

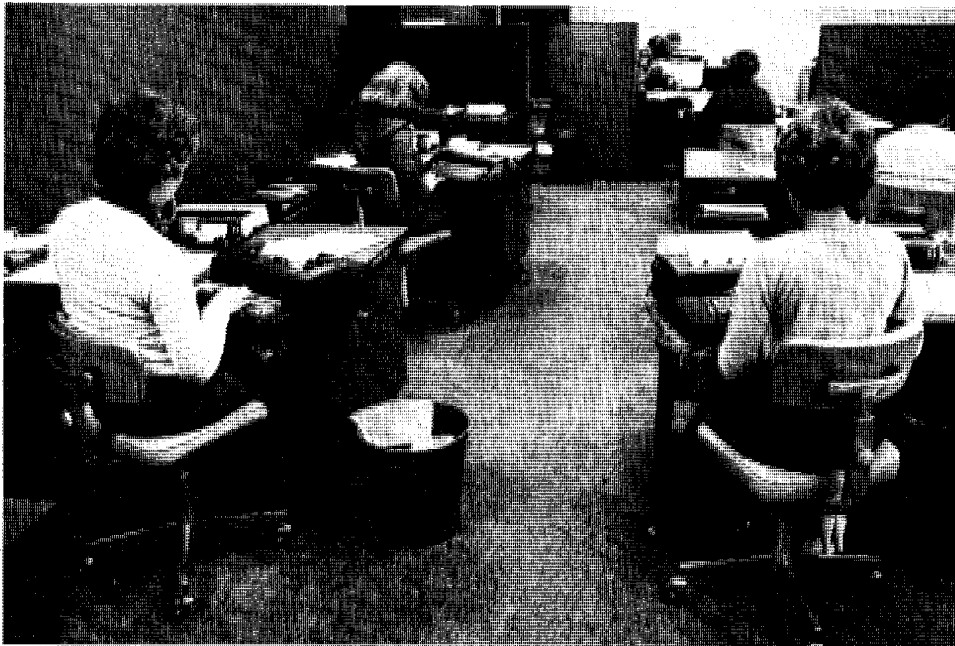
CURA**reporter**

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When Women Must Work:

A Study of the Location of Jobs With Livable Wages for Women in Minnesota

by *Esther Wattenberg and William J. Craig*



The nature of women's paid work absorbed considerable attention in the decade of the 70s. Studies, both nationally and in Minnesota, documented the dramatic rise in women's labor force participation, the continued disparities between men's and women's wage levels, the persistence of occupational segregation, and the indispensable role of women's wages for family income at a time of raging inflation.

Underlining this growing concern with women's work outside of the home was the startling phenomenon associated with the last decade: the large number of women and children on their own, economically speaking. The long held notion that men could be counted on for the sole support of their families was severely shaken. Instead, the fact emerged that catastrophic events occur in the lives of one out of every four women with dependent children, forcing them to face the role of breadwinner. Desertion, separation and divorce, death or the disability of the father, unemployment and underemployment were revealed in the 1970 census data as not infrequent circumstances which thrust women into economic crises. There is mounting evidence that data to be revealed in the 1980 census will enlarge this picture of women as the chief breadwinners for their families.

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Esther Wattenberg is an associate professor in the University's School of Social Work. She is also coordinator for CURA's Office of Social Service Training Projects. William J. Craig is the assistant director of CURA. This article presents the highlights of a study they have been pursuing for the past two years. For the full paper call 373-7803. The authors wish to thank James Franczyk, Sheila Leik, and Holly Sampson for their contributions to this work.

The literature on the nature of women's paid work and the incidence of these shattering life events rarely, if ever, considers the local availability of well paid jobs for women. We found that no systematic study had been undertaken in Minnesota to determine where jobs that will pay a livable wage for women are located.

The question of job location is one that has gone almost unexplored, yet it is one of the most critical factors for a working mother. The length of the trip to work and the amount of time it takes are important considerations when a woman is responsible for the care of a home and dependent children in addition to her paid work. Women in Minnesota, for example, have been found to have shorter journeys to work than men in terms of both time and distance. Indeed, job location is an indispensable factor in policy-making. One of the regulations that governs WIN (the job project for women on AFDC) specifies that women on this mandatory work project are not required to accept a job that goes beyond a two hour per day driving distance (unless the community standards go beyond this limit).

This study was undertaken to attempt to answer several basic questions. Are there jobs available that will pay an adequate wage to women as economic heads of households? If so, where are these jobs located within the state? Further, what are the characteristics of those regions which generate jobs for women with a livable wage? Finally, what are the consequences of the wide variations in job opportunities that we found within the state?

The Need to Work

Why one should attach importance to location of jobs, with livable wages for women becomes apparent when we examine the factor of need. Presently, only one-third of Minnesota's families rely on a male breadwinner as the sole economic support. It is widely acknowledged that the contribution of women's wages to family income is indispensable in an inflationary economy. But it is the circumstance of women becoming the *only* breadwinner that forces a close examination of jobs and wage patterns and their locations throughout the state. In 1970, one could safely say that urban areas held the largest concentration of women and children on their own. However, between 1970 and 1975 these figures changed dramatically. A sharp increase in divorce in the more traditional areas of the state changed the picture. While the divorce rate for Minnesota's metropolitan areas increased from 34 percent of all marriages in 1970 to 50 percent in 1977, in the rural and small town regions of the state it doubled from 17 percent in 1970 to 32 percent in 1977. Changing attitudes toward divorce have slowly filtered out to the rural

Table 1: NUMBER OF MEN AND WOMEN EARNING \$6500 OR MORE IN 1970 BY COUNTY

County	People earning \$6,500 or more			Females as a percent of those earning \$6,500 +
	TOTAL	MALE	FEMALE	
Aitkin	1,092	977	115	10.5
Anoka	33,052	29,641	3,411	10.3
Becker	2,523	2,315	208	8.2
Beltrami	2,726	2,351	375	13.8
Benton	2,745	2,500	245	8.9
Big Stone	818	744	74	9.0
Blue Earth	7,275	6,386	889	12.2
Brown	3,660	3,354	306	8.4
Carlton	4,623	4,245	378	8.2
Carver	5,044	4,619	425	8.4
Cass	1,399	1,222	177	12.7
Chippewa	1,675	1,524	151	9.0
Chisago	2,845	2,565	280	9.8
Clay	7,058	6,322	736	10.4
Clearwater	581	506	75	12.9
Cook	553	482	71	12.8
Cottonwood	1,812	1,680	132	7.3
Crow Wing	4,454	3,987	467	10.5
Dakota	30,036	27,047	2,989	10.0
Dodge	1,770	1,625	145	8.2
Douglas	2,342	2,163	179	7.6
Faribault	2,352	2,170	182	7.7
Fillmore	2,444	2,188	256	10.5
Freeborn	5,990	5,495	495	8.3
Goodhue	5,403	4,899	504	9.3
Grant	739	639	100	13.5
Hennepin	201,801	172,941	28,860	14.3
Houston	2,313	2,164	149	6.4
Hubbard	924	835	89	9.6
Isanti	2,545	2,349	196	7.7
Itasca	5,185	4,749	436	8.4
Jackson	1,556	1,443	113	7.3
Kanabec	1,234	1,119	115	9.3
Kandiyohi	3,953	3,570	383	9.7
Kittson	677	612	65	9.6
Koochiching	2,797	2,609	188	6.7
Lac Qui Parle	1,110	1,042	68	6.1
Lake	2,436	2,309	127	5.2
Lake of the Woods	314	289	25	8.0
Le Sueur	2,779	2,559	220	7.9
Lincoln	599	565	34	5.7
Lyon	2,971	2,671	300	10.1
McLeod	4,138	3,695	443	10.7
Mahnomen	475	445	30	6.3

areas. Tolerating bad marriages is on the decline in every part of the state.

Life Crises

Divorce is only one of four life events that plunge women and their dependents into the realities of the wage-earning economy. Others are: the death of the husband, the sudden or sometimes chronic unemployment or underemployment of the husband, and the disability of the husband through a physical or emotional condition which renders him unable to work. In Minnesota in 1970 one out of every four women with minor children was faced with one of these circumstances and thereby placed in economic risk.

Divorce brings poverty to many women and their children. Between 1968 and 1974 the real income for married couples increased 21.7 percent while for divorced women real income decreased by 29.3 per-

cent. By 1974 divorced and separated women had incomes that were just about half that of married women and their families. As of 1975 less than 22 percent of divorced women with children were collecting child support regularly. In addition, the amount and frequency of payments are known to drop drastically with the passage of time. Despite national, state and local efforts to locate fathers and make them shoulder their responsibilities, these female headed families are usually left to their own resources.

Widowhood has much the same impact on a family. Social Security may offset loss of income, but the lower the husband's wage level at the time of death, the lower the payments. In 1969, for widows under 35 years with dependent children, 1969 income from all sources except work was only half what was required to keep a family on a low level budget.

In some situations the husband may re-

County	People earning \$6,500 or more			Females as a percent of those earning \$6,500 +
	TOTAL	MALE	FEMALE	
Marshall	1,047	943	104	9.9
Martin	3,327	3,092	235	7.1
Meeker	2,106	1,968	138	6.6
Mille Lacs	1,850	1,670	180	9.7
Morrison	2,702	2,432	270	10.0
Mower	7,986	6,931	1,055	13.2
Murray	1,269	1,165	104	8.2
Nicollet	3,247	2,945	302	9.3
Nobles	2,741	2,522	219	8.0
Norman	801	732	69	8.6
Olmsted	15,789	13,738	2,051	13.0
Otter Tail	4,854	4,377	477	9.8
Pennington	1,624	1,464	160	9.9
Pine	1,941	1,759	182	9.4
Pipestone	1,230	1,106	124	10.1
Polk	4,081	3,745	336	8.2
Pope	1,525	1,383	142	9.3
Ramsey	95,703	82,143	13,560	14.2
Red Lake	483	435	48	9.9
Redwood	2,123	1,885	238	11.2
Renville	2,006	1,803	203	10.1
Rice	5,810	5,246	564	9.7
Rock	1,468	1,375	93	6.3
Roseau	1,141	1,002	139	12.2
St. Louis	36,603	33,232	3,371	9.2
Scott	5,584	5,122	462	8.3
Sherburne	2,895	2,615	280	9.7
Sibley	1,728	1,624	104	6.0
Stearns	11,185	10,167	1,018	9.1
Steele	4,164	3,854	310	7.4
Stevens	1,237	1,113	124	10.0
Swift	1,247	1,153	94	7.5
Todd	1,815	1,663	152	8.4
Traverse	661	573	88	13.3
Wabasha	2,306	2,093	213	9.2
Wadena	1,146	1,038	108	9.4
Waseca	2,223	2,029	194	8.7
Washington	16,700	15,079	1,621	9.7
Watonwan	1,556	1,422	134	8.6
Wilkin	1,026	938	88	8.6
Winona	5,879	5,336	543	9.2
Wright	5,558	5,176	382	6.9
Yellow Medicine	1,637	1,515	122	7.5

main at home, but not be able to provide adequately for the family. According to the 1970 census 11.6 percent of the male labor force was disabled, with various degrees and durations of disabilities. Almost two-thirds were disabled for periods of over five years. Disability, unemployment, and underemployment of the spouse drastically reduce household income. Social insurance may replace part of the lost income, e.g. Workman's Compensation and Social Security, but no insurance exists for underemployment, and unemployment benefits have a time limit. Even when insurance coverage is available, the economic picture is gloomy.

The CURA Study

How do women and their dependent families survive when faced with these pivotal life events? Public assistance or a job, and most often both, seem to be

the answer. But do jobs pay enough to make a difference? To find out, we did a county-by-county analysis, locating jobs that paid a livable wage and were available to women. In order to complete a county-by-county analysis it was necessary to use data from the 1970 census. The limitations of using data that are a decade old are obvious. However, there is evidence that patterns of employment for women have not changed substantially. The data assembled by this study provide a base of information from the 1970 census that should be a significant benchmark for measuring a decade's change, yet to be revealed in the 1980 census.

To examine the question of where the jobs are that pay women a livable wage, we selected \$6,500 as an annual wage in 1970 that would provide a family of four with the basic necessities of life above a poverty level. This figure is roughly equivalent to the Bureau of Labor Statistics minimum in-

come for a standard low level budget. The equivalent in June 1979 dollars would be \$12,300.

What does this livable wage provide? For a family of four it means rental housing at a modest level; a USDA nutritionally adequate diet, assuming the family never eats in restaurants; transportation that depends chiefly on public vehicles, supplemented by a six year old car requiring few repairs; occasional replacement of clothing; and insurance coverage for major illness. There is no provision for vacations, major breakdown of household equipment, or saving a small nest egg. It is a bare bones wage.

The data for this study were derived from an examination of the actual jobs that women held that paid \$6,500 or above as revealed in the 1970 census data, county-by-county. A comparison was made with the number of jobs that men held, paying that wage level, county-by-county. Further, a projection was made on the potential competition for jobs at this support wage level, within various parts of the state.

Where Are the Jobs?

Table 1 presents the county-by-county data and illustrates with startling clarity the unequal distribution of jobs with livable wages between men and women in 1969. Minnesota, like the nation at large, has developed a labor market in which women claim only a small portion of the jobs with a livable wage. In Minnesota only 14 percent or one in seven of all women employed in 1969 earned \$6,500 or more and the distribution of these jobs was highly unequal. Hennepin County, with the highest number of jobs available, had nearly 1,000 times the number of jobs available in Mahnomon County (the lowest). Together, Hennepin and Ramsey counties accounted for more than half of the jobs in the state at this wage level.

For men, the picture was considerably brighter. While in most counties men comprise two-thirds or less of the labor force, 90 percent of the workers earning the livable wage were men. In only a few counties did this dominance decrease—notably in Hennepin County, where men still held over 85 percent of the better paid jobs.

While the data in Table 1 are interesting they have the major disadvantage of not considering the number of people in the county who might be competing for an available job. All other things being equal, Table 1 would lead one to believe that the best opportunities for a job paying a support wage exist in the counties with larger populations. But this is not necessarily the case.

The availability of support level jobs for women is better presented in Figure 1. This map takes into account the size of the population in each county that might be competing for the available jobs. Since our concern is with job availability for women

whose families may be at risk, we compared the size of the population at risk (one in four families with children under 18 years) in each county with the number of jobs held by women that paid \$6,500 or more. This ratio, always greater than 1.0, is an indicator of the competition for a job. To aid in reading the map, counties have been grouped into three equal size clusters of counties indicating levels of job availability.

The ratio of job availability for the state as a whole (1.7) falls within the range of ratios defining the best group. Only Hennepin, Ramsey, Mower, and Olmsted counties offer job availabilities better than the state average. The other 83 counties do worse than the state ratio. The difference in job availability between the worst and the best counties is nearly 7 to 1.

Determinants of Job Availability

What accounts for the small number of jobs with livable wages available to women? And further, what accounts for the wide variation in their distribution in the state?

Occupational Segregation

To put the first question in perspective, one should note that despite the widespread labor force participation of women in this last decade, there is a persistent and deteriorating relative income position between men and women. Generally, this is attributed to the fact that the occupational structure of Minnesota, as of the rest of the country, has changed little over three decades. Despite the vast social and economic shifts of the last century, jobs remain sex typed and astonishingly resistant to change. Women remain clustered in a small range of occupations, few of which generate wage levels appropriate for the support of a family.

As Table 2 illustrates, nearly one-quarter of all women workers in 1970 were employed in one of four occupations: secretary, sales clerk, waitress, or elementary school teacher. Those have been the most popular jobs for women for decades. Women comprise 98 percent of all secretaries, 96 percent of all typists, 68 percent of all sales clerks, 95 percent of all waitresses, and 91 percent of all cashiers.

The salaries of female dominated jobs are low. Only two of the top ten jobs provide a livable wage: elementary teacher and registered nurse. And registered nurses frequently work only part-time. Thus, of the top ten jobs, representing 42 percent of the jobs held by women in 1970, only elementary teachers regularly made enough to support a family.

Geographic Inequities

While occupational segregation accounts for the small number of jobs with livable wages available to women in the state as a

whole, what accounts for the wide variation in their location, county-by-county? What are the features of a county that either generate or withhold higher level wages for women's work?

We examined a number of county characteristics in order to explain these geographic inequities: size of cities, economic strength, location, and types of industry. Table 3 presents an overview of how these various characteristics compared with our three county groupings for job availability as shown in our data map (Figure 1).

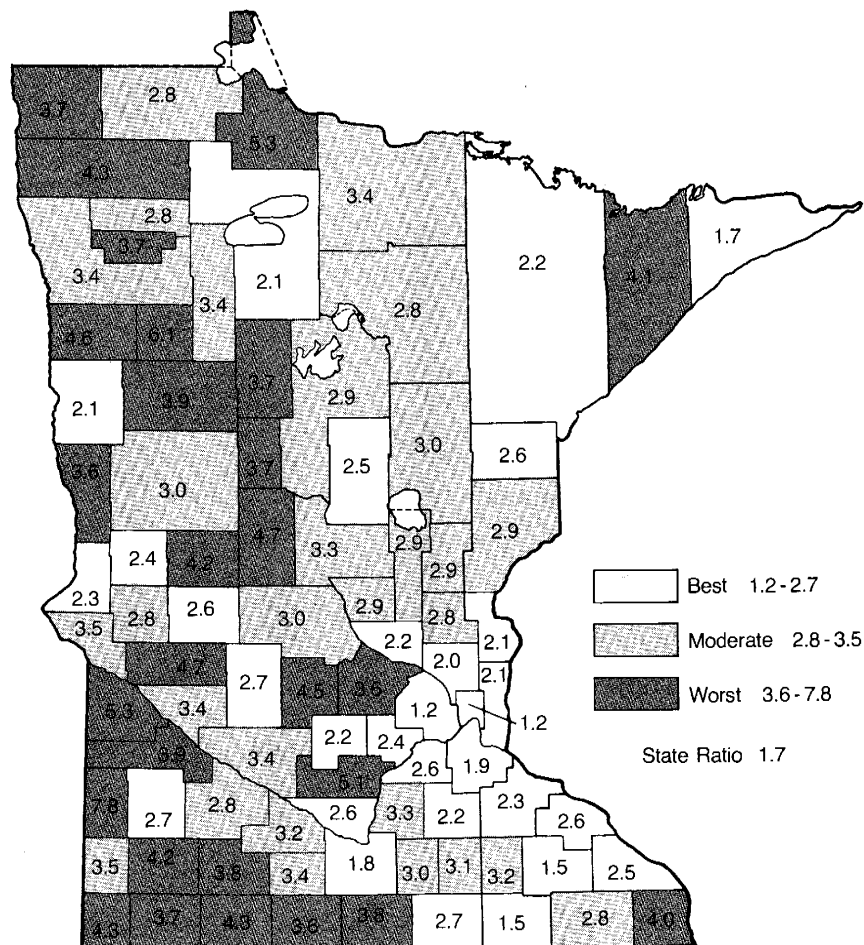
The counties with the best job opportunities are concentrated in the populous metropolitan area and southeastern Minnesota, but are otherwise scattered across the state. Forty-six of the 53 cities having over 10,000 people are in these counties. Larger cities tend to be economically strong and often support unions which have succeeded in making wage gains for their members. For example, Austin's meat packing union has made Mower County one of the best places in the state for women seeking wages above our \$6,500 threshold. However, several counties that do not contain large cities are in this group. Some of these are adjacent to the large city of another county, for example, Nicollet's

adjacency to Mankato in northern Blue Earth County. Other counties have no large city nearby, but their smaller cities have been successful in attracting satellite plants of Twin Cities industry, such as the 3M plant in Hutchinson (McLeod County). Counties of southeastern Minnesota fall within the manufacturing belt of the nation and, therefore, have diversified manufacturing enterprises. State universities and hospitals bring an above average number of well paid jobs to some counties.*

The factors that make these counties good places for women to work make them good for men too. Only in Lake and Houston counties did the position of women not improve significantly with the position of men. Where the economy is most vigorous, women benefit along with men. And women have responded to good economic situations with higher labor force participation. For example, 10 percent more of the women in Beltrami County are in the labor force (38.6 percent) than in Lac qui Parle County (28.6 percent) which is in the worst group.

*A few counties do not fit any of the descriptions laid out. These tended to be small counties where census sampling problems may have distorted the results.

Figure 1: AVAILABILITY OF JOBS FOR WOMEN THAT PAY A LIVABLE WAGE*



* (Number families with dependent children) / 4
Number women earning \$6500 or more

At the other end of the spectrum are counties with the *worst* ratio of dependent families to well paid jobs for women. For these counties the ratio was over twice the state mean. These counties tended to be in the western half of the state. Only two had cities of over 10,000 people. They are rural counties, usually with an economy based on agriculture, and lacking in local industry or in state or regional public service jobs. The recreation industry, present in several of these counties, has a high labor force participation rate for women. The jobs which the industry provides for women, which are seasonal, part-time, unattached to benefit systems and close to minimum wage levels, may be useful as a small supplemental income but are in no way adequate to support a family. Douglas County is an example. Although it has a fair size city, Alexandria, which depends heavily on the recreation industry for an economic base, it offers women meager economic opportunities. Only those so-called recreation counties which have a healthy and vigorous economy in addition to the recreation industry will give women any assurance of a job with a livable wage.

The presence of a county hospital and nursing homes in a county will employ relatively large numbers of women, but will not

generate a sufficient number of good paying jobs to bring their counties into a positive profile. What is required is a regional enterprise, such as an institution of higher education or a state hospital, that can draw dollars from a larger area.

The presence of manufacturing enterprises presents a complex picture. Generally, the location of diversified manufacturing is a factor in good paying jobs for women. However, if a county has an industry that by tradition and practice has excluded women from its high wage level jobs then, obviously, no advantage to women occurs. For example, in Lake County despite a taconite plant and forest products industry, few women occupy positions that pay a livable wage. Generally, about 5 percent of the work force in the lumber and mining industries are likely to be women and they work in low paying support staff jobs: secretarial, clerical, and service.

Distinctive occupationally segregated patterns are associated with certain industries. Apparel and food industries, for example, rely heavily on women workers at the low end of pay scales. The apparel industry is one of Minnesota's lowest paying industries. The majority of its workers are semi-skilled, mass production sewing machine operators, predominantly women.

The presence of these enterprises within a county will not generate many jobs with livable wages for women.

In the *moderate* group are counties caught between the other groups. Many contain Minnesota's medium-sized cities. One notes that these counties may have specialized manufacturing plants, such as paper or snowmobile factories, but women are typically not employed in the higher paying jobs in these enterprises. Alternatively, the counties may have a state hospital or a state university or a regional institution.

While the presence of certain institutions such as state universities, regional hospitals, and public service jobs, are indicators of good jobs for women, closer examination of the employment patterns within education and health institutions is needed before generalizations can be made. Elementary schools in a region represent good jobs for women but not in sufficient numbers. Community colleges, typically, do not provide a large number of good jobs for women. For those counties that fall in the moderate group, the number of well paid jobs available to women is simply not large enough to move the county into the best group. In some of these counties (Itasca and Koochiching with paper mills) the general economy may even be fairly strong, but this has not benefited women workers.

Table 2: MAJOR OCCUPATIONS FOR WOMEN IN MINNESOTA, 1970¹

Rank Order	Occupation	Number	Women as a Percent of All Persons in This Occupation ²	Percent of All Working Women	Median Salary ³	Occupations Dominated by Part-time Workers ⁴	Rank Order in 1940 ⁵
1	secretary	45,249	98.1	8.3	\$5,117.	—	1
2	sales clerk	29,273	68.0	5.4	2,830	part-time	3
3	waitress	26,428	95.1	4.8	2,362	part-time	5
4	elementary teacher	24,985	85.9	4.6	7,151	—	2
5	bookkeeper	24,542	81.2	4.5	4,284	—	7
6	registered nurse	18,647	97.9	3.4	6,623	part-time	8
7	nurses aides, orderlies	18,342	88.4	3.4	3,327	part-time	24
8	typist	15,645	96.2	2.9	4,500	part-time	1
9	assembler	14,366	59.6	2.6	5,146	—	6
10	cashier	13,326	91.2	2.4	3,075	part-time	7
TOTAL							
	all female workers	544,969	38.0	100.0	4,453	part-time	

¹Data from 1970 Census of Population, Table 176, except where noted.

²1970 Census of Population, Table 171.

³For those working at least fifty weeks per year.

⁴Labeled 'part-time' where median income of all workers is less than 75 percent of the median income of those working fifty weeks or more.

⁵1940 Census of Population, Table 13. Many job categories were different from those of the 1970 Census. Some liberty was taken in matching those jobs and their rank with the 1970 categories.

Table 3: GENERAL CHARACTERISTICS OF COUNTIES GROUPED ACCORDING TO JOB AVAILABILITY

	Best	Moderate	Worst
Location	metropolitan and others	scattered	western half of the state
City Size	large	medium	small
Economic Strength	vigorous	strong	weak
Types of Industry	diversified manufacturing special manufacturing state university	some manufacturing higher education regional hospital	agriculture

Recommendations

It must be remembered that our study was based on data derived from the 1970 census. Ten years later the county-by-county picture may show some modification. The general pattern of economic disparities, we suspect, has not changed. What has changed is the numbers of women who daily find that they must work in order to support their families. All indications are that these numbers are steadily increasing. It is now more compelling than ever that we look to the 1980 census to disclose the number and availability of jobs with a livable wage for women. Every region of the state needs to analyze the attributes of its economy that facilitate or inhibit a fair share of the labor market for women. At least three policy issues are suggested by our study:

- Policies which guide the location of state jobs and institutions must be examined in the light of their impact on providing employment with livable wages for women. More equity could be attained by a judicious placement of regional or state institutions.
- The state Department of Economic Development and the Regional Development Commissions must be aware of the consequences of locating industries and their impact on jobs for women. Locating industry in less well off areas could provide ben-

efits for both these companies and the local women.

- Programs that assist women themselves to break into traditionally male jobs should be developed and operated around the state. This is an obvious task for the state Department of Education.

In addition, a number of further studies are called for. They follow from the work mentioned above as well as from avenues we could not pursue due to the lack of data.

- Studies should examine the mobility patterns of women and their dependent families at the time of life crises.
- Studies on the economic survival of women, left on their own, should be undertaken. A particular focus should be on counties providing the poorest job opportunities.
- The relationship of AFDC to job availability should be examined. Whether or not AFDC is an appropriate subsidy to a poor wage market should be discussed publicly.
- More data is needed on the commuting patterns of women. If the maximum distance they will drive to work is significantly less than for men, more dispersed job opportunities should be developed.
- Better data is needed on the part-time nature of the work performed by women with dependent children. The census provides no single table combining hours worked per week and weeks worked. Is the work voluntarily part-time or is part-time work all that is available?
- And finally, when the 1980 census information becomes available, a comparative study to this one should be undertaken to measure the changes, if any, that have occurred over the decade.

Related Readings

Blau, Francine. "Occupational Overload: Sex Segregation and the Labor Market." A speech presented on March 10, 1975 at a CURA sponsored Spring Hill Conference: Career Options for Minnesota Women—Some Realities of Re-Entry. Available in CURA's Library, 316 Walter Library, University of Minnesota.

Leik, Sheila. "Profile of Earnings for Female-Headed Families." June 1979. A paper available in CURA's Library, 316 Walter Library, University of Minnesota.

Minnesota Department of Employment Services. *Women in Minnesota: An Economic Analysis of Their Work Experience*. St. Paul: Research and Planning Branch of the Minnesota Department of Employment Services. 1977.

Rosine, John. "Women's Work in 1980—Where Will the Jobs Be?" A speech presented on March 10, 1975 at a CURA sponsored Spring Hill Conference: Career Options for Minnesota Women—Some Realities of Re-Entry. Available in CURA's Library, 316 Walter Library, University of Minnesota.

Sawhill, Isabel V. and Ross, Heather L. *Time of Transition: The Growth of Families Headed by Women*. Washington D.C.: The Urban Institute. 1975.

Wattenberg, Esther and Reinhardt, Hazel. "Female-Headed Families: Trends and Implications." *Social Work*. Volume 24, Number 6. November 1979. pp. 460-67.

BECO—New CURA Office Opens

CURA's newest project center, BECO (the Bio-Energy Coordinating Office), was opened in January. BECO was established with four goals in mind:

1. to provide a forum for the exchanging of information and ideas on bio-energy research and energy policy between interested University faculty and staff;
2. to provide a wider forum for information exchange among institutions throughout the state that are engaged in bio-energy related areas. Such institutions include: Minnesota colleges and universities; a number of state agencies (Department of Agriculture, Department of Natural Resources, Energy Agency, Pollution Control Agency); and other appropriate state, local, and regional agencies;
3. to encourage research in bio-energy related areas and provide information on possible funding sources for such research;
4. and finally, to compile and update descriptions of ongoing research efforts at the University which are related to bio-energy.

BECO has begun a series of seminars on various aspects of bio-energy. The se-

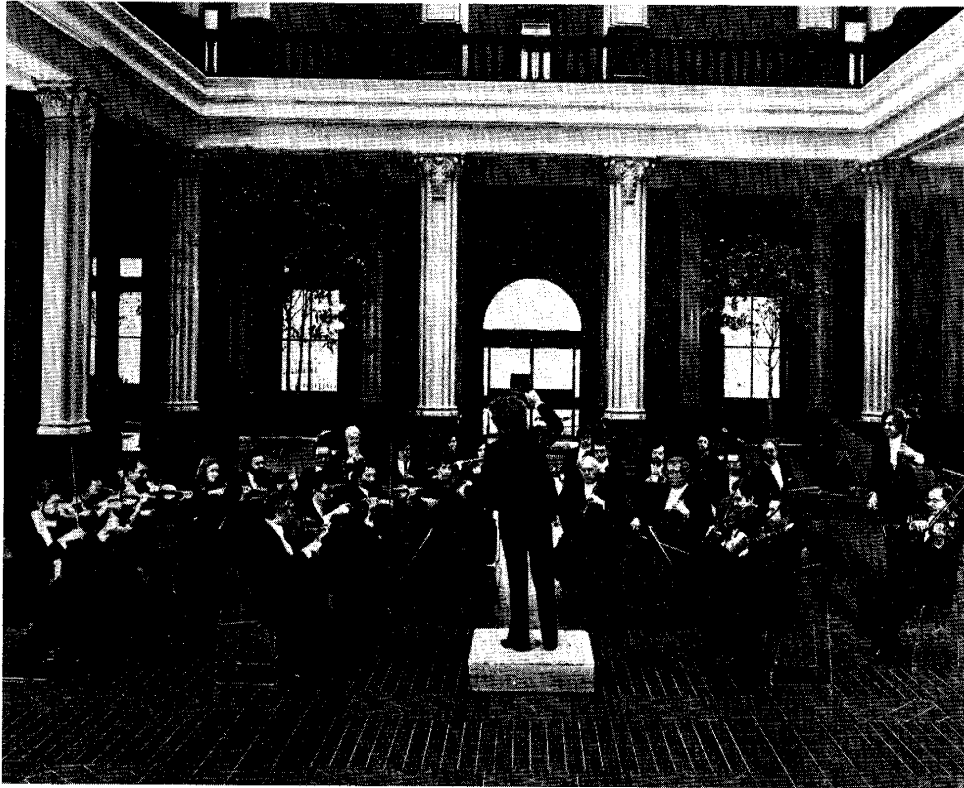
ries, held twice a month on Friday afternoon, is designed as a forum for exchanging specialized information between research and policy people. University people involved in biochemistry, botany, agricultural engineering, agricultural economics, soils, forestry, and land use planning have been attending as well as staff people from a number of different state agencies.

The office is also sponsoring some research on the use of Minnesota lands for growing biomass energy crops, such as cattails. Future plans include participation in curriculum development and preparation of policy papers. BECO hopes to assist appropriate departments with the development of graduate level courses that will look at the impact of energy on various aspects of society, such as transportation, housing, industry, and agriculture. A series of policy papers are projected dealing with the long term prospects of solar, biomass, and other alternative energy sources giving special attention to what types of public policy initiatives are needed to foster these potential new energy sources.

BECO is administered by Douglas C. Pratt, director and Nancy J. Andrews, assistant director. Offices are located in room 316, Walter Library, at the University of Minnesota. Phone: 373-7796.

Financing Performing Arts in the Twin Cities

by Joseph Galaskiewicz



Joseph Galaskiewicz is an assistant professor of sociology at the University of Minnesota. This article is part of a larger study of Twin Cities cultural organizations that he has been engaged in over the past two years with CURA funding. He plans to update his research this year to cover changes from 1977 to the present. Galaskiewicz holds a Ph.D. in sociology from the University of Chicago and is the author of *Exchange Networks and Community Politics* (Beverly Hills: Sage, 1979) and several articles on community structure and decision-making.

While financing of arts organizations across the country is often tenuous at best, the performing arts in the Minneapolis-St. Paul metro area, through the late 1970's, at least, appear to be alive and well.

What is the secret of this success? Corporate executives claim the business community is responsible. Government officials point to state and municipal revenues flowing to local cultural organizations. Thus it appears that both the private sector and the

public are helping Twin Cities arts organizations overcome the difficulties that cultural organizations in other cities face.

In 1978, a research assistant and I conducted interviews with administrators of 45 Twin Cities cultural organizations to find out something about the finances of local arts groups. The study was supported by the Center for Urban and Regional Affairs. Although a variety of organizations were included in the larger study, we are reporting only on the professional and amateur theaters and professional orchestras in this article. As background information and for comparisons we used four national surveys of similar organizations.

Shortage of Funds— A Chronic Condition

Performing arts administrators are often asked why they seem to be always short of money. After all, computer manufacturers, cereal distributors, and clothing retailers are able to balance their books without having to ask for handouts. Yet arts administrators, their staffs, and boards must make

annual rounds to the state arts board, patrons' homes, and corporate foundations.

Two economists, William Baumol and William Bowen, argue in *Performing Arts—The Economic Dilemma* (1966) that non-profit theaters, orchestras, dance companies, and opera companies are always in financial trouble because they are by nature labor intensive. In contrast to other industries, production in arts organizations cannot be significantly increased by technological innovation. Unlike workers in manufacturing, performers are not intermediaries between raw materials and the completed commodity—their activities are themselves the commodity.

A theater may lengthen its season, schedule several performances of the same production, or move to a larger auditorium. An orchestra may rent out its hall when on tour, hire non-union musicians, or undertake a subscription drive. But after a certain point, further moves toward more efficiency and cost effectiveness produce diminishing returns. The "quality" of the artistic experience declines, consumption drops off, and spiraling costs for materials and especially labor drive the organization either to higher ticket prices or, worse still, deficit spending. Baumol and Bowen's thesis not only explains poverty in the arts but legitimates it as well.

Financing the Performing Arts— National Studies

If asked to describe the changes in financing of their organizations over the past twenty years, most people in the performing arts would tell you that more of their funds now come from businesses and government and that their organizations are less and less able to meet expenses with earned income (ticket sales, tuition, sale of services, and the like). The reason is quite simple. Even though their costs spiral, as Baumol and Bowen suggest, there is little arts organizations can do to increase production and earn more. Business, government, foundations, and private individuals must provide the needed revenue to fill the gap between earned income and expenditures.

A look at national data will show that these observations appear to be accurate. Baumol and Bowen analyzed the expenditures and earned income of the New York Philharmonic, the Cincinnati Orchestra, the Metropolitan Opera, Covent Garden, and eleven major orchestras from 1948 to 1964. As their theory would predict, the absolute dollar differences between these organizations' earned income and their expenditures increased annually. Furthermore, between 1960 and 1964, earned income as a percentage of total expenditures decreased for all organizations studied except the Cincinnati Orchestra.

A well known Ford Foundation report,

The Finances of the Performing Arts (1974), found similar patterns. In 1971, the foundation received responses from 166 of the largest professional non-profit resident theaters, operas, symphonies, ballets, and modern dance companies in the United States. The study found that "support from the public sector increased from almost \$2 million in 1965-66 to nearly \$8 million in 1970-71, and private sector contributions increased from \$22 million to more than \$44 million." It was during this period that the Ford Foundation itself began to make sizeable grants to the performing arts and the National Endowment for the Arts came into being.

The figures in Table 1 bear this out. Between 1965-66 and 1970-71, theaters and orchestras became more dependent on government funds, foundation gifts, and grants; and theaters became more dependent on corporate gifts. For some reason corporate contributions were a less significant part of symphony income in 1971 than in 1966. Furthermore, earned income was a smaller percentage of total expenditures in 1970-71 than it was in 1965-66. Obviously, the earnings of these organizations were falling far behind rising costs.

These data are updated by two more recent studies. A study conducted by the Theatre Communications Group (TCG) of 44 of the largest non-profit professional theaters in the country (82 percent response rate) shows some trends extended that first became evident in the Ford survey. For example, individual contributions are becoming still less important to theaters, while business, federal, and state/local money is becoming more important. This marks a continued move away from individual support of theaters toward organizational or institutional support. However, in contrast to trends cited in the Ford Report, it appears that the ratio of earned income to expenditures has stabilized. While percentage of operating expenses earned dropped from 71.9 percent in 1965-66 to 64.2 percent in 1970-71, it actually increased to 65.4 percent in 1976-77.

There are no published data on finances of orchestras for 1976-77, but a data file maintained by the American Symphony Orchestra League (ASOL) was made available to us. For 1976-77 ASOL surveyed 117 major metropolitan and regional orchestras (88 percent response rate) with budgets ranging from \$100,000 to \$10 million.

The trends found for orchestras almost directly parallel those found for theaters. Federal and state/local government grants continue to be more and more important to orchestras. Unfortunately, private gifts and grants are not broken down, but it is clear that private-sector support is becoming less important. Finally, as we saw for theaters, the ratio of earned income to total expenditures seems to have stabilized.

In all fairness, Baumol and Bowen only predicted that the absolute dollar difference between earned income and expenditures would increase, and there is no doubt that it has indeed increased since 1970-71. However, I would further deduce from their theory that the ratio of earned income to expenditures would decrease. In labor intensive industries such as the non-profit performing arts there are supposedly ceilings on productivity and the costs which can be passed on to consumers. Thus while the cost of operating the organization increases from year to year, the absolute dollar amount of earned income should stay the same.

Yet our data show that somehow professional theaters and orchestras have been able to reorganize themselves to compensate for the increased costs they face and to earn comparable proportions of total expenditures in recent years. Where funds were needed, the government increasingly became a source of revenue. But, it appears that recently the organizations have been able to generate a great deal of revenue on their own. We must caution, however, that our data go only as far as fiscal year 1976-77 and the situation may have changed over the past two and a half years.

Arts Funding in the Twin Cities

The financial data for the Twin Cities arts organizations surveyed in 1978 were taken from interviews with the administrators of the organizations and/or their budget officers. We asked for the budget and total income of the organization for fiscal year 1976-77. We also asked for the dollar amounts that businesses, private individuals, local foundations, non-local foundations, city agencies, state agencies, and the federal government gave to the organizations. Finally, we asked for the amount of earned income.

The study involved three professional theaters (the Cricket Theatre, the Guthrie Theater, and the Children's Theatre), four amateur theaters (Lakeshore Players, Theater in the Round, Minnetonka Community Theater and Jewish Community Center) and two orchestras (the St. Paul Chamber Orchestra and the Minnesota Orchestra).

In Table 2 we see that the average budgets of these three kinds of organizations differ considerably. In 1976-77, the two orchestras had an average budget of \$3,014,204, while the amateur theaters averaged \$287,801. Professional theaters had an average budget of \$1,612,197. Other differences are evident as well. The average percentage of earned income over expenditures was 58.9 for amateur groups, 48.3 for professional theaters, and 42.9 for orchestras. Amateur theaters were more dependent on income from state and local government than professional groups. Pro-

fessional groups tended to be much more dependent on local foundations, the federal government, and individual gifts than amateur groups.

We do not have a national sample of amateur theaters, but we can compare local professional theaters and orchestras to similar groups elsewhere. To begin with, the ratio of earned income to total expenditures for local professional theaters, on the average, was considerably smaller than for theaters elsewhere. Here, earned income of these organizations averaged 48.3 percent of total expenditures; nationally, professional theaters earned about 65.4 percent. In all fairness, however, we should note that the variance among local professional theaters is quite high. The earned income of one organization was 68.8 percent of its expenditures; for another it was only 30.3 percent. The ratio of earned income to expenditures of orchestras is more comparable to orchestras elsewhere. Locally, they averaged 42.9 percent; nationally the ASOL orchestras earned about 46.2 percent. However, again the difference between the local organizations is great. Earned income for one orchestra was 55.2 percent of expenditures; for the other it was only 30.5 percent.

Although we cannot compare expenditures of local government and businesses to expenditures of governments and businesses elsewhere, we can see if local professional theaters and orchestras are more or less dependent upon government and business than organizations elsewhere. Looking at both Tables 1 and 2, we see that in 1976-77 Twin Cities professional theaters were, on the average, more dependent on business and foundations for gifts and grants than professional theaters elsewhere, but less dependent on federal and state/local funds. Orchestras follow a similar pattern. In 1976-77 Twin Cities orchestras were, on the average, more dependent on the private sector and less dependent on state/local revenues than orchestras nationally. While both the private and public sectors may want to take credit for supporting the performing arts locally, it seems that the private sector is more important to local professional organizations.

But is the ratio of earned income to expenditures among Twin Cities performing arts organizations changing? Our theoretical discussion and the Baumol and Bowen study would lead us to believe that over time performing arts organizations would be less able to pay their own way. Organizations in operation longer would earn a smaller proportion of total expenditures. To our surprise, however, in the Twin Cities just the opposite is true. There is almost a perfect correlation between organizations' age and the percent of earned income: the older the organization, the more likely it is to earn over 50 percent of its expenditures. This pattern holds true for both amateur

and professional organizations. The ratio of earned income to total expenditures is much less for organizations formed since 1966-67 than it is for organizations formed prior to 1966-67.*

But if new organizations are receiving more funding from outside, where does it come from? Table 3 gives average income as a percentage of expenditures for six sources specified by the age of the arts organizations and their status. It is clear that newer amateur theater groups are more dependent on state/local grants and business gifts than are older theaters. To the extent that older groups depend on outside revenue, they tend to look to individual contributions and local foundation gifts. Among professional groups, the pattern is similar. Newer organizations tend to depend more on both local and non-local foundations, business gifts, and state/local grants, and older groups tend to depend more on individual contributions and federal grants. As we observed, institutional aid is becoming more important to arts organizations, but it seems to be especially important for the organizations which have only recently come on the scene.

In Conclusion

Our findings suggest it may be time to re-think the Baumol and Bowen thesis. Arts organizations evidently are more capable of responsible fiscal management than Baumol and Bowen suspected. There may now be as much creativity in the office of the business manager as there is on the stage. Some in the profession believe that the proliferation of manuals and handbooks on the management of non-profit organizations is responsible for this turnaround; others have cited the new programs in graduate schools of business administration. I suspect that the increased effort to be *fiscally responsible* is due more to the shift in funding patterns away from individual contributors to institutional support. Just as managers of government, corporations, and foundations are held accountable for the funds entrusted to them, so also must arts administrators be held accountable. The control of the philanthropist was more direct and far-reaching than that of the institutional donor, but it was also more paternalistic and less bureaucratic. It certainly is not unreasonable to expect that arts administrators play by the rules of those upon whom they depend for revenues.

On the other hand, although the proportion of earned income may have stayed constant, the quality of the artistic experience may have suffered. This, of course, is virtually impossible to measure. But if it were true, the Baumol and Bowen thesis

Table 1: NATIONAL PERFORMING ARTS FUNDING PATTERNS
Income as Percentage of Total Operating Expenditures

	Professional Theater (non-profit)			Professional Orchestra		
	1965-66 ^a (N = 27)	1970-71 ^a (N = 27)	1976-77 ^b (N = 44)	1965-66 ^a (N = 91)	1970-71 ^a (N = 91)	1976-77 ^c (N = 117)
Source:						
Individuals:	8.5%	8.3%	6.7%	16.8%	12.1%	} 23.9%
Businesses: ^d	.4	2.0	3.1	8.4	5.4	
Foundations: ^e	5.9	8.9	7.3	3.5	11.0	
Other private: ^f	1.8	5.5	4.2	10.9	12.0	
Federal government:	1.8	4.1	5.5	.1	1.8	4.5
State/local government:	.8	3.2	4.6	3.0	3.7	8.5
Earned income: ^g	71.9	64.2	65.4	54.4	46.1	46.2

^aFord Foundation Report. *The Finances of the Performing Arts*, (New York: Ford Foundation, 1974), Appendix C, p. 19, 37.

^bTheatre Communications Group. *TCG Survey 76-77*, (New York: Theatre Communications Group, Inc.) Table 7, p. 23 & Table 9, p. 27.

^cAmerican Symphony Orchestra League. Private communication, October 1, 1979.

^dThis category is for tax deductible contributions only; business expense contributions are not included.

^eThis category includes both local and national foundation gifts and grants.

^fThis category includes combined/United art fund contributions and other local contributions.

^gThis category includes all income from ticket sales, sale of services, recordings/films/radio/TV, and performances of other groups. Investment income and/or income from endowment are not included.

Table 2: TWIN CITIES PERFORMING ARTS FUNDING PATTERNS, 1976-77
Income as Percentage of Total Operating Expenditures

	Amateur Theater (N = 4)	Professional Theater (non-profit) (N = 3)	Professional Orchestra (N = 2)
Average Budget:	\$287,801	\$1,612,197	\$3,014,204
Source:			
Individuals:	2.4%	4.6%	11.4%
Businesses: ^a	4.9	11.1	4.2
Local foundations:	1.9	22.9	20.7
National foundations:	.0	2.0	.0
Federal government: ^b	.6	3.0	4.5
State/local government: ^b	5.7	2.3	.9
Earned income: ^c	58.9	48.3	42.9

^aThis category is for tax-deductible contributions only; business expense contributions and gifts in kind are not included.

^bThis category includes grants for operations, special programs, and facilities. Payment for services are included under earned income.

^cThis category includes all income from ticket sales, sale of services, recordings/film/radio/TV, concessions, and performances of other groups. Income from investments and endowment or from parent organizations are not included.

Table 3: TWIN CITIES PERFORMING ARTS FUNDING PATTERNS
BY AMATEUR/PROFESSIONAL STATUS AND BY LENGTH OF TIME
IN OPERATION Average Income As Percentage of Total Expenditures

	Amateur		Professional (non-profit)	
	Year of origin Prior to 1967 (N = 2)	After 1967 (N = 2)	Prior to 1967 (N = 3)	After 1967 (N = 2)
Source:				
Individuals:	3.2%	.9%	9.2%	4.5%
Businesses:	2.6	6.0	5.0	13.4
Local foundations:	3.7	.1	15.4	32.0
National foundations:	.0	.0	.0	3.0
Federal government:	.0	1.1	4.5	2.2
State/local government:	1.6	9.9	.9	3.0

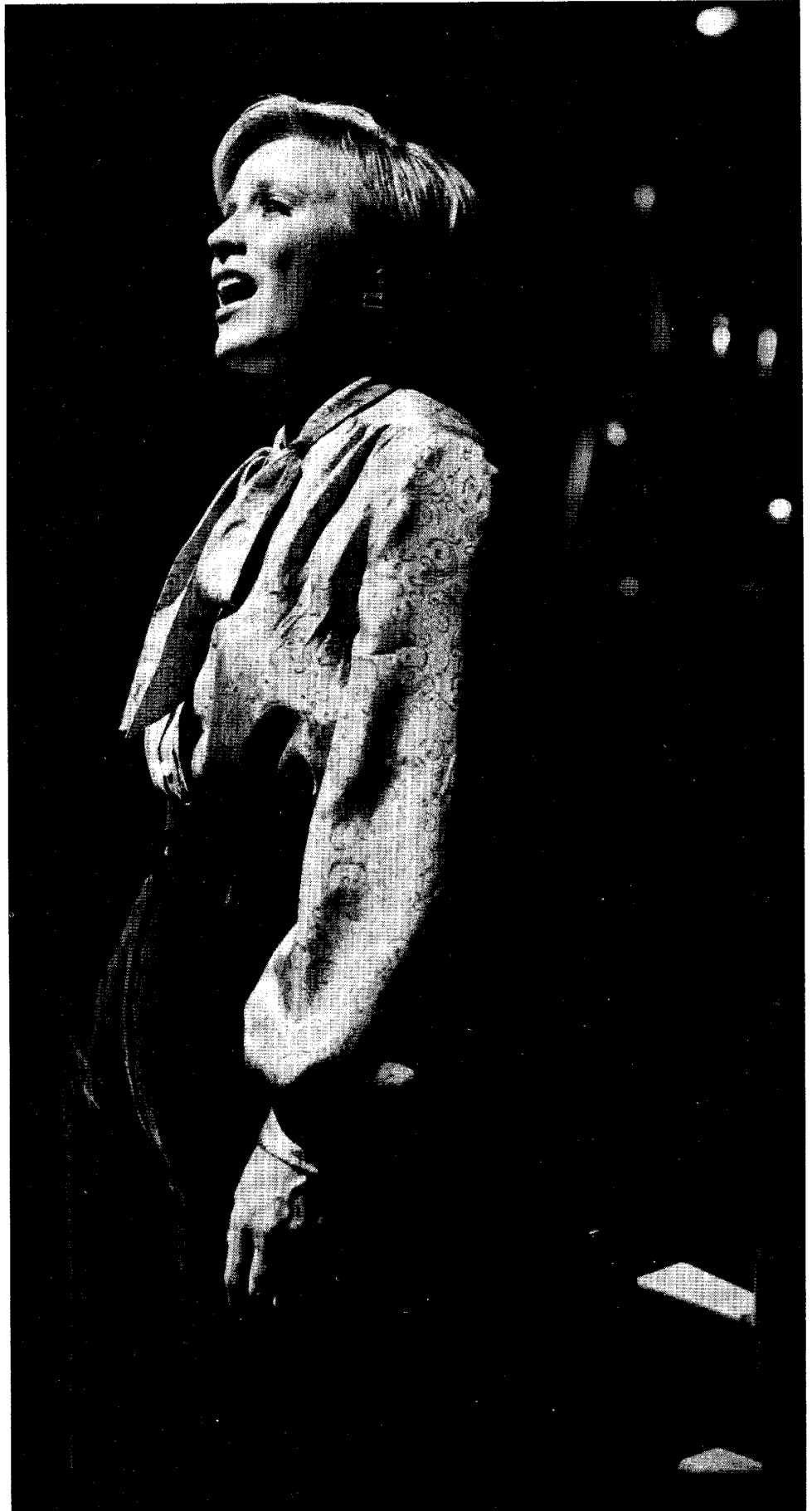
*A table detailing this point is available from the author, upon request.

would still be intact. This unmeasured variable—quality—is an important factor in their equation. But even if we did have a measure of the quality of artistic performances, the effect of the new *fiscal responsibility* might not be felt for two or three years. It seems that we will have to leave these issues for future research to explore.

Our Twin Cities findings suggest that there are different funding patterns among older and newer organizations. The older organization can absorb more of its costs with earnings; conversely, the newer organization is more dependent on support from outside. There are several possible explanations for this. First, older groups may have a better developed audience. Newer groups have to build their reputations and audiences slowly. Second, the older organizations may be better able to compete for top management because they have the prestige, reputation, and financial resources to attract top arts administrators. Newer organizations are likely to be dominated by the performers who started them. These performer-administrators may be less skilled in fiscal management and their creative enthusiasm may lead them to be less concerned about paying their own way.

A third possibility is that the willingness of local businesses, foundations, and state/city/county agencies to make funds available to newer organizations encouraged them to build programs on the premise that these funds would be available in the future. On the positive side, these organizations need not worry as much about gate revenue as the older organizations. They can specialize more, experiment more, and add more variety to the community arts menu. In this respect a conscientious business and government community has contributed to the health and welfare of the arts community. On the negative side, these organizations' livelihood and survival are more dependent upon fluctuations in the economy and political environment.

Needless to say, our findings raise more questions than they answer. Is the Baumol and Bowen thesis wrong? Will the ratio of earned income to expenditures be held constant? Can management adjust to annual inflation rates of 13 percent? How will the arts industry change with fewer *real* dollars available for consumer spending? Will business and government still be willing to fill the income gap as pressures to economize increase both in the public and private sectors? For that matter, why did business and government make funds available to arts organizations when they did? It is certainly easier to pose questions about financing the arts than it is to answer them. Yet the answers to these and other questions are critical for the arts administrator, artist, and arts patron of the 80s.



Minnesota's Peat: A Waiting Resource in Our Northern Wastelands

by Jeffrey P. Anderson

Jeffrey P. Anderson is a research fellow with CURA. This article includes a brief review of his master's thesis: "The Peat Resources of Koochiching County, Minnesota: An Inventory and Evaluation," (Department of Geography, November 1978). Anderson has been a consultant to the Minnesota State Planning Agency, specializing in computer modeling for state and regional land uses. His current work with CURA is with the new Bio-Energy Coordinating Office, where he is exploring lands in Minnesota that are suited for growing biomass energy crops and especially cattails.

On July 24, 1975, the Minnesota Gas Company (Minnegasco) announced its application to the Minnesota Department of Natural Resources (DNR) for a twenty-five year lease on 491 square miles of state-owned land in northern Minnesota containing approximately 200,000 acres of peat. With a \$1 million grant received from the federal Energy Research and Development Administration, Minnegasco and the Illinois Institute of Gas Technology have been conducting an experimental program in peat gasification. If this laboratory project proves successful, Minnegasco hopes to begin producing natural gas from peat with a demonstration plant in northern Minnesota. Though this operation may still be six years away, it provides an interesting alternative to Minnesota's reliance on imported fossil fuels.

How Peat is Formed

Peat is the accumulation of dead plant material in a water-saturated environment. The decay process that forms peat works largely through fungi, anaerobic bacteria, and microscopic animals and proceeds in a stratigraphic fashion. As one generation of plants follows another, layer after layer of organic residue is deposited in the swamp or marsh. The constitution of these successive layers changes as time goes on since a sequence of different plant life is likely to occur.

Minnesota's Peatlands

Minnesota contains nearly half of the nation's peatlands. The greatest number of these deposits developed in potholes, depressions and small lake basins. However, in total acreage such deposits account for

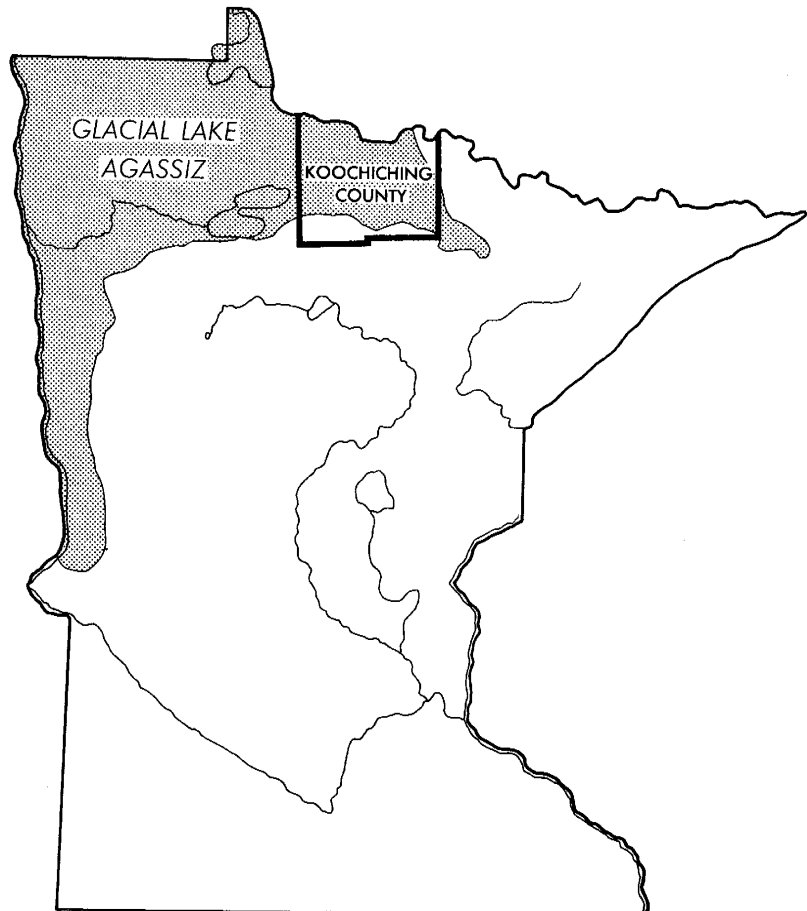


Figure 1: LOCATION OF KOOCHICHING COUNTY AND EXTENT OF GLACIAL LAKE AGASSIZ IN MINNESOTA

less than 15 percent of all of the peat in the state. Over 85 percent of Minnesota's peatlands developed on the poorly-drained marshy landscapes of former glacial lake plains.

Glacial Lake Agassiz was the largest such body of water, occupying a vast natural basin north of the continental divide. It stretched across what is now northwestern Minnesota, northeastern South Dakota, and eastern North Dakota. At one time it covered more than 110,000 square miles in Minnesota (Figure 1). Wave action and sedimentation eventually leveled the lake floor, which, when the lake drained, became a flat, marshy plain. Much of the eastern section of the old lake is a great wetland known as the Big Bog. It is here that some of the most extensive peatlands in the world are located. Koochiching County (which is

discussed later) lies in the heart of these peatlands.

Past Uses of Peat

Peat has been used in Minnesota, at one time or another, in all three of its common applications: for fuel, as a medium for agricultural production, and for horticultural purposes.

As early as 1870, a committee of the Minnesota State Legislature considered the possibility of fueling locomotives with peat. Nothing came of that proposal, but in the winter of 1919-20 peat was used in powdered form to heat the Phoenix Building* in Minneapolis. All attempts to use peat for fuel were short-lived, however, a cir-

*Razed in 1961 to make way for the new Minneapolis Public Library.

cumstance best explained by the enormous resources of natural coal and other fossil fuels in the United States.

Agricultural applications of peat reached a short but impressive peak when at the turn of the twentieth century thousands of acres of peat-land in the Big Bog region of northern Minnesota were drained and put under cultivation. The experiment ended badly because of crop failures, tenant insolvency, and high taxes.

Today, selected peatlands in Minnesota are being used for agricultural endeavors. Vegetable and sod farming on peat in the Twin Cities area and elsewhere have proved highly profitable. Commonly grown vegetables now being marketed include carrots, cabbage, cauliflower, celery, potatoes, lettuce, radishes, and onions.

Peat is also used in horticulture, principally as a soil additive and as a planting medium. Minnesota's share of the horticultural peat market is not large. Despite its massive deposits, the state produces and markets only 3 percent of the horticultural peat sold in this country. This may change, however, if the production of horticultural peat continues to rise, as it has since 1973.

Turning Wastelands into Natural Gas

Minnegasco's application to lease state lands has not yet been either granted or rejected. The area they propose to lease holds only about 3 percent of Minnesota's total peat reserves, yet it represents more land than is devoted to any other single industrial, agricultural, or mining enterprise in Minnesota. The project poses a spectrum of questions for the state as to what constitutes the wisest management of peatlands, a resource until now only marginally exploited.

The Minnesota Peat Program

Because Minnesota's peatlands have previously been considered virtual wastelands, no state-wide inventory of the resource existed until recently. In response to Minnegasco's proposal and the need for more definitive peat information, the Minnesota Peat Program was initiated in 1976. This program, principally funded by state legislative appropriations, is administered by the Division of Minerals at the Minnesota Department of Natural Resources. The current work schedule includes:

- an in field inventory of Minnesota's peat deposits,
- an assessment of the impact peat development would have on the surrounding natural environment,
- a study of potential methods of reclaiming land where peat has been extracted,
- exploration of the social and economic impact that development would have on surrounding communities,

Table 1: TOTAL RESERVES OF FUEL PEAT BY OWNERSHIP IN KOOCHICHING COUNTY

Ownership Group	Acres	Cubic Yards of Peat	Tons of Peat
Federal	64,700	724,864,000	98,762,000
State	734,000	8,221,250,000	1,120,150,000
Tax Forfeit	60,600	679,168,000	92,536,000
Private	89,700	1,004,420,000	136,852,000
Total	949,000	10,629,702,000	1,448,300,000

- research into potential uses of peat,
- and an examination of potential policy frameworks for administering peat development.

CURA Peat Studies

While Minnesota's Peat Program is compiling an impressive log of information on the state's peatland, many basic questions concerning peat quality, quantity, ownership, and distribution can be addressed using a computer and presently stored resource data. The rapid analysis and mapping capabilities of the computer make it an invaluable tool for resource planning purposes.

In 1976 and 1977, CURA together with the Minnesota State Planning Agency used the Minnesota Land Management Information System (MLMIS)* to generate computer maps displaying the ownership and areal extent of the peatlands in Koochiching County, the southwestern part of the Arrowhead region, and in the northern headwaters of the Mississippi River.** The MLMIS was initiated under the direction of CURA in response to the need for centrally stored and standardized resource information. The MLMIS computer files hold physical and cultural data about the state, organized in spatial units of 40 acres each.

Peatlands in Koochiching County

Some of the most extensive peat deposits in Minnesota are the nearly one million acres found in Koochiching County (Figure 2). About 95 percent of these lands (950,000 acres) are the peats best suited for energy purposes. The remaining 5 percent are peats that developed from sphagnum moss—they do not offer an energy potential equal to the others, but are highly valued for their horticultural uses.

Sixty-seven percent of the peat in Koochiching County is covered with stands of timber having some commercial value.

Black spruce is the dominant species growing on peat soils and currently accounts for about 25 percent of the timber harvested in the county. Although a prime pulp species, only about half of the annual desirable harvest of black spruce is accomplished presently, largely because of the remoteness and difficult terrain of the peatlands.

The State of Minnesota is the dominant owner of peat in Koochiching County, holding 78 percent of the total. This includes the massive deposits in the western portion of the county where Minnegasco proposes to lease land. Most of the state-owned peat is forested with black spruce, but large open tracts of peat are found in the central and western parts of the county. Federal, tax-forfeit, Indian, and private ownership account for the remaining 22 percent of the peat in Koochiching County with roughly equal ownership among them.

The peats best suited for fuel use are characterized by moderate to high degrees of decomposition, low mineral content (ash), and relatively high densities (10-20 lbs./cu ft). Volume estimations depend on approximate stratigraphic assessments plus the area estimates obtained from the computer files. Using appropriate figures for depth, acreage, and bulk density, the total reserves of fuel peat were computed and are shown for the dominant ownership groups in Table 1. The totals are of an arresting magnitude: nearly 1.5 billion tons of fuel peat lie in Koochiching County. Of the total, the State of Minnesota owns over 1 billion tons. Most of this state-owned peat is under forest vegetation, but large quantities (about 300,000 tons) are found under cover of open marshes or non-productive timber. The absence of heavy timber makes these deposits more desirable since the peat can be harvested without the cost of tree removal.

Energy Content of Peat

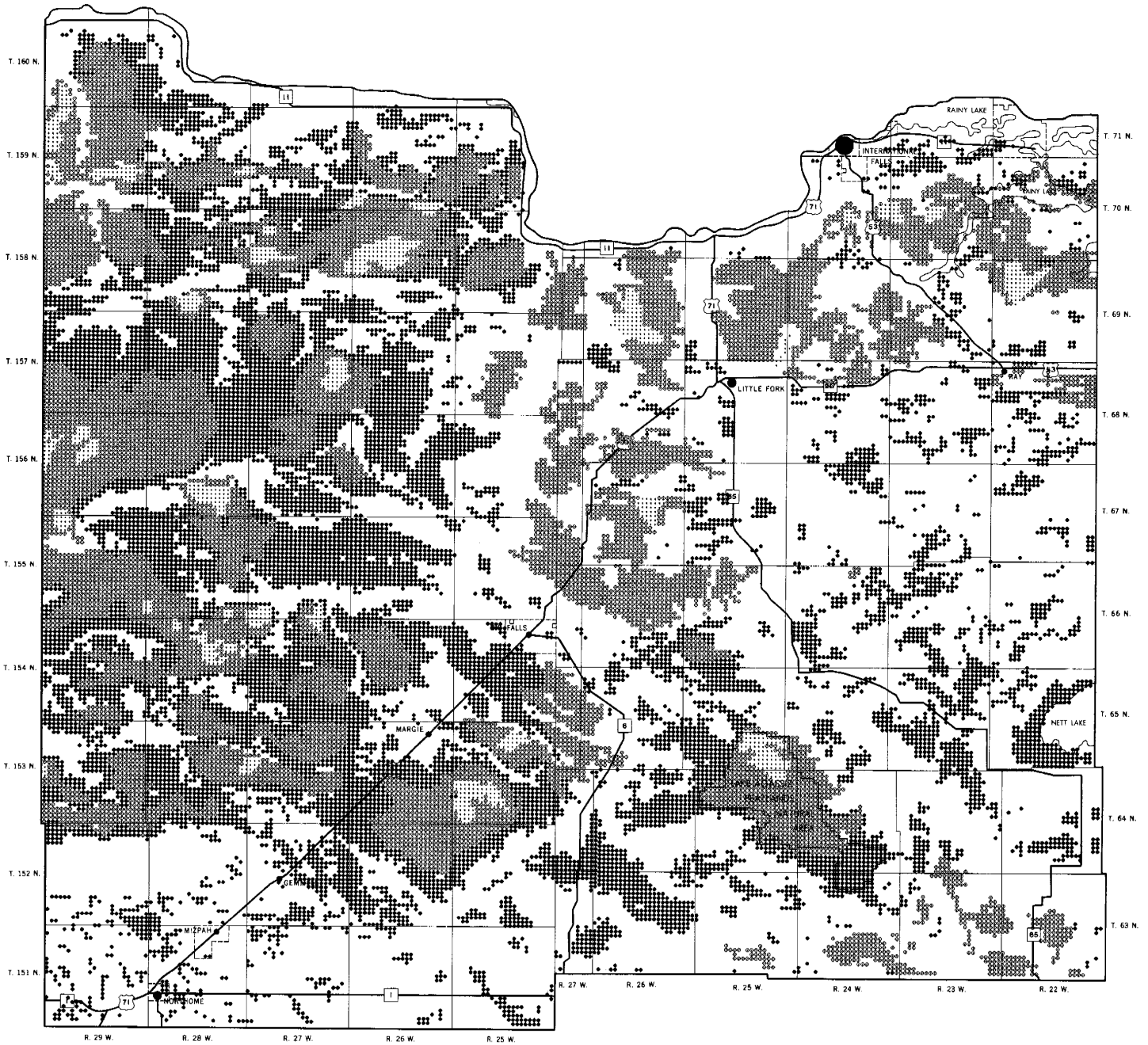
The heating value of fuel peats is approximately 8,000 to 9,000 BTU/lb. when oven dried. Commercial quantities of peat, however, are seldom oven dried because of labor and mechanical expense. Air drying is the most economical and commonly used method.




Generally, air drying will reduce the moisture content to about 50 percent.

*Now administered by the Land Management Information Center of the Minnesota State Planning Agency.

**Koochiching County Peat Resources, 1976. Minneapolis: CURA and Minnesota State Planning Agency, Map Series No. 4, 1004 MLMIS. Major Peat Resources in Minnesota, Undated. Minneapolis: CURA and Minnesota State Planning Agency, Map Series Nos. 5 & 6.

Figure 2: PEAT RESOURCES—KOOCHICHING COUNTY



-  Peats with high energy value
-  Peats with moderate energy value
-  Peats with high horticultural value

Peats with a moisture content of 50 percent have a heating value of approximately 4,000 to 4,500 BTU/lb. or about half the value of the same peat when oven dried.

Even though the heating value of air dried peat is about half of most coal, the vast reserves in Minnesota hold tremendous energy potential. Ireland uses about 2 million tons of peat annually for domestic and industrial fuel purposes, a quantity representing only about .2 percent of the state-owned fuel peat in Koochiching County. In Russia an estimated 66 million tons of fuel peat is burned annually to produce a reported 14.6 billion kilowatt hours of electricity. This figure represents about 6.6 percent of the state-owned fuel peat in Koochiching County. Minnegasco's proposed gasification plant would produce an annual output of approximately 25 percent of the natural gas consumed in Minnesota during 1974. If operated on a continuous basis, this utility could provide twenty years of service to the state from 200,000 acres of peat or a little over one-fifth of the fuel peat available in Koochiching County.

Officials at Minnegasco guess that the cost of natural gas produced from peat (\$3.75 per 1 million BTU), though not competitive with today's natural gas costs (\$3.05 per 1 million BTU), would be competitive with new Canadian sources of natural gas (\$4.38 per 1 million BTU).

Sphagnum Peat

The most common use of peat in the United States is in agricultural and horticultural industries. Only about 3 percent of the national production is supplied by Minnesota producers. Most of the domestic needs are met by operations in eastern states and foreign countries, primarily Canada. The sphagnum moss peat, because of its uniform quantities, is quite popular for horticultural applications and generally commands a higher market price than other peats.

The total volume of sphagnum peat in Koochiching County was determined using areal and stratigraphic measurements. These volume calculations are shown for the principal ownership groups in Table 2. Over 22 million tons of sphagnum peat are found in this county—more than 150 times the total production of sphagnum peat in all of the United States during 1974. A 500-acre peat bog could satisfy the resource requirements for the entire horticultural industry for 20 years at the 1974 rate of use.

Table 2: TOTAL RESERVES OF SPHAGNUM PEAT BY OWNERSHIP IN KOOCHICHING COUNTY

Ownership Group	Acres	Cubic Yards of Peat	Tons of Peat
Federal	4,800	53,760,000	2,923,000
State	31,400	351,680,000	19,123,000
Tax Forfeit	300	3,136,000	171,000
Private	900	10,304,000	560,000
Total	37,400	418,880,000	22,777,000

Conclusions

Although peat is an ultimately exhaustible resource, no immediately foreseeable demands for fuel, horticultural uses, or agricultural production suggest major conflicts between uses. However, allocation of peat types to the most suitable applications is a wise procedure even in the absence of conflict.

There will probably not be another stampede to drain and farm the peatlands such as occurred at the turn of the century. Current use of peatland for agriculture is limited in Koochiching County and should never be of a scale to conflict with other peatland endeavors.

Production of horticultural peat in Minnesota is presently marginal. Should this industry expand, a considerable supply of sphagnum peat could be obtained from bogs set aside for such purposes.

Timber production is vital to Koochiching County's economy and in terms of peatland allocation, it is the black spruce forests that most often coincide with fuel quality peat. Expansion of tree harvesting might go hand in hand with the development of fuel peatlands, since deforestation is a necessary preliminary step to peat mining. If significant development of fuel peat does occur, it will be important to sequence deforestation carefully with fuel peat mining so that neither use is compromised.

Another potential use of these peatlands is for the production of renewable bio-energy crops, such as cattails. This relatively new concept is now being investigated by an interdisciplinary team at the University of Minnesota. Using the peatlands as fields for growing renewable energy crops could present the state with an alternative approach to using peat for energy purposes. Based on present research, however, it is impossible to say whether this use would conflict with peat mining or whether mined peatlands could be reclaimed for producing such energy crops.

While the energy potential of all the peat in Koochiching County is staggering, the mining of many deposits is neither environmentally nor economically acceptable. The 22,000 acres within the Lake Agassiz Peatlands Natural Area, for example, have been set aside for preservation and enjoy protection from development of any kind. Other deposits in the central and eastern parts of the county are too small or isolated to be mined economically.

Minnegasco's project could present Minnesota with a ready market for large volumes of peat. The question of whether the state should allow the removal of so vast a natural resource requires careful thought. Minnesota remains a state dependent on outside energy sources, and if energy shortages increase, the state may be forced to seek alternative energy supplies at home. Though peat is not currently the most economic source of energy it could become an important alternative energy source. It would be unfortunate if the state was forced to perform necessary peat research under the adverse conditions created by an emergency. The decision regarding use of Minnesota's peat for fuel is one that should be made before a severe energy shortage causes public or political pressure to influence the decision.



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