

# Growing Crops for Energy: A Bibliography of Bioenergy References 1970-1980

by Julie A. Winkler

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#### INTRODUCTION

This bibliography was assembled during the summer of 1980 by Julie A. Winkler, then a graduate student in geography. The major emphasis is on the environmental, economic, and social impacts of the production of nontraditional crops on energy farms, forests, and plantations.

The original bibliography existed on 3x5 index cards. Since that time, some references have been added and the entire bibliography has been entered into a computerized retrieval system, called INDEX, at the Minnesota Department of Energy, Planning, and Development. Documentation for the original bibliography is included in the appendix. This documentation includes notes on the resources and methodology used to compile the bibliography.

This bibliography includes 460 citations as well as a subject index. To use this index, locate the subject of interest and note the numbers following that subject title. Those numbers are the sequential numbers of the citations. Within the bibliography, this is the first line of each citation and is preceded by the word "CURA."

Cross-indexing can be accomplished by comparing number lists. If, for example, one were interested in <u>legal issues</u> in <u>Minnesota</u>, the person would compare those two number lists and see that citation number 421 is found in each list. More complex cross indexing can be done easily with this manual method or the INDEX computer system. INDEX can also search on other characteristics, such as author.

This bibliography was printed by INDEX. Some compromises were made to produce a document which looked like a standard bibliography, i.e. author, title, publisher, date. Missing from INDEX is the capability of handling lower case letters or underlining. Instead of using these clues to what a given line in the citation means, INDEX is explicit in noting author (AU), title (TI), etc. These extra notes were deemed more distracting than helpful in a standard bibliography such as this. For a vast majority of citations, there will be no confusion about what a line signifies. Books and reports will present no problem. Periodicals can be identified by noting the inclusion of volume number and pages. The various publications available from NTIS (National Technical Information Service) include an accession number which is required for inquiring after or ordering a publication. No publisher is noted for these publications, only NTIS and its address (in several forms). In those rare cases where the NTIS accession number is unknown, the local access point is given: the University of Minnesota Library collection and catalog number.

For notes on current unpublished research, investigators are directed to the "Bio-Energy Directory" produced by: The Bio-Energy Council

> 1625 Eye Street N.W., Suite 825A Washington, D.C. 20006 (202) 833-5656

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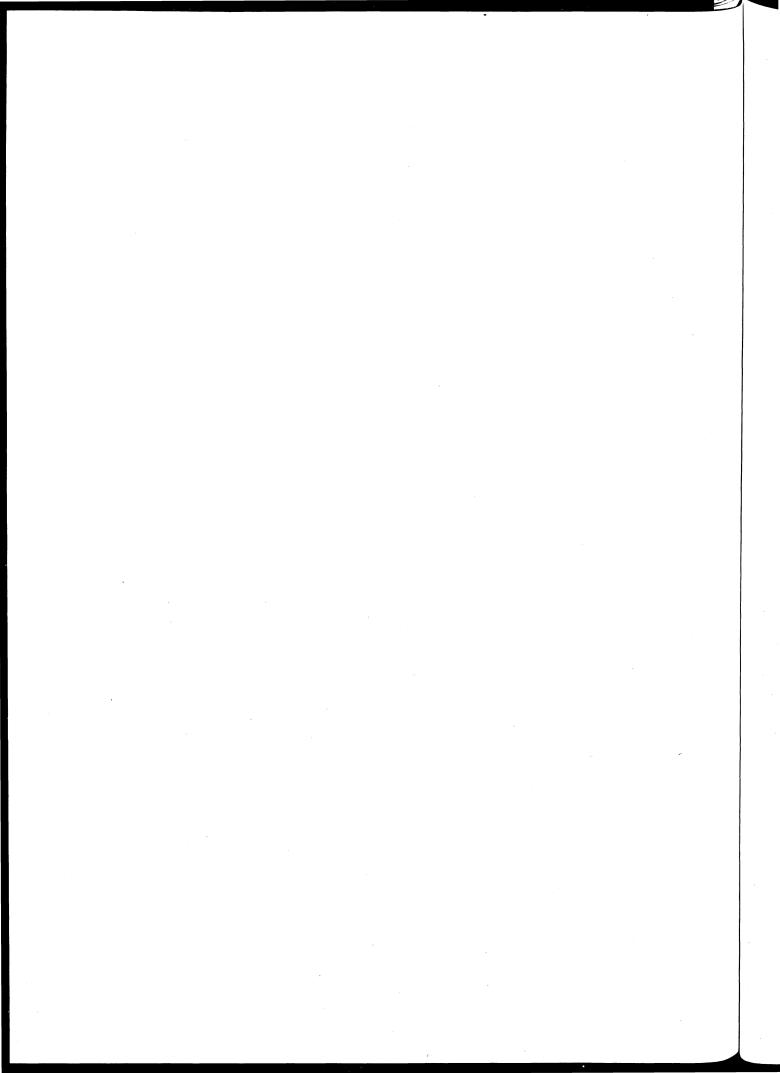
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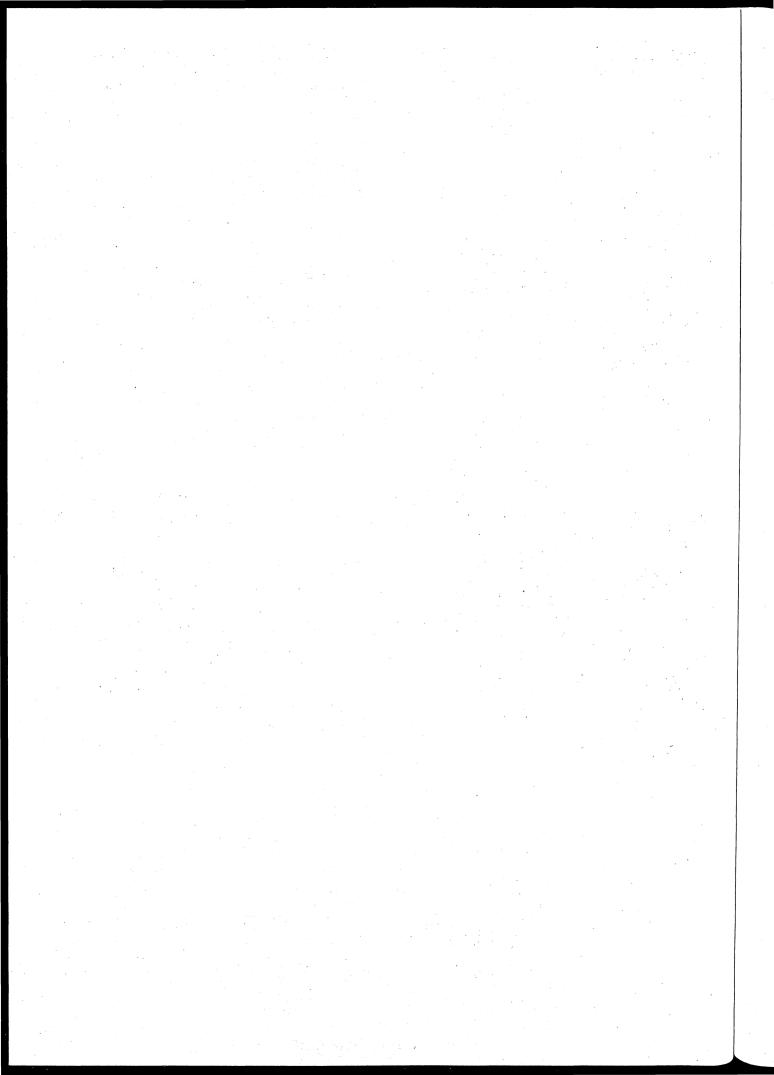
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# APPENDIX:

DOCUMENTATION FOR THE BIBLIOGRAPHY



### Emphasis of the Bibliography

This bibliography provides a collection of references for books, articles, reports, and conference proceedings dealing with the production of biomass as a renewable energy source. The major emphasis of the bibliography is on the environmental, economic, and social impacts of the production of non-traditional crops on energy farms, forests, and plantations. Non-traditional energy crops include cattails, reeds, shrubs, and tree species such as black spruce, alders, willows, poplars, and cottonwoods. Only a few references were collected on the production of traditional food and cash crops such as corn, sugar beets, and sugarcane for energy, on the use of crop and forest residues for energy production, and on the use of aquatic biomass for energy. Also, only a few references were collected on the processes and technologies involved in converting plant materials to alcohols and gases. Articles appearing in national or international journals and reports on the use of peat as an energy source were not included except when the reference dealt with the use of peatlands to grow energy crops. All articles dealing with peat in Minnesota were included in the bibliography, as peat mining is one of the major land uses conflicting with bioenergy farming in the state.

Most of the references have been published in the last ten years. Little research on biomass farming was done before 1970; indices and journals before 1970 were not searched. Also, foreign journals and indices were not searched for relevant references. This does not mean that little work on bioenergy has been done outside of the United States. Canada, Sweden, Finland, and Ireland have all been active in bioenergy research.

### Organization of the Bibliography

The bibliography is organized so that a researcher can easily find all citations on a particular subject; for example, all citations on the production of cattails as an energy crop. Each citation is given a number that appears in the upper-right hand corner of the index card, and the cards are filed numerically. Accompanying the reference cards is a group of subject cards. Examples of subject card headings include: "Bioenergy: General," "Bioenergy: Environmental Issues and Impacts," "Bioenergy: United States Programs and Policies." Under each heading are the numbers of the citations that deal with that subject (see Figure 1). The researcher uses these numbers to find the complete reference in the numerical file. This system allows each citation to be cross-referenced under several subject headings. For example, the number of the citation, "Silviculture Farms: Land Availability," would appear under the subject headings: "Bioenergy: Forests," "Bioenergy: Land Use and Planning," and "Bioenergy: Energy Farms, Forests, and Plantations."

Each subject card includes the general heading, "Bioenergy," and a more specific subheading such as "Environmental Issues and Impacts." This method will permit the index to be combined with any other index such as a bibliography on peat. Citations on the environmental impacts of bioenergy farming appear under the subject card, "Bioenergy: Environmental Issues and Impacts;" while citations on environmental impacts of peat mining would appear under the subject card, "Peat: Environmental Issues and Impacts." All references dealing with peat in Minnesota are listed on subject cards with the general heading, "Peat."

| FI | GURE | 1 |
|----|------|---|
| FΙ | GURE | 1 |

a) Example of a Subject Index card

| Bioenergy:     | Wetlands |
|----------------|----------|
| 0101           |          |
| 0289<br>B0010  |          |
| C0047          |          |
| C0050<br>C0061 | 4        |
|                |          |
|                |          |

## b) Example of a Geographic Index card

| Bioenergy:                             | Canada |   |             |
|--|--------|---|-------------|
|  |        |   |             |
| 0022                                   |        |   | Х           |
| 0092                                   |        |   |             |
| 0097                                   |        |   |             |
| 0118                                   |        |   |             |
| 0208                                   |        |   |             |
| 0288                                   |        |   |             |
| B0031                                  |        |   |             |
| C0028                                  |        |   |             |
| C0056                                  |        |   | · · · · · · |
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|  |        |   |             |
|  |        |   |             |
|  |        |   |             |

The bibliography also has a geographic index arranged by state, region of the United States, and foreign country. All United States publications specific to a state or region are listed on the index card labeled with the name of the state or region. A reference on using wood energy to power electric power plants in Vermont is noted on the card headed "Bioenergy: Vermont" as well as under the subject headings, "Bioenergy: Forestry" and "Bioenergy: Electric Power Generation." Only general works with sections on bioenergy in Minnesota and references from the <u>Bio-energy</u> <u>Directory</u> and computer searches are noted on the geographic index card for Minnesota. All other Minnesota citations are filed separately (see page17). Citations indexed by foreign country include citations specific to that country and all references published in that country.

The subject and geography headings are given in Table 1.

This indexing system allows users unfamiliar with the bioenergy literature to easily find a collection of references on any specific topic. Users familiar with the literature will find this system more difficult to use. A researcher familiar with the literature may know the author of a publication and would like to find the complete reference or may want to find all works by a specific author. This is difficult to do with a bibliography filed numerically and cross-referenced by subject. Also, when updating the bibliography it is difficult to know if a publication has already been included. If a large number of users familiar with the bioenergy literature use the index or if the index is to be updated frequently, it may be worthwhile to have a duplicate set of cards arranged alphabetically by author.

# TABLE 1: SUBJECT AND GEOGRAPHIC HEADINGS

| Bioenergy: | Alcohols and Gases   |
|------------|--|
| Bioenergy: | Aquatic Biomass  |
| Bioenergy: | Arizona  |
| Bioenergy: | Australia  |
| Bioenergy: | Bibliographies and Directories   |
| Bioenergy: | Brazil   |
| Bioenergy: | California   |
| Bioenergy: | Canada   |
| Bioenergy: | Cattails (typha)   |
| Bioenergy: | Conference Proceedings   |
| Bioenergy: | Conversion Systems and Technologies  |
| Bioenergy: | Crop and Forest Residues   |
| Bioenergy: | Denmark  |
| Bioenergy: | Economic Consideration and Impact  |
| Bioenergy: | Electric Power Generation  |
| Bioenergy: | Energy Farms, Forests and Plantations  |
| Bioenergy: | Energy Equivalents   |
| Bioenergy: | Enviromental Issues and Impacts  |
| Bioenergy: | Finland  |
| Bioenergy: | Florida  |
| Bioenergy: | Forestry (Wood)  |
| Bioenergy: | Forestry: Alders   |
| Bioenergy: | Forestry: Poplars  |
| Bioenergy: | General  |
| Bioenergy: | Georgia  |
| Bioenergy: | Germany  |
| Bioenergy: | Grasses  |
| Bioenergy: | Great Plains   |
| Bioenergy: | Hawaii   |
| Bioenergy: | Indiana  |
| Bioenergy: | Ireland  |
| Bioenergy: | Kentucky   |
| Bioenergy: | Land Use and Planning  |
| Bioenergy: | Legal Issues   |
| Bioenergy: | Maine  |
| Bioenergy: | Maryland   |
| Bioenergy: | Michigan   |
| Bioenergy: | Minnesota  |
| Bioenergy: | New York   |
| Bioenergy: | New Zealand  |
| Bioenergy: | Northeastern United States   |
| Bioenergy: | Northwestern United States   |
| Bioenergy: | Oregon   |
| Bioenergy: | Pennsylvania   |
| Bioenergy: | Puerto Rico  |
| Bioenergy: | i de la constante de |
| Bioenergy: | Reeds (Phragmites)<br>Remote Sensing   |
| Bioenergy: | Shrubs   |
| Bioenergy: | South Carolina   |
| Bioenergy: | Southern United States   |
| Bioenergy: | Southeastern United States   |
| stochergy. | Soucheastern united States   |
|            |  |

### TABLE 1 (continued)

Bioenergy: Southwestern United States Bioenergy: Sugar Crops Bioenergy: Sweden Bioenergy: United Kingdom Bioenergy: United States Programs and Policies Bioenergy: Vermont Bioenergy: Virginia Bioenergy: Water Resources Bioenergy: Western United States Bioenergy: Wetlands Energy: General Peat: Canada Peat: Classification and Types Peat: Chemical Products Peat: Conversion Processes and Technologies Peat: Economic Considerations and Impacts Peat: Electric Power Plants Peat: Enviromental Issues and Impacts Peat: Finland Peat: General Peat: Harvesting Peat: Hydrology Peat: Hydrology: Water Quality Peat: Jamaica Peat: Land Use and Planning Peat: Maps Peat: Mineralogy Peat: Minnesota Peat: Policies and Programs Peat: Resources and Inventories Peat: Sweden Peat: Vegetation Peat: Wildlife

#### The Library Search

The library search consisted of three parts: 1) a search of the University of Minnesota main card catalog at Wilson Library, 2) a search of relevant indices for bioenergy references, and 3) an issue by issue search through relevant journals.

The following keywords were used in the card catalog search: alders, bioenergy, biofuel, biomass energy, bogs, cattails, <u>cyperaceae</u>, fens, <u>phragmites</u>, reeds, renewable energy, sedges, <u>typha</u>, wetlands, and willows. Whenever a relevant reference was found, the complete citation was copied onto a 3 x 5 index card. The call number and the campus library in which the book is located are also included on the index card. These books were then found, and where applicable, the chapter headings were added to the index cards. Also, the bibliographies of these books were searched for bioenergy citations. When a reference on bioenergy was found in a book, the complete citation was copied onto a separate index card. The author and title of the book and the number of the page on which the citation was found are also noted on the index card. This information makes it easier to obtain the publication through Inter-Library Loan. Figure 2 shows an example of a reference available in the University libraries and of a reference obtained from the bibliography of a book.

The indices searched for bioenergy references, the libraries in which the indices are located, and the keywords used in the searches are given in Table 2. Again, whenever a bioenergy reference was found, the citation was copied onto a 3 x 5 card. In many cases these citations are incomplete as several of the indices do not give complete bibliographic information.

### FIGURE 2

#### a) Reference Available in University of Minnesota Library

0045 Boyle, Godfrey. Living on the Sun: Harnessing Renewable Energy for an Equitable Society. London: Marion Boyars, 1975. 127p. Architecture Library 621 B697 Chapter Headings: 1) Energy and Exploitation 2) Domestic Energy Consumption 3) Plant Power 4) Direct Solar Power 5) Wind Power 6) Water Power 7) Integration 8) Renewable Energy in a Decentralized Society

b) Reference Obtained from the Bibliography of a Book

Middleton, P., Argue, R., Burrell T., and Hathaway, G. "Canada's Renewable Energy Resources: An Assessment of Potential." Toronto: Middleton Assoc., 1976. 0097

Source: Phillips et al., editors. <u>Chemistry</u> <u>for Energy</u>. Washington DC: American Chemical Society, 1979, p.162.

# TABLE 2: INDICES SEARCHED FOR BIOENERGY REFERENCES

| Index   | Location                             | Years Searched                 | Keywords  |
|---|--------------------------------------|--------------------------------|---|
| *Bibliography of Agriculture                                | St. Paul                             | 1970 - 1979                    | fuel, biomass, cattails   |
| *Biological and Agricultural<br>Index                       | Bio-Medical,<br>St. Paul             | 1970 - July 1980               | fuel, cattails  |
| Energy Index  | Engineering                          | 1973 - 1974                    | biomass, forests, organic<br>fuels, renewable<br>resources, trees, wetlands |
| *Energy Research Abstracts                                  | Engineering,<br>Government Documents | 1977 - 1979<br>1980 (no. 1-12) | biomass   |
| Environment Index   | Wilson Periodicals                   | 1971 - 1979                    | biomass, energy, renewable<br>resources, wood                               |
| *The Renewable Energy -<br>Environment Collection<br>(TREE) | Engineering                          | (not applicable)               | biomass   |

\*Important Source

For instance, the <u>Environment Index</u> gives the title of the article and the journal in which it is published but does not give the author. The name, volume or year, and page number or item number of the index where the reference was found are also included on the reference card. If an abstract or a short description was given in the index, it was also copied onto the index card (see Figure 3).

Several journals were searched issue by issue for relevant articles (Table 3). Articles on bioenergy found in the journals and references found in the bibliographies of these articles are included in the index. The index card for a reference cited in the bibliography of a journal article includes the author of the article where the reference was found, the name of the journal, the volume number and date, and the page number (Figure 4). The book review sections of the journals were also searched for relevant books. The index card for a book reviewed in a journal includes the name of the journal, volume and date, and the page number of the book review.

#### Bio-Energy Directory

An important source of information on ongoing bioenergy projects is the <u>Bio-Energy Directory</u> published annually by the Bio-Energy Council, 1625 Eye Street N.W., Washington, D.C. 20006. The directory includes the location, objective, sponsoring organization, chief investigator(s), project status, and funding results of each bioenergy project.

The 1979 <u>Bio-Energy Directory</u> was searched for projects dealing with the production of energy crops. The relevant project summaries were xeroxed and placed in a notebook. Each project summary was given a number prefixed by the letter "B," and this number was included on the appro-

FIGURE 3

Citation Found in an Index

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0071 Splinter, W.E. Trees and Energy. Great Plains Agricultural Research Committee. <u>Great Plains Agricultural</u> <u>Council Publication</u>. 76, 1975.

Source: Bibliography of Agriculture, 1976, no. 025354.

## TABLE 3: JOURNALS SEARCHED FOR BIOENERGY REFERENCES

| Journal  | Location  | Years Searched  |
|--|---|---|
| Alternative Sources of Energy                        | Architecture                                      | 1972 - 1979   |
| *Annual Review of Energy                             | Engineering                                       | 1976 - 1979   |
| Applied Energy                                       | Engineering                                       | 1975 - 1979   |
| BioJoule: The Biomass<br>Energy Institute Newsletter | Engineering (TREE<br>Collection)                  | 1972 - April, 1980  |
| *CHEMTECH (Chemical<br>Technology)                   | Chemistry   | 1971 - 1979, 1980<br>(no. 2-7)                                |
| *Energy  | Mines, Metallurgy,<br>and Chemical<br>Engineering | 1976 - 1979, 1980<br>(no. 1-4)                                |
| Energy Conversion                                    | Engineering                                       | 1973 - 1979   |
| Energy Information                                   | Mines   | 1976 (no.3,4); 1977,<br>1978, 1979 (no.1)                     |
| Energy Insider                                       | Engineering (TREE<br>Collection)                  | 1979, 1980 (no.1-11)  |
| Energy Policy  | Mines   | 1973 - 1975, 1977,<br>1978 (no.3,4); 1980<br>(no.1)           |
| *Energy Review                                       | Engineering                                       | 1974 - 1979, 1980<br>(no.1-4)                                 |
| Energy Sources                                       | Mines   | 1973 - 1978   |
| Energy Today   | Engineering (TREE<br>Collection)                  | 1979 (Vol.6, no.22-<br>Vol.7, no.8); 1980<br>(Vol.7, no.9-20) |
| Energy World   | Mines   | 1973 - 1978   |
| Environment  | Wilson Periodicals                                | 1970 - 1979, 1980<br>(no.1-5)                                 |
| Environmental Science and Technology                 | Engineering                                       | 1978 - 1979   |
| Institute of Fuel                                    | Mines   | 1971 - 1978, 1979<br>(no.1-3), 1980<br>(no.1,2)               |

\*

## TABLE 3 (continued)

| Journal   | Location                         | Years Searched                |
|---|----------------------------------|-------------------------------|
| International Journal of<br>Environmental Studies | Technology, St.<br>Paul          | 1970 - 1978                   |
| Journal of Energy                                 | Engineering                      | 1977 - 1979                   |
| *Journal of Forestry                              | Forestry                         | 1970 - 1979                   |
| Journal of Soil and Water<br>Conservation         | St. Paul                         | 1970 - 1979, 1980<br>(no.1-3) |
| Land Economics                                    | Wilson Periodical                | 1970 - 1979                   |
| Minnesota Energy Review                           | Engineering (TREE<br>Collection) | 1978 - 1979                   |
| Solar Energy                                      | Engineering, St.<br>Paul         | 1970 - 1978; 1979<br>(no.1-6) |

\*Important Source

### FIGURE 4

# a) Reference Cited in the Bibliography of a Journal Article

0016

Cliff, E. <u>Timber, the Renewable Resource</u>. National Commission on Materials Policy. U.S. Government Printing Office, 1973.

Source: Tillman, CHEMTECH, Vol.7, 1977, p. 615.

priate subject and geographic index cards. An example is the number B0009 which appears under the subject heading, "Bioenergy: Economic Considerations and Impacts." Using this number the description of the project, "Identification and Development of Highest Value Uses for the Total Tree Biomass," can be found in the <u>Bio-Energy Directory</u> notebook. Computer Searches

The COMPENDEX, NTIS, and SSIE databases were searchea for bioenergy references. These databases were suggested by Carol Baldwin, Search Analyst and Energy Bibliographer for the University of Minnesota, Engineering Library. The COMPENDEX database is the machine-readable version of the <u>Engineering Index</u>. The NTIS (National Technical Information Service) data base consists of government-sponsored research, development, and engineering plus analyses prepared by federal agencies, their contractors or grantees. The COMPENDEX and NTIS databases were searched for the period, January 1970 to July 1980. SSIE (Smithsonian Science Information Exchange) Current Research is a database containing reports of both government and privately funded research projects, either currently in progress or initiated and completed during the most recent two years. The keywords used in the computer search are given in Table 4.

The computer printout gives the author or chief investigator, title or project name, source, date, and an abstract for each reference. The computer printouts are filed by the type of database in a separate notebook labeled "Bioenergy: Computer Searches." The printout for each reference was given a number prefixed by the letter "C," and the citation was cross-referenced under the appropriate subject and geographic headings.

## TABLE 4: KEYWORDS LISTED IN COMPUTER SEARCHES

Keywords Used Alone:

Bioenergy

Biomass

Biofuels

Keywords Used With the Terms "Energy" and "Bioenergy"

Wetlands

Cattails

Sedges

Alders

Willows

Typha

Peat

Grasses

Land Use

### Minnesota Citations

This bibliography was prepared for people conducting research on bioenergy in Minnesota. So that these users can easily find articles and reports on bioenergy and peat energy in Minnesota, all Minnesota publications are filed separately. Each Minnesota citation was given a number prefixed by the letter "M," and this number was listed on the appropriate subject cards.

References on energy in Minnesota were found by contacting agencies and researchers in the state conducting energy research and by searching the bibliographies of articles and reports dealing with Minnesota. Whenever possible, a copy of the report was obtained from the issuing agency for the CURA Library. All reports available in the CURA Library are so indicated on their index cards. When a citation was found in the bibliography of a report, the author, title, date, and issuing agency of the report where the citation was found were included on the index card.

CURA is now on the Department of Natural Resources, Minerals Division, mailing list. Whenever a new report is received, a reference card with the complete bibliographic information should be made out, a number prefixed by the letter "M" should be assigned to the citation, and the number should be listed on the appropriate subject cards. It should also be noted on the reference card that the report is available in the CURA Library. Updating and Revising the Bibliography

References can be added to the bibliography by simply making out an index card for the citation, assigning a number to the citation, and adding the number under the appropriate geographic and subject headings.

There are several ways that the bibliography can be updated. Each year's edition of the <u>Bio-Energy Directory</u> can be searched for relevant energy projects and the project descriptions added to the <u>Bio-Energy</u> <u>Directory</u> notebook. Materials added to the computer databases can be added to the bibliography. Contact Carol Baldwin (373-2957) for information on obtaining monthly printouts of materials added to the databases. Also, recent indices and journals can be searched for relevant references. The indices and journals that were the best sources for bioenergy citations are indicated in Tables 2 and 3. Agencies and researchers in Minnesota conducting energy research can be contacted to obtain information on new reports and projects.

Additional subject headings can also be added. It may be desirable to subdivide some of the larger subject groupings. For example, the subject heading, "Bioenergy: Forests," could be broken into "Bioenergy: Forests: Spruce," "Bioenergy: Forests: Willows," etc.

### Center for Urban and Regional Affairs

311 Walter Library 117 Pleasant Street SE University of Minnesota Minneapolis, Minnesota 55455 612/373-7833