### WATER QUALITY -

## AN ANNOTATED BIBLIOGRAPHY OF AVAILABLE INFORMATION



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Lee Doggett - DEP - Casco Bay Estuary Project
Ron Dyer - DEP - Nonpoint Source Pollution Program
Joyce Noel - DEP - Water Bureau
Louis Flagg - DMR - Inland Fisheries and Anadramous Fish
Walter Foster - DMR - Director, Industry Service Division
Don Card - DMR - Regional Biologist

and question about soil suitablility may be directed to the local Soil and Water Conservation District Offices:

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# ANNOTATED BIBLIOGRAPHY OF INFORMATION RELATING TO WATER QUALITY ISSUES

The sources listed in this booklet represent the most complete updating of information available regarding water quality issues for the State of Maine. The sources range from small pamphlets and local reports, to state-wide and regional studies performed by, or in conjunction with, federal and state government agencies.

The material is organized alphabetically by subject matter, beginning with "Agricultural" and ending with "Wastewater Treatment." References which have applicability in several topics are given in each topic area. Within each topic area, the resources are listed chronologically.

Agriculture - nonpoint source study of Maine, and several interlocal reports on soils and soil characteristics.

Estuary/Bay - all information relating to Casco Bay in particular, and water quality issues in regards to estuaries and bays in general. The information dates from 1978 to the present.

<u>Groundwater Resources</u> - information relating to the formation, study, and protection of groundwater resources.

<u>Lakes</u> - information relating to lake watershed protection and lake water quality., including phosphorus loading.

Nonpoint Source Pollution - information for identifying and controlling nonpoint source pollution. The earliest reference is what is known as "The Environmental Quality Handbook" (1974), later replaced by specific manuals on "Best Management Practices" (1990).

<u>Rivers</u> - studies and technical data relating to river water quality, tributaries, and land use standards relating to water quality in rivers.

Water Quality - information relating to protection of wellheads and general area-wide water quality studies, such as the Section 208 (of the Federal Water Pollution Control Act Amendments of 1972 - P.L. 92-500) Water Quality Management Plans.

<u>Wastewater Treatment</u> - information regarding the treatment of wastewater and stormwater runoff.

This information is available either through the federal or State agency responsible for publication, the Regional Planning Commissions, or the library of the Department of Economic and Community Development (Office of Community Development - OCD). Many of these studies, while useful, are somewhat dated, and the reviewer has made every effort to point this out. In addition, many of these studies and reports are **out of print**, and OCD may have the only copy. Thus a charge for copying some of the larger reports may be necessary. Those interested in examining these reports can do so at the library at OCD during normal business hours.

Finally, this listing is not meant to be exhaustive; new materials will be added as they come in. It is hoped that as more communities, and federal and state agencies, deal with the problem of water quality, whether they affect inland or marine waters, new information, studies, and reports will be produced and passed on through resources such as this bibliography.

This publication was made possible by a grant from the U. S. Department of Environmental Protection, administered by the Casco Bay Estuary Program in the Maine Department of Environmental Protection.

#### <u>Agriculture</u>

Agriculture, U.S. Dept. of. Study of Non-Point Agricultural
Pollution - Maine. Orono, ME.: Soil Conservation Service.
June, 1978. Available from the Department of Economic &
Community Development - Office of Comprehensive Planning
(DECD - OCD).

Report discussing three sources of agricultural nonpoint source pollution. Part I discusses the causes and effects of soil erosion and possible treatment. Part II discusses animal manure: the amount produced, disposal techniques, and water quality considerations. Part III discusses the use of agricultural chemicals and their impact on water quality. and rill erosion averages 6 tons per acre per year, with 1.8 million tons of eroded soil in Maine annually. About 60% of the State's cropland needs conservation treatment. About two million tons of manure are generated annually. Only 60 of about 2800 farms were identified as having manure recycling plans. Reported fish kills evaluations show that most have been caused by improper handling of pesticides. The overall objective of the study was to identify the location, extent, and kinds of agricultural practices causing water pollution from sediment, animal manure, and agricultural chemicals. Maps, tables, and charts. 92 pp.

Environmental Protection, Maine Department of. Strategy for Managing Nonpoint Source Pollution from Agricultural Sources. Augusta, ME.: NPS Agricultural Task Force. October 1991. Available from DEP - Nonpoint Source Pollution Program.

The NPS Pollution Management Plan identified nine major source categories of nonpoint pollutants. The three major components to the prevention or reduction of agricultural nonpoint source pollution are (1) agricultural BMPs; (2) an implementation program emphasizing a voluntary compliance or use of BMPs but including a mandatory compliance or enforcement component and an evaluation of the implementation strategy; (3) agency roles and responsibilities. 68 pp.

#### Estuary/Bay

Blake, Bradbury D. <u>Presumpscot: A Profile of Estuarine</u>
<u>Pollution and Recovery, 1975</u>. Portland, ME.: University of
Maine at Portland-Gorham. Available from DECD - OCD.

Important report! Even handed compilation and comparison of several studies concerning the Presumpscot River and associated estuary. Good historical documentation of polluters and other forces inhibiting water quality. Studies include the DEP Study (1974), Normeandeau (1974), S.D. Warren (1973), Normeandeau Sludge Study (1975?). Significant examination of biological organisms affected by pollution of sewage, storm run-off, pulp and paper mill sludge deposits, heavy metals, agricultural deposits. Discussion of efforts by Portland, Falmouth, Westbrook, Gorham, and Windham to treat domestic sewage. Excellent examination of efforts by S.D. Warren to reduce pollution discharges from the mill through the construction of its own secondary treatment facilities. For follow-up assessment, see State of Maine Water Quality Assessment, 1990, above.

Card, Donald J. <u>Casco Bay Resources Inventory</u>. West Boothbay Harbor, ME.: Department of Marine Resources. 1979.

Available from DECD - OCD.

INFORMATION NOT AVAILABLE FOR REVIEW.

Hutchinson, Alan E., Richard C. Ferrero, J. Topinka, W. Korjeff, and M. Rowe. <u>Casco Bay Coastal Resources Inventory - Marine Wildlife/Marine Flora</u>. Augusta, ME.: Dept. of Inland Fisheries & Wildlife. December, 1980. Available from DECD - OCD.

Using the effects of an oil spill upon the marine flora and fauna of Casco Bay as a base, this study examines wildlife habitats and locations through inventory and analysis, and the possible effects upon the resource. Part I: Marine Wildlife - Resource inventory of marine birds (with population assessments and areas of importance) and seals. Significant appendices include maps and the seasonal rankings for marine bird and seal areas, and seasonal expectations. Tables include primary and nesting bird species of the bay, seasonal population estimates, seal haul-out sites, and percent population supports in areas of concentrated use. Part II - Inventory of Benthic Flora - Review of salt marsh plants and rocky shore macro algae, inventory of fauna resource, review and recommendations for protection from oil spills, damage assessment. Important appendices include atlas of aerial photographs and salt marsh overlays. 210 pp.

Card, D.J., R.A. Aho and L. Gillespie. <u>Casco Bay Marine</u>
<u>Resources Inventory</u>. West Boothbay Harbor, ME.: Department of Marine Resources, Fisheries Research Laboratory.

December, 1980. Available from DECD - OCD.

Companion volume to above study. Section 1 - Major focus on chemistry, biological effects, and aftermath of a major oil spill in the Casco Bay. Section 2 - Marine resources inventory including discussions on twenty resources: (Resource species) lobsters and crabs, clams and mussels, scallops, herring; (Fisheries resources) lobster facilities, aquaculture sites, fish traps, anadromous fish streams, and industrial intakes; (Recreational resources) parks and beaches, marinas and yacht clubs, critical and natural areas, wildlife preserves, and historic and scenic sites. Section 3 - Inventory and assessment program delineation for marine resources. Appendices includes toxic and sublethal effects of oil on marine organisms, clam survey procedures, and in-depth examination of the lobster, crab, scallop, mussel, marine worm, and finfish fisheries of the bay. Good background, clear data on above species. Section 4 -Resource Atlas. Priceless. Sections 5 - 7 - Listing of each area by topic, including location and other information for each resource in bay. Approx. 300 pp.

Parker, Charles E. <u>The Currents of Casco Bay and the Prediction of Oil Spill Trajectories</u>. West Boothbay Harbor, ME.: November, 1982. Available from DECD - OCD.

Scientific, yet readable study of currents in Casco Bay. Major focus is disposition of potential oil spill. 73 pp.

Waters, Michael & Phillip Marcoux. A Study of the Water

Quality and Anadramous Fisheries of the St. George River

Estuary. Augusta, ME.: State Planning Office. 1981.

Available from DECD - OCD.

Report is "divided into several sections. Section One deals with historical and existing land uses along the river, primarily obstructions to fish passage. Section Two deals with all laws pertaining to alewife and smelt management, and water quality. Section Three deals with the biology and management of the fishes found historically or currently in the river basin: alewives, smelts, shad, and Atlantic Salmon. Section Four deals with the physical and chemical factors influencing the river basin. Test results for dissolved oxygen, water temperature, water Ph, and CO<sub>2</sub> are included. Recommendations included retaining current alewife management plan, improving fish passage around barrier to Sennebec Pond, ensure continual fish passage to North Pond, and the re-introduction of shad and salmon into the system. Approx. 150 pp.

Card, Donald J. & Ronald Aho. <u>Coastal Marine Resources Inventory</u>
- 1982 - Small Point to Pemaquid Point. West Boothbay
Harbor, ME.: Department of Marine Resources. (Publication date unknown). Available from DECD - OCD.

See <u>Card</u>, et. al, above for project description. This report focuses on the area between Small Point and Pemaquid Point, Sheepscot Bay. 422 pp.

\_\_\_\_\_\_. Coastal Marine Resources Inventory - 1983. Pemaquid

Point to Spruce Head. West Boothbay Harbor, ME.:

Department of Marine Resources. (Publication date unknown).

Available from DECD - OCD.

See <u>Card</u>, et. al., above for project description. This report focuses on the area between Pemaquid Point and Spruce Head, Muscongus Bay. 589 pp.

Gerber, Robert G., Inc. <u>City of Portland Island Ground Water</u>
<u>Management Study</u>. Freeport, ME: Robert G. Gerber, Inc.
August, 1986.

See Gerber, in "GROUNDWATER RESOURCES" below.

Conservation, Maine Department of. <u>Land Use Districts and Standards</u>. Augusta, ME.: Land Use Regulation Commission. August 5, 1989.

See "LAKES", below. Some information on islands.

Campbell, Dr. Daniel E. <u>The Maquoit Bay Shellfish Kill of 1988:</u>
<u>An Ecological Tragedy</u>. West Boothbay Harbor, ME.: March,
1989. Available from DECD - OCD.

Excellent description of the complex forces, in this case without human "help", that caused the massive shellfish kill. Readable catalogue of the biological organisms and mechanisms which influence the wealth or poverty of a shellfish bed. 5 pp.

Heinig, Christopher S. <u>Maquoit and Middle Bays Comprehensive</u>

<u>Plan Revision</u>. South Harpswell, ME.: Intertide

Corporation. June 16, 1989.

See "NON-POINT SOURCE POLLUTION", below.

Ruffing, Jennifer. The Estuary Book. Augusta, ME.: State Planning Office. January, 1991. Available from the State Planning Office (SPO).

Excellent examination of forces, natural and otherwise, at work affecting the water quality of estuaries. Chapter 1 reviews the geology and ecology of the Maine coast, particularly

estuaries. Chapter 2 discusses the effects pollution, land use, and changes in wetland configuration has on water and habitat quality in the estuary. Chapter 3 discusses important information and strategies for estuary planning and management, including inventories, map use and local policy and regulatory development. 48 pp.

Office; February, 1991. Available from the SPO.

Companion report to above <u>Estuary Book</u>. Maine coast broken up into three sections: southern, mid-coast, and down east. All major estuaries profiled and mapped, with minor estuaries only profiled. Despite lack of maps for these latter estuaries, an important resource. Approx. 100 pp.

#### Groundwater Resources

Caswell, W. Bradford & Schuyler Ludwig. <u>Maine Coastal Area Water Supply and Demand</u>. Augusta, ME.: State Planning Office. 1978. Available from DECD - OCD.

Report producing surveys and maps for all coastal towns: (1) Examination of water supply problems facing coastal towns between 1976 - 1986. Future water demand indicated by population growth, building starts, and expansion of commercial-industrial water users. (2) Ability of municipal systems to supply additional water indicated by quantity and quality of their sources, condition of distribution systems, and by financial status of water companies relative to projected improvements and expansion. (3) Sources and availability of ground-water supplies indicated by presence of gravel and bedrock aquifers of adequate quantity and quality. Poor ground-water sources indicated by areas of low-yield bedrock wells, naturally poor-quality water, or by contaminated water. Report conclusions: (1) most common problem with ground-water sources is high iron concentrations. Iron removal cost prohibitive for municipal suppliers; locate well drilling away from iron-bearing areas. (2) Contamination of surface and ground-water supplies occurring in many coastal Most of problems related to encroachment of development into watershed. (3) Lack of funds needed to construct treatment facilities, new water mains, reservoirs, and water towers. 244 pp.

SEA Consultants, Inc. <u>Engineering Report Groundwater Recharge</u>
<u>Area Analysis and Planning - Town of Kennebunk, Maine</u>.
Winthrop, ME.: December, 1979. Available from DECD - OCD.

Conclusions and recommendations for two aquifers in West Kennebunk area: (1) Approximately 3.42 X 10<sup>7</sup> gallons/day & 1.41 X 107 flow through the Plains area aquifer and Radio Town Range aquifer, respectively. (2) Recharge occurs over most of surface area of both aquifers; most of flow through Plains aquifer begins upslope in Sanford. (3) Groundwater supplies adequate to support residential development under existing three acre zoning. (4) Licensed Soil Evaluator and minimum separation distance of 48 inches considered proper for local ordinances. (5) Regulations be enacted prohibiting location of solid waste disposal facilities and industries using wet chemical processing techniques. (6) Town should institute regular schedule of groundwater monitoring using existing cased test wells, et. al. 72 pp.

Underhill, Celica. <u>Bunganuc Brook Survey Report [Brunswick]</u>.

Augusta, ME.: Maine's Coastal Program. August 22, 1980.

Available from DECD - OCD.

In-depth study of the 5.59 square mile Bunganuc Brook drainage basin, involving analysis for total coliform, fecal coliform, and water tests for acidity, alkalinity, CO<sub>2</sub>, Chloride, Chlorine, Chromium hexavalent, color, copper, dissolved oxygen, hardness, iron, nitrogen ammonia, nitrogen nitrate, nitrogen nitrite, Ph, and reactive phosphorus. 22 pp.

Smith, Wilbur & Associates, Inc. <u>Water Quality and Land Use</u>

<u>Considerations in the Bunganuc Brook Watershed</u>. Providence,
R.I.: October 20, 1981. Available from DECD - OCD.

"Pollution sources were identified and their relative importance examined. Determined that the closure of the sludge disposal dump should have major influence in reduction of bacterial contamination of the Bunganuc Brook and mouth of Maquoit Bay. Plans to close the dump expected to improve water quality. Other minor polluters in the watershed should be monitored. Land spreading os sludge appears to be a viable option for support." Description of Watershed Area includes data on demographic and land use trends, topography, surficial geology/soils, and land cover types. Water Quality Analysis includes stream classification, existing conditions, bacteriological results, sources of contamination, and water quality results. Management Considerations include securing the site, composting, land spreading, landscaping, parent material, and soils. Appendices include water quality test data, and sample floodplain and watershed zoning ordinance from Wellesley, Mass. Approx. 100 pp.

Blakesley, Robert G. <u>State Policies and Programs Regarding Maine's Drinking Water</u>. Augusta, ME.: Executive Department; State Planning Office. July, 1984. Available from DECD - OCD.

Overview of water supply issues, key findings, and existing (1984) State policies. List of issues that form basis for following parts. "Part I focuses on the provision of drinking water, from private supplies to non-community public suppliers and community supplies. Presented are policies and issues pertaining to water system and public health standards, condition of systems, financing and water costs." Part II "addresses protection of water sources." Part III focuses on "water supply planning and coordination of State agencies involved." Appendices deal with overview of water resources, patterns of water usage, public water supply systems, and selected references. 110 pp.

Tomorrow, Maine. <u>Groundwater Quality: A Handbook for Community Action</u>. Hallowell, ME.: Maine Association of Conservation Commissions. March, 1986. Available from DECD - OCD.

Handbook written to encourage local volunteer groups and individuals concerned with water quality to fill information void. Purpose of this handbook is to outline a process by which a conservation commission or other community group can collect data to determine whether or where activities and land uses likely to have involved toxic materials occurred. Valuable tables include historic land uses which may threaten water supplies and land use/activity inventory worksheet. Clear methodology of inventory process organization, conducting the inventory (including use of public records and interviews), using the results. Appendices include bibliography of materials held in the Maine State Library (in Augusta) relating to economic development, industries, water supply, and toxic materials; towns with published local histories and local registers; selected state agencies. 48 pp.

Gerber, Robert G., Inc. <u>Town of Freeport Bedrock Aquifer Study - Background Research and Data Collection</u>. Freeport, ME.: May, 1986. Available from DECD - OCD.

Geological study of Freeport bedrock aquifer. First portion of this report discusses the surficial and bedrock geology of the area as it relates to the hydraulic characteristics of the individual aquifer units. The second portion of the report reviews the water source and the water quality information obtained from slightly more than 16% of 1446 questionnaires mailed, published literature, and water quality test data. 59 pp.

. <u>City of Portland Island Ground Water Management Study</u>. Freeport, ME: Robert G. Gerber, Inc. August, 1986. Available from DECD - OCD.

Clear explanation of the surficial and bedrock geology and their aquifers, along with the allied problem of saltwater intrusion. Findings show that, with the exception of large areas on the west side of Peaks Island, and on the northern and southwestern portions of Long Island, dug wells are a bad alternative for water supply due to relatively thin soils. bedrock wells are the most suitable for the islands, overpumping can lead to saltwater intrusion. Recommendations: 1) Preserve Quantity - Through zoning density allowances and site plan review, excessive lowering of the groundwater table can be minimized. Do not exceed the safe yield of the aquifers. 2) Preserve Quality - Periodic inspection of subsurface disposal systems, and when property changes hands, new inspections of the system be required. Change current policy to one that plans for future island ground water and sewage disposal self-sufficiency. If overboard discharges are to be allowed in the future, minimum

lot sizes be increased by 50%. Maps include bedrock and surficial geologic maps, time of travel contours, potentiometric surface maps, and special features maps. Appendices include well type distribution for the islands, bedrock well yield distributions, well distributions by geologic unit code, and others. Approx. 100 pp.

Caswell, W.B. <u>Ground Water Handbook for the State of Maine</u>.

Augusta, ME.: Maine Geological Survey. 2nd ed., 1987.

Available from the Maine Geological Survey (MGS).

Basic resource for any study examining ground water resources. "The first chapter is a general introduction to ground water geology. Second chapter is a brief summary of ground water use, abundance, quality, and sources in Maine. The third chapter describes ground water and related maps and reports that are available from MGS. Fourth chapter gives examples of typical problems with providing suitable ground water supplies, and preventing contamination." 135 pp.

Dutram, Paul W. <u>Ground Water Standing Committee: Annual Report</u>
<u>to the Land and Water Resources Council</u>. Augusta, ME.:
Executive Department; State Planning Office. January, 1987.
Available from DECD - OCD.

From Summary: "Review by subcommittees of groundwater rules, regulations, and laws, making recommendations for adoption of protection measures. Classification Subcommittee developed new groundwater classification system and local groundwater protection planning process. Risk Assessment Subcommittee catalogued and appraised threats to state's groundwater. Education Subcommittee and State Groundwater Coordinator instituted groundwater education program. Interagency Coordination Subcommittee evaluated existing programs, initiated new ones, and strengthened interagency contacts." 31 pp.

Environmental Protection Agency, U.S. An Annotated Bibliography on Wellhead Protection Programs. Washington, D.C.: Office of Ground-Water Protection. August, 1987. Available from EPA - Boston.

"The bibliography is divided into two sections. The first contains a matrix of all 142 references and indicates which Wellhead Protection Program elements are discussed in the individual references. The second section is an annotated bibliography of the documents listed in the matrix. These have been grouped first by State and within each state section alphabetically by author. Additionally, an "other" section has been included which contains material written by the Federal government or other organizations not associated with a specific State." With the reorganization of many state agencies, some of the contact points may no longer be valid. 75 pp.

. The Planning Process for Local Groundwater Protection.

Augusta, ME.: Executive Department, Land and Water
Resources Council. January 1, 1988. Available from DECD OCD.

Clear, well written guide to the planning process for inventory and analysis of current and future groundwater protection planning. Includes designation of committee, methods for data gathering including: mapping techniques and use, demographic data use, extent of public and private water supplies, location of potential threats, well inventories. Comprehensive list of agencies, sources of contamination, performance standards and protection mechanisms. While somewhat simplistic, an excellent manual for a committee to use to get started. 32 pp.

Environmental Protection, Maine Department of. State of Maine

1988 Water Quality Assessment. Augusta, ME.: 1988.

Available from The Department of Environmental Protection (DEP).

Major technical report on the quality of Maine's inland and coastal waters. Generally well written report and assessment. Areas of concern are broken down into ambient water quality, water quality trends, causes of nonattainment (using required Federal or state specifications), and future water quality trends. Good breakdown of conditions on surface waters by rivers, ponds and lakes, and estuarine waters for pollution and biological problems. Strong identification of point and non-point, toxic and non-toxic sources of pollution. Weak spots in Trends and use of Tables as explanatory of text. Water Quality Management section particularly well written and exhaustive. User must take advantage of appendices. 172 pp.

Environmental Protection Agency, U.S. <u>Wellhead Protection</u>

<u>Programs: Tools for Local Governments</u>. Washington, D.C.:

Office of Ground-Water Protection. April, 1989. Available from EPA - Boston.

This publication "describes how municipalities can, as part of a State Wellhead Protection Program, develop and implement effective techniques for the protection of ground water."

Section 2 (identifying local needs) highlights the issues of establishing local objective, delineating protection areas, evaluating sources of contamination, and examining implementation issues. Section 3 (choosing the appropriate tools for wellhead protection) describes management tools (with successful examples) and notes how tools can be effectively combined: zoning and subdivision ordinances, site plan review, design and performance standards, source prohibitions, purchase of property or development rights, public education, ground water monitoring, and other methods. Section 4 (local implementation) describes

management issues during implementation. Section 5 provides additional sources of information. 48 pp.

Local Financing for Wellhead Protection. Washington,
 D.C.: Office of Ground-Water Protection. June, 1989.
 Available from EPA - Boston.

Provides information to State and local managers of water quality and water supply about a variety of financing approaches to support protection initiatives. Discussion of Safe Water Drinking Act and the Wellhead Protection Program, along with requirements for state programs. Each program must: specify roles and duties of State and local governments and suppliers; delineate the Wellhead Protection Area; develop management approaches to protect the supply; develop contingency plans for each public water supply system; proper siting of new wells; and the insurance of public participation. Discussion of regulatory and management measures; funding sources including dedicated taxes and fees, private expenditures, intergovernmental grants, and loans; institutional management options; and several case studies from around the country. 57 pp.

Conservation, Maine Department of. <u>Land Use Districts and Standards</u>. Augusta, ME.: Land Use Regulation Commission. August 5, 1989. Available from the Land Use Regulation Commission (LURC).

General land use districts and performance standards for the unorganized territories and communities in Maine. Relevant districts and standards include: Aquifer Protection Subdistrict (P-AR) - standards meant to protect sources of ground water. Allowed uses are recreational activities with small or no impact, while permitting agricultural and forestry management activities (except for fertilizer application). Significant uses requiring a permit are land management roads and water crossings, mineral extraction, shoreland alterations, and single family detached dwellings. Soils & Geology Protection Subdistricts (P-SG) areas, 10 acres or more, with average slopes greater than 60%, or unstable soil types. Uses allowed without a permit are minimal impact, recreation based uses. Significant permit required uses are timber harvesting, land management roads and water crossings, shoreland alterations, fill/dredge/grade/drain, accessways for mineral excavation, etc. There are no exemptions in this district.

Environmental Protection, Maine Department of. State of Maine

1990 Water Quality Assessment. Augusta, ME.: 1990.

Available from DEP - Water Bureau.

Major revision and shift in technical direction from 1988 Report. This report includes more technical data, more general water quality trends information. Due to reassessment of length of major rivers, miles of river water quality attainment status don't compare with 1988 Report. Little movement towards higher quality attainment percentages due to state and federal funding cut-backs. Larger emphasis on Nonpoint Source Pollution. Appendices virtual copies of 1988 Report, due to little change in water quality. New information in River Basin Attainment Status worth reviewing. 242 pp.

Dyer, Ronald, et. al. <u>Watershed: An Action Guide to Improving Maine Waters</u>. Augusta, ME.: Department of Environmental Protection, State Planning Office/Coastal Program, University of Me. Cooperative Extension. April, 1990. Available from the State Planning Office (SPO).

Good, general resource for the layperson concerning nonpoint source pollution, and abatement action which can be taken in the home and community. Clear delineation of threats to specific kinds of water bodies. Important resource/information listing for state agencies concerned with this project. 18 pp.

#### <u>Lakes</u>

Conservation, Maine Department of. An Action Program for Management of Lakes in Maine's Unorganized Areas. Augusta, ME.: Land Use Regulation Commission's Lakes Policy Commission. January 19, 1989. Available from LURC.

In an effort to deal with increasing development near and along lakes in unorganized territories LURC, through the Lakes Policy Committee formulated planning criteria for management of lakes in LURC's territory. Through the collection of information concerning scenic and natural resources from the Wildlands Lake Assessment (1986), the Committee classified lakes under one of four classifications: multiple value, single value, regional value, or local value. Through the Action Program, the Committee developed five regulatory and non-regulatory management objectives: (1) clarification of policies and objective, (2) creation of clear criteria for shoreland development application review, (3) creation of "lake concept plans," (4) categorization of lakes into one of seven management classifications, and (5) appropriate actions by other state agencies and groups to support the overall plan. All lakes over 10 acres in size are listed, using a somewhat obscure resource rating table not adequately defined in the text. 49 pp.

. <u>Land Use Districts and Standards</u>. Augusta, ME.: Land Use Regulation Commission. August 5, 1989. Available from LURC.

General land use districts and performance standards for the unorganized territories and communities in Maine. districts and standards include: Great Pond Protection Subdistrict (P-GP) - land use standards for activities allowed 250' of normal without permits, and those which require permits. highwater mark, standards meant to protect water quality, recreation potential, fishery habitat, and scenic character from development impacts. Exceptions include campgrounds, commercial sporting camps with structures up to 8,000 sq. ft., and retail stores and restaurants up to 2,000 sq. ft. Shoreland Protection Subdistrict (P-SL) - protection of 250' within flowing waters, and 75' within coastal, inland, and standing water bodies (less than 10 acres). Standards meant to protect shoreland areas. Exceptions to standards are commercial sporting camps with structures up to 8,000 sq. ft., and industrial and commercial structures less than 8,000 sq. ft. which are water-dependant. Fish & Wildlife Protection Subdistrict (P-FW) - standards to conserve fish and wildlife habitats, including description of habitats and land use standards for activities which require and do not require permits. 148 pp.

Sage, Kathy. <u>Implementation Strategies for Lake Water Quality Protection</u>. Winslow, ME.: North Kennebeck Regional Planning Commission. June 1990. Available from DECD - OCD.

"This manual, together with the two companion manuals, Comprehensive Planning in Lake Watersheds and Phosphorus Control in Lake Watershed: A Technical Guide for Evaluating New Development, is a key element to the phosphorus control program, as administered by the DEP." This manual presents model ordinances for towns to incorporate the phosphorus control standards using the Comprehensive Planning manual and the technical review process defined in the Technical Guide into the local development review process. Additional provisions include erosion and sedimentation controls for construction projects. This manual also outlines the process for gaining public support necessary to adopt new phosphorus controls, listing agencies and materials available to assist the towns. Non-regulatory measures, suggested to supplement adoption of ordinances, can also address phosphorus contributions from existing development. 241 pp.

Androscoggin Valley Council of Governments. <u>Comprehensive</u>

<u>Planning for Lake Watersheds</u>. Department of Environmental
Protection: July, 1990. Available from DECD - OCD.

Good general planning guide for lake watersheds. Chapter 1 deals with a discussion of the factors which determine water quality and its effects on lake quality. Chapter 2 provides a good method for lake watershed map generation and structure Chapter 3 discusses the planning and analysis of inventories. phosphorus content calculations and watershed data collection results. While seemingly complex, material is clearly organized and provided in a step-by-step approach. Central chapter to the publication. Chapter 4 discusses other sources of phosphorus, including timber harvesting, agriculture, open space consideration, and road maintenance and construction. Chapter 5 serves to aid municipalities in development of policy concerning lake watershed protection, discussing each of the issues concerning the integration of the comprehensive planning process and lake watershed protection. Good examples of Inventory, Analysis, and Policy discussions. Appendices include a simplified method of future area development, calculations for large developments, and sample subdivision logs, for (1) maintaining accurate open space designations, (2) keeping track of cumulative watershed development. 54 pp.

#### Nonpoint Source Pollution

Soil & Water Conservation Commission, Maine. Maine Erosion and Sediment Control on Commercial, Industrial, Residential, Recreation, and Governmental Construction Sites - Environmental Quality Handbook. Augusta, ME.: Maine SWCC. June, 1974. Available from DECD - OCD.

Original Best Management Practices Handbook. Though replaced by the new "Best Management Practices" for each subject, this served as the model for the last twenty years. Begins with principles and practices needed for erosion control, with references to specific sections. Section 2 gives the methodology for equating soil loss per acre of the site under construction by factoring in soil erodibility, rainfall, slope-length, and slope-gradient with values given for each factor. Section 3 gives methodology for measurement of rill erosion. Section 4 gives methodology for measurement of gully erosion. Sections 5 - 7 give standards and specifications for methods of erosion and sedimentation reduction. 121 pp.

Environmental Protection, Maine Department of. <u>State of Maine</u> 1988 Water Quality <u>Assessment</u>. Augusta, ME.: 1988.

See Assessment, in "GROUNDWATER RESOURCES", above.

Heinig, Christopher S. <u>Maquoit and Middle Bays Comprehensive</u>

<u>Plan Revision</u>. South Harpswell, ME.: Intertide
Corporation. June 16, 1989. Available from DECD - OCD.

Reassessment of 1980's Comprehensive Plan. Part I reviews Land Use, Marine Resources, Slope & Soils, Nonpoint Source Pollution, Marinas, Harbor Management, Access, and Open Space & Natural Features. Report makes strong point of connections between marine resources and nonpoint source by reviewing impacts on shellfish harvests and water quality. Report served as justification for creation of Coastal Watershed Protection Zone (CPWZ) in Brunswick. Appendix I is summary of Rhode Island study concerning creation of Waste Water Management Districts (WWMD). Includes WWMD Model Ordinance. Part II - Inventory & Assessment - Well researched analysis of topics which influence Maquoit & Middle Bays. Summary shows slopes, soil analyses, summary of marine resources, potential pollution sources, and water access points. Entire report serves as important background for the Bays, was well as exemplary discussion of the issues, recommendations, inventory and assessment of the development factors that will affect the Bays in the future. 74 pp.

Environmental Protection, Maine Department of. <u>State of Maine Nonpoint Source Pollution Assessment Report</u>. Augusta, ME.: Bureau of Water Quality Control. 1989. Available from DEP - Nonpoint Source Pollution Program.

Narrative and technical data which is presently incorporated into the State of Maine Water Quality Report (§305b) to the EPA. Narrative provides useful background into how data is assembled, and what agencies oversee the regulatory management methods. Useful information includes statewide water quality summary describing pollutant, categories of nonpoint sources, and identification of nonpoint source impaired and threatened waterbodies. Important discussion of program coordination involving all appropriate state agencies, regional agencies, municipal boards and commissions, and future program initiatives. Appendix III lists groundwater areas (by county) not attaining water quality standards due to nonpoint sources. 215 pp.

DeWick, Stephen C. <u>Mere Point & Sabino Wastewater Study</u>. Bath, ME.: Kimball Chase Company, Inc. December, 1989.

See <u>Dewick</u> in "WASTEWATER TREATMENT", below.

Environmental Protection, Maine Department of. <u>State of Maine</u> 1990 Water Quality <u>Assessment</u>. Augusta, ME.: 1990.

See Assessment, in "GROUNDWATER RESOURCES", above.

. <u>Model Erosion and Sediment Control and Stormwater</u>

<u>Management Ordinance - Draft</u>. Augusta, ME.: 1990.

Available from DEP - Nonpoint Source Pollution Program.

Draft ordinance language from the Department of Environmental Protection. Available from DEP - Nonpoint Source Pollution Program. 10 pp.

Conservation, Maine Department of. <u>Best Management Practices for Erosion Control and Water Quality Protection in Timber Harvesting Operations</u>. Augusta, ME.: Bureau of Forestry. June, 1991. Available from DEP - Nonpoint Source Pollution Program.

Guidelines for mitigating effects surrounding forestry practices. Publication carries reader through planning the operation (especially timing and location), construction of the operation (design of roads, skid trails, and stream crossings), and compilation of laws affecting timber harvest and water quality. Specific BMPs includes Roads and Trails, Erosion Control Devices (drainage dips, water bars, etc.), Stream Crossings, and other activities which may affect water quality (especially the close-out operations). Appendices offer lists of groups and agencies offering technical assistance, and laws and

programs concerning harvesting and water quality. 48 pp.

Best Management Practices for Erosion Control and Sedimentation in Agricultural Operations. Augusta, ME.: Bureau of Water Quality. June, 1991.

See Operations, in "AGRICULTURAL", above.

Smith, Jody. <u>Maine Erosion Control and Sedimentation Handbook</u>
<u>for Construction - Best Management Practices</u>. Augusta, ME.:
Bureau of Water Quality. March, 1991. Available from DEP Nonpoint Source Pollution Program.

Handbook designed to aid those in the construction practices to minimize erosion during development. Divided into three parts: Sections 1-18 describe nonstructural measures for erosion and sedimentation control; Sections 30-49 describe structural measures; Sections 70-73 describe materials specifications. The most commonly used and easily installed techniques are presented first, followed by more complex structures, typically requiring assistance by a skilled professional. 283 pp. See also BMPs for Erosion and Sediment Control produced by the Me. Department of Transportation in May, 1992.

Brunswick. <u>DRAFT Performance Standards for Coastal Protection</u>
<u>Zone (CPZ)</u>. August, 1991. Available from DECD - OCD.

Includes appropriate definitions, permitted and exempted uses. Major provisions includes sections on stormwater management (required for all development in CPZ) addressing wet-ponds," recharge/infiltration devices and dry wells, vegetated buffer strips, grassed swales. Section on Setbacks exceeds Shoreland Zoning requirements. Innovative standards for Individual Sewage Disposal System (ISDS), and fertilizer and pesticide application. This document has gone through several major revisions. Thus far, the Maintenance Agreement and ISDS life spans remains weak areas.

- Best Management Practices for Stormwater Run-off - DRAFT.

Augusta, ME.: Bureau of Water Quality. October, 1991.

Available from DEP - Nonpoint Source Pollution Program.

TO BE INCLUDED UPON PUBLICATION.

#### Rivers

Blake, Bradbury D. <u>Presumpscot: A Profile of Estuarine</u>
<u>Pollution and Recovery, 1975</u>. Portland, ME.: University of
Maine at Portland-Gorham.

See "ESTUARY", above.

Cowing, D.J. and J.L. McNelly. <u>Drainage Areas of Surface Water</u>

<u>Bodies of the Royal and Presumpscot River Basins in South-</u>

<u>western Maine</u>. Open-File Report #78-556. Augusta, ME.:

U.S. Geological Survey. 1978. Available from USGS.

Technical data on lakes and rivers in these two basins. Part I consists of lakes and ponds in the Presumpscot and Royal river basins, listing name, drainage area (sq. mi.), lake number, latitude, longitude, hydrologic unit code, and county code. Part II consists of listings of the rivers and streams in the Presumpscot and Royal river basins, in downstream order. In addition to the information supplied for the lakes and ponds, the stream number and the downstream order number are furnished. 23 pp.

Fontaine, R.A. <u>Drainage Areas of Surface Water Bodies of Southern Maine Coastal River Basins</u>. Open-File Report. Augusta, ME.: U.S. Geological Survey. 1979. Available from USGS.

Technical data on lakes, ponds, and rivers in Southern Cumberland, York counties. Part I consists of lakes and ponds in the basins, listing name, drainage area (sq. mi.), lake number, latitude, longitude, hydrologic unit code, and county code. Part II consists of listings of the rivers and streams in the basins, in downstream order. In addition to the information supplied for the lakes and ponds, the stream number and the downstream order number are furnished. 23 pp.

Jordan, Edward C. Co., Inc. <u>Card Brook Drainage Area Study -</u>
<u>Ellsworth, Maine</u>. Portland, ME.: September, 1979.
Available from DECD - OCD.

Study evaluated hydrologic and soils characteristics of the drainage area, and effect of development. Flood potential and hazard, effect of development on runoff analyzed. Soil types and erosion potential determined and sensitive areas identified. Study found that development would increase flood hazard due to additional run-off. Nonstructural recommendations: maintenance of natural drainage patterns by prohibiting channel modifications, creation of buffer zones; establish maximum limit of 70% impervious area for commercial and industrial development; enlarge resource protection area, require minimum one - two acre

lot sizes; establish uniform gravel pit development guidelines with help from the Hancock County Regional Planning Commission. Structural recommendations: require on-site surface runoff storage for developments larger than 20 acres; adoption of additional guidelines to minimize construction activity and development impact. 58 pp.

Marine Resources, Maine Department of. <u>Sanitary Report on the Royal and Cousins River</u>. West Boothbay Harbor, ME.: Fisheries Research Station. 1980. Available from DECD - OCD.

INFORMATION UNAVAILABLE FOR REVIEW.

Walters, Michael. A Natural Resource Inventory of the Banks along the St. George & Mill Rivers - for the Town of Thomaston. Augusta, ME.: August, 1980. Available from DECD - OCD.

Report of the topography, bedrock and surficial geology, vegetative cover, wildlife, and laws pertaining to land use along the St. George and Mill Rivers. While focus is on natural resources, complete description of soil types and geologic conditions clearly covered. 59 pp.

Connors, James, Allen Myers & Barry Timson. The Turbidity

Problem in the Eastern River, Dresden, Maine. [publication place unknown]: Earth Surface Research, Inc. February 25, 1982. Available from DECD - OCD.

Examination of the possible causes of high levels of suspended sediment in the tidal portions of the Eastern River. Specific goals of study were to evaluate known turbidity values, isolate possible causes, and recommend further monitoring tasks to alleviate the problem. Primary cause of turbidity found to be from fish populations' feeding habits directly contributing to suspended sediments, and wave resuspension of surface sediment on intertidal mudflats. Recommendations include reduced carp population through sport fishing, and establishment of aquatic vegetation on the unvegetated tidal flats (which may prove not be cost effective). 52 pp. (plus three maps).

Conservation, Maine Department of. Maine Rivers Study. Augusta, ME.: DOC. May, 1982. Available from DECD - OCD.

Major examination of major rivers and their basins in the state. Major findings: 1) number and diversity of natural and recreational river resources unique in NE U.S., 2) over 4200 miles of rivers and river segment identified, 3) potential exists for conservation of complete watersheds or river ecosystems, 4) potential exists for conflicts between hydroelectric development and natural and recreational rivers, 5) there is a

significant base of citizen and public agency support for conservation and management of river resources, 6) variety of alternatives available for conservation. Four step study method: 1) identification and definition of unique river values; 2) identification of significant river resource values, 3) river category evaluation, 4) river category synthesis; 5) comparative river evaluation. Rivers and segments divided into unique natural rivers and unique recreational rivers. Subjects reviewed for the former were: geologic/hydrologic features, river related critical/ecological resources, undeveloped river areas, scenic river resources, and historical river resources. Subjects reviewed for the latter were: anadramous fisheries, riverrelated inland fisheries, river-related recreational boating. Appendices break down above subjects into table form. Culmination of study is final segregation of rivers into four categories: "A" (possessing six or more resource values with regional, statewide, or greater significance), and two or more state significant values) to "D" (rivers possessing one or more resource values of regional significance), with in-depth descriptions of all "A" and "B" rivers. Excellent methodology definition and explanation. 249 pp.

Inland Fisheries & Wildlife, Maine Departments of, Marine
Resources, and Atlantic Sea Run Salmon Commission. State of
Maine Statewide River Fisheries Management Plan. Augusta,
ME.: State Planning Office. June, 1982. Available from
DECD - OCD.

Report by DMR, IF&W, & ASRSC on quality of commercial and recreational fisheries in major river basins on state. Most useful are tables on lake and river accessibility to spawning fish, quality and types of fisheries by river basins, fish barriers, fish restoration and fishway plans, barrier dams, and fishway passage requirements. Maps on anadromous fisheries, atlantic salmon fisheries, major inland fisheries and hydropower sites, and fishways and barriers for inland fisheries. Information essentially current (1991). 156 pp.

Rosenfeld, Mary. A Basic Guide to the Kennebunk River and its Tributaries for Arundel, Kennebunk, and Kennebunkport.

Kennebunk, ME.: Friends of the Kennebunk River. 1989.

Available from DECD - OCD.

Study of river initiated by three major concerns: groundwater supplies important major source of drinking water, wetlands play an important role in flood and pollution controls, and scenic and wildlife habitats held in high regard. Examinations include growth and change characteristic of basin; hydrology, geography, scenic and wildlife diversity characteristics of the basin; commercial and recreational uses; DEP classification and testing results; groundwater and aquifers; wetland functions; floodplains; wildlife inventory; and inter-

local ordinance for basin and watershed protection. 116 pp.

Executive Department, Maine. <u>Maine Rivers Inventory</u>. Vol. I-III. Augusta, ME.: State Planning Office. 1987. Available from DECD - OCD.

Updated <u>Maine Rivers Study</u>, expanded to three volumes, to include core laws protecting rivers and associated resources.

Environmental Protection, Maine Department of. <u>State of Maine</u> 1988 Water Quality <u>Assessment</u>. Augusta, ME.: 1988.

See Assessment, in "GROUNDWATER RESOURCES", above.

Conservation, Maine Department of. <u>Land Use Districts and Standards</u>. Augusta, ME.: Land Use Regulation Commission. August 5, 1989. Available from LURC.

General Land use districts and performance standards for the unorganized territories and communities in Maine. Relevant districts and standards include: Special River Transition Protection Subdistrict (P-RT) - protection for waters and shorelands of Maine's outstanding river segments, while allowing for management and compatible development in areas between I unorganized townships and municipalities outside of LURC's jurisdiction. Uses allowed without a permit include: recreational uses, limited forestry and agricultural activities, skid trails/roads and winter haul roads (shortest practicable route), Level A road projects (reconstruction within existing rights-of-way). Uses requiring a permit are Level B roads (minor relocations and reconstructions of roads outside existing rightsof-ways), single family detached dwellings, shoreland alterations, land management roads, water crossings, and gravel pits for road use. Exceptions include Level C roads (construction of new roads, alterations and reconstructions other than allowed in Levels A & B), permanent docking facilities, and non-commercial boat ramps and ways serving the public.

Risser, Tamara. <u>A Study of the Cousins River</u>. Portland, ME.: Greater Portland Council of Governments. April, 1990.

Available from DECD - OCD.

Solid examination of the geologic and biological characteristics of the Cousins River, a tributary of the Royal River in Cumberland County. After watershed mapping, the extent of a sand and gravel aquifer was discovered to extend from Pownal south through Freeport. Further complicating the situation is the Royal River's lower water quality rating than the Cousins. Since the river interchange waters during the tidal flows, concern was expressed over exchange of pollution as well. The study finds that the Cousins River has a uniquely accessible

recreational value, as well as a variety of habitat areas. Discussion includes both present and future threats to water quality and suggested zoning implementation techniques to preserve the river. 46 pp.

Environmental Protection, Maine Department of. <u>State of Maine</u> 1990 Water Quality Assessment. Augusta, ME.: 1990.

See Assessment, in "GROUNDWATER RESOURCES", above.

#### Water Quality

Sheehan, Frederick H., Jr., et. al. <u>The Greater Portland Council of Governments Areawide Water Quality Management Plan.</u>

<u>Volume I - Existing Water Quality Management.</u> Portland, ME.: Greater Portland Council Of Governments. November, 1977. Available from DECD - OCD.

Intensive study of water quality issues as part of the Section 208 Water Quality Study, for twenty municipalities which participate as member communities of the GPCOG, in addition to Standish, Otisfield, Raymond, and Harrison. Significant waterbodies and rivers include Crooked River, Long, Lake, Sebago Lake; Nonesuch and Scarborough Rivers; Stroudwater River; the Little, Pleasant, and Piscataqua Rivers, which are tributary to the Presumpscot River; and the Royal River. Other significant salt and fresh waters are: the Fore River, Back Cove, Presumpscot River estuary, Royal and Cousins Rivers estuary, Harraseeket River, Little Sebago Lake, and two Highland Lakes. While generally containing dated material, this volume is useful for setting the parameters by which the following two volumes were set. Useful historical data includes Water Quality Sampling Sites and Results for bacteria and water quality for 1975 - 76, point source inventories, private dischargers, solid waste generation estimates for 1975 - 2000 and by municipality. this reference, along with those for the other major watersheds in the state, has been replaced by the Water Quality Assessment study published every three years by DEP. 112 pp.

. The Greater Portland Council of Governments Areawide
Water Quality Management Plan. Volume II - Water Quality
Problems & Potential Solutions. Portland, ME.: GPCOG.
November, 1977. Available from DECD - OCD.

While dated, this valuable (and hefty) reference will give useful information for the towns in the GPCOG region. Chapter 2.1 deals with land use and water quality. Two important sections of this chapter deal with a town-by-town assessment of existing growth and land use controls, and maps showing existing and alternative land use patterns. Chapter 2.2 gives a basin-bybasin account of effects of nonpoint source pollution on each basin; a discussion of future water quality for lakes, rivers, combined sewer overflows (CSOs), and coastal areas in the region; estimated loads and impacts for existing and future point sources; estimated present and future effects of solid waste disposal and sludge upon water quality; and estimated present and future effects of other activities (road salt, oil spills and storage, boat sewage discharges, and global warming). Important maps in this section are those detailing drainage basins, showing significant bacterial loads and raw sewage discharges. Chapter 2.3 presents potential solutions to the water quality problems

Choosing the right system requires a detailed understanding of the local problems and careful planning of the facilities to solve those specific problems. The manual presents information and techniques for recognizing and evaluating wastewater management problems frequently faced by small communities and for planning the range of facilities which will solve those problems, given due consideration to costs, communities characteristics, and growth management. In essence, it is a guide to performing the first stage (Step 1) under the EPA Municipal Construction Grants Program. Part 1 of the manual was prepared to give an overview of the planning process and the regulatory context under which it fits, and is likely to be useful for local officials, concerned citizens, and engineers active in wastewater planning. Part 2 is a technical reference, showing the details of the planning process with examples from case studies. 148 pp.

Cogger, Craig, et. al. <u>Design and Installation of Low-Pressure</u>
<u>Pipe Waste Treatment Systems</u>. North Carolina State
University: Dept. of Soil Science. May, 1982.

Low-pressure pipe distribution is ideal for systems which suffer from clogged soils, anaerobic conditions due to high groundwater, and systems which are situated in shallow soils. This manual delineates the site and soil requirements for LPP systems, the layout of the system, dosing and distribution design, equipment specifications, installation procedures, LPP design and installation on sloping ground, modified LPP systems using fill, and inspection and maintenance. Appendices include design specs for a sample LPP, pipe and fittings, construction inspection checklist, and maintenance checklist. 31 pp.

Ciotoli, Peter A. & Kenneth C. Wiswall. <u>Management of On-site</u>
<u>and Small Community Wastewater Systems</u>. Cincinnati, OH.:
U.S. Environmental Protection Agency. July, 1982.
Available from EPA - Boston.

A comprehensive guide for small communities and their engineers to develop a management program for alternative technologies for solving wastewater pollution problems. Part I includes general guidance, with an example of the development of a management program. Part II presents a methodology for analysis by reviewing institutional options; formulating an operations plan by regulating design, installation of on-site and small community systems; institutional options for operations and maintenance and residuals disposal. Of special interest to municipalities is the section on formulation of a financial and implementation plan. 223 pp.

Foreman, Brian. <u>Vacuum Sewerage</u>. Rochester, IN.: AIRVAC Division of Burton Mechanical Contractors, Inc. 1983.

Vacuum sewerage is a mechanized system of wastewater

transport. With a vacuum sewerage system, sewage flows by gravity from the home to the lot line where an automatic vacuum operated valve is located. When sufficient sewage is present, the valve opens and sucks the sewage into the network of PVC sewers. Where the natural terrain is applicable to a gravity system, the vacuum system is rarely cost effective. Technical document explaining use of system. 50 pp.

Otis, Richard J. P.E. <u>Site Evaluation for Onsite Treatment and Disposal Systems</u>. Madison, WI.: Rural Systems Engineering, Inc. 1983.

Systems designed to discharge partially treated wastewater to the soil for ultimate disposal are the most reliable and least costly. Manual delineates onsite system design strategies, wastewater treatment and disposal by soil (detailed discussion here), and site evaluation. Good general guide to subject, with bibliography. 38 pp.

. Onsite Wastewater Treatment - Septic Tanks. Madison, WI: Rural Systems Engineering, Inc. 1983.

Good, basic description of septic tanks, particularly concerning history, performance, design, construction (with installation, operation and maintenance). A useful industrial application follows the main text. 15 pp.

. Subsurface Soil Absorption System Design Work Session Stump Creek Subdivision. Madison, WI.: Rural Systems
Engineering, Inc. 1983.

Case study of project in which a developer wants to subdivide 130 acres of a parcel located on the fringe of a major metropolitan area but beyond the reach of existing sewers which are planned to be extended in 25 years. Present zoning is residential on 40,000 sq. ft. minimum lots. Subsurface soil absorption must be used for wastewater disposal. Discharges not permitted into Stump Creek which flows along the western boundary of the property. Developer must be able to subdivide parcel into at least 100 lots in order to realize reasonable profit. Good for group discussions, conferences of LPIs and CEOs. 20 pp.

. Onsite Wastewater Disposal: Distribution Networks for Subsurface Soil Absorption Systems. Madison, WI.: Rural Systems Engineering, Inc. 1983.

Design manual for gravity flow, dosing, and uniform application distribution networks, including description and performance. Design criteria includes types of distribution networks using large diameter perforated pipe networks - single line, closed loop, distribution box, drop box, and relief line - with description, design criteria, and limitations for each. For

networks using small diameter pipe, design criteria and implementation thoroughly explained. Good technical document. 46 pp.

. Onsite Wastewater Disposal: Evapotranspiration and Evapotranspiration/Absorption Systems. Madison, WI.: Rural Systems Engineering, Inc. 1983.

"Evapotranspiration is an appealing method for onsite disposal of wastewater because it may be used where site conditions for subsurface infiltration-percolation systems are unsuitable due to the absorption capacity or treatment capability." Evapotranspiration (ET) design utilized where protection of groundwater is essential, relying solely on evaporation and transpiration for disposal so that no discharge to surface or groundwaters is necessary. Evapotranspiration/Absorption (ETA) is identical to the ET design except that the impermeable liner is omitted so that the absorptive capacity of the soil can be utilized. Used where the natural soil doesn't have a sufficiently high permeability to absorb all of the wastewater to be disposed of. 16 pp.

. <u>Subsurface Soil Absorption of Wastewater - Trenches and Beds</u>. Madison, WI.: Rural Systems Engineering, Inc. 1983.

Given suitable soils, subsurface soil absorption is the best method of wastewater disposal for small flows. This manual describes trenches and beds, their application, design, soil requirements, design criteria, and examples of applications make this a valuable resource. 25 pp.

\_\_\_\_\_. <u>Subsurface Soil Absorption of Wastewater - Artificially</u>
<u>Drained Systems</u>. <u>Madison</u>, WI.: Rural Systems Engineering,
Inc. 1983.

"Soils with high water tables or saturated conditions that limit the use of conventional subsurface disposal methods sometimes can be drained to permit the use of trench or bed systems. Curtain drains, vertical drains or underdrains may be used depending upon the nature of the drainage problem. Of the three, only curtain drains are used to any great extent." [Can be used in conjunction with above manual.] 17 pp.

Lombardo & Associates, Inc. <u>Novel Alternatives: Small</u>
<u>Alternative Wastewater Systems Workshops</u>. Boston, MA.:
Lombardo & Associates, Inc. 1983.

Small descriptive booklet on the treatment of small wastewater flows utilizing aquaculture based systems, through discussion of aquaculture systems (combined aquatic plants, meadow/marsh/pond and marsh/pond systems, mixed aquaculture, peat beds, fish aquaculture, vascular aquatic plants, and existing

natural wetlands); design consideration summary; and, composting toilets. Good introductory material, with bibliography. 16 pp.

Simmons, John D. & Jerry O. Newman. <u>Design Workbook for Small-Diameter, Variable-Grade, Gravity Sewers</u>. Clemson, SC.: U.S. Dept. of Agriculture. 1983.

In many rural areas, where soils do not meet local requirements for disposal systems, inexpensive collection and transport systems are needed to move liquefied sewage to central treatment facilities. A system similar to the Mt. Andrew installation in one economic solution. This system demonstrates that the VGS system, with about 1 day's storage on site, has worked satisfactorily with small-diameter plastic pipe sewers. A well-designed septic tank can be used in place of interceptor tanks, but a wet well (sump pump) would still be needed for those tanks requiring effluent pumps. Chapter headings: defining the VGS concept, the Alabama system, the operational characteristics of the Mt. Andrew system, estimating wastewater flows from rural communities, recommended design considerations for VGS system, several design examples, two discussion exercises, calculations to lower the hydraulic gradient, and a computer program (written in Fortran) which can calculate the "design matrix" in designing a variable grade sewer. 45 pp.

Environmental Protection Agency, U.S. <u>Financial Capability</u>
<u>Summary Foldout - A Simplified Approach</u>. Washington, D.C.:
Office of Water. June, 1984. Available from EPA - Boston.

The information requested on this foldout provides the basic data needed to demonstrate financial capability in accordance with the Financial and Management Capability Policy. The process of developing answers to the questions posed in this pamphlet will help communities assess which alternative is best for their own needs. Additional information is available from the EPA's Financial Capability Guidebook. 7 pp.

Anderson, Damann L., et. al. <u>Technology Assessment of</u>
<u>Intermittent Sand Filters</u>. Cincinnati, OH.: U.S. EPA
Office of Municipal Pollution Control. April, 1985.

Intermittent sand filters are beds of medium to coarse sands, underlain with gravel container underdrains. Primary or secondary effluent is intermittently applied to the surface and purification of the effluent occurs as it infiltrates and percolates through the sand bed. Intermittent sand filters compare favorably in economics and performance with extended aeration package plants and lagoon systems. Treatment needs for communities with flows less than 0.106 MGD for which sand filtration is ideally suited, represent 63% of the total national needs to the year 2000. Despite their long historical use, their

performance capabilities have not been fully optimized. 31 pp.

Environmental Protection Agency, U.S. Reducing the Cost of Operating Municipal Wastewater Facilities. Washington, D.C.: Office of Municipal Pollution Control. December, 1985.

Small, four page pamphlet on cost reductions through identifying high cost areas, itemizing high cost components, reviewing cost reduction opportunities, developing and evaluating cost reduction programs, and developing a plan. 4 pp.

Walters, Daniel H. <u>Case Studies of Innovative and Alternative</u>

<u>Technologies for Sewage Collection and Treatment - Case</u>

<u>Study #1 - Iselin, PA. Marsh-Pond-Meadow Treatment</u>

<u>Facility</u>. Morgantown, W.VA: EPA National Small Flows
Clearinghouse. January 17, 1986.

In response to severe sewage disposal problems confronting up to 3,000 Pennsylvania communities, a Rural Wastewater Research and Demonstration Program was established to develop inexpensive methods of sewage treatment and to demonstrate their applicability in small rural communities. Iselin was chosen as typical: population 300, sewage disposal problems due to volume generated, small lot sizes, poor soils, and the inability to generate revenue for conventional types of wastewater treatment. Two alternatives were examined: a community subsurface disposal system and a marsh-pond-meadow treatment system (the former is discussed in Case Study #8). Performance is listed as very good, the only problem noted is the occurrence of NHz-N spikes during the month of February. The marsh-pond-meadow system cost \$174,085 (\$2,763/connection) with additional design and land acquisition costs. Savings of 44 cents on the dollar achieved in relation to conventional treatment. User fee of \$10/month used to cover maintenance and operation. needs to the year 2000. 31 pp.

. Case Studies of Innovative and Alternative Technologies
for Sewage Collection and Treatment - Case Study #2 - Cedar
Rocks. Vacuum Collection System. Morgantown, W.VA: EPA
National Small Flows Clearinghouse. January 29, 1986.

Vacuum collection involves the transport of an air/wastewater mixture from a residence through a special vacuum valve to a central collection station using pressure differentials as the driving force. The conditions which can generally make the vacuum collection more economically attractive are poor soil conditions; high groundwater table; undulating topography, requiring deep excavation of a lift station; and areas of low building density. Advantages are reduction in pipe sizes, elimination of manholes, ease of field changes to allow rerouting around obstacles, installation of pipes at shallower

depths, and sealed pipes which exclude infiltration. 9 pp.

. <u>Case Studies of Innovative and Alternative Technologies</u>
<u>for Sewage Collection and Treatment - Case Study #7 - Cannon Beach, Oregon. Wetlands/Marsh</u>. Morgantown, W.VA: EPA
National Small Flows Clearinghouse. March 6, 1986.

During the 1970s, the existing wastewater treatment facilities were not capable of meeting the current summer discharge requirements. Year-round residency was 1200, summer residency an additional 4,000. Population projections indicated resident population would rise to 2560, and summer residential numbers to 7040 by the year 2000. Original scheme of artificial marsh and aquaculture treatment turned down by reviewing agencies. Natural wetland/marsh treatment scheme approved, and fully operational by 1984. Costs found to be 26% lower than artificial marsh system. User's fee of \$14.24/month projected in 1983. Performance rated good. 14 pp.

Environmental Protection Agency, U.S. <u>Guide to Nonpoint Source</u> <u>Control</u>. Washington, D.C.: Office of Water. July 1987.

"This document is designed as a user's guide to the techniques [then] available for controlling nonpoint source pollution. Booklet includes a general evaluation of nonpoint source modeling and other techniques, followed by a chapter assessing models now in use, with a third chapter summarizing best management practices. Sources of information listed at end of text. End notes are used in the third chapter to substantiate studies referred to in the BMP discussion." Useful first step material. 121 pp.

Design Manual: Municipal Wastewater Disinfection. Cincinnati, OH.: Office of Research and Development. October, 1986.

Once the need for wastewater disinfection, along with its criteria is discussed, the manual discusses the disinfection alternative and options considered feasible for municipal wastewater disinfection. A qualitative screening procedure is presented in Chapter 3 for evaluating and selecting an appropriate disinfection technology. Kinetics and Hydraulic considerations are presented in Chapter 4, followed by halogen (dehalogenation) disinfection design, ozone disinfection, and ultraviolet disinfection discussions in the subsequent chapters. 247 pp.

Gidley, James S. & Stephen P. Dix. <u>Case Studies of Innovative</u>

<u>and Alternative Technologies for Sewage Collection and</u>

<u>Treatment - Case Study #3 - Maysville Area, Muskingum</u>

<u>County, OH. Variable Grade Effluent Sewers</u>. Morgantown,

W.VA: EPA National Small Flows Clearinghouse. September,

1987.

A large portion of the Mayswille area has been under a construction ban through most of the 1970s - early 1980s because the soils were unsuitable for leaching fields. The cost of constructing a conventional gravity system was found to be prohibitively expensive because of the low density. A variable grade effluent system was designed having an as-bid cost of about 35% less than a conventional gravity sewer system. The end cost burden per home is expected to be only about \$1,000. 13 pp.

Shanaghan, Peter E. <u>It's Your Choice - A Guidebook for Local</u>
Officials on Small Community Wastewater Management Options.
Washington, D.C.: U.S. Environmental Protection Office,
Office of Municipal Pollution Control. September, 1987.
Available from EPA - Boston.

Pamphlet discusses problems and opportunities regarding wastewater management for small municipalities. Booklet describes the process for local definition of the problems concerning water quality, discusses what to look for in selecting a consulting engineer (as well as help from other sources), considering local options (matching systems to lot sizes, conventional, alternative, and cluster sewer systems), determining the problem areas and evaluating the most cost effective solutions using available technologies, and investigating the problems and solutions for funding of the project. Well laid out illustrations of various onsite, collection, and treatment systems, with accompanying text. 73 pp.

Environmental Protection Agency, U.S. <u>Design Manual - Phosphorus</u>
<a href="Removal">Removal</a>. Cincinnati, OH.: Office of Research &
<a href="Development">Development</a>. September, 1987.

"This manual discusses several proven phosphorus-removal methods, including phosphorus removal obtainable through biological activity as well as chemical precipitation techniques." Chapter 2 presents a recommended approach to selecting a phosphorus removal strategy, by identifying the required effluent phosphorus limits and screening potential phosphorus-removal techniques. The screening process is a step-by-step procedure. After applying the methodology, the user can go to a specific chapter dealing with the potential process: Chapter 3 - biological phosphorus removal; Chapter 4 - phosphorus removal by mineral addition; Chapter 5 - discussion of all aspects of sludge handling associated with sludge generated from phosphorus-removal facilities. 116 pp.

Design Manual: Dewatering Municipal Wastewater Sludge.
 Cincinnati, OH.: Office of Research and Development.
 September, 1987.

This manual present information on dewatering processes for municipal sludge. The manual revises and updates previous information, as well as the upgrading of existing dewatering processes. Proper sludge management requires the use of several sludge treatment and disposal processes. Design parameter, performance capabilities, and design deficiencies for all dewatering processes are presented. The major types of dewatering processes discussed in this manual include: air drying processes, sand beds, freeze assisted sand bed, vacuum assisted beds, wedgewire beds, lagoons, paved beds; belt press filtration; centrifugation, high-g machines, low-g machines; vacuum filtration; pressure filtration, fixed volume, and variable volume. The manual walks the user through preliminary considerations, sludge characteristics and preparatory treatment, process selection, conditioning, air drying processes, mechanical dewatering process, case studies in air drying and mechanical dewatering systems, design examples/cost analyses, O & M, and manufacturers and sources of equipment. 193 pp.

. Report on the Use of Wetlands for Municipal Wastewater

Treatment and Disposal. Washington, D.C.: Office of
Municipal Pollution Control, Office of Water. October,
1987.

Report presented to Chairman of the Senate Committee on Environment and Public Works reviewing "current knowledge of the use of both natural and constructed wetlands for municipal wastewater treatment and disposal, including the extent and circumstances of this practice, and summarizes the regulatory issues involved in response to a request by the Chairman. Additional information and guidance concerning projects in which wetlands play a role in the treatment and disposal of municipal wastewater effluent more recently issued by the Office of Water to supplement the report is provided as an attachment to the original report." 40 pp.

D.C.: Office of Water. March, 1988. Available from EPA Boston.

This document applies to wastewater treatment facilities and their collection and outfall systems that are to be constructed, renovated, expanded in capacity, or improved in quality of treatment. The purpose of this document is to encourage the application of value engineering (VE) techniques during the design of these facilities. VE, applied during design, is effective in controlling the cost of construction of these facilities, and in minimizing the life cycle cost (LCC) of

operation, maintenance, and replacement (OM&R). 28 pp.

. <u>Design Manual - Constructed Wetlands and Aquatic Plant</u>
Systems for <u>Municipal Wastewater Treatment</u>. Cincinnati,
OH.: Center for Environmental Research Information.
September, 1988. Available from EPA - Boston.

Important manual detailing an exciting new area of wastewater treatment - natural wetlands, constructed wetlands, and aquatic plant systems. With the rising costs of "concrete and steel" facilities, the use of either constructed or natural wetlands becomes an attractive alternative. Where natural wetlands are located conveniently to municipalities, the major cost for a discharge system is for pumping treatment plant effluent to the site. For natural wetlands, plant types are suggested to maintain workability; for constructed wetlands, free water surface and subsurface flow systems are discussed. For aquatic plant systems, floating plant and submerged plant systems are discussed. Design of constructed wetlands and aquatic plant systems are discussed in detail. 83 pp.

Martin, Russell, Thomas Poy, & Charles Pycha. <u>Variable Grade</u>
<u>Sewers - Special Evaluation Project</u>. Chicago, IL.:
Municipal Facilities Branch, Technical Support Branch.
September, 1988.

Brief pamphlet describing the variable grade sewer (VGS), one of which was discussed in the EPA <u>Case Study</u> (see Gibley, et. al. above). Evaluation of design, construction, operation of five systems in Ohio. Findings: few systems utilized negative grade, thus not adequately demonstrating a significant advancement; surge tanks are costly; reduction in pipe sizes must be carefully determined; odor controls must be considered in the design; site restoration problems should be minimized, along with quality testing and marking of components for future work. Three of the five VGS projects only has minimal amounts of negative grade, and the surging that results from the negative grades in a VGS system has not had an appreciable test. Complete with bid prices. 17 pp.

. <u>Casco Bay Dye/Sampling Study</u>. Boston, MA.: EPA Water Management Division. August, 1989. Available from DECD -OCD.

Results of dye and sampling studies performed in August, 1989. The goal of the dye studies was to determine initial dilution and effluent plume transport from Portland, South Portland, Falmouth, and Yarmouth wastewater treatment plants. The sampling studies were focused on acute toxicity testing at the Portland, South Portland, and Falmouth POTW discharges. Also limited salinity, conductivity, temperature and dissolved oxygen

data from the Royal and Fore Rivers. 50 pp., with maps.

Environment One Corp. <u>Design Handbook - Low Pressure Sewer</u>
<u>Systems using Environment One Grinder Pumps</u>. Schenectady,
N.Y.: Environment One Corp. October, 1989.

Design manual for Environment One Grinder Pumps for use in low pressure sewer systems. Material includes description and operation of a LP sewer system, the LP sewer system design, installation instructions and wiring diagrams. 43 pp.

DeWick, Stephen C. <u>Mere Point & Sabino Wastewater Study</u>. Bath, ME.: Kimball Chase Company, Inc. December, 1989.

Available from DECD - OCD.

Examination of various septic system alternatives for the Mere Point (Brunswick) and Sabino (W. Bath) areas. Report included survey of areas by soil type, adjacent marine resources, current septic or sanitary systems. Discussion of five alternative systems, with cost analyses for each system in each of the two areas. Recommendations called for combination individual and cluster subsurface septic systems. Design capacities, project costs and operating costs discussed for each alternative. While yearly charges to users in Mere Point system would be reasonable (\$325/yr), costs in Sabino were much higher (\$693/yr), due to increased number of individual systems. Good use of septic system diagrams, with complete cost estimates for each alternative possible in Mere Point and Sabino. Appendices include Overboard Discharge Law, water quality results, survey questionnaires, area survey results, and test pit logs. 78 pp.

Converse, James C. & E. Jerry Taylor. <u>Wisconsin Mound Soil</u>
<u>Absorption System - Siting, Design and Construction Manual</u>.

Madison, WI.: College of Agricultural and Life Sciences,
Small Scale Waste Management Project. January, 1990.

The Wisconsin mound wastewater soil absorption system was developed in the early 1970s to be used on sites with specific site characteristics where in-ground gravity flow trench or bed soil absorption system were restricted. Designed primarily for 1) slowly permeable soils, 2) shallow permeable soils over crevice bedrock, and 3) permeable soils with high water tables. 37 pp.

Environmental Protection Agency, U.S. <u>Urban Targeting and BMP Selection</u>. Chicago, IL.: Water Division - Region V. November, 1990.

"Following the recommendation in the State 305(b) reports, NPS Assessment Reports, and NPDES permitting requirements that urban runoff can be a significant contributor to degraded water quality in the receiving waters." The manual addresses the

nature and characteristics of urban runoff, and the types of water quality problems most likely to occur; the types of BMPs most appropriate for control of NPS pollutant loads; and, a procedure for prioritizing urban areas for the application of controls beyond the baseline measures initially applied. Important baseline manual for planners and those concerned with program management and development. 54 pp.

. Small Wastewater Systems - Alternative Systems for Small Communities and Rural Areas. Washington, D.C.: E.P.A., Office of Water. c. 1990. Available from EPA - Boston.

Helpful chart listing all available alternative systems with illustration showing possible locations.

Wright-Pierce, Inc. <u>A Review of Wastewater treatment and Septage</u>

<u>Management Alternatives for Peaks Island - City of Portland,</u>

<u>Maine</u>. Topsham, ME.: Wright-Pierce, Inc. April, 1991.

A draft report of a study of alternatives to the Welch St. treatment option based on a review of cost and non-monetary Findings include: (1) the wastewater treatment alternatives include a facility on an inland site and pumping to Portland; (2) each of the alternatives have sub-options; (3) while the alternatives are viable, all cost more than the Welch St. treatment option; (4) the alternatives will likely take substantially longer (2-3 yrs.) to implement than the Welch St. option; (5) one of the key objections to the Welch St. option are aesthetic concerns; (6) the design of the Welch St. facility incorporated extraordinary measures to mitigate potential odor and visual impacts; (7) based on cost and implementation issues alone, the Welch St. option is preferred, while based on aesthetic and expansion issues, the inland treatment alternative is preferred; (8) are the aesthetic and expansion capacity benefits of the inland site worth the additional \$225-250,000 in annual cost to the City, along with 2-3 year delay?; and finally, (9) the most cost-effective option for Peaks Island is continued private pump out and transport to the mainland. 66 pp.