Pulp Mills and the Environment: An Annotated Bibliography for Northern Alberta

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Introduction

The following is an annotated list of books, technical reports and periodical articles related to the development and operation of pulp and paper mills in northern Alberta. The purpose of this work is to encourage members of the public to learn about these industries and their effects on the environment. I hope that readers of the materials listed in this bibliography will become better informed and will help influence the decisions being made in these industrial developments.

The nearly 350 references are grouped into 16 categories. The categories and the items in each category are listed alphabetically. Each category has some very general as well as some very technical materials. Hence, readers should be able to find something at an introductory level before they attempt to read the more complex materials. As some materials may fit into more than one of the categories, the titles of some categories include references to other categories. Some materials on pesticides and heavy metals (such as mercury) are included because their behaviour in ecosystems is similar to some waste chemicals of pulp and paper mills.

- **Air Pollution**: air quality around pulp mills, and general measurement and abatement techniques
- **Chemistry**: introductory as well as very technical materials
- **Economics**: environmental, community and industrial general materials
- **Environment**: procedures, examples and suggestions about how to improve the process
- **Environmental Impact Assessments**: studies on effluent effects on fish
- **Fish Toxicology**: caring for forests and planting trees
- **Forestry**: worker and resident health aspects of environmental pollution
- **Human Health**: legal requirements and procedures
- **Legal**: tree cutting and related regulations
- **Logging**: monitoring mills and their effluents for the future, including accidents
- **Monitoring**: general aspects of design and operation
- **Planning**: techniques and problems
- **Pulp and Paper Mills**: effluent problems and solutions
- **Waste Management**: quality and management
- **Water Pollution**: Water: Rivers and Lakes
Most of the materials listed were published after 1980. At least 90% of the materials are available in each of the following three libraries. All are available in at least one of these libraries.

Alberta Environment Library  
14th Floor, Oxbridge Place  
9820 106 Street  
Edmonton, Alberta  
T5K 2J6  
[Telephone: (403) 427-5870]

Athabasca University Library  
Athabasca University  
Athabasca, Alberta  
T0G 2R0  
[Telephone: (403) 675-6254]

Cameron Library  
University of Alberta  
Edmonton, Alberta  
T6G 2J8  
[Telephone: (403) 492-4174]

For legal materials, readers could also consult the library at the:
Environmental Law Centre  
201 10350 124 Street  
Edmonton, Alberta  
T5N 3V9  
[Telephone: (403) 482-4891]

Government publications are often available both as paper materials as well as on microfiche (photographs condensed onto film that are read on a special reader). Microfiche materials are indicated by their MICROLOG numbers.

Acknowledgements

This bibliography was compiled from computer searches of the Scitech Database (based on three Alberta Government Libraries: Alberta Environment, Alberta Agriculture and Alberta Research Council) and the holdings of the libraries of Athabasca University and the Environmental Law Centre.

I thank the many people, especially the staffs of the libraries mentioned above and members of Friends of the Athabasca Environmental Association, who contributed considerable time and effort to help make this information available to the public.

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May 11, 1992
Air Pollution (see also Waste Management)


Gases from the lagoon included reduced sulphur compounds and hydrocarbons (e.g. para-cymene, chloroform).


A technical manual including affects on plants, control of gases and particulates, and source control for pulp mills.


Prepared by Intera Environmental Consultants and Western Research and Development Ltd. for Research Management Division of Alberta Environment.

Alberta Oil Sands Environmental Research Program (AOSERP) Reports 119, 120 and 124.

An air quality model that uses three components: a time series file of meteorological data, a program that estimates ground level concentrations, and a frequency analysis program to allow examination of various scenarios.


Some lichens (each a combination of a fungus and an alga) are very sensitive to air pollution. This study set up a permanent set of monitoring plots. During the study, 79 species were found in the Fort McMurray area.


A technical introduction to air pollution.


A layperson’s introduction to origins, effects, kinds, approaches to study, importance, and responsibility for air pollution.


Prepared for Beal Associates Consulting.

This report was prepared on the effects of these air pollutants on mammalian livestock and wildlife.


Includes sampling, analytical techniques, environmental analyses, and emissions from combustion sources.


A short study on wood fibers blown from chip piles into a near-by residential area.


Comprehensive treatment of how air pollutants affect forest health.


An introduction to air pollutants, effects of air pollution, measurement of air pollution, meteorology, regulations and control of air pollutants.
Chemistry (see also Waste Management)


A compact introduction to chemistry for the layperson.


A help for chemical compounds and terms.


A special issue of this periodical on the effects of toxic chemicals on ecosystems.


Not seen.


An introduction to the major earth elements and their interactions with other elements and with living things.


An example of a protocol for taking and analyzing samples.


A bibliography of 1300 citations on organic compounds of potential concern.


A bibliography of 1100 citations on these two heavy metals.


Gives information on chemical names, formulas, synonyms, exposure limits (for the USA), harmful effects and symptoms, etc. for thousands of compounds.


Potentials for extraction of various chemicals (rather than pulp) from poplar trees. Perhaps some of the byproducts of pulp mills could be used for manufacture of useful chemicals?


The chemist's "Bible" for finding out basic information on chemicals.
Economics

Covers North American locational trends, markets and prices, manufacturing costs, wood supplies, and economic prospects.

Dated but covers some of the things to be considered.

An economic timber supply model including: delivered wood cost model, geographically-referenced forest inventory and harvest scheduling model.

Includes chapters on: species diversity and extinction, modern agriculture, environmental values, pollution and waste, and market mechanisms.

An old look at how forestry contributes to rural employment across Canada.

Examined: selected pulp and paper products, wood chips, pulpwod, fiber-board, particle-board, wafer-board, hard-board, veneer and plywood, lumber, energy, chemicals and animal feed for markets in North America, Europe, and Asia.

ENFOR is an acronym for ENergy from the FORest, a program for renewable energy production from biomass. Based on work done in 1977, it was concluded that wood chips would be competitive with natural gas until 1983. The research found that felling and skidding costs were higher for aspen cut by chain saw rather than a mechanical cutter.

Twenty-two essays.

Dealing with non-growth.

Rethinking economics and economic policies for the United States.

A broad view of wildlife’s worth.

Sixteen papers on the economics of small towns and rural areas including discussions on
linking theory and action, community adaptation and innovation, and support systems for development.


One hundred tables and many figures broken down by province and region. Statistics on forestry resources and management activities, production, export, employment and prices in Canada as well as some information on world trade.


Not seen.

Jacobs, Peter and Barry Sadler. Sustainable Development and Environmental Assessment: Perspectives on Planning for a Common Future. Hull, Quebec: Canadian Environmental Assessment Research Council (CEARC), [1990?].

Ideas from round table discussions held in 1987.


A short (47 pages) introduction to the environmental problems facing Canada and some suggested solutions.


On overview of forest projects in northern Alberta.


The authors are from the London Environmental Economics Centre and prepared this information for the U.K. Department of the Environment. The book covers sustainable development, including environmental costs in calculating total economic value, discounting the future, and incentives for environmental improvements.


In 1975-76 at least $608,000 was spent in the Fort McMurray area on consumptive and non-consumptive use of fish and vertebrate wildlife. This estimate excludes non-Albertans, commercial and non-recreational uses of these animals.


Economic values of wildlife, logs, fish, trapping and collecting, medicines, food and industrial products, new domesticated organisms, genetic resources, pollination, pest control and recreation.


Potentials for other uses of aspen besides pulp: veneer and plywood, furniture blanks and parts, pallet stock, animal bedding, etc.
Environment (general)


The history and cost of land degradation with examples from around the world.


Names, addresses, telephone numbers, mandates, publications and periodicals.


A series of essays from a world perspective.


Structure, dynamics, heterogeneity and management of landscapes.


A collection of letters and papers written by members of the association about pulp mill developments on the Athabasca River.


Gives a set of objectives and priorities for national and international action.


A short, general introduction to ecology.


This lists the names, addresses, contact persons, and brief description of over 200 organizations and agencies in Alberta and Yukon that are concerned with environmental matters.


An environmentalist views the “wholesale sell-off of Canada’s Boreal forest”.


A good introduction to the sciences, economics, and ethics involved with exploitation of resources.


Basic principles and case studies.


When one looks at exploitation of natural resources, one often fails to look at the importance of wild lands.


An overview of of environmental indices for Canada, France, Japan, West Germany, Italy, United Kingdom and United States.
A short overview from a European perspective.

An introductory text.

Catalogue number: En 73-2/6E.
An overview of environmental problems in Canada.

Catalogue number 11-509E Occasional
General facts on population, socio-economic factors and environmental conditions.

Environmental research Monograph 1973-1.
An overview of the major habitats, vascular plants and vertebrate animals typical of the boreal forest of Alberta.

Prepared for Alberta Oil Sands Environmental Program.
Eighteen maps showing vegetation and surficial geology of the study area around Fort McMurray.

Studies in Biology no. 122.
A short introduction to the ecology of running water.

Another introductory text.

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**Environmental Impact Assessments (EIAs) (see also Legal)**

Prepared for the Alberta Railway Corporation.
An EIA for the rail line to the Daishowa mill in the Peace River area.

EIA and supplemental reports for the pulp mill at Slave Lake.

Old guidelines on planning, preparation, review, and decisions on EIAs. Notes on various acts.

A very early EIA.

EIA for the Whitecourt paper mill.


This EIA actually has many parts that were produced separately and after these publications. For example see also: Jack Phelps (Roadway Planning Branch) *Alberta-Pacific Pulp Mill: Roadway Infrastructure Brief* of October 1989.


This is a supplement to the EIA concerning substitutes for molecular chlorine gas bleaching.


This is the initial review of the Alberta-Pacific EIA. The public hearings associated with this review were the most extensive in Alberta’s history. Transcripts of the hearings (50 volumes) and written submissions (750) are held in the Alberta Environment, Athabasca University and University of Alberta libraries.


This is a review of the above review of the Al-Pac proposal but it only considers the bleaching process.


A short handbook produced by the residents of Eagle Valley from their experiences dealing with developments in the Caroline Gas Field. Chapters include: Talk to Your Neighbours and Stick Together, Stand Up to the Company, Be Reasonable and Cooperative, Get Involved in the Emergency Response Plan, Keep an Eye on the Company, Obtain Information and Stay Informed, Expect Both Negative and Positive Impacts in Your Community.


A handbook for doing an environmental audit of a company. Could be used to help prepare or critique an EIA.


When EIAs are done the human social impacts also have to be considered.


Social Impact Assessment Series, No. 7. A critical review of 600 publications on SIA.


EIA (in 4 volumes) for expansion of the pulp mill in Hinton. Champion recently changed its name to Weldwood. Former names were St. Regis Pulp Mill, Northwood Pulp and Paper Co., and Northwest Pulp and Power Co.

An example of an EIA for a plant that disposes of waste chemicals by incineration, land burial, and deep well injection.


A European view of the EIA process.


A review of the processes across Canada.


A commercial listing of publications on how the public can be involved in decisions affecting the environment.


An EIA in five volumes: the report itself (December 1987), two addenda on their public Consultation Program Documentation (November and December 1987), a Supplemental Information to the Environmental Assessment Report (April 1988), and An Environmental Review of the Daishowa Rail Spur (June 1988).


An example of a review process in British Columbia.


A brief overview of the EIA process on the Al-Pac mill up to May 1990.


A study of the review process for the Alberta-Pacific pulp mill with recommendations for future hearings on environmental matters.


Volume I - Project Description. Volume II - Biophysical Resources Impact Assessment. Volume III - Socio-Economic Assessment. Executive Summary:

The EIA for the heavy oil project at Cold Lake.


Prepared for the Slave Lake Pulp Corporation.

This is the environmental baseline survey of the river and is a supplemental report for the EIA.


Includes: context, rationale, support from decision-makers, staffing and organization, and trends.


Prepared for Alberta Research Council, ARC Contribution Series 1855.

This is a review of the review, of the review of the Al-Pac proposal. It concentrates on the effects of chlorinated organic compounds and biological oxygen demand of the effluent.

Nine papers from a conference held in 1983.


EIA for the Whitecourt pulp mill.


Recommendations on how the public should be involved in decisions made that affect the environment. Topics include: right to participate, various mechanisms for public consultation, and typical presentations made by the public.


Testing the ELECTRE method of determining environmental consequences on a proposed electrical transmission line.


This report reviews the federal Environment Assessment and Review Process (EARP) and makes several recommendations on the public hearing procedures, intervenor funding, and changes in legislation.


Another EIA for northern Alberta.

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**Fish Toxicology** (see also Monitoring)


Fourty-five pesticides and PCBs were examined in 190 fish.


Mercury was thought to come from former use of fungicides or fish migration from Saskatchewan. This study was used to determine the amount of fish that could be safely consumed.


Fourty-five compounds were tested for in 500 fish.


Although these compounds were not detected in the Athabasca River where methoxychlor was used for killing black fly larvae, they were found in the North Saskatchewan River. Their presence there was hypothesized to come from black fly control efforts in Saskatchewan via fish migration.


For comparisons between southern and northern rivers.
Most toxicity studies look at the effects of a single chemical. This study showed synergistic effects of three toxic substances on rainbow trout.


Abstracts of 76 papers published between 1973 and 1986. The papers relate the effects of pulp effluents on fish respiration, oxygen transport, metabolism, growth, and reproduction.


These studies were done because groundwater was to be pumped into the Athabasca River in connection with the oil sands mining and because the groundwater is saline and has considerable vanadium. The studies were done with rainbow trout, lake whitefish, four crustaceans, a chironomid and a mayfly.


Not seen.


A very short term study, but gives an idea of the problems involved in fish bioassays. Some
procedures on how to conduct fish toxicity studies.


An example of a short term study of some organic compounds found in pike and sediments.


An example of a larger study of chlorinated organics found in fish and sediments.


Sampling sites included the Athabasca, Beaver, Peace and Saskatchewan River systems. In the Athabasca River, nine species of fish were collected from five locations. Mercury concentrations averaged from 45 to 321 micrograms per kilogram [ug/Kg] (=.045 to .321 milligrams per kilogram [mg/Kg] or parts per million [ppm]) of fish.


Fish tainting is seen to be a problem for anglers.


An introduction to fish diseases caused by bacteria, fungi, viruses, parasites, malnutrition, toxic substances and organic wastes.

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**Forestry (see also Logging)**


This outlines the procedures and codes used to describe forest stands. Descriptors include: density, height, species, commercialism, origin, slope, disturbances, condition, understory and treatment of clearings.


An introduction to how timber maps were produced for the Alberta Forest Inventory (Phase 3) and summary results for the ten forest management districts.


Outlines how calculations were made to calculate volumes of usable wood fiber.


Outlines how calculations were made for Gross Total Volume (cubic metres of tree stems per hectare), Gross Merchantable Volume (excluding stump and top volumes) and Defect Volume (volumes not usable, defective or decayed, for saw logs or pulpwood).

Sample of several technical bulletins for specific forest regions, in this case the Northeast.


Sample of several technical reports on wood volumes (cubic metres per hectare) and numbers of tree stems per hectare for different forest types in northern Alberta.


Short explanation of the quota policy, that is the percentage share of the annual allowable cut of a management unit.


Ground and aerial checks on the accuracy of how air photographs were interpreted.


A ten page overview of the importance of forests and federal government activity in forestry. A good speech with much data.


Summary of a conference held at Lakehead University in Thunderbay, Ontario. Good for names and addresses of experts on the boreal forest.


A world view of forestry and development.


Biomass estimates of trees in various parts of Canada.


A group of mathematical models and computer simulations for managing forestry operations. This is one book in a series on Biological Resource Management.


Set of recommendations.


Use of wood wastes (from clarifier sludge and grit) for adding organic material back to the soil.


Four articles on: forests of central Europe, timber exports, economics and future timber supplies.

Classification of forest types and information on vegetation.


A promotional brochure about the properties of aspen wood fibers. Excellent electron micrographs.


An outline of the problems in the forest industries in Canada.


Catalogue number: M77-35/1986 E.

A pamphlet on satellite imagery of forests.


The Council put forward 140 recommendations, most of which are now implemented or being implemented. However there are some still outstanding concerns such as public participation in Forestry Management Agreements (Recommendation 38), closed system pulp mills (57), and affects of forestry on fish and wildlife (65-71).


This panel was chaired by Bruce P. Dancik. It made comments and submitted 133 recommendations on: public involvement, regulatory agencies (Forestry, Lands and Wildlife; Recreation and Parks), forestry planning, forest inventories, environmental impacts, integrated management, and reforestation.


Catalogue number Fo 41-10/1986 E.

Overview of the amounts of harvestable trees.


Contributions in Economics and Economic History, Number 69.

Historical perspectives of forestry in Canada.


Forest Industry Lecture Series No. 17.

A booklet on how aspen should be managed for improving populations of wildlife.


Covers the interconnectiveness of forests, use of forests, impacts of our use, politics of forests, and wholistic forest use.


Technical Bulletin No. 8, Forest Resource Development Agreement.

An introduction to the mixed wood forest of the southern boreal forest of Saskatchewan.


Textbook on forest ecology.


A criticism of the U.S. Forest Service and how it seems to be more interested in timber sales...
than long term forest protection. Some interesting points on manipulations of figures about economics and jobs.

Introduction to applied ecological topics such as reforestation.

About 50 papers on climate and forest renewal, productivity and management.

An old review of when poplar trees were considered as "weeds".

A review of the use of and research on herbicides in Canada.

This book is about old growth forests, forest conservation, sustainable forestry, and forest policy of the Pacific Northwest.

The sub-title says it all.


A survey conducted in September 1990 to determine the views of 2,562 foresters across Canada. Less than three in ten foresters ranked the current condition of forests in their province as excellent or good. Other topics included: forest problems, current and changing management practices, wood supply, harvesting, preservation, clearcutting, pesticides, performance of industry as well as provincial and federal governments, development agreements, and the role of the public.


Observations made in 1979 in Alberta, Saskatchewan and Manitoba showed some young stands of shrubs and trees had considerably more above-ground standing crop than was expected from previous studies.

A discussion paper for the Alberta Conservation Strategy. Contains perspectives on administration, management, economics, pulp technologies, multiple users, and sustainability of Alberta’s forests.
Reviews insect control by physiological (e.g., hormones and growth regulators, sex pheromones, and genetics) and biological (e.g., bacteria, baculoviruses, fungi, microsporidia, parasites, predators) methods instead of by insecticides (biocides).


Eleven essays that overview the removal of forests in various parts of the world.


A forester's view of the forest industry in B.C.


A conservationist's overview of forest management in the United States.


Proceedings of a symposium held 5-6 April 1991 at Kananaskis, Alberta.

Abstracts and transcripts of talks given at this conference.


Contains 120 short articles on three topics: development and deforestation in the tropics, forestry problems in Canada (British Columbia and Nova Scotia), and global impacts of deforestation.


Despite its seemingly specialized title, this book contains a lot of general information on forest management.


A text for U.S. forestry students.


A result of interviews with people who live and work in Canada's forests.


Environmental Research Monograph 1974-3.

Short description of natural plant communities and revegetated areas near Fort McMurray. Also gives some results of growth chamber studies.


A short introduction to weather and forest fires.


An excellent field guide useful for describing forests.


A specialized textbook; considerable physiology of trees.


The Westworth report includes The Slave Lake, Athabasca and Lac La Biche Forest Regions (i.e. the FMA for Al-Pac). It lists 614 sites that possess "significant natural features", i.e. fish habitat and aquatic features, vegetation and terrain features, or wildlife habitat.


An 18 page summary of "An Exploration and Assessment of the Implications of Climatic Change for the Boreal Forest and Forestry Economics of the Prairie Provinces and Northwest Territories: Phase One" by E.E. Wheaton, T. Singh, R. Dempster, K.O. Higginbotham, J.P. Thorpe, G.C. Van Kooten, and J.S. Taylor. One major prediction is that, because of global warming, the southern edge of the boreal forest may shift northwards between 250 and 900 km.

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**Human Health** (see also Chemistry and Planning)


Exposure to dioxins and other chemicals from the accident did increase the number of human cases of cancer.


Local medical concerns to the pulp mills of Prince George.

*Human Health* (see also Chemistry and Planning)


Impacts on human health have to be reconsidered after recent allegations of fraud in some key studies. See Van Strum and Merrell below.


Old study of literature.


Ten general papers on environmental and health effects of toxic chemicals.


A quick look at risk assessment.


A review.


Van Strum, Carol and Paul Merrell. *Dioxin Human Health Damage Studies: Damaged Data?* Journal of Pesticide Reform, volume 10, number 1, pages 8-12, Spring 1990. Overview of the investigations that indicate fraud occurred in several studies of industrial accidents upon which safe levels of dioxins were based.


**Legal** (see also EIAs)


Alberta, Province of. *Forests Act and Forest Management Agreements* (section 16 of Forests Act). Edmonton: Queen’s Printer, various dates. The Forest Act controls regulations on the use of the province’s forests. The Forest Management Agreements (FMAs) are made between the Province and individual companies. FMAs include definition of the Forest Management Area, withdrawals of land from the agreement, rights over land, cut periods, reforestation, forest protection, charges and dues, and mill construction and operation. For example, Order in Council 575/86 was made with Weldwood of Canada in 1986 and O.C. 778/88 was with Proctor & Gamble Inc. in 1988.


Includes: importation, manufacture, storage, transportation, pollution, emergencies.


A layperson’s guide to private prosecution.


A legal critique of the EIA process that points out several areas that could be improved.


A layperson’s guide to this federal legislation.


Gives 12 recommendations to improve the implementation and administration of the act.


Proceedings of round table discussions on: siting hazardous waste disposal sites, obtaining compliance, plant closure activities, victim compensation, emergency spill response, avoidance and recycling of hazardous wastes.


The Acts are old but the possible actions are not.


A concise listing of provincial and federal acts that deal with environmental issues, including: assessment, air, water, land, noise, wildlife and heritage.


Discusses ownership, regulation and management including: disposition of timber, Forest Management Agreements, reforestation, enforcement and environmental concerns.


Recommendations on standards setting, air and water quality standards, licensing procedures and requirements, monitoring compliance, non-compliance, prosecution, offenses and penalties, and the Environment Enforcement Unit.


Canadian law with respect to pollution, including tort actions, statutory actions and environmental prosecutions.


Environmental perspectives by various levels of government, industry and the public on the constitutional framework, policies, administration of policies, and future directions.


Proceedings of a national conference.

Vomberg, Mac. *Bibliography of Legal Materials on Transportation of Hazardous Substances.*
Edmonton: Environmental Law Centre, 1982.
Seven pages of cases, articles and acts. There are many implications for the transport of chemicals to pulp mills.

American federal law and incentives.

Logging (see also Forestry)

ENR Report Number T/137.
How to estimate the potential of soil erosion at stream crossings and how to reduce the damage.

Regulations on sizes and positions of culverts for logging and other roads that need to cross streams.

ENFOR Project P-170.
Contractor: Groupe Dryade Itee.
MICROLOG 83-4446, 4 fiche
ENFOR is an acronym for ENergy from the FORest, a program for renewable energy production from biomass. Reviews extending forest cutting rotations, removal of snags and fallen trees, sensitivity of animals to human disturbances, and calls for more research in Canada. Concentrates on vertebrates.

MICROLOG 84-0471, 2 fiche
Cat. No. Fs 97-6/1208
Studies on on a creek on Vancouver Island. Logging without a buffer zone increased soil erosion and hence sediments in the creek. Increased sediments and reduced detritus decreased numbers of organisms. Lack of a buffer zone also increased winter scouring which also decreased populations. A less than 10 m riparian buffer zone and natural debris dams provided leaf litter and so more food for invertebrates and fish.

A pamphlet for managing private wood lots.

Information Report M-X-162.
MICROLOG 87-03020, 2 fiche
In Nova Scotia, Prince Edward Island, New Brunswick, Quebec and Ontario land owners who sell trees for pulp and lumber have formed various organizations to help market their products and share resources for forest management activities.

Recommendations for five kinds of roads used by timber and petroleum industries.

Recommendations for building, maintaining, and abandoning stream crossings.


Recommendations for industries making utility corridors and stream crossings in the forests of Alberta.


The department's recommendations to reduce the visual impacts of logging.


The department's recommendations to reduce erosion in watersheds being logged. The recommendations are to be used in the development of Annual Operating Plans (AOPs).


These are the regulations to be followed by loggers with respect to such things as: Annual Operating Plans, setbacks from water courses, reforestation, wildlife habitat considerations, road construction and abandonment, campsites, and waste disposal.


Experiments and recommendations on management of buffer zones.


Interviews and ideas on the history, problems and future of logging in the United States.


A study on these tires which are supposed to lessen soil compaction.


Research done on the effects of clear-cutting.

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**Monitoring (see also Fish Toxicology)**


Includes: objectives and guidelines, monitoring of rivers and lakes, biochemical oxygen demand, fish protection, physiological responses, and research needs.


A baseline study of the aquatic invertebrates of the Athabasca, Muskeg and Steepbank Rivers.


About re-cycled paper.


White pelicans are fish-eating birds. Their eggs and tissues can be used to monitor toxic substances in water bodies. This report gives
some behavioural information on these birds. See also D. Ealey. *The Distribution, Foraging Behaviour, and Allied Activities of the White Pelican in the Athabasca Oil Sands Area*. AOSERP Report 83.


Intended for monitoring water quality with aquatic macroinvertebrates. Chironomids, mayflies, oligochaets, caddisflies and stoneflies comprised 53%, 21%, 18%, 2% and 1% of the 27,229 specimens collected in a 85 km stretch one summer. Densities reached 3,294 individuals per square metre. Densities decreased 31% downstream of the Suncor Tar Sands plant.


Twenty-seven species of fish were found, 11 of which were common. Diversity reduced to 18 species at the Athabasca Delta. Walleye, Goldeye, Long-Nose Sucker and White Sucker migrate upstream in spring even under ice cover. Lake Whitefish migrate upstream in the fall to spawn. Best introduction to the biology of the fish in the Athabasca River.


A similar study to Machniak and Bond, see below. White and Longnose Suckers seem to be part of the Lake Athabasca population, at least 150 km to the north.


Eight case studies were looked at AFTER the projects were approved and developed.


A sample of the monitoring carried out when methoxychlor was being used to kill black fly larvae in the Athabasca River.


Recommendations on the biological criteria (toxicity tests) used to achieve aquatic environmental protection.


Life cycle studies were carried out on 7 species of stoneflies, 7 mayflies and 8 caddisflies at Fort McMurray. These studies were disrupted in July and August 1977, presumably because of black fly control measure done 450 km upstream at Athabasca.


Outlines how standards, such as effluent limitations, are set. Many of the standards given are out of date.

This creek is a tributary of Muskeg River which in turn is a tributary of the Athabasca River. Over 160 species of macroinvertebrates were collected. Chironomids were most abundant but caddisflies had the most biomass. Several distinctive communities were identified. Most insects had one year life cycles. There was a typical diel drift cycle.


Of 2213 fish collected by seine and gillnet, 14 species were found. Lake Whitefish (68.2%), Longnose Sucker (6.8%), Goldeye (6.6%), Walleye (4.3%), Northern Pike (3.9%), Flathead Chub (2.8%), White Sucker (2.4%), Trout-Perch (2.2%) Arctic Grayling (1.1%), Mountain Whitefish (0.7%), Burbot (0.7%), Lake Chub (0.2%), Yellow Perch (0.1%), and Rainbow Trout (1 specimen). The Athabasca River between Fort McMurray and Cascade Rapids is a critical spawning habitat for Lake Whitefish. Lake Whitefish, and possibly Goldeye and Walleye, migrate between the study area and the Peace-Athabasca Delta, 300+ km away. Insects are consumed in large numbers by Goldeye, Lake and Mountain Whitefish, and Grayling. Pike and Walleye feed primarily on fish.


Fish that moved, from the Athabasca River, upstream for spring spawning included Longnose Suckers (52%), Arctic Grayling (20%) and White Suckers (14%). In the spring, Mountain Whitefish (7%) migrated upstream for feeding and movements of Northern Pike (3%) and Walleye (3%) were also recorded. Resident fish included Pearl Dace, Brook Stickleback, Lake Chub, Longnose Dace and Slimy Sculpin. Other fish recorded were: Lake Whitefish, Goldeye, Dolly Varden, Burbot, Trout-Perch, Flathead Chub, Lake Cisco, Redbelly Dace, Brassy Minnow, Spottail Shiner, Brook Stickleback, and Yellow Perch.


Deals with fish migration and populations of the Mackay, Dover and Dunkirk Rivers. Similar findings as Machniak and Bond, 1979.


Studies of the water quality, periphyton, benthic macroinvertebrates and fish.


Studies of the water quality, periphyton, benthic macroinvertebrates and fish.


Prepared for Daishowa Canada Co. Ltd.

Examples of macroinvertebrate and water quality surveys as required by the permit holder.


Prepared for Daishowa Canada Co. Ltd.

An example of a short term study of dissolved oxygen.


A 12 page overview.


A 200 page report.


Not seen.


A handbook for managing an environmental audit. Could be used to help prepare or critique a management plan.


The results of a technical conference on monitoring air and water quality.


Alberta Oil Sands Environmental Research Program Report 100, Project LS 10.2.

More than 10 lakes were surveyed to find the kinds (19+) and distributions of the large aquatic plants.


Alberta Oil Sands Environmental Research Program Report 84, Project WS 1.6.1

A basic study of the spawning of the major fish of these rivers.


A basic review.

Planning (see also EIA and Human Health)


An overview of statistics on socio-economics, transportation, forest resources, agriculture, petroleum and natural gas, oil sands, coal, fish and wildlife, water, and recreation for the northern half of the province.


Agriculture, recreation, tourism, logging, hunting and mining plans for provincial lands located between Athabasca and Slave Lake.


Land use plans for the upper Athabasca River, around Hinton, are described.


A NATO conference that reviews four case histories on ecological accidents, and outlines possible scenarios with oil spills and trichloroethylene.

Includes chapters on: public safety organizations, industrial response teams, commercial response organizations, training concerns, tools, and case histories of accidents.


Includes contingency planning, evacuation, emergency procedures, and emergency equipment. American rules and regulations.


Topics include: planning, warning, evacuation, emergency actions, restoration, reconstruction, perceptions of hazards, attitudes and adjustments, and disaster research. A good summary of research findings.


An open appeal to the Prime Minister asking for reforms in policies, regulations, and institutions.


A mixture of papers on hazardous materials including: spills, emergency response, transportation, detection, risk assessment, and education. Be careful, some of them were trying to sell certain technologies.


Essays on development, some of which deal with environmental issues.


A primer on deciding between social benefits and environmental risk. Non-mathematical.

### Pulp and Paper Mills (see also Air Pollution and Water Pollution)


Names and addresses of the 306 firms (sawmills, planer mills, panel board mills, wood treatment plants, and pulp and paper mills) that use cut logs in Alberta. Statistics for 1987 are provided for each firm as well as several useful appendices.


Good overview for air and water pollution but references are old.


Covers extended and oxygen delignification, substitution of bleaching chemicals and process modifications.


Reviews environmental issues with respect to use of wood, pulping, bleaching, papermaking and recycling, biotechnology and legislation in the United Kingdom. There are 105 abstracts plus 18 additional references.

This is a training manual written mainly from the environment protection point-of-view. It covers the importance and history of the industry in Canada, wood preparation, pulping, screening and cleaning, bleaching, stock preparation, paper machines and dryers, chemical recovery, steam and electrical generation, and effluent treatment. Its appendices include: chemical symbols, wood chemistry, and a glossary.


A review of such topics as: forestry operations, debarking, pulping systems, chemical recovery, washing and screening, bleaching, papermaking, steam and power, effluents, computer applications, energy, and costs.


Addresses of pulp and paper businesses in Canada and U.S.A.


When the black liquor is burned in a recovery unit, the combustion products form deposits inside the unit. These deposits reduce the efficiency of the recovery unit. This paper describes an instrument that measures the amount of deposit accumulation.


Dead load refers to the amounts of non-reactive chemicals being re-cycled within the pulping process. This paper focuses on improving the efficiencies of the white liquor evaporation process at the Great Lakes Forest Products mill.


Recommendations to the Canadian industry to improve its technologies and increase research and development.


This article concentrates on the environmental problems of a pulp mill in Creston, British Columbia. It also covers the frustrations of ordinary people trying to deal with the pulp industry.


Use of poplar in an alternative process to Kraft bleaching.

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**Waste Management** (see also Air Pollution and Water Pollution)


Not seen.


Not seen.

From a symposium held by the American Chemical Society in April 1986. Thirty-one papers on distribution, toxicology, risk assessment and risk management.


Covers such techniques as: wet oxidation, fluidized bed incineration, pyrolysis, electric reactors, plasma systems, chemical transformations and advanced incinerators.


A review of the thermal mechanisms for destruction of certain hazardous wastes.


Good overview of many topics, including: dioxins, various thermal processes, aerobic and anaerobic decomposition, landfill, and sampling.


Not seen.


Not seen.


Text on treatment techniques for municipal wastewater.


Mathematical factors for designing waste water treatment facilities, such as sludge ponds.


General overview.

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**Water Pollution (see also Fish Toxicology and Waste Management)**


Procedures for testing water samples.


Prepared for the Technical Advisory Committee, Pulp and Paper Sector of MISA (Municipal/Industrial Strategy for Abatement) and Ontario Ministry of the...
Environment by the Expert Committee on Kraft Mill Toxicity.

The best overview on the kinds and sources of wastes produced by kraft types of pulp mills.


MICROLOG 87-01079, 2 fiche

Gives long lists of chemicals and groups of chemicals found in pulp mill effluents. Such chemicals cause, or are suspected of causing: toxicity to aquatic organisms, mutations, cancers, fish tainting, or taste and odour problems for drinking water.


This report looks into what pollution impacts (especially on fish) may occur in Canada. There is a large annotated bibliography on the effects of pulp and paper mill effluents; also a short summary of human health effects of such mills.


This is a draft report.


Not seen.


Biological Report 85 (1.8). Contaminant Hazard Review number 8.

A concise introduction to the problems of dioxins in wildlife. Recommends a maximum of 0.01 ppt (parts per trillion) in water to protect aquatic life or 10-12 ppt in food items of wildlife.


Alberta Oil Sands Environmental Research Program AF 4.9.1.

Reviews detrimental effects of increased suspended and settled sediments on fish, benthic invertebrates, and primary producers. Upper tolerance for fish is about 80-100 mg/L and as low as 10-15 mg/L for bottom invertebrates. Sediments can arise from vegetation removal, road construction, and industrial activities.


Addition of pesticides to the Athabasca River has many similarities to the addition of toxic effluents. This summary paper has a number of useful references.


Twenty-one papers related to application of methoxychlor to the Athabasca River. As stated above the behaviour of pesticides is similar to many toxic wastes.


A historical document.

Industrial Programs Branch, Environmental Protection Programs Directorate, Environmental Protection Service,

A short report on the industry's responses to federal government standards up to 1982. It includes: total suspended solids, biochemical oxygen demand, toxicity, sulphite pulping, compliance technology, research and development, effluents to municipal systems.


Excellent overview of chemicals, laboratory procedures, ecological effects, bioaccumulation, and bioassays.


Production, transformations and toxicity of arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc.


Includes production, behaviour and toxicity of: aliphatic hydrocarbons, aromatic hydrocarbons - monocyclics and polycyclics, chlorinated pesticides, petroleum hydrocarbons, phenols, polychlorinated biphenyls, and polychlorinated dibenzo-p-dioxins (PCDD).


Mercury seems to naturally occur in many lakes and rivers of Alberta. Some pulp mills used mercury to produce chlorine for bleaching. Though the mercury was supposed to be in a closed system, some escaped. Mercury compounds were formerly used in pulp mills as slimicides. This book explains how mercury moves around ecosystems.


A 15 page summary.


This report gives information on lethal and sublethal effects of kraft effluents on various aquatic organisms as well as regulations for Europe and North America.


These compounds were found at 95% of the sites. The high amounts found at some sites spurred the development of more stringent control regulations.


A review of the status of dioxins produced by the kraft pulping process.

Basic descriptions of 10 lakes in the Richardson River and Grayling Creek basins. The lakes were not found to be highly susceptible to acidification.


An introductory world view of water management.


The committee worked towards partially restoring water levels adversely affected by the W.A.C. Bennett Dam in British Columbia. Pollution of the Peace and Athabasca Rivers will affect this delta, which is a part of Wood Buffalo National Park.


Presents data on vegetation, fish, birds and mammals.


Perhaps someone will to do a similar study of the Peace or Athabasca Rivers?


An old paper but it has some information on the people and resources at the mouth of the Athabasca River.


An introduction to water: its properties, role in the ecosphere, human uses and abuses, as well as legal, economic and management issues in the U.S.A.


Standards on water quality.


Alberta Oil Sands Environmental Research Program Report 92, WS 1.6.2.

Baseline studies of Algar, Horse, Hangingstone, Gregoire and Christina Rivers.


One of the findings of this report is that the most productive time of the year for the lower Athabasca River is the winter, when flow and turbidity are low and numbers of phytoplankton and animals are high.


Prepared by International Environmental Consultants Ltd. for Research Management Division.

Alberta Oil Sands Environmental Research Project Report L-76.

Use of a mass balance approach to model movement of dissolved chlorine, total alkalinity and total hardness in the lower Athabasca River.