary with the Mattagami Region CA, yet this is in a remote area 100 km north of Sudbury where cross-boundary relations are nonexistent. The distance between these CA offices is about 290 km. In contrast, the GRCA borders 9 other CAs, which increases chances for partnerships. Visits between northern CA offices and project sites require several hours of driving time and significant transportation costs. The North Bay-Mattawa CA office is closest to the NDCA, yet it is still about 125 km distant.

Population decline must also be considered in relation to the lasting feasi-

bility of the NDCA. The City of Greater Sudbury experienced a 6.1% population decrease (10,000 people) from 1996 to 2001 (Statistics Canada 2001). In spite of this decline, a long-term population increase of 2.4% by 2028 is projected for Sudbury; however, this is not substantial considering the costs associated with servicing an aged community (OMF 2000). In contrast, the predicted growth rate in this same period is 33.4% for Ontario and 56.7% for southern Ontario (OMF 2000), which will undoubtedly strain the network of CAs in southern Ontario. Should the municipal tax base in Sudbury not keep pace with local servicing costs, funding for all municipal services, including the NDCA, will diminish.

Figure 5. Population Densities of Ontario Conservation Authorities



(Data source: Conservation Ontario 2000)

Discussion

Theoretical discussions about the CA model frequently include statements about its capabilities, attributing success to the "inherent flexibility" of the model (Hale 1988: 34) and the soundness of the founding principles (Shrubsole 1996). In practice, previous works (e.g. OSCCA 1967, Voison 1976, OMNR 1987, Mitchell and Shrubsole 1992, Ivey *et al.* 2002) have illustrated difficulties with local capacity, jurisdictional conflicts, low government support, variable program offerings and low public awareness – all of which are presumably examples of problems occurring in implementing the founding principles in practice. Due to variation among CAs, exploring individual CA responses to mid-1990s restructuring requires con-

sideration of how the founding principles have been applied in relation to the CA and region in question. Results for the NDCA are discussed accordingly.

Watershed as a management unit

The NDCA resulted from amalgamation of two smaller CAs and three contiguous watersheds. Not only was this decision ecologically sound, this jurisdiction was sensible from a flood management standpoint as it included the undeveloped headwaters, Sudbury's urban core and several neighbouring towns. With regional government in 1973 it became reasonable to merge CA administration and service costs for the Sudbury area. Moreover, difficulties with municipal services linked to amalgamation of Greater Sudbury in 2001 (i.e. disproportionate costs vs. benefits) do not appear to have been a problem with watershed management as surrounding towns were already represented on the NDCA board, contributing financially and receiving services. These points give testimony to the soundness of the watershed management unit principle.

There are areas within its watershed jurisdiction where the NDCA is not active and more than half of the NDCA jurisdiction is Crown land. Yet reducing such jurisdictions to save money, focus resources and reduce overlap between CAs and OMNR (as suggested by the 1987 *Review of the Conservation Authorities Program*) would undermine the watershed principle by limiting the NDCA to urban Sudbury – a small portion of the actual drainage area. Despite funding constraints, the NDCA does maintain its primary function in flood control. In this jurisdiction it is appropriate for the Authority to draw on its OMNR partner to consider what level of activity and collaboration are needed to address watershed management. Although institutional and economic issues challenge the watershed principle in this part of northern Ontario, agency coordination and collaboration can help to maintain ecological and functional integration of water and land management.

Provincial-Municipal Partnership

The partnership principle supported municipal involvement and the formation of CAs where sufficient population, private land and tax revenues existed. Supplemental grants once available to smaller rural and northern CAs extended opportunities to regions across Ontario by reasonably accounting for economic variation. However, the mid-1990s restructuring to "rebalance" government partnership obligations questioned this principle as well as provincial understanding of regional variation.

Results indicate there was provincial downloading to the municipal government during the 1990s and NDCA municipal funding has not compensated for the provincial cutback. CAs that relied most on provincial assistance with the fewest immediate options for funding replacement were affected most (Fehl 1997). NDCA budget and program changes confirm this point. Measured fiscally, provincial support for the NDCA dropped significantly by 78.5% between 1992 and 2002 to account for 17% of total revenues.[2] All but a few seasonal "non-core" programs were lost.

[2] Since 2002, new provincial initiatives aimed at source water protection have injected funds into the Ontario CA program as a whole. Related changes and implications for the NDCA are the subject of future inquiry.

Self-generated revenues and municipal levies are now the main sources of CA funding (Shrubsole 1996, Ivey *et al.* 2002, Conservation Ontario 2004b). NDCA other revenues increased by 5% on average after provincial cutbacks in 1995. The manner in which this increase was achieved shows that costs are being passed down to residents and businesses and that the sale of conservation lands has become a revenue option. This illustrates the need to develop alternative sources of funding in order to avoid future land sales that threaten conservation. Short of restoring provincial funding for CAs, NDCA could call on their OMNR provincial partnership for technical support to explore options for capacity building and programming aimed at replacing provincial revenues.

Local Initiative

Local initiative stipulates that watershed communities must work together and get involved in local resource management. This principle is currently tested by the NDCA's ability to pay, which is influenced by a volatile resource economy and modest tax levy that must support a large jurisdiction requiring flood and erosion control infrastructure. The NDCA also shares dispersed settlement patterns recognized to negatively affect local awareness for watershed issues and sense of community, both of which are essential to grassroots support (OSCCA 1967, Mitchell and Shrubsole 1992). The success of the city-run Land Reclamation Program indicates that community spirit and support for local conservation initiatives in Sudbury are strong (Lautenbach *et al.* 1995); however, citizen support for the NDCA has not been studied.

It is curious that while the municipality has long funded regreening efforts, resources have not been channelled through the NDCA. For example, NDCA contributions to the Land Reclamation Program have consisted mainly of tree and labour donations, which amounted to less than 0.4% of project funding in 2002 (VETAC 2002). It seems that the NDCA, as a local conservation agency, should have a lead role on this project. One can surmise that the initial scale of flood management problems kept the NDCA engaged while other local groups mobilized to address other local environmental problems. Indeed, flood control was an immediate solution mandated to CAs while regreening would require more time.

Upholding agency credibility and capacity are related to strong local support. The sale of conservation lands, the abandonment of community recreation, the scaling back of education programs, and the general reduction of NDCA operations threaten to reduce ties with watershed residents. NDCA-led efforts for non-core programs in areas like habitat restoration have been modest. Necessary conservation programs have been largely complemented by the watershed community, the NDCF, and volunteer organizations. These efforts demonstrate the value of existing community links and the need for interagency collaboration so that the NDCA can continue to meet its minimum mandate requirements and establish a more visible role in conservation.

Coordination and Cooperation

As noted above, local funding/service alliances and user fees are important sources of revenue in other jurisdictions that have helped some CAs respond to provincial reductions, but these sources have not been a major source of assist-

ance for the NDCA. Interagency collaboration for public and private interests is limited by great distances between the NDCA and other CAs, which have reduced opportunities to exchange equipment, human resources, and technical assistance. However, recent technological advances in communications, internet, and GIS could help to bridge these distances and support some technical/administrative alliances. The cooperation of the NDCA in this study suggests that there is opportunity to enhance relations with Sudbury's academic institutions. This could provide a two-way exchange of data, research, technology, and participation in support of conservation, education, and public awareness.

The formation of the Timberwolf Golf Course on NDCA flood reservoir lands is one example of how corporate partnership can contribute to NDCA revenues and local economic development. Formal inquiry into the feasibility and benefits of active recreation facilities may uncover additional ways to generate revenue. Establishing new service alliances for the NDCA is another avenue yet to be fully explored. A conference of northern Ontario watershed representatives would provide a forum for resource managers, researchers, government, business, environmental groups, educators, First Nations and non-aboriginal community members to discuss conservation issues of regional importance. An opportunity for networking and knowledge sharing would benefit participants who may share common challenges but have little chance for interaction.

Healthy Environment for a Healthy Economy

The notion of conservation in a mining hinterland seems somewhat of a paradox. Industrial resource extraction has long been accepted as *the* local economic driver and core of Sudbury's identity. However, as Lautenbach *et al.* (1995: 109) point out, "the destructive influence of past mining activities not only left Sudbury with a severe environmental problem, but its 160,000 inhabitants also inherited conditions that greatly restricted their socio-economic prospects." The early establishment of CAs in Sudbury revealed the roots of community and growing local willingness to transform Sudbury into a more sustainable community.

NDCA flood management initiatives have been successful in reducing costly floods and enabling urban development. However, recent reductions in job-creation and the loss of non-core programs have not helped the NDCA to support the local environment and economy. Long-term consideration of renewable resources like timber would contribute to regreening and complement an economy that has long focused on non-renewable resource extraction.

Sudbury is an amalgamation of towns with longstanding ties to the mining sector and there are several mining companies in Sudbury that have benefited immensely from developing local resources. However, Inco and Falconbridge contributions to municipal reclamation since 1978 (2.5% and 1% of funding respectively) (VETAC 2005) indicate that industry could have an expanded role in restoration. The NDCA must continue to build bridges with community businesses and municipal partners in recognizing the importance of a healthy environment for a healthy economy.

Comprehensive Approach

The comprehensiveness of the NDCA has been challenged by the cutbacks outlined above, notably, the relative absence of conservation programming. Difficult

adjustments were made to restructure NDCA operations, and expenses have been scaled back greatly in all areas to avoid deficit. The NDCA now focuses its resources on flood management and maintaining aging capital works projects for flood and erosion control. While all program spending has decreased, it is significant that only 5% of total program spending is allotted to conservation. This has undermined implementation of actual conservation projects for habitat restoration, wetland rehabilitation, and tree planting, which stand to contribute to Sudbury's environmental rehabilitation. These appear to be essential programs for a CA located within an environment recovering from severe industrial degradation.

Ultimately, this questions the parochial view of government in overlooking the importance of local and regional contexts with regard to resource and environmental policy making (e.g. Clark 2002, Mitchell 2002). Complete consideration of the problems experienced by all CAs in Ontario should be factored into provincial policies that will affect every CA. For instance, it can be argued that even the introduction of supplemental grants in 1968 to assist rural CAs was insufficient in the case of the NDCA because overall environmental degradation was not considered in the grant formula. Subsequently, when the 1987 *Review of the Conservation Authorities Program* reconsidered the suitability of population and land base factors used to calculate the grants, the needs of highly urbanized jurisdictions were used to rationalize change:

> *Arguments can be made that it is the highly developed urban areas that require additional assistance since there are usually many more people affected by a given flooding or erosion problem. In many cases as well, the required solution is much more expensive to implement (i.e. size and scope of remedial measure required, land cost, reallocation costs for affected residents, roads and other services, etc.) (OMNR 1987: 62).*

Results show that supplemental grants to the NDCA were absorbed primarily by capital projects for flood and erosion control – problems related to the highly degraded state of Sudbury's environment. Ecosystem restoration has remained peripheral due to fiscal constraint; however, there is a strong case for habitat restoration, wetland rehabilitation, and tree planting to be core programs. Such programs would help to address the root of flooding and erosion problems in parallel with current reactive management measures (i.e. flood protection infrastructure) and contribute to the regreening of Sudbury. Above all, the true scale of "remedial measure[s] required" (OMNR 1987: 62) in Sudbury surpasses most other places in Ontario, yet has not been reflected in provincial policy concerning CAs. Policymakers need to consider resource-based, low density regions alongside rural agricultural and densely settled urban regions so that CAs can respond better to challenges. Comprehensive management cannot be claimed so long as these critical and interrelated aspects of watershed management are overlooked.

Conclusion

This research explored the NDCA's response to mid-1990s provincial restructuring in the context of northern Ontario. Provincial funding and program

changes have placed restrictions on all Ontario CAs. For the NDCA this means that the municipality covered one half of total revenues (1996 to 2002), while the province accounted for one quarter. This imbalance has compromised NDCA program diversity, narrowed its focus and challenged the partnership principle. Only 5% of mean program spending goes to conservation initiatives, which undermines the role of the NDCA as an agent of environmental conservation in Sudbury. Also, self-generated revenues have become increasingly important to maintaining CAs; however, it appears that certain contextual influences currently limit the potential of these revenues for the NDCA.

Specific research needs remain to address the challenges and needs outlined herein:

1. Gauging resident awareness, perceptions, and support for the NDCA (and all CAs) and its role in local conservation;
2. Identifying potential cost-sharing and service alliances for the NDCA (and other CAs), including the nature and logistics of such alliances for CAs in northern Ontario and outlying areas of southern Ontario;
3. Feasibility assessments for user fee generating recreation facilities (e.g. campgrounds) for CAs in northern Ontario and outlying rural areas in southern Ontario to test long-standing assumptions about their potential;
4. Regional quantitative analysis of contextual land base and socio-economic influences known to influence CA performance in order to develop theoretical and practical understanding and inform CA funding and programming policy.

Satisfying these research needs, among others, will broaden our understanding of Ontario CAs and advance provincial conservation initiatives.

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References

Aronoff, Stan. 1993. *Geographic Information Systems: A Management Perspective.* Ottawa, ON: WDL Publications.

Baldin, Eric. 2003. *Visitor Statistics for Conservation Authorities in Ontario: Current Status and Methods.* Master's Thesis, Department of Geography and Environmental Studies, Wilfrid Laurier University, Waterloo, ON.

Bank of Canada. 2005. *Rates and Statistics*. Bank of Canada. http://www.bankofcanada.ca/en/rates/inflation_calc.html [accessed on June 1, 2005].

City of Greater Sudbury. 2004. *Key Facts, City of Greater Sudbury*. City of Greater Sudbury. http://www.city.greatersudbury.on.ca/keyfacts [Accessed on: March 10, 2004].

Clark, Tim. 2002. *The Policy Process: A Practical Guide for Natural Resource Professionals.* New Haven and London: Yale University Press.

Conservation Ontario. 2000. *Conservation Authority Watershed Area and Population Data.* Toronto, ON: Conservation Ontario.

Conservation Ontario. 2004a. *Conservation Ontario Summary of the Submission: Reinvestment in Ontario's Conservation Authorities - Now and In The Future*. Conservation Ontario. http://www.conservation-ontario.on.ca/policy-issues/index.html#Transfer? [accessed on: November 5, 2006].

Conservation Ontario. 2004b. *Fact Sheet: White Paper on Watershed-Based Source Protection Planning.* Conservation Ontario. http://www.conservation-ontario.on.ca/news/ 2004_Feb18/Fact_Sheet_White_Paper.pdf [accessed on: March 1, 2004].

Fehl, Tracy. 1997. *Provincial Funding Changes for Conservation Authorities of Ontario: The Implications for Shoreline-related Management of the Lower Great Lakes.* Unpublished Master's Thesis, Department of Geography, University of Waterloo, Waterloo, ON.

Hale, Philip. 1988. Ontario's Conservation Authorities: The Watershed, a Model for Resource Management. *Journal of Canadian-Pakistan Cooperation* 2(1): 33-38.

Ivey, Janet, Rob de Loe, and Reid Kreutzwiser. 2002. Groundwater Management by Watershed Agencies: An Evaluation of the Capacity of Ontario's Conservation Authorities. *Journal of Environmental Management* 64(3): 311-331.

Krause, Peter, Anthony Smith, Barbara Veale and Marilyn Murray. 2001. Achievements of the Grand River Conservation Authority, Ontario, Canada. *Water Science and Technology* 43(9): 45-55.

Lautenbach, William, Jim Miller, Peter Beckett, John Negusanti, and Keith Winterhalder. 1995. Municipal Land Restoration Program: The Regreening Process. In *Restoration and Recovery of an Industrial Region,* J. Gunn, ed.: 109-122. New York, New York: Springer-Verlag.

Mitchell, Bruce. 2002. *Resource and Environmental Management, 2nd edition.* Harlow, England: Pearson Education Limited.

Mitchell, Bruce and Dan Shrubsole. 1992. *Ontario Conservation Authorities: Myth and Reality*. Waterloo, Ontario: University of Waterloo.

Nickel District Conservation Authority (NDCA). 1980. *History of Conservation Authorities in Watershed Planning.* Sudbury, Ontario: NDCA.

Nickel District Conservation Authority (NDCA). 1982. *A Tour through 25 Years of Watershed Management.* Sudbury, Ontario: NDCA.

Nickel District Conservation Authority (NDCA). 1984. *Biennial Report, 1983-1984.* Sudbury, Ontario: NDCA.

Nickel District Conservation Authority (NDCA). 1990. *Annual Report.* Sudbury, Ontario: NDCA.

Nickel District Conservation Authority (NDCA). 1994. *Annual Report.* Sudbury, Ontario: NDCA.

Nickel District Conservation Authority (NDCA). 1995. *Annual Report.* Sudbury, Ontario: NDCA.

Nickel District Conservation Authority (NDCA). 1998a. *Nickel District Conservation Authority Schedule of Accumulated Capital Project Expenditures.* Sudbury, Ontario: NDCA.

Nickel District Conservation Authority (NDCA). 1998b. *Audited Financial Statements.* Sudbury, Ontario: NDCA.

Ontario Ministry of Environment (MOE). 2001. *Metals in Soil and Vegetation in the Sudbury Area (Survey 2000 and Additional Historic Data)*. Toronto, Ontario: MOE.

Ontario Ministry of Finance (OMF). 2000. *Ontario Population Projections: 1999 – 2028*. Government of Ontario. http://www.gov.on.ca/FIN/english/demographics/demog00e.htm [Accessed on March 1, 2004].

Ontario Ministry of Natural Resources (OMNR). 1997. *Transfer Payments to Conservation Authorities*. Toronto, Ontario: OMNR.

Ontario Ministry of Natural Resources (OMNR). 1987. *A Review of the Conservation Authorities Program.* Toronto, Ontario: OMNR.

Ontario Select Committee on Conservation Authorities (OSCCA). 1967. *Report on the Select Committee on Conservation Authorities*. Toronto, Ontario: Queen's Printer.

Ontario Watershed Planning Implementation Project Management Committee (OWPIPMC). 1997. *An Evaluation of Watershed Management in Ontario, Final Report*. Government of Ontario. http://www.ene.gov.on.ca/programs/3513e.pdf [Accessed March 1, 2004].

Powell, J. Russ. 1981. River Basin Management in Ontario. *Canadian Water Resources Journal* 6(4): 51-65.

Revell, D. 1959. *Junction Creek Conservation Report: Land and Forest.* Sudbury, Ontario: JCCA.

Richardson, Arthur. 1960. Ontario's Conservation Authority Program. *Journal of Soil and Water Conservation* 15(5): 252-256.

Richardson, Arthur. 1974. *Conservation by the People: The History of the Conservation Movement in Ontario to 1970*. Toronto, Ontario: University of Toronto Press.

Saarinen, Ovia. 2004. Addressing Sudbury's Real Problems: Sprawl, Governance and Funding Impede Development in Sudbury. *The Sudbury Star*, Sudbury, Ontario. February 20, 2004.

Shrubsole, Dan. 1990. The Evolution of Public Water Management Agencies in Ontario: 1946 to 1988. *Canadian Water Resources Journal* 15(1): 49-66.

Shrubsole, Dan. 1996. Ontario Conservation Authorities: Principles, Practice and Challenges 50 Years Later. *Applied Geography* 16(4): 319-335.

Statistics Canada. 2001. *Community Profiles.* Statistics Canada. http:www//12.statcan. ca/English/ profil01/PlaceSearchForm1.cfm [Accessed Jan 14 2004].

Thomson, Kenneth and J. Russ Powell. 1992. Conservation Authorities in Association. *Canadian Water Resources Journal* 17(1): 270-276.

Vaillancourt, Bob. 2003. NDCA Sells Land to Raise Cash. *The Sudbury Star*, Sudbury, Ontario. November 28, 2003.

Vegetation Enhancement Technical Advisory Committee (VETAC). 2005. Land Reclamation Program: Annual Report. Sudbury: City of Greater Sudbury.

Vegetation Enhancement Technical Advisory Committee (VETAC). 2004. Land Reclamation Program: Annual Report. Sudbury: City of Greater Sudbury.

Vegetation Enhancement Technical Advisory Committee (VETAC). 2002. Land Reclamation Program: Annual Report. Sudbury: City of Greater Sudbury.

Voison, Greg. 1976. A Developer's View of Ontario Conservation Authorities. *Canadian Water Resources Journal* 1(1): 35-39.

Watelet, Anne and Peter Johnson. 1999. Hydrology and Water Quality of the Raison River: Overview of Impacts of Recent Land and Channel Changes in Eastern Ontario. *Water Quality Research Journal of Canada* 34(3): 361-390.

Winfield, Mark and Greg Jenish. 1999. *Ontario's Environment and the Common Sense Revolution: A Fourth Year Report*. Toronto: Canadian Institute for Environmental Law and Policy.

Wuksinic, Doug. 2004. *BMA Municipal Study for the City of Greater Sudbury 2003.* City of Greater Sudbury. http://www.city.greatersudbury.on.ca [Accessed April 1, 2004].