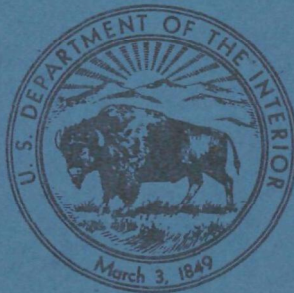


# LAKE HURON

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| CTION, *LAKE SHORES, LAKE MICH/   | *MICHIGAN, *GREAT LAKES, *JURISDI | W69-07636 |
| ON, *RIPARI/ JUDICIAL DECISIONS,  | *MICHIGAN, *GREAT LAKES, LAKE HUR | W69-02019 |
| TS, DAMAGES, WATER POLLUTION, L/  | *MICHIGAN, *DOCKS, *RIPARIAN RIGH | W68-01329 |
| N, MATHEMATICAL M/ *GREAT LAKES,  | *MODEL STUDIES, *WATER CIRCULATIO | W70-04099 |
| IN, ALDRIN/ *PESTICIDE RESIDUES,  | *MONITORING, *LIPIDS, DDT, DIELDR | W72-04740 |
| VEST, INSPECTION, LEGAL ASPECTS,  | *MONITORING, ON-SITE INVESTIGATIO | W70-10321 |
| LANKTON RECORDER, RADIOCARBON U/  | *NET PLANKTON, HARDY CONTINUOUS P | W70-03311 |
| HARBOR(CANADA), *TUBIFEX, GLYCI/  | *NUTRITIONAL RESOURCES, *TORONTO  | W70-02972 |
| ERS, CO/ *LIMNOLOGY, *EQUIPMENT,  | *OFFSHORE PLATFORMS, *LAKES, *TOW | W72-02886 |
| , *GREAT LAKES, *LAKE ERIE, EUTR/ | *OHIO, *PROGRAMS, ACID MINE WATER | W69-05160 |
| ACIDS, BACTERIA/ *LAKE ONTARIO,   | *OLIGOCHAETES, *TUBIFICIDS, AMINO | W70-02972 |
| ANIC CARBON, DUNLOP LAKE(CANADA/  | *ONTARIO(CANADA), *URANIUM, INORG | W71-00114 |
| ADY FLOW, ROUGHNESS COEFFICIENT,  | *OPEN CHANNEL FLOW, *STREAMFLOW,  | W69-01137 |
| *LAKE HURON, GEORGIAN BAY,        | *ORCONECTES.:                     | W71-05208 |
| S, *GREAT LAKES, WATER POLLUTIO/  | *ORGANIC MATTER, *BOTTOM SEDIMENT | W71-10327 |
| E HURON, *RIPARIAN RIGHTS, BEDS,  | *OWNERSHIP OF BEDS, WHARFS, ADMIN | W69-02019 |
| RATURE, BENTHIC FAUNA, MAYFLIES,  | *OXYGEN SAG, THERMAL STRATIFICATI | W68-00683 |
| OBENTHOS.:                        | *PARTICULATE ORGANIC MATTER, MACR | W69-01620 |
| ORINATED HYDROCARBON PESTICIDES,  | *PESTICIDE RESIDUES, LAKE MICHIGA | W70-07138 |
| *LIPIDS, DDT, DIELDRIN, ALDRIN/   | *PESTICIDE RESIDUES, *MONITORING, | W72-04740 |
| ASTES, PILOT PLANTS, BIOCHEMICA/  | *PHOSPHATES, *LIME, *INDUSTRIAL W | W70-01989 |
| RODUCTIVITY, / *ACID MINE WATER,  | *PHYTOPLANKTON, *LAKES, PRIMARY P | W71-00114 |
| OR, *LAKE MICHIGAN, *LAKE HURON,  | *PLANKTON, ECOLOGY, ZOOPLANKTON,  | W71-08665 |
| *MARINE ANIMALS, *CRUSTACEANS,    | *PLANKTON, *LAKES, BIOLOGICAL COM | W71-12083 |
| AT/ *WATER RESOURCES, *MICHIGAN,  | *PLANNING, *WATERSHEDS(BASINS), W | W71-10744 |
| URCES, *WATER POLLUTION CONTROL,  | *POLLUTION ABATEMENT, *GREAT LAKE | W72-00247 |
| TERS, PRODUCTIVITY, PHYTOPLANKT/  | *PRIMARY PRODUCTIVITY, SURFACE WA | W70-02983 |
| , *EUTROPHICATION, *ZOOPLANKTON,  | *PRIMARY PRODUCTIVITY, LAKE HURON | W70-03311 |
| UDIES, *BATHYMETRY, *LAKE HURON/  | *PROFILES, *SOUNDING, *SEISMIC ST | W71-05564 |



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| LAKES, *LAKE ERIE, EUTR/ *OHIO,  | *PROGRAMS, ACID MINE WATER, GREAT | W69-05160 |
| FFE/ HEAVY METALS, *GREAT LAKES, | *PUBLIC HEALTH, WATER POLLUTION E | W70-10321 |
| NG CLOSURES, CHLOR-ALKALI PLANT/ | *RECOMMENDATIONS, *MERCURY, FISHI | W70-10321 |
| HIGAN, *GREAT LAKES, LAKE HURON, | *RIPARIAN RIGHTS, BEDS, *OWNERSHI | W69-02019 |
| POLLUTION, L/ *MICHIGAN, *DOCKS, | *RIPARIAN RIGHTS, DAMAGES, WATER  | W68-01329 |
| , *GREAT LAKES, LAKE ERIE, LAKE/ | *RIVER FLOW, *CHANNEL IMPROVEMENT | W69-02693 |
| , *LITTORAL DRIFT, LAKE HURON, / | *SEDIMENT TRANSPORT, *GREAT LAKES | W72-03581 |
| AT LAKES, LAKE MICHIGAN, LAKE S/ | *SEDIMENTS, *EUTROPHICATION, *GRE | W70-07269 |
| LPINS, CRAYFISH, TROUT, PERCHES, | *SEICHES, FISHKILL, MORTALITY, TU | W71-05208 |
| AKE HURON/ *PROFILES, *SOUNDING, | *SEISMIC STUDIES, *BATHYMETRY, *L | W71-05564 |
| OL, *GREAT LAKES, *LITTORAL DRI/ | *SHORE PROTECTION, *EROSION CONTR | W71-03908 |
|                                  | *SHORELAND MANAGEMENT.:           | W71-03908 |
| ATER TEMPERATURE, *GROWTH RATES, | *SMALLMOUTH BASS, *FISH PHYSIOLOG | W69-09057 |
| , *GREAT LAKES, *LITTORAL DRIFT, | *SOIL EROSION, *FLOOD DAMAGE, BAN | W71-03908 |
| HYMETRY, *LAKE HURON/ *PROFILES, | *SOUNDING, *SEISMIC STUDIES, *BAT | W71-05564 |
| :                                | *SPECIES DIVERSITY, MICROFOSSILS. | W69-05762 |
| *CALCIUM, *FOOD CHAINS, *LAKES,  | *SPECTROMETERS, *FISH, PERCHES, B | W69-07850 |
| / *BENTHIC FAUNA, *GREAT LAKES,  | *ST LAWRENCE RIVER, OLIGOCHAETES, | W70-03315 |
| IT RIVER, WABI/ *LAKE ST. CLAIR, | *ST. CLAIR RIVER, *MERCURY, DETRO | W71-11682 |
| KE(ONT), CANADA, DOROSOMA CEPED/ | *STABLE STRONTIUM, BONE, PERCH LA | W69-07850 |
| L, *WATER UTILIZATIO/ *MICHIGAN, | *STANDARDS, *WATER QUALITY CONTRO | W72-00199 |
| RENT JURISDICTION, *ENFORCEMENT, | *STATE BOUNDARIES, OFFENSES(CRIMI | W69-07636 |
| ATER, EQUATIONS, *UNSTEADY FLOW, | *STEADY FLOW, ROUGHNESS COEFFICIE | W69-01137 |
| COEFFICIENT, *OPEN CHANNEL FLOW, | *STREAMFLOW, *DISCHARGE MEASUREME | W69-01137 |
| M, *FOOD CHAINS, *LAKES, *SPECT/ | *STRONTIUM RADIOISOTOPES, *CALCIU | W69-07850 |
| *LAKE MICHIG/ *DATA COLLECTIONS, | *SURFACE WATERS, *LAKE SUPERIOR,  | W72-03910 |
| LAKES, BEHAVIOR, SCULPINS, CRA/  | *THERMAL POLLUTION, *FISH, *GREAT | W71-05208 |
| RS, *DYE RELEASES, TRACKING TEC/ | *THERMOCLINE, *LAKE HURON, *TRACE | W72-02885 |
| , GLYCI/ *NUTRITIONAL RESOURCES, | *TORONTO HARBOR(CANADA), *TUBIFEX | W70-02972 |
| NT, *OFFSHORE PLATFORMS, *LAKES, | *TOWERS, CONSTRUCTION, INSTRUMENT | W72-02886 |
| / *WATER QUALITY, *GREAT LAKES,  | *TRACE ELEMENTS, *WATER POLLUTION | W69-08562 |
| TEC/ *THERMOCLINE, *LAKE HURON,  | *TRACERS, *DYE RELEASES, TRACKING | W72-02885 |
| AKE MICHIGAN, *LAKE HURON, *PLA/ | *TROPIC LEVEL, *LAKE SUPERIOR, *L | W71-08665 |
| OURCES, *TORONTO HARBOR(CANADA), | *TUBIFEX, GLYCINE, NUTRIENT UPTAK | W70-02972 |
| A/ *LAKE ONTARIO, *OLIGOCHAETES, | *TUBIFICIDS, AMINO ACIDS, BACTERI | W70-02972 |
| RON, *WATER POLLUTION, *CURRENT/ | *TURBULENCE, *DIFFUSION, *LAKE HU | W72-00578 |
| CIRCULATION, *DENSITY CURRENTS,  | *TURBULENCE, LIMNOLOGY, DIFFUSION | W72-02883 |
| UTING, SHALLOW WATER, EQUATIONS, | *UNSTEADY FLOW, *STEADY FLOW, ROU | W69-01137 |
| P LAKE(CANADA/ *ONTARIO(CANADA), | *URANIUM, INORGANIC CARBON, DUNLO | W71-00114 |
| EVEL FLUCTUATIONS, *GREAT LAKES, | *VARIABILITY, *FREQUENCY ANALYSIS | W72-03123 |
| *LAKES, SILICA, CALCIUM, SODIU/  | *WATER CHEMISTRY, *CLAY MINERALS, | W71-05888 |
| N SOURCES, *GRE/ *WATER QUALITY, | *WATER CHEMISTRY, *WATER POLLUTIO | W71-05883 |
| *CURRENTS(WATER), *LAKE HURON,   | *WATER CIRCULATION, *DENSITY CURR | W72-02883 |
| TS(WATER), LAKE E/ *GREAT LAKES, | *WATER CIRCULATION, WINDS, CURREN | W72-03124 |
| R, NUCLEAR POWERPL/ *LAKE HURON, | *WATER CIRCULATION, *COOLING WATE | W70-09606 |
| M/ *GREAT LAKES, *MODEL STUDIES, | *WATER CIRCULATION, MATHEMATICAL  | W70-04099 |
| LAKES, *VARIABILITY, *FREQUENC/  | *WATER LEVEL FLUCTUATIONS, *GREAT | W72-03123 |
| POLLUTION CONTROL, *POLLUTION A/ | *WATER POLLUTION SOURCES, *WATER  | W72-00247 |
| ION A/ *WATER POLLUTION SOURCES, | *WATER POLLUTION CONTROL, *POLLUT | W72-00247 |
| ULENCE, *DIFFUSION, *LAKE HURON, | *WATER POLLUTION, *CURRENTS(WATER | W72-00578 |
| WATER QUALITY, *WATER CHEMISTRY, | *WATER POLLUTION SOURCES, *GREAT  | W71-05883 |
| POLLUT/ *MICHIGAN, *GREAT LAKES, | *WATER POLLUTION CONTROL, *WATER  | W71-06053 |
| LAKES, *WATER POLLUTION CONTROL, | *WATER POLLUTION SOURCES, WATER Q | W71-06053 |
| URON, *HALOGENS, *GREAT LAKES, / | *WATER POLLUTION SOURCES, *LAKE H | W71-05882 |
| , *GREAT LAKES, *TRACE ELEMENTS, | *WATER POLLUTION EFFECTS, CHLORID | W69-08562 |
| ACE ELEMENTS, *WATER POLLUTION / | *WATER QUALITY, *GREAT LAKES, *TR | W69-08562 |
|                                  | *WATER QUALITY MONITORING.:       | W71-05883 |
| *WATER POLLUTION SOURCES, *GRE/  | *WATER QUALITY, *WATER CHEMISTRY, | W71-05883 |
| ILIZATIO/ *MICHIGAN, *STANDARDS, | *WATER QUALITY CONTROL, *WATER UT | W72-00199 |
| NNING, *WATERSHEDS(BASINS), WAT/ | *WATER RESOURCES, *MICHIGAN, *PLA | W71-10744 |

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| EUTROPHICATION, L/               | *GREAT LAKES, | *WATER RESOURCES, WATER QUALITY,  | W70-06658 |
| , *SMALLMOUTH BASS,              | *FISH PHYSI/  | *WATER TEMPERATURE, *GROWTH RATES | W69-09057 |
| ANDARDS, *WATER QUALITY CONTROL, |               | *WATER UTILIZATION, ENVIRONMENTAL | W72-00199 |
| RESOURCES, *MICHIGAN, *PLANNING, |               | *WATERSHEDS(BASINS), WATER QUALIT | W71-10744 |
| GREAT LAKES, WINDS; VELOCITY, A/ |               | *WAVES, LAKE MORPHOMETRY, LAKES,  | W70-06459 |
| URON, LAKE ERIE, DETROIT EDISON/ |               | *WHITECAPS, LAKE SUPERIOR, LAKE H | W70-06459 |
| *LAKE SUPERIOR, *EUTROPHICATION, |               | *ZOOPLANKTON, *PRIMARY PRODUCTIVI | W70-03311 |

EUTROPHICATION OF THE ST. LAWRENCE GREAT LAKES,

US BUREAU OF COMMERCIAL FISHERIES, ANN ARBOR, MICH.

ALFRED M. BEETON.

LIMNOL OCEANOGR, VOL 10, PP 240-254, JUL 1968. 15 P.

DESCRIPTORS:

\*GREAT LAKES, \*FISH POPULATIONS, \*EUTROPHICATION, \*CHEMICAL PROPERTIES, NUTRIENTS, LAKES, DISSOLVED SOLIDS, OLIGOTROPHY, SUMMER, CLASSIFICATION, LAKE HURON, LAKE MICHIGAN, LAKE SUPERIOR, LAKE ONTARIO, LAKE ERIE, DISSOLVED OXYGEN, HYPOLIMNION, PLANKTON.

IDENTIFIERS:

\*ACCELERATED EUTROPHICATION, MAN'S EFFECTS, MESOTROPHY.

ABSTRACT:

LAKES HURON, MICHIGAN, AND SUPERIOR ARE CLASSIFIED AS OLIGOTROPHIC LAKES ON THE BASIS OF THEIR BIOLOGICAL, CHEMICAL, AND PHYSICAL CHARACTERISTICS. LAKE MICHIGAN TRENDS TOWARD MESOTROPHY AS SHOWN BY THE HIGH CONTENT OF DISSOLVED SOLIDS IN ITS WATERS. LAKE ONTARIO IS MESOTROPHIC IN THAT IT RETAINS THE BIOTA OF AN OLIGOTROPHIC LAKE BECAUSE OF ITS LARGE DEEP-WATER AREA BUT HAS THE NUTRIENT RICHNESS OF A EUTROIC LAKE. LAKE ERIE, THE MOST PRODUCTIVE OF THE LAKES AND THE SHALLOWEST, IS EUTROPHIC. SEVERAL CHANGES COMMONLY ASSOCIATED WITH EUTROPHICATION IN SMALL LAKES HAVE BEEN OBSERVED IN THE GREAT LAKES, CHANGES THAT APPARENTLY REFLECT ACCELERATED EUTROPHICATION IN THE GREAT LAKES BECAUSE OF MAN'S ACTIVITY. CHEMICAL DATA COMPILED FROM NUMEROUS SOURCES, DATING BACK TO 1854, INDICATE A PROGRESSIVE INCREASE IN THE CONCENTRATIONS OF MAJOR IONS AND TOTAL DISSOLVED SOLIDS, PARTICULARLY CHLORIDES AND SULFATES, IN ALL OF THE LAKES EXCEPT LAKE SUPERIOR. THE PLANKTON HAS CHANGED SOMEWHAT IN LAKE MICHIGAN, AND THE PLANKTON, BENTHOS, AND FISH POPULATIONS OF LAKE ERIE NOW DIFFER GREATLY FROM THOSE OF THE PAST. RECENTLY AN EXTENSIVE AREA OF HYPOLIMNETIC WATER OF LAKE ERIE HAS DEVELOPED LOW DISSOLVED-OXYGEN CONCENTRATIONS IN LATE SUMMER.

FIELD 05C

ACCESSION NO. W68-00247

GREAT LAKES LIMNOLOGICAL INVESTIGATIONS,

A. M. BEETON.

UNIV OF MICH, GREAT LAKES RES DIV PUB, VOL 4, PP 123-128, 1960. 6 P.

DESCRIPTORS:

\*EUTROPHICATION, GREAT LAKES, \*LAKE ERIE, LAKE HURON, LAKE MICHIGAN, LAKE SUPERIOR, \*FISH POPULATIONS, LAKES, DISSOLVED OXYGEN, WATER TEMPERATURE, BENTHIC FAUNA, MAYFLIES, \*OXYGEN SAG, THERMAL STRATIFICATION, TUBIFICIDS, MIDGES, CADDISFLIES, LAKE TROUT, LAMPREYS, CHEMICAL ANALYSIS, DISSOLVED SOLIDS, SEASONAL, BAYS, REVIEWS.

IDENTIFIERS:

UNITED STATES BUREAU OF COMMERCIAL FISHERIES.

ABSTRACT:

STUDIES OF LAKE ERIE FOR THE PAST 30 YR INDICATE THAT EUTROPHICATION IS ACCELERATING. THE LAKE HAS CHANGED FROM ONE THAT SUPPORTED A LARGE COLD WATER FISH POPULATION, DEMANDING A HIGH OXYGEN CONTENT, INTO ONE DOMINATED BY WARM WATER SPECIES ADAPTED TO HIGHER TEMPERATURES AND LOWER OXYGEN CONCENTRATIONS. MAJOR CHANGES HAVE ALSO TAKEN PLACE IN ITS BOTTOM FAUNA. PRIOR TO SUMMER 1953, THE MAYFLY LARVAE AVERAGED ABOUT 400/SQ M OF LAKE BOTTOM; A LONG CALM IN SUMMER 1953 PRODUCED A THERMAL STRATIFICATION THAT SEVERELY DEPLETED OXYGEN IN THE BOTTOM WATERS, FOLLOWING WHICH THERE WERE ONLY 44 LIVE MAYFLY LARVAE/SQ M. CADDISFLY LARVAE, ONCE ABUNDANT, AVERAGED LESS THAN 1/SQ M IN 1957. TUBIFICIDS INCREASED FROM 12/SQ M IN 1929 TO 551/SQ M IN 1957, AND MIDGE LARVAE FROM 56/SQ M IN 1929 TO 299/SQ M. LAKE ERIE IS THE MOST CHANGED OF THE GREAT LAKES. THE TROUT POPULATION OF LAKE MICHIGAN WAS RAPIDLY DEPLETED RECENTLY, BUT THE LOSS LARGELY RESULTED FROM LAMPREY PREDATION. LAKE SUPERIOR SHOWS SURPRISING UNIFORMITY OF CHEMICAL CONDITIONS BOTH AREALLY AND BATHYMETRICALLY. OXYGEN SATURATION OCCURS EVEN IN THE DEEPEST WATERS OF LAKES HURON, MICHIGAN, AND SUPERIOR, ALTHOUGH CONCENTRATIONS ARE REDUCED IN GREEN BAY AND SAGINAW BAY; CERTAIN AREAS OF LAKE ERIE ARE CHARACTERIZED BY LOW CONCENTRATIONS. (BYRNE-WISC)

FIELD 05C, 02H

ACCESSION NO. W68-00683

NAVIGABLE WATERS - RIGHTS OF RIPARIAN OWNER HELD NOT TO INCLUDE THE RIGHT TO  
CONSTRUCT A PERMANENT DEEP WATER DOCK INTO LAKE HURON,

JOHN E. S. SCOTT.

WAYNE STATE LAW REV, VOL 7, NO 3, PP 492-496, SPRING 1961. 5 P, 31 REF.

DESCRIPTORS:

\*MICHIGAN, \*DOCKS, \*RIPARIAN RIGHTS, DAMAGES, WATER POLLUTION, LAKE  
HURON, OWNERSHIP OF BEDS, SUBMERGED LANDS ACT, NAVIGATION, ADMIRALTY,  
DREDGING.

ABSTRACT:

THIS IS A MICHIGAN CASE CONCERNING DOCK CONSTRUCTION ON LAKE HURON.  
OBRECHT V NATIONAL GYPSUM CO, 361 MICH 399, 105 N W 2D 143 (1960).  
RIPARIAN OWNERS BROUGHT SUIT TO ENJOIN AN ADJOINING RIPARIAN FROM  
CONSTRUCTING A DOCK INTO LAKE HURON. THE COURT HELD AGAINST THE  
DEFENDANT, STATING THAT WHILE IT RECOGNIZES THE COMMON LAW RIGHT TO  
'WHARF OUT', THE PUBLIC RIGHT IN THE WATERS AND SUBMERGED LANDS OF THE  
GREAT LAKES, HELD IN TRUST BY THE STATE, IS SUPREME AGAINST THE  
DEFENDANT'S ASSERTED RIPARIAN RIGHTS. HOWEVER, THE DEFENDANT WAS NOT  
REQUIRED TO REMOVE THE DOCK BECAUSE OF 'GREAT PROPERTY LOSS,' AND WAS  
ONLY REQUIRED TO BEAR THE DAMAGES OF ADJOINING RIPARIANS. THE ARTICLE  
DISCUSSES THE GENERAL DOCTRINE, CONCERNING THE RIGHT TO WHARF OUT AND  
CONCLUDES THAT THE CASE IS CONSISTENT WITH MICHIGAN LAW. (CRABTREE-FLA)

FIELD 04C, 06E

ACCESSION NO. W68-01329

STEADY AND UNSTEADY EFFECTS ON DISCHARGE IN A RIVER CONNECTING TWO RESERVOIRS.

CORNELL UNIV, ITHACA, N Y.

JAMES A. LIGGETT, AND WALTER H. GRAF.

TECH REP 5, WATER RESOUR CENTER, AUG 1967. 10 P, 9 FIG, 4 REF. DWRR PROJECT A-009-NY.

DESCRIPTORS:

FLOOD ROUTING, SHALLOW WATER, EQUATIONS, \*UNSTEADY FLOW, \*STEADY FLOW, ROUGHNESS COEFFICIENT, \*OPEN CHANNEL FLOW, \*STREAMFLOW, \*DISCHARGE MEASUREMENT, LAKE HURON.

IDENTIFIERS:

FINITE DIFFERENCE METHOD, ST CLAIR RIVER(MICHIGAN).

ABSTRACT:

THE EFFECTS OF THE FRICTIONAL COEFFICIENT, LAKE LEVELS AND UNSTEADY FLOW ARE CONSIDERED FOR A RIVER WHICH JOINS 2 RESERVOIRS. THESE EFFECTS ARE STUDIED NUMERICALLY BY USING A SOMEWHAT IDEALIZED MODEL OF THE ST. CLAIR RIVER, WHICH CONNECTS LAKE HURON TO LAKE ST. CLAIR. THE ANALYSIS SHOWS THAT EACH OF THESE FACTORS HAS A LARGE EFFECT ON THE FLOW. AN UNSTEADY FLOW ANALYSIS OF THE RIVER IS PROBABLY NECESSARY IF THE LAKE LEVELS ARE SUBJECT TO ANY MAJOR FLUCTUATIONS. A METHOD IS PROPOSED BY WHICH THE FRICTIONAL CONSTANT CAN BE DETERMINED ACCURATELY. THE ADJUSTMENT PROCESS OF THE FRICTIONAL CONSTANT CAN BE EITHER INTERNAL OR EXTERNAL TO THE MACHINE COMPUTATION. IF THE CONSTANT IS ALLOWED TO VARY WITH BOTH DEPTH AND DISTANCE ALONG THE RIVER, QUITE A NUMBER OF RUNS WILL BE NECESSARY TO DETERMINE IT ACCURATELY. THE PRESENT STUDY INDICATES (BUT DOES NOT PROVE) THAT CONTINUOUS AND ACCURATE GEOMETRICAL DATA (CROSS SECTION, SLOPE, ETC.) ARE PROBABLY NOT NECESSARY FOR SUCH A PROGRAM.

FIELD 02E

ACCESSION NO. W69-01137



STRONTIUM ISOTOPE COMPOSITION AND TRACE ELEMENT CONCENTRATIONS IN LAKE HURON  
AND ITS PRINCIPAL TRIBUTARIES.

OHIO STATE UNIV, COLUMBUS.

GUNTER FAURE, LOIS M. JONES, AND RENE EASTIN.

REP 2, DEPT OF GEOL, AUG 1967. 109 P, 21 FIG, 20 TAB, 28 REF. OWRR PROJECT  
B-004-OHIO.

DESCRIPTORS:

GEOCHEMISTRY, BEDROCK, SEDIMENTARY PETROLOGY, GREAT LAKES, MINERALOGY,  
RADIOISOTOPES, STRONTIUM RADIOISOTOPES, LAKE HURON, TRACE ELEMENTS.

IDENTIFIERS:

BEDROCK COMPOSITION.

ABSTRACT:

CONCENTRATIONS OF THE MAJOR CATIONS: NA, K, CA, AND MG AND SR WERE DETERMINED FOR 64 SAMPLES OF SURFACE WATER FROM LAKE HURON AND FOR 17 OF ITS MAJOR TRIBUTARY RIVERS. ISOTOPIC COMPOSITIONS OF STRONTIUM WERE MEASURED FOR 30 SAMPLES OF LAKE WATER AND FOR 13 OF TRIBUTARY RIVERS. CONCENTRATIONS OF DISSOLVED IRON AND TOTAL PHOSPHORUS WERE DETERMINED FOR A SMALL SUITE OF LAKE AND RIVER WATER. THE DATA DOCUMENTS IMPORTANT DIFFERENCES IN THE CHEMICAL COMPOSITION OF WATER DISCHARGED INTO LAKE HURON BY LAKE SUPERIOR, LAKE MICHIGAN AND TRIBUTARY RIVERS. THESE DIFFERENCES ARE RELATED TO DIFFERENCES IN THE CHEMICAL AND MINERALOGICAL COMPOSITION OF THE BEDROCK UNDERLYING THE GREAT LAKES DRAINAGE BASIN. THE STRONTIUM CONTRIBUTED TO LAKE HURON BY WATER DRAINING THE CANADIAN SHIELD ALONG ITS NORTHERN SHORE IS ENRICHED IN RADIOGENIC STRONTIUM 87. THE AVERAGE STRONTIUM 87/STRONTIUM 86 RATIO IS 0.718. THE RIVERS DRAINING SEDIMENTARY ROCKS OF MICHIGAN AND SW ONTARIO CONTRIBUTE STRONTIUM WHOSE ISOTOPE COMPOSITION IS SIMILAR TO THAT IN THE MODERN OCEANS. A GEOCHEMICAL MODEL IS PRESENTED REPRESENTING THE CHEMICAL COMPOSITION OF WATER IN LAKE HURON.

FIELD 02H

ACCESSION NO. W69-01139

COMPARISON OF THE DISTRIBUTION OF ORGANIC MATTER IN THE FIVE GREAT LAKES,

MICHIGAN UNIV., ANN ARBOR, GREAT LAKES RESEARCH DIV., INST. OF SCIENCE AND  
TECH.

ANDREW ROBERTSON, AND CHARLES F. POWERS.

PART OF FINAL REPT. OF USPHS GRANT WP-00311. MICHIGAN UNIV SPEC NO 30 OF THE  
GREAT LAKES RES DIV PP 1-18, 1967. 18 P, 7 TAB, 3 FIG, 22 REF. ONR-104-818.

DESCRIPTORS:

\*EUTROPHICATION, \*GREAT LAKES, NUTRIENTS, PLANKTON, ZOOPLANKTON,  
PRODUCTIVITY, SURFACE WATERS, WATER QUALITY, DISSOLVED SOLIDS, ORGANIC  
MATTER, BIOLOGICAL PROPERTIES.

IDENTIFIERS:

\*PARTICULATE ORGANIC MATTER, MACROBENTHOS.

ABSTRACT:

PARTICULATE AND DISSOLVED ORGANIC MATTER WERE MEASURED IN ALL 5 OF THE  
GREAT LAKES AND THE BIOMASS OF ZOOPLANKTON AND MACROBENTHOS WERE  
MEASURED IN THE UPPER 3 LAKES. IN GENERAL, TOTAL ORGANIC MATTER  
INCREASES IN THE ORDER, SUPERIOR, HURON, MICHIGAN, ERIE, ONTARIO, THE  
SAME ORDER AS SHOWN BY TOTAL DISSOLVED SOLIDS AND TOTAL DISSOLVED  
ORGANIC MATTER. THIS MAY ALSO REPRESENT THEIR RELATIVE STATES OF  
EUTROPHICATION. DISSOLVED ORGANIC MATTER CONTENT IN THE SURFACE WATERS  
IS 2.22-2.98 MG/1 IN LAKE SUPERIOR, 2.52-2.91 MG/1 IN LAKE HURON,  
3.24-5.81 MG/1 IN LAKE MICHIGAN, 5.82-6.01 MG/1 IN LAKE ERIE, AND  
5.85-6.53 MG/1 IN LAKE ONTARIO. THE PARTICULATE ORGANIC MATTER IS MUCH  
GREATER THAN THE AMOUNTS OF ZOOPLANKTON AND MACROBENTHOS. (KNAPP-USGS)

FIELD 05C

ACCESSION NO. W69-01620

OBRECHT V NATIONAL GYPSUM CO (RIPARIAN RIGHTS IN GREAT LAKES).

361 MICH 399, 105 NW 2D 143 (1960).

DESCRIPTORS:

JUDICIAL DECISIONS, \*MICHIGAN, \*GREAT LAKES, LAKE HURON, \*RIPARIAN RIGHTS, BEDS, \*OWNERSHIP OF BEDS, WHARFS, ADMINISTRATIVE AGENCIES, STATE JURISDICTION, ABATEMENT.

ABSTRACT:

PLAINTIFF HOMEOWNERS ON LAKE HURON BROUGHT SUIT AGAINST THE DEFENDANT RIPARIAN OWNER, WHICH WAS BUILDING A LARGE LOADING DOCK, AND AGAINST THE MICHIGAN DEPARTMENT OF CONSERVATION TO OBTAIN A DECREE THAT AN ACT AUTHORIZING SUCH DEPARTMENT TO CONVEY TO THE DEFENDANT CERTAIN LAKE BOTTOM LANDS WAS UNCONSTITUTIONAL. GENERALLY, THE BEDS OF THE GREAT LAKES ARE INALIENABLE AND THE PUBLIC TITLE AND RIGHT OF MICHIGAN IN LAKE HURON'S BED IS SUPREME AGAINST A RIPARIAN OWNER'S RIGHT TO WHARF OUT. THE LEGISLATURE OR ITS AUTHORIZED AGENCY MUST APPROVE BEFORE ANY DEEP-WATER DOCK CAN BE CONSTRUCTED. SINCE THE AREA WHERE THIS DOCK WAS CONSTRUCTED WAS SUBSTANTIALLY DEVOTED TO VACATIONING OR LIVING IN THE WOODED SECTOR OF THE SHORE, THE DEFENDANT'S ACT OF CONSTRUCTING A DOCK IN THE LOCALITY CONSTITUTED AN ACTIONABLE NUISANCE. BECAUSE THE DOCK CONSTRUCTION IS COMPLETED, IT WOULD BE AN EVEN GREATER WRONG TO FORCE ITS REMOVAL, BUT PLAINTIFFS CAN RECOVER DAMAGES. (WILLIAMS-FLA)

FIELD 06E, 02H

ACCESSION NO. W69-02019

EVALUATION OF CHANNEL CHANGES IN ST. CLAIR AND DETROIT RIVERS,

WEATHER BUREAU, CHICAGO, ILL.

IVAN W. BRUNK.

WATER RESOURCES RES, VOL 4, NO 6, PP 1335-1346, DECEMBER 1968. 12 P, 6 FIG, 3  
TAB, 9 REF.

DESCRIPTORS:

\*RIVER FLOW, \*CHANNEL IMPROVEMENT, \*GREAT LAKES, LAKE ERIE, LAKE  
MICHIGAN, LAKE HURON, STAGE-DISCHARGE RELATIONS, STREAM GAGES,  
HYDROGRAPHS.

IDENTIFIERS:

ST. CLAIR RIVER, DETROIT RIVER, STREAMFLOW ESTIMATES.

ABSTRACT:

EXTENSIVE IMPROVEMENTS FOR NAVIGATION HAVE BEEN MADE IN THE ST.  
CLAIR-DETROIT RIVER (SCDR). CHANNEL CHANGES HAVE LOWERED THE LEVEL OF  
LAKE MICHIGAN-HURON BY ABOUT 2 FEET, BRINGING ABOUT THE LOWEST LEVELS  
OF RECORD IN 1964 AND 1965. THE UNRECOGNIZED CHANGES IN THE REGIMEN OF  
THE SCDR BEFORE 1900 HAVE ALSO RESULTED IN THE COMPUTATION OF FLOWS  
THAT ARE MUCH TOO LARGE. THE DISCHARGE OF LAKE ERIE AND THE  
PRECIPITATION IN THE ERIE BASIN ARE USED TO DERIVE MORE REASONABLE  
ESTIMATES OF THE FLOW OF THE SCDR BEFORE 1900. THE AMOUNT OF MATERIAL  
EXCAVATED FROM CHANNELS AND THE ANNUAL DIFFERENCES IN REPORTED AND  
COMPUTED FLOW OF THE SCDR FROM 1869-1908 ARE TABULATED. HYDROGRAPHS  
SHOW COMPUTED FLOW AND LAKE ERIE FLOW FROM 1860-1967.

FIELD 02E

ACCESSION NO. W69-02693

ANNUAL REPORT, FISCAL YEAR 1968,

OHIO STATE UNIV., COLUMBUS. WATER RESOURCES CENTER.

G. P. HANNA, JR.

ANNUAL REPORT TO OFFICE OF WATER RESOURCES RESEARCH, SEPTEMBER 1, 1968. 118 P.

DESCRIPTORS:

\*OHIO, \*PROGRAMS, ACID MINE WATER, GREAT LAKES, \*LAKE ERIE, EUTROPHICATION, GROUND WATER, HYDROLOGY, SMALL WATERSHEDS, WATER QUALITY, ALGAE, PHOSPHATES, ECONOMICS, RECREATION DEMAND, TAXES, APPALACHIA.

ABSTRACT:

EIGHT CURRENT ALLOTMENT PROJECTS AND SEVEN MATCHING GRANTS PROJECTS ARE DESCRIBED. A STRONG ORIENTATION OF THE CENTER'S ACTIVITIES TOWARD THE PROBLEMS OF WATER QUALITY IN LAKE ERIE IS EVIDENCED BY THESE PROJECTS. FOUR BIOLOGICAL PROJECTS WERE DESIGNED TO FILL CRITICAL GAPS IN THE AVAILABLE KNOWLEDGE PERTAINING TO CHEMICAL, PHYSICAL AND BIOLOGICAL PHENOMENA IN WESTERN LAKE ERIE AND ITS TRIBUTARY STREAMS. TWO PROJECTS INVOLVING THE ECONOMICS OF THE AREA ALSO PROVIDES THE BROADENING OF OUR INVOLVEMENT IN THE LAKE ERIE BASIN. TWO PROJECTS, ASSOCIATED WITH THE CENTER'S EARLIER EMPHASIS ON ACID MINE DRAINAGE, REMAIN. THREE HYDROLOGICAL PROJECTS ARE ALSO INCLUDED; ONE DEALING WITH CHARACTERISTICS OF SMALL WATERSHEDS, THE OTHER TWO RELATING TO GROUND-WATER FLOWS. COMPLETION OF A STUDY ON STRONTIUM ISOTOPE AND TRACE-ELEMENT CONCENTRATIONS IN LAKE HURON IS ALSO REPORTED. A SOCIOLOGICAL STUDY IS ALSO UNDERWAY TO EXAMINE COMMUNITY REACTIONS TO WATER PROBLEMS IN RELATION TO PLANNING.

FIELD 09D

ACCESSION NO. W69-05160

A PRELIMINARY REPORT OF THE FOSSIL DIATOM FLORA FROM LAKE HURON SEDIMENTS,  
MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.

E. F. STOERMER, AND J. J. YANG.

SUPPORTED BY FWPCA. PROC 11TH CONF GREAT LAKES RES, VOL 11, PP 253-267, APR  
1968. 15 P, 4 FIG, 1 TAB, 37 REF.

DESCRIPTORS:

\*DIATOMS, \*LAKE HURON, PALEOLIMNOLOGY, QUATERNARY PERIOD.

IDENTIFIERS:

\*SPECIES DIVERSITY, MICROFOSSILS.

ABSTRACT:

THIS PAPER REPORTS FLORISTIC ANALYSIS OF SUBFOSSIL DIATOM REMAINS RECOVERED FROM BOTTOM SEDIMENTS TAKEN IN A CORE FROM 45 DEG 01.0 MIN N, 82 DEG 01.0 W, LAKE HURON. THIRTEEN 1 CCM SAMPLES, SPACED AT 15 CM INTERVALS, WERE TAKEN FROM A 1.8 M CORE. EXAMINATION OF STANDARD SUBSAMPLES IN MICROSCOPIC PREPARATIONS REVEALED A TOTAL OF 187 DISCERNABLE TAXONOMIC ENTITIES. OF THESE, 160 HAVE BEEN REFERRED TO RECOGNIZED TAXA. CONSIDERING THE LOCATION OF THE SAMPLING AREA, AN UNEXPECTEDLY HIGH PROPORTION OF THE TAXA FIND THEIR PRIMARY HABITAT IN BIOCOENOSSES OTHER THAN THE PLANKTON. THERE IS A TENDENCY FOR THE NUMBER OF SPECIMENS RECOVERED PER SAMPLE TO DECREASE WITH DEPTH IN THE SECTION, ALTHOUGH THERE IS CONSIDERABLE VARIATION BETWEEN SAMPLES THROUGHOUT ITS LENGTH. ON THE BASIS OF FLUCTUATIONS IN DIVERSITY OF THE FLORA, IT APPEARS THAT A MAJOR DISTURBANCE IS RECORDED IN THE 135 CM SAMPLE. ON THE BASIS OF SHIFTS IN RELATIVE ABUNDANCE OF THE DOMINANT PLANKTON SPECIES AND THEIR KNOWN AUTECOLOGY, IT APPEARS THAT THE DISTURBANCE REPRESENTS A RETURN TO RELATIVELY LOWER MINERAL NUTRIENT LEVELS. IT IS POSTULATED THAT THIS EVENT IS CORRELATED WITH THE NIPISSING STAGE OF LAKE HURON. IT APPEARS THAT EITHER RAISING OR LOWERING NUTRIENT LEVELS MAY AFFECT DIATOM DIVERSITY HENCE DIVERSITY ESTIMATES ALONE PROVE MISLEADING.

FIELD 02H, 05C

ACCESSION NO. W69-05762



COMMON JURISDICTION OF COUNTIES.

MICH COMP LAWS ANN SECS 45.10, 45.12, 45.14 (1967), AS AMENDED, (SUPP 1968).

DESCRIPTORS:

\*MICHIGAN, \*GREAT LAKES, \*JURISDICTION, \*LAKE SHORES, LAKE MICHIGAN, LAKE HURON, LAKE SUPERIOR, BOUNDARIES(SURFACES), LOCAL GOVERNMENTS, LEGISLATION, LEGAL ASPECTS.

IDENTIFIERS:

\*COUNTIES, \*CONCURRENT JURISDICTION, \*ENFORCEMENT, \*STATE BOUNDARIES, OFFENSES(CRIMINAL), PENALTIES(CRIMINAL).

ABSTRACT:

COUNTIES NOW IN EXISTENCE OR TO BE LATER ORGANIZED WHICH BORDER UPON THE SHORES OF LAKE MICHIGAN OR LAKE HURON SHALL HAVE JURISDICTION OF ALL OFFENSES COMMITTED ON THAT PART OF THE LAKE WHICH IS WITHIN THE STATE. OFFENSES SHALL BE TRIED IN EITHER OF THE TWO COUNTIES NEAREST THE SITE OF THE OFFENSE. CHIPPEWA COUNTY AND LATER ORGANIZED COUNTIES WHICH BORDER UPON THE SHORE OF LAKE SUPERIOR SHALL HAVE COMMON JURISDICTION OVER OFFENSES ON PARTS OF THE LAKE WITHIN THE STATE. TRIAL SHALL BE HAD IN THE FIRST COUNTY TO ISSUE PROCESS AGAINST THE OFFENDER. (HARRIS-FLA)

FIELD 06E

ACCESSION NO. W69-07636

STRONTIUM-CALCIUM RELATIONSHIPS IN AQUATIC FOOD CHAINS,

ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO). ENVIRONMENTAL RESEARCH BRANCH.

I. L. OPHEL, AND J. M. JUDD.

AVAILABLE FROM CLEARINGHOUSE AS CONF 670503 AT \$3.00 IN PAPER COPY AND \$0.65 IN MICROFICHE. SYMP ON RADIOECOLOGY, PROC 2ND NATIONAL SYMP, MAY 15-17, 1967, ANN ARBOR, MICH, NELSON, DANIEL J AND EVANS, FRANCIS C (EDS). US ATOMIC ENERGY COMM, DOC CONF 670503, PP 221-225. 4 TAB, 13 REF.

DESCRIPTORS:

\*STRONTIUM RADIOISOTOPES, \*CALCIUM, \*FOOD CHAINS, \*LAKES, \*SPECTROMETERS, \*FISH, PERCHES, BULLHEADS, LAKE HURON, ONTARIO, CANADA, CARP, SUCKERS, ECOSYSTEMS, RADIOACTIVITY, BIOTA, STREAMS, GENETICS.

IDENTIFIERS:

\*STABLE STRONTIUM, BONE, PERCH LAKE(ONT), CANADA, DOROSOMA CEPEDIANUM, KINCARDINE(ONT), BRASENIA SCHREBERI, PONTECERIA CORDATA, TYPHA ANGUSTIFOLIA, NUPHAR VARIEGATUM, RATIOS, NUPHEA ODORATA, FONTINALIS, POTAMOGETON PUSILLUS, STOMACH, BOTTOM ORGANISMS.

ABSTRACT:

THIS RESEARCH WAS UNDERTAKEN TO DETERMINE DIFFERENCES IN STRONTIUM CONTENT OF FISH FROM TWO LAKES AND TO INVESTIGATE CAUSES FOR THESE DIFFERENCES. IN WATERS CHRONICALLY CONTAMINATED WITH STRONTIUM-90 (SR-90), THE AMOUNT OF THE RADIO-NUCLIDE INCORPORATED INTO FISH TISSUES IS DIRECTLY RELATED TO THE STABLE STRONTIUM CONTENT. HUMAN INTAKES OF SR-90 WILL DIFFER IN SAME MANNER AS THE STABLE ELEMENT. DIFFERENT SPECIES OF FISH FROM THE SAME LAKE AND IDENTICAL SPECIES IN DIFFERENT LAKES WERE FOUND TO HAVE MARKED VARIATIONS IN STABLE STRONTIUM CONTENT. NO CORRESPONDING VARIATION IN CALCIUM CONTENTS WAS FOUND. TWO PLANT SPECIES SEEM TO DRAW ON SUPPLIES OF STABLE STRONTIUM WHICH ARE NOT IN EQUILIBRIUM WITH THE WATER COMPARTMENT OF THE ECOSYSTEM. FOOD ORGANISMS IN LAKES HAVE MARKED DIFFERENCES IN STRONTIUM (SR) AND CALCIUM (CA) CONTENT AND SR/CA RATIOS. STOMACH CONTENTS ANALYSES INDICATE A CORRELATION BETWEEN SR/CA RATIOS IN FOOD AND THOSE IN FISH. IT APPEARS THAT DIFFERENCES IN STABLE STRONTIUM (AND RADIOSTRONTIUM) CONTENT AMONG FISH ARE DEPENDENT ON FEEDING HABITS OF THE SPECIES AND MAY INDICATE THAT INDIVIDUAL FISH FORM FEEDING HABITS THAT PERSIST THROUGHOUT THEIR LIFE, OR THAT THERE EXIST GENETIC CHARACTERISTICS RELATED TO SR/CA METABOLISM IN THE FISH. (SEE ALSO VOL. 2, NO. 18, FIELD 5C, W69-07441) (JONES-WISC)

FIELD 05C

ACCESSION NO. W69-07850

NATURAL AND POLLUTION SOURCES OF IODINE, BROMINE, AND CHLORINE IN THE GREAT LAKES,

MICHIGAN UNIV., ANN ARBOR. DEPT. OF METEOROLOGY AND OCEANOGRAPHY.

MARY A. TIFFANY, JOHN W. WINCHESTER, AND RONALD H. LOUCKS.

J WATER POLLUT CONTR FEDERATION, VOL 41, NO 7, P 1319-1329, JULY 1969. 11 P, 10 FIG, 5 TAB, 13 REF. CONTRACT NO AT(11-1)-1705AEC).

DESCRIPTORS:

\*WATER QUALITY, \*GREAT LAKES, \*TRACE ELEMENTS, \*WATER POLLUTION EFFECTS, CHLORIDES, HALOGENS, ALGAE, WATER POLLUTION SOURCES, WATER CHEMISTRY, WATER ANALYSIS.

IDENTIFIERS:

\*BROMINE, \*IODINE.

ABSTRACT:

THIS STUDY INVOLVES THE DETERMINATION OF TRACE ELEMENTS I, BR, AND CL IN THE GREAT LAKES, USING NEUTRON ACTIVATION ANALYSIS OF 90 WATER SAMPLES FROM LAKE SUPERIOR AND ITS TRIBUTARY STREAMS, LAKE MICHIGAN, SOUTHERN LAKE HURON, LAKE ST. CLAIR, WESTERN LAKE ERIE, AND NORTHERN LAKE ONTARIO. POSSIBLE POLLUTION BY BROMINE THROUGH AN ATMOSPHERIC ROUTE IS OF INTEREST BECAUSE OF THE COMBUSTION OF LEADED GASOLINE. IODINE DEFICIENCY IN LAKE WATER MAY BE RELATED TO THYROID DISORDERS AMONG MARINE FISH WHICH HAVE BECOME ADAPTED TO FRESH WATER, AND ALGAE MAY OFFER COMPETITION FOR THE AVAILABLE IODINE. CHLORINE IS A NOTICEABLE CONTAMINANT EXCEPT IN LAKE SUPERIOR. THE LAKE SUPERIOR STREAMS APPEAR TO REPRESENT A GOOD AVERAGE OF THE ATMOSPHERIC INPUTS OF I, BR, AND CL. (KNAPP-USGS)

FIELD 05A, 02K

ACCESSION NO. W69-08562

COASTAL CURRENTS IN STRATIFIED SEAS,

WISCONSIN UNIV., MADISON.

G. T. CSANADY.

PAPER PRESENTED AT MIDWEST GEOPHYSICS COLLOQUIUM, ANN ARBOR, MICHIGAN, MAY 9-10, 1969. OWRR PROJECT B-009-WIS.

DESCRIPTORS:

STRATIFICATION, LIMNOLOGY, GREAT LAKES, LAKE HURON, CURRENTS(WATER), COASTAL STRUCTURE.

IDENTIFIERS:

KELVIN WAVES, WAVE VELOCITY, COASTAL JETS.

ABSTRACT:

THE LINEARIZED EQUATIONS OF MOTION FOR A STRATIFIED LIQUID ARE SHOWN TO POSSESS STEADY-STATE SOLUTIONS SIMILAR IN SPATIAL STRUCTURE TO KELVIN WAVES, IN WHICH THE VELOCITY AMPLITUDE DECAYS EXPONENTIALLY WITH DISTANCE FROM A STRAIGHT SHORE. A COMBINATION OF VARIOUS DIFFERENT FREE MODES OF THIS KIND CAN RESULT IN 'COASTAL JETS' OF FAIRLY COMPLEX STRUCTURE. APPLICATION OF THE RESULTS TO IDEALIZED MODELS OF THE GREAT LAKES SUGGESTS THAT STRATIFICATION MAY INDEED BE AT LEAST A CONTRIBUTORY CAUSE OF THE COMPLEXITIES OF 'COASTAL JETS' OBSERVED, FOR EXAMPLE, IN LAKE HURON. (AUTHOR)

FIELD 02H

ACCESSION NO. W69-09026

RELATIONSHIP OF TEMPERATURE TO TOTAL ANNUAL GROWTH IN ADULT SMALLMOUTH BASS,  
DEPARTMENT OF LANDS AND FORESTS, PICTON (ONTARIO). GLENORA FISHERIES STATION.  
DANIEL W. COBLE.

JOURNAL OF FISHERIES RESEARCH BOARD OF CANADA, VOL 24, NO 1, P 87-99, JAN  
1967. 13 P, 1 FIG, 4 TAB, 23 REF.

DESCRIPTORS:

\*WATER TEMPERATURE, \*GROWTH RATES, \*SMALLMOUTH BASS, \*FISH PHYSIOLOGY,  
THERMAL POLLUTION, AQUATIC ENVIRONMENT.

IDENTIFIERS:

SOUTH BAY, LAKE HURON.

ABSTRACT:

THE PURPOSE OF THIS STUDY WAS TO FIND OUT IF TOTAL ANNUAL GROWTH OF  
SMALLMOUTH BASS, MICROPTERUS DOLOMIEUI LACEPEDE, IS RELATED TO  
TEMPERATURE AND, IF SO, WHAT VARIATION AROUND THE RELATIONSHIP EXISTS.  
TWO SETS OF INFORMATION WERE USED: ORIGINAL DATA ON TWO POPULATIONS OF  
SMALLMOUTH BASS IN ONTARIO FOR WHICH RATHER DETAILED INFORMATION ON  
GROWTH AND TEMPERATURE WERE OBTAINED, AND PUBLISHED DATA ON GROWTH OF  
SMALLMOUTH BASS IN VARIOUS WATERS THROUGHOUT THE NORTH AMERICAN RANGE.  
TOTAL YEARLY GROWTH OF SMALLMOUTH BASS OF AGES 3-5 IN SOUTH BAY, LAKE  
HURON, AND IN SEVERAL OTHER WIDELY SCATTERED POPULATIONS WAS RELATED TO  
MEAN SURFACE WATER TEMPERATURE FOR THE PERIOD JULY THROUGH SEPTEMBER,  
MORE GROWTH BEING ASSOCIATED WITH WARMER WATERS. THE DIFFERENCE IN THE  
MANIFESTATION OF A GROWTH-TEMPERATURE RELATIONSHIP APPEARS TO BE REAL,  
RATHER THAN A RESULT OF DIFFERENCES IN DATA OR TREATMENTS OF THEM, AND  
INDICATES, THEREFORE, THAT OTHER FACTORS MAY INFLUENCE TOTAL ANNUAL  
GROWTH AS MUCH AS, OR MORE THAN, TEMPERATURE. (ROSS-VANDERBILT)

FIELD 05C

ACCESSION NO. W69-09057

ECOLOGICAL FACTORS AND THE DISTRIBUTION OF CLADOPHORA GLOMERATA IN THE GREAT LAKES,

WISCONSIN UNIV., MILWAUKEE. DEPT. OF BOTANY.

RICHARD P. HERBST.

THE AMER MIDLAND NATUR, VOL 82, NO 1, P 90-98, JULY 1969. 9 P, 3 FIG, 1 TAB, 15 REF.

DESCRIPTORS:

\*ECOLOGY, \*EUTROPHICATION, \*GREAT LAKES, \*ALGAE, NUTRIENTS, PHOSPHORUS, POPULATION, POLLUTANTS, MAPPING, HYDROGEN SULFIDE, CITIES, LAKE HURON, LAKE ERIE, LAKE ONTARIO, LAKE MICHIGAN, WATER TEMPERATURE, PHOSPHATES, TURBIDITY.

IDENTIFIERS:

CLADOPHORA GLOMERATA.

ABSTRACT:

NUTRIENT ENRICHMENT IN THE GREAT LAKES HAS PROVIDED FERTILE AREAS FOR GROWTH OF ALGAL NUISANCES. ONE OF THESE SPECIES, CLADOPHORA GLOMERATA, HAS BECOME A MAJOR PROBLEM FOR MANY CITIES BORDERING THE GREAT LAKES. ECOLOGICAL FACTORS CONCERNING ITS GROWTH IN MILWAUKEE'S HARBOR WERE STUDIED, AND ITS DISTRIBUTION IN THE GREAT LAKES DETERMINED. PHOSPHORUS LEVELS APPEAR TO BE CLOSELY LINKED WITH CLADOPHORA INCREASES.  
(GABRIEL-USGS)

FIELD 05C, 02H

ACCESSION NO. W70-00667



CHANGES IN THE BIOLOGY OF THE LOWER GREAT LAKES,

OHIO STATE UNIV., COLUMBUS. NATURAL RESOURCES INST.

CHARLES A. DAMBACH.

BULLETIN OF THE BUFFALO SOCIETY OF NATURAL SCIENCES, VOL 25, NO 1, P 1-17,  
1969. 19 REF.

DESCRIPTORS:

\*BIOLOGY, \*GREAT LAKES, \*LAKE ERIE, \*LAKE MICHIGAN, \*LAKE ONTARIO, LAKE HURON, AESTHETICS, ECOLOGY, ECONOMICS, OHIO, COMMERCIAL FISHING, PUBLIC HEALTH, WALLEYE, VEGETATION, WILD RICE, SILTS, PLANKTON, MAYFLIES, FAUNA, FISH, OLIGOCHAETES, MIDGES, SNAILS, PHOSPHORUS, NUTRIENTS, ALGAE, DIATOMS, CHLOROPHYTA, DISSOLVED OXYGEN, PIKE, CARP, DRUM(FRESHWATER), CISCO, LAKE TROUT, EUTROPHICATION, STRIPED BASS, CYANOPHYTA, WATER POLLUTION EFFECTS, ELECTRIC POWERPLANTS.

IDENTIFIERS:

HEXAGENIA, CHIRONOMIDAE, PROCLADIUS, CHIRONOMUS PROMOSUS, TRICHOPTERA, LEECHES, FINGERNAIL CLAMS, WHITE FISH, ALEWIFE, GIZZARD SHAD, SEA LAMPHREY, COHO SALMON.

ABSTRACT:

DRAMATIC BIOLOGICAL CHANGES HAVE APPEARED IN BOTTOM FAUNA AND AMONG CERTAIN FISHES OF THE LOWER GREAT LAKES. OF SPECIAL SIGNIFICANCE IS ABUNDANT INCREASE, SINCE 1959, OF THE MIDGE PROCLADIUS, A SUPPOSEDLY MORE POLLUTION-TOLERANT FORM, WHILE CHIRONOMUS PROMOSUS HAS DECREASED, SUGGESTING THAT POLLUTION ZONES HAVE EXTENDED FURTHER INTO THE LAKES. THE MAYFLY IS NOW RARE. BENTHIC FAUNA IS NOW DOMINATED BY OLIGOCHAETES AND MIDGES, WITH SOME FINGERNAIL CLAMS, SNAILS, AND LEECHES ON THE INCREASE. CHEMICAL CONDITIONS PROBABLY PROVIDE A MORE RELIABLE INDEX TO CHANGES THAN PLANKTON DATA, BUT ARE DIFFICULT TO RELATE. SPECIES COMPOSITION, ONCE DOMINATED BY DIATOMS, ARE NOW DOMINATED BY BLUE-GREEN ALGAE. DECLINE OF CERTAIN HIGH QUALITY FISHES, NOTABLY THE BLUE PIKE AND WALLEYE PIKE, IS LARGELY RESPONSIBLE FOR THE ACCELERATED PUBLIC INTEREST IN CORRECTIVE MEASURES. RELATIVE SIGNIFICANCE OF ENVIRONMENT VERSUS OVERFISHING IS DEBATABLE. INCREASE IN EUTROPHICATION RATE OF THE GREAT LAKES, ESPECIALLY LAKE ERIE, IS SIGNIFICANT. HUMAN TECHNOLOGY CAN SO MODIFY THE ENVIRONMENT THAT BIOLOGICAL POPULATIONS ARE SIGNIFICANTLY AFFECTED. BIOLOGISTS WITH REQUISITE KNOWLEDGE, SHOULD DEVELOP BETTER GUIDELINES FOR WEIGHING COSTS OF EACH INCREMENT OF DEGRADATION AND EACH INCREMENT OF IMPROVEMENT. (SEE W70-01942). (JONES-WISCONSIN)

FIELD 05C, 02H

ACCESSION NO. W70-01943

LABORATORY AND PILOT PLANT STUDIES ON PHOSPHATE REMOVAL FROM INDUSTRIAL WASTEWATER,

HERCULES, INC., WILMINGTON, DEL.

BRUCE W. DICKERSON, AND PHILIP J. FARRELL.

J WATER POLLUT CONTR FEDERATION, VOL 41, NO 1, P 56-62, JAN 1969. 2 FIG, 7 TAB, 5 REF.

DESCRIPTORS:

\*PHOSPHATES, \*LIME, \*INDUSTRIAL WASTES, PILOT PLANTS, BIOCHEMICAL OXYGEN DEMAND, CENTRIFUGATION, DEWATERING.

IDENTIFIERS:

\*ALUM, \*FERRIC SULFATE, LAKE HURON(MICH), SODA ASH, SUSPENDED SOLIDS, PH.

ABSTRACT:

LABORATORY AND PILOT PLANT TESTS WERE MADE TO DEVELOP A TREATMENT METHOD FOR A WHEAT FLOUR WASTE STREAM WITH 300 TO 330 MG/L OF PHOSPHATES AND 5000 MG/L BOD. LAB STUDIES SHOWED THAT LIME REMOVED PHOSPHATE MORE EFFICIENTLY THAN ALUM AND FERRIC SULFATE. PILOT PLANT STUDIES SHOWED THAT A 5 MG/L PHOSPHATE CONCENTRATION IS ATTAINABLE AT CONTROLLED PH. CENTRIFUGATION ACHIEVED 20 TO 40% SOLIDS AND APPEARED MOST PRACTICAL. THEY DID NOT CLAIM THIS TO BE AN ECONOMICAL PROCESS FOR PHOSPHATES REMOVAL. (LEDBETTER-TEXAS)

FIELD 05D

ACCESSION NO. W70-01989

PRELIMINARY INVESTIGATION OF THE EXPLOITATION OF SOME POTENTIAL NUTRITIONAL  
RESOURCES BY THREE SYMPATRIC TUBIFICID OLIGOCHAETES,

TORONTO UNIV. (ONTARIO). DEPT. OF ZOOLOGY.

RALPH D. BRINKHURST, AND KIAN E. CHUA.

JOURNAL FISHERIES RESEARCH BOARD OF CANADA, VOL 26, NO 10, P 2659-2668, 1969.  
2 FIG, 3 TAB, 24 REF.

DESCRIPTORS:

\*LAKE ONTARIO, \*OLIGOCHAETES, \*TUBIFICIDS, AMINO ACIDS, BACTERIA,  
DETRITUS, WATER POLLUTION.

IDENTIFIERS:

\*NUTRITIONAL RESOURCES, \*TORONTO HARBOR(CANADA), \*TUBIFEX, GLYCINE,  
NUTRIENT UPTAKE, LIMNODRILUS, PELOSCOLEX, SAGINAW BAY(MICHIGAN), LAKE  
HURON.

ABSTRACT:

THREE SPECIES OF TUBIFICIDS (TUBIFEX TUBIFEX, LIMNODRILUS HOFFMEISTERI,  
PELOSCOLEX MULTISETOSUS) CHARACTERISTIC OF AREAS POLLUTED BY HIGH  
AMOUNTS OF ORGANIC MATTER WERE STUDIED TO DETERMINE THEIR UTILIZATION  
OF HETEROTROPHIC BACTERIA AND GLYCINE. EIGHT SPECIES OF BACTERIA WERE  
CULTURED FROM MUD SAMPLES TAKEN FROM TORONTO HARBOR. SEVEN BACTERIA  
DEVELOPED AT ANY ONE TIME, WITH CHROMOBACTERIUM AND AEROMONAS  
ALTERNATING IN THE SAMPLES. PELOSCOLEX GUT CONTENTS YIELDED ALL SEVEN  
SPECIES OF BACTERIA; LIMNODRILUS AND TUBIFEX DID NOT CONTAIN AEROMONAS;  
PSEUDOMONAS WAS ABSENT FROM TUBIFEX. LABORATORY CULTURES OF WORMS  
INDICATED ONLY ONE BACTERIAL SPECIES SURVIVED PASSAGE THROUGH GUTS, A  
DIFFERENT BACTERIUM FOR EACH TUBIFICID. STUDIES ON UPTAKE OF C-14  
LABELLED GLYCINE INDICATED INSIGNIFICANT UPTAKE BY TUBIFEX AND  
LIMNODRILUS. SIGNIFICANT UPTAKE WAS DEMONSTRATED IN PELOSCOLEX, GLYCINE  
BEING CONCENTRATED IN THE CHLORAGOGEN SURROUNDING THE INTESTINE.  
RESULTS MAY INDICATE DIFFERENCES IN UTILIZATION OF POTENTIAL  
NUTRITIONAL RESOURCES BY THE THREE SPECIES. FREE ORGANIC MATTER AND  
MICROFLORA AVAILABLE AS FOOD FOR DETRITUS FEEDERS MAY BE MORE RELEVANT  
TO THEIR ECOLOGY THAN MORE COMMONLY INVESTIGATED PHYSICAL AND INORGANIC  
FACTORS. TABULAR DATA INCLUDE RESULTS OF BACTERIAL IDENTIFICATIONS FROM  
FIELD AND LABORATORY STUDIES. (VOIGTLANDER-WISCONSIN)

FIELD 05C

ACCESSION NO. W70-02972

WATER QUALITY STUDIES ON THE GREAT LAKES BASED ON CARBON FOURTEEN MEASUREMENTS  
ON PRIMARY PRODUCTIVITY,

MINNESOTA UNIV., MINNEAPOLIS.

WILLIAM G. PARKOS, THEODORE A. OLSON, AND THERON O. ODLAUG.

WATER RESOURCES RESEARCH CENTER, MINNESOTA UNIV GRADUATE SCHOOL, MINNEAPOLIS,  
WRRR BULLETIN 17, 1969. 121 P, 23 FIG, 25 TAB, 70 REF, 10 PLATES, APPENDIX  
A, B, C, D, E, F. OWRR PROJECT A 011-MINN.

DESCRIPTORS:

\*PRIMARY PRODUCTIVITY, SURFACE WATERS, PRODUCTIVITY, PHYTOPLANKTON,  
GREAT LAKES, LAKE SUPERIOR, LAKE MICHIGAN, LAKE HURON, LAKE ERIE, WATER  
QUALITY.

IDENTIFIERS:

CARBON-14 MEASUREMENT, SHIPBOARD INCUBATION.

ABSTRACT:

CARBON-14 MEASUREMENTS OF SURFACE WATER PRIMARY PRODUCTION OF LAKES  
SUPERIOR, MICHIGAN, HURON, AND ERIE ARE REPORTED. ESTIMATES ARE BASED  
ON SHIPBOARD INCUBATION OF SAMPLES COLLECTED AT IRREGULAR INTERVALS  
DURING THE 1967 AND 1968 SHIPPING SEASONS. LAKE SUPERIOR PROVED TO BE  
THE LEAST PRODUCTIVE OF THE LAKES STUDIED, MEAN SURFACE PRODUCTIVITY OF  
16.72 MILLIGRAMS OF CARBON/CUBIC METER PER DAY. THE OTHER LAKES SHOWED  
INCREASING LEVELS OF PRODUCTIVITY: LAKE HURON, 23.04 MILLIGRAMS OF  
CARBON/CUBIC METER PER DAY, LAKE MICHIGAN, 37.62 MILLIGRAMS OF  
CARBON/CUBIC METER PER DAY, AND LAKE ERIE, 175.20 MILLIGRAMS OF  
CARBON/CUBIC METER PER DAY. HIGHEST PRODUCTIVITY LEVELS IN EACH LAKE  
TENDED TO OCCUR NEAR LARGE POPULATION CENTERS. (KOONCE-WISCONSIN)

FIELD 02H

ACCESSION NO. W70-02983

A STUDY OF THE OPEN WATER DISTRIBUTION AND ABUNDANCE OF NET PLANKTON AS AN INDEX OF EUTROPHICATION IN LAKE SUPERIOR,

MINNESOTA UNIV., MINNEAPOLIS. SCHOOL OF PUBLIC HEALTH.

T. A. OLSON.

TECHNICAL COMPLETION REPORT, JUNE 1969. 2 P. OWRR PROJECT NO A-011-MINN.

DESCRIPTORS:

\*LAKES, \*GREAT LAKES, \*LAKE SUPERIOR, \*EUTROPHICATION, \*ZOOPLANKTON, \*PRIMARY PRODUCTIVITY, LAKE HURON, LAKE MICHIGAN, LAKE ERIE, WATER POLLUTION EFFECTS, BIOINDICATORS, CARBON RADIOISOTOPES, PHYTOPLANKTON, WATER POLLUTION SOURCES, ENVIRONMENTAL EFFECTS, SECONDARY PRODUCTIVITY, WATER QUALITY, OLIGOTROPHY, ANALYTICAL TECHNIQUES.

IDENTIFIERS:

\*NET PLANKTON, HARDY CONTINUOUS PLANKTON RECORDER, RADIOCARBON UPTAKE TECHNIQUE, PLANKTON ABUNDANCE, PLANKTON DISTRIBUTION, SEASONAL VARIATIONS, DAILY VARIATIONS, WATER MASSES, WATER POLLUTION ASSESSMENT.

ABSTRACT:

BASED UPON CRITERIA OF NET PLANKTON ABUNDANCE, DETERMINED WITH THE HARDY CONTINUOUS PLANKTON RECORDER (CPR), AND PRIMARY PLANKTON PRODUCTIVITY (PPP), DETERMINED FROM MEASUREMENTS OF CARBON-14 UPTAKE, THE STATUS OF FOUR GREAT LAKES SAMPLED, IN INCREASING ORDER OF EUTROPHICATION, IS: SUPERIOR, HURON, MICHIGAN, ERIE. LAKE ERIE IS MORE THAN FOURFOLD PRODUCTIVE THAN ANY OTHER LAKE SAMPLED. EUTROPHICATION INCREASES PROGRESSIVELY FROM NORTH TO SOUTH. MEAN SEASONAL PRODUCTIVITY GENERALLY INCREASED WITH ASCENDING TEMPERATURE OF SURFACE WATERS. SHARPLY DELINEATED REGIONS OF HIGH ZOOPLANKTONIC DENSITY WAS OBSERVED, AS EXPECTED. SPECIES COMPOSITION AND ABUNDANCE OF ZOOPLANKTON DIFFER AMONG WATER MASSES WITHIN LAKES, SHOWING SEASONAL AND DAILY VARIATIONS. ZOOPLANKTERS ARE MORE ABUNDANT LOCALLY IN CHEMICALLY POLLUTED AREAS WITHIN LAKES. LOWEST PPP WAS OBSERVED IN CENTRAL LAKE SUPERIOR. LOWER LAKES ARE MOST PRODUCTIVE, AND ESPECIALLY MARKED INCREASES IN PPP OCCUR IN REGIONS WHERE MASSES POPULATION AND INDUSTRY HAVE ENRICHED THE LAKES. RADIOCARBON UPTAKE AND CPR ARE EFFECTIVE TOOLS FOR STUDY OF TROPHIC STATUS OF WATERS OF GREAT LAKES BASIN, AND CPR CAN PROVIDE ASSESSMENT OF POLLUTION AND EUTROPHICATION ON A SCALE HITHERTO UNAVAILABLE FOR THE GREAT LAKES. (EICHORN-WISCONSIN)

FIELD 02H, 05C

ACCESSION NO. W70-03311

COMPONENTS OF THE BOTTOM FAUNA OF THE ST LAWRENCE, GREAT LAKES,

TORONTO UNIV (ONTARIO). DEPT. OF ZOOLOGY; AND FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA).

R. O. BRINKHURST, A. L. HAMILTON, AND H. B. HERRINGTON.

GREAT LAKES INSTITUTE, UNIV OF TORONTO, NO PR 33, MAR 1968. 50 P, 7 TAB, 23 REF, APPENDIX WITH 11 FIG.

DESCRIPTORS:

\*BENTHIC FAUNA, \*GREAT LAKES, \*ST LAWRENCE RIVER, OLIGOCHAETES, SAMPLING, SEASONAL, DEPTH, LAKE ERIE, LAKE ONTARIO, TUBIFICIDS, DISTRIBUTION, WATER POLLUTION, EUTROPHICATION, OLIGOTROPHY, LITTORAL, LIMNOLOGY, BATHYMETRY, TEMPERATURE, ECOLOGY, TROPHIC, LAKE HURON, OXYGEN.

IDENTIFIERS:

SPHAERIIDAE, CHIRONOMIDAE, GEORGIAN BAY(ONTARIO), MESOTROPHIC, LAKE NIPIGON(ONTARIO), LAKE ATHABASKA(ONTARIO), GREAT SLAVE LAKE(ONTARIO); CREE LAKE(ONTARIO), PATRICIA DISTRICT LAKES, STRAITS OF MACKINAC, SPECIES COMPOSITION, DETROIT RIVER, MAUMÉE RIVER, TAXONOMY, CORE ANALYSES, CHEMICAL CONDITIONS, TAXONOMIC KEYS.

ABSTRACT:

BOTTOM FAUNA WERE SAMPLED DURING SYNOPTIC CRUISES THROUGH GEORGIAN BAY, LAKE ONTARIO, AND LAKE ERIE AND DISTRIBUTIONS OF THEIR MAJOR COMPONENTS DETERMINED. OLIGOCHAETA, SPHAERIIDAE, AND CHIRONOMIDAE WERE SEPARATED. IDENTITY OF SPECIES AND THEIR DISTRIBUTION IS DISCUSSED. REFERENCE IS MADE TO OTHER GREAT LAKES STUDIES ON BENTHOS. SAMPLES REPRESENTING ALL SEASONS WERE INCLUDED WHERE POSSIBLE. RESULTS ARE PRESENTED IN TAXONOMIC GROUPS AND DISTRIBUTION MAPS. MAPS OF DEPTH PROFILES, INDICATING DEGREE OF OXYGEN DEPLETION IN LAKE ERIE IN SUMMER, AND BATHYMETRICAL MAPS ARE INCLUDED. 31 SPECIES OF TUBIFICIDAE FROM THE GREAT LAKES AND SOME IN CANADIAN LAKES ARE RECORDED. IN GROSSLY POLLUTED SITUATIONS, THE NUMBER OF OLIGOCHAETES IS VERY HIGH. SPECIES OF THE SPHAERIIDAE IDENTIFIED IN THE GREAT LAKES INSTITUTE COLLECTION ARE LISTED. THE TAXA OF CHIRONOMIDAE, REASONABLY COMPLETE IN ASSESSMENT OF THE PROFUNDAL AND SUBLITTORAL FAUNA, FROM THESE THREE LAKES ARE LISTED. TO FACILITATE COMPARISON BETWEEN THESE LAKES A MEASURE OF THE 'TROPHIC CONDITIONS' OF EACH AREA WAS CALCULATED ACCORDING TO ABILITY TO WITHSTAND EUTROPHIC CONDITIONS, PROVIDING NUMERICAL VALUES WHICH AID IN THE COMPARISONS OF VARIOUS BODIES OF WATER. KEY TO TUBIFICIDAE IS GIVEN. (JONES-WISCONSIN)

FIELD 02H, 05C

ACCESSION NO. W70-03315



A NUMERICAL STUDY OF LARGE-SCALE MOTIONS IN A TWO-LAYER RECTANGULAR BASIN,  
WATERLOO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.

KENNETH B. YUEN.

MANUSCRIPT REPORT SERIES, NO 14, MARINE SCIENCES BRANCH, DEPARTMENT OF  
ENERGY, MINES AND RESOURCES, OTTAWA, 1969. 119 P, 58 FIG, 6 TAB, 59 REF.

DESCRIPTORS:

\*GREAT LAKES, \*MODEL STUDIES, \*WATER CIRCULATION, MATHEMATICAL MODELS,  
WINDS, WAVES(WATER), CURRENTS(WATER), LAKES, FREQUENCY, SEICHES.

IDENTIFIERS:

LAKE CIRCULATION.

ABSTRACT:

LARGE-SCALE MOTION IN THE GREAT LAKES IS PREDICTED THROUGH THE USE OF  
COMPUTER-ORIENTED MATHEMATICAL MODELS. A ONE-LAYER ONE-DIMENSIONAL  
MODEL IS CONSTRUCTED FOR LAKE HURON. SPATIAL INTEGRATION OF THE  
HYDRODYNAMICAL EQUATIONS BY FINITE-DIFFERENCE TECHNIQUES YIELDS THE  
FREQUENCIES OF THE LOWEST LONGITUDINAL FREE BAROTROPIC MODES OF LAKE  
HURON. THE POWER SPECTRAL ANALYSIS OF WATER LEVEL RECORDS IS CARRIED  
OUT TO VERIFY THESE CALCULATED FREQUENCIES. A NUMERICAL MODEL IS  
CONSTRUCTED FOR A TWO-LAYER RECTANGULAR BASIN OF CONSTANT DEPTH. THE  
RESPONSE OF THE BASIN UNDER THE INFLUENCE OF WIND STRESS IS STUDIED.  
SIX CASES WERE INVESTIGATED, IN WHICH THE WIND STRESS WAS IMPULSIVE,  
CONSTANT OR PERIODIC IN TIME. THE BEHAVIOR OF THE BASIN IS DISCUSSED IN  
TERMS OF THEORETICAL FORCED AND FREE MOTIONS. (KNAPP-USGS)

FIELD 02H

ACCESSION NO. W70-04099

THE AGING GREAT LAKES,

CHARLES F. POWERS, AND ANDREW ROBERTSON.

SCIENTIFIC AMERICAN, VOL 215, NO 5, P 94-100, 102, 104, 1966. 8 FIG.

DESCRIPTORS:

\*EUTROPHICATION, \*GREAT LAKES, \*LAKE ERIE, LAKE HURON, FISH, FISH POPULATIONS, BASS, HERRING, WALLEYE, PIKES, LAMPREYS, CARP, TROUT, COMMERCIAL FISHING, PERCHES, INDUSTRIAL WASTES, WASTES.

IDENTIFIERS:

DETROIT RIVER, CATTARAUGUS CREEK(N Y), ALEWIFE, SUCKERS.

ABSTRACT:

A GENERAL PHYSICAL AND GEOGRAPHICAL LOOK AT THE GREAT LAKES TOGETHER WITH SOME ECOLOGICAL CHANGES THAT HAVE OCCURRED BECAUSE OF MAN'S ACTIVITIES ARE PRESENTED. NATURAL AGING ASPECTS OF THE LAKES VERSUS ACCELERATED AGING (EUTROPHICATION) ARE COMPARED. ONE OF THE FIRST INSTANCES OF MAN'S CATASTROPHIC EFFECTS ON THE NATURAL RESOURCES FOLLOWED THE BUILDING OF THE WELAND CANAL, WHICH ALLOWED THE SEA LAMPREY AND ALEWIFE TO PENETRATE AROUND NIAGARA FALLS INTO THE INNER LAKES. BY THE 1950'S THE ALEWIFE HAD KILLED OFF NEARLY ALL THE LAKE TROUT AND BURBOT IN LAKES HURON, MICHIGAN AND SUPERIOR. THE ALEWIFE HAS BECOME PROMINENT AND THREATENS TO CHANGE THE ECOLOGICAL BALANCE BY FEEDING ON THE EGGS OF MORE DESIRABLE SPECIES. THE COHO SALMON EXPERIMENT IN LAKES MICHIGAN AND SUPERIOR, TO REDUCE THE ALEWIFE POPULATION IS BRIEFLY DISCUSSED. ECOLOGICAL ALTERATIONS THAT WILL OCCUR AS THE RESULT OF POLLUTION WILL BE MORE PROFOUND. INDUSTRIAL AND MUNICIPAL POLLUTANTS THAT ARE DISCHARGED INTO LAKE ERIE AND THEIR EFFECT ON COMMERCIAL FISHING ARE DRASTIC. BETWEEN 1956 AND 1965 CATCHES OF BLUE PIKE, WALLEYE, LAKE HERRING, WHITEFISH, AND SAUGER DECLINED WHILE CATCHES OF UNDESIRABLE SPECIES ROSE. (HASKINS-WISCONSIN)

FIELD 02H, 05C

ACCESSION NO. W70-05415

CHEMICAL CHARACTERISTICS OF SOUTH-CENTRAL LAKE HURON,

BUREAU OF COMMERCIAL FISHERIES, ANN ARBOR, MICH.

HERBERT E. ALLEN.

MICHIGAN UNIV, ANN ARBOR, GREAT LAKES RESEARCH DIVISION, PUBLICATION NO 11, P 45-53, 1964. 2 FIG, 2 TAB, 8 REF.

DESCRIPTORS:

\*LAKE HURON, \*CHEMICAL PROPERTIES, \*CHEMICAL ANALYSIS, TEMPERATURE, HYDROGEN ION CONCENTRATION, CONDUCTIVITY, CALCIUM, POTASSIUM, SODIUM, CHLORIDES, SULFATES, SILICA, CURRENTS(WATER).

IDENTIFIERS:

SAGINAW BAY.

ABSTRACT:

WATER SAMPLES FOR CHEMICAL ANALYSIS WERE COLLECTED FROM SOUTH-CENTRAL LAKE HURON BETWEEN JUNE AND NOVEMBER, 1956. DATA IS BASED ON 233 SAMPLES TAKEN FROM STATIONS AT THE MOUTH OF SAGINAW BAY AND ALONG A TRANSECT FROM HARBOR BEACH, MICHIGAN, TO GODERICH, ONTARIO. MEDIAN VALUES WERE CHOSEN TO REPRESENT THE USUAL COMPOSITION OF THE LAKE SINCE AVERAGE VALUES WERE INFLUENCED BY WATER OUTFLOW FROM SAGINAW BAY. MEDIAN VALUES FOR THE EIGHT CRUISES WERE: SODIUM, 2.54 PPM; POTASSIUM, 0.85 PPM; CALCIUM, 26.7 PPM; CHLORIDE, 5.9 PPM; SULFATE, 13 PPM; SILICA 1.9 PPM; AND CONDUCTIVITY 174 MICRO-OHMS AT 18C. MEDIAN VALUES FOR ALL CHEMICALS, WITH THE EXCEPTION OF SILICA, WERE HIGHER AT THE SURFACE THAN IN SUBSURFACE SAMPLES ALTHOUGH DIFFERENCES WERE SLIGHT. ABOVE MEDIAN CONCENTRATIONS WERE OBTAINED MOST FREQUENTLY FOR SODIUM, CALCIUM, CHLORIDE, AND CONDUCTIVITY, ATTRIBUTABLE TO SAGINAW BAY WATER OUTFLOW AND SUBSTANTIATED BY CURRENT PATTERNS EVALUATED BY DRIFT BOTTLES RELEASED DURING THREE CRUISES. RESULTS, WITH THE EXCEPTION OF CALCIUM (2-3 PPM HIGHER) AND SILICA, AGREED WITH PREVIOUSLY PUBLISHED DATA. THE REASON FOR DIFFERENCES IN CALCIUM RESULTS WERE UNKNOWN. SEASONAL AND DEPTH DIFFERENCES IN SILICA CONCENTRATIONS WERE ATTRIBUTED TO ITS INCORPORATION BY DIATOMS. (HASKINS-WISCONSIN)

FIELD 02H

ACCESSION NO. W70-05423

FRESH WATER WHITECAPS,

HOBART AND WILLIAM SMITH COLLEGES, GENEVA, N.Y.

EDWARD C. MONAHAN.

AVAILABLE FROM THE CLEARINGHOUSE AS AD-698 977, \$3.00 IN PAPER COPY, \$0.65 IN MICROFICHE. JNL OF ATMOSPHERIC SCIENCES, V. 26, NO. 5, PT. 2, P. 1026-1029, SEPT. 69. ONR CONTRACT N00014-68-C-0409, NR 083-212.

DESCRIPTORS:

\*WAVES, LAKE MORPHOMETRY, LAKES, GREAT LAKES, WINDS, VELOCITY, AIR TEMPERATURE, THERMAL PROPERTIES, HYGROMETRY, ANEMOMETERS, BUBBLES.

IDENTIFIERS:

\*WHITECAPS, LAKE SUPERIOR, LAKE HURON, LAKE ERIE, DETROIT EDISON VESSEL, NAUGATUCK VESSEL, AIR WATER INTERACTIONS, WIND VELOCITY.

ABSTRACT:

PHOTOGRAPHIC OBSERVATIONS OF THE WHITECAP COVERAGE OF LARGE FRESH WATER LAKES WERE MADE IN CONJUNCTION WITH MEASUREMENTS OF WIND VELOCITY, AND AIR AND SURFACE WATER TEMPERATURES. THE FRACTION OF THE WATER SURFACE COVERED BY WHITECAPS SHOWS AN ABRUPT INCREASE AS THE WIND VELOCITY INCREASES FROM APPROXIMATELY 7 TO APPROXIMATELY 8 M/SEC. THIS ABRUPT CHANGE IS QUALITATIVELY IN ACCORD WITH THE PUBLISHED OBSERVATIONS OF 'CRITICAL' WIND VELOCITIES ASSOCIATED WITH NUMEROUS OTHER WATER-SURFACE AND SURFACE-RELATED PHENOMENA. THE WHITECAP COVERAGE OF FRESH WATER BODIES, PARTICULARLY AT THE HIGHER WIND VELOCITIES, IS MUCH LESS THAN THE PUBLISHED VALUES OF WHITECAP COVERAGE OF OCEANS UNDER THE SAME WIND CONDITIONS.

FIELD 02L, 07B

ACCESSION NO. W70-06459

THE GREAT LAKES WATER RESOURCE,

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, CHICAGO, ILL. GREAT LAKES REGION.

H. W. POSTON, AND C. R. OWNBEY.

JOURNAL AMERICAN WATER WORKS ASSOCIATION, VOL 60, NO 1, P 15-20, 1968. 4 REF.

DESCRIPTORS:

\*GREAT LAKES, \*WATER RESOURCES, WATER QUALITY, EUTROPHICATION, LAKE ERIE, LAKE ONTARIO, LAKE MICHIGAN, PHOSPHATES, PRODUCTIVITY, FERTILIZATION, CHEMICALS, DISSOLVED OXYGEN, STRATIFICATION, BACTERIA, SEWAGE EFFLUENTS, STORM RUNOFF, SEWERS, ST. LAWRENCE RIVER, LAKE HURON, NEW YORK, MICHIGAN, ILLINOIS, WISCONSIN, OHIO, INDIANA, PENNSYLVANIA.

IDENTIFIERS:

CANADIAN GOVERNMENT, ONTARIO, DETROIT(MICH), CALUMET RIVER(ILL), FOX RIVER(WIS), SAGINAW RIVER(MICH), CUYAHOGA RIVER(OHIO), MAUMEE RIVER(OHIO), MENOMINEE RIVER(WIS).

ABSTRACT:

LAKE ERIE HAS THE LARGEST CONTRIBUTING POPULATION TO DEGRADATION ON ITS WATERSHED AND THE LARGEST DISCHARGER OF MUNICIPAL EFFLUENTS UNDERGOING ONLY TOKEN NUTRIENT REDUCTION. MODIFICATION OF TREATMENT PLANT DESIGN AND OPERATING PRACTICES CAN REDUCE PHOSPHATE CONCENTRATION IN WASTE WATER TO A HIGH DEGREE. ACCURATE MEASUREMENT OF PRODUCTIVITY AND EFFICIENT TECHNIQUES FOR CONTROL OF AQUATIC ORGANISMS ARE NEEDED. CHEMICAL CONSTITUENTS ARE INCREASING; FOR EXAMPLE, CHLORIDES TRIPLED FROM 1910 TO 1960; OXYGEN DEPLETION RESULTS FROM OVERSTIMULATION OF BIOLOGICAL ACTIVITY; HEALTH HAZARDS ALONG THE SHORES PREVAIL FROM INADEQUATELY DISINFECTED SEWAGE EFFLUENTS. THE LARGEST SINGLE PLANNING EFFORT UNDER WAY AT PRESENT IS THE GREAT LAKES-ILLINOIS RIVER BASINS STUDY UNDER THE FEDERAL WATER POLLUTION CONTROL ACT. THE INTERNATIONAL JOINT COMMISSION IS ALSO COORDINATING A STUDY. PLANS FOR LOCAL ACTIONS ARE FORMULATED. THE ADMINISTRATORS' AND POLICY MAKERS' TASK WILL BE TO ASSURE PROPER BALANCE IN THE EFFORTS DIRECTED TO RESEARCH, PLANS FOR ACTION AND APPLICATION. SOME ACCEPTABLE INSTITUTIONAL ARRANGEMENT MUST BE EVOLVED TO SETTLE DISPUTES BETWEEN CONFLICTING INTERESTS. AN ORGANIZATION HAVING AUTHORITY TO COMMAND EFFECTIVE ACTION MUST BE ESTABLISHED, CORRELATING EFFORTS OF PHYSICAL SCIENTISTS, ENGINEERS, ECONOMISTS, LAWYERS, AND POLITICAL SCIENTISTS. A TVA OF THE GREAT LAKES IS SUGGESTED. (JONES-WISCONSIN)

FIELD 068

ACCESSION NO. W70-06658

PESTICIDE CONCENTRATIONS IN GREAT LAKES FISH,

BUREAU OF COMMERCIAL FISHERIES, ANN ARBOR, MICH. GREAT LAKES FISHERY LAB.

ROBERT E. REINERT.

CONTRIB. NO. 371 OF GREAT LAKES FISHERY LABORATORY. PESTICIDES MONITORING JOURNAL, VOL. 3, NO. 4, P 233-240, MARCH 1970. 8 TAB, 1 FIG, 8 REFS.

DESCRIPTORS:

\*GREAT LAKES, \*DIELDRIN, \*DDT, CHLORINATED HYDROCARBON PESTICIDES, \*PESTICIDE RESIDUES, LAKE MICHIGAN, GAS CHROMATOGRAPHY, LAKE ERIE, LAKE TROUT, LAKE HURON, LAKE ONTARIO, LAKE SUPERIOR, PESTICIDE REMOVAL.

IDENTIFIERS:

DDD, DDE, ALEWIFE.

ABSTRACT:

REPORTS ON A 4 YEAR STUDY BY ANN ARBOR GREAT LAKES FISHERY LABORATORY OF THE BUREAU OF COMMERCIAL FISHERIES ON INSECTICIDE LEVELS IN FISH FROM THE GREAT LAKES. THE TWO INSECTICIDES FOUND IN ALL GREAT LAKES FISH HAVE BEEN DDT (DDT, DDD, DDE) AND DIELDRIN. FISH FROM LAKE MICHIGAN CONTAIN FROM 2 TO 7 TIMES AS MUCH OF THESE INSECTICIDES AS THOSE FROM THE OTHER GREAT LAKES. INSECTICIDE LEVELS CALCULATED ON A WHOLE-FISH BASIS SHOW A MARKED DIFFERENCE FROM SPECIES TO SPECIES. WITHIN A SPECIES THERE IS ALSO AN INCREASE IN DDT AND DIELDRIN LEVELS WITH AN INCREASE IN SIZE. IF THESE INSECTICIDE LEVELS ARE, HOWEVER, CALCULATED AS PPM OF INSECTICIDE IN THE EXTRACTABLE FISH OIL, THE DIFFERENCES IN CONCENTRATION BETWEEN SPECIES AND THE DIFFERENCES BETWEEN SIZE GROUPS BECOMES CONSIDERABLY LESS. LABORATORY EXPERIMENTS INDICATE THAT FISH CAN BUILD UP CONCENTRATIONS OF DDT AND DIELDRIN AT THE PARTS-PER-MILLION LEVEL FROM PARTS-PER-TRILLION CONCENTRATIONS IN THE WATER. (SJOLSETH-WASHINGTON)

FIELD 05C

ACCESSION NO. W70-07138

CHANGES IN THE ENVIRONMENT AND BIOTA OF THE GREAT LAKES,

WISCONSIN UNIV., MADISON.

A. M. BEETON.

EUTROPHICATION: CAUSES, CONSEQUENCES, CORRECTIVES, P 150-187. PRINTING AND PUBLISHING OFFICE, NATIONAL ACADEMY OF SCIENCES, WASHINGTON, D C, 1969. 15 FIG, 1 TAB, 76 REF.

DESCRIPTORS:

\*SEDIMENTS, \*EUTROPHICATION, \*GREAT LAKES, LAKE MICHIGAN, LAKE SUPERIOR, LAKE HURON, LAKE ERIE, LAKE ONTARIO, NITRATES, WATER POLLUTION SOURCES, WATER POLLUTION EFFECTS, PHYSICOCHEMICAL PROPERTIES, BENTHOS, FISH POPULATIONS, DISSOLVED SOLIDS, DISSOLVED OXYGEN, SULFATES.

IDENTIFIERS:

CHLORIDES, LITERATURE REVIEW, GREEN BAY, SAGINAW BAY.

ABSTRACT:

ALTHOUGH CONCERN OVER CHANGES IN THE GREAT LAKES HAS EXISTED FOR MANY YEARS, THE IDEA THAT THE LAKES ARE UNDERGOING ACCELERATED EUTROPHICATION IS RECENT. ENVIRONMENTAL CHANGES CAN BE CONSIDERED IN THREE CATEGORIES: POLLUTION OF INSHORE AREAS, LONG-TERM CHANGES IN OPEN WATERS, AND CHANGES IN SEDIMENTS. ON THE BASIS OF ACCEPTED PHYSICOCHEMICAL CHARACTERISTICS, LAKES SUPERIOR, MICHIGAN, AND HURON ARE OLIGOTROPHIC, LAKE ERIE IS EUTROPHIC AND LAKE ONTARIO IS IN AN INTERMEDIATE CONDITION. SUPERIOR REMAINS OLIGOTROPHIC, EXCEPT FOR LOCALIZED POLLUTION; CHANGES IN FISH STOCKS ARE TRACEABLE TO COMMERCIAL FISHING AND PREDATION BY LAMPREY. LAKES MICHIGAN AND HURON HAVE UNDERGONE CHANGES INVOLVING DISSOLVED OXYGEN, TOTAL DISSOLVED SOLIDS AND BIOTA WHICH INDICATE INCREASING EUTROPHY, ESPECIALLY IN GREEN AND SAGINAW BAYS. LAKE ERIE HAS SHOWN MAJOR CHANGES IN LIMNOLOGICAL FACTORS AND BIOTA; EFFECTS OF INCREASED POLLUTION AND EUTROPHICATION OF ERIE HAVE SPREAD TO LAKE ONTARIO. THE MOST IMPORTANT CHANGES APPARENTLY ARE THOSE OCCURRING IN SEDIMENTS OWING TO THE CONTRIBUTION OF LARGE QUANTITIES OF ALLOCHTHONOUS MATERIALS RESULTING FROM URBANIZATION AND INDUSTRIALIZATION. CHANGES IN SEDIMENTS ARE IMPORTANT FACTORS IN THE OBSERVED CHANGES IN LIMNOLOGICAL FACTORS AND FISH POPULATIONS. ABATEMENT OF PRESENT CONDITIONS IN LAKE ERIE IS THEORETICALLY POSSIBLE. (SEE ALSO W70-03975). (VOIGTLANDER-WISCONSIN)

FIELD 05C

ACCESSION NO. W70-07269

COASTAL ENTRAPMENT IN LAKE HURON,

WATERLOO UNIV. (ONTARIO).

G. T. CSANADY.

FIFTH INTERNATIONAL WATER POLLUTION RESEARCH CONFERENCE, SAN FRANCISCO, JULY 26-AUGUST 1, 1970. PREPRINT, 7 P, 8 FIG, 1 REF.

DESCRIPTORS:

\*LAKE HURON, \*WATER CIRCULATION, \*COOLING WATER, NUCLEAR POWERPLANTS, MIXING, FLUORESCENCE, DYE RELEASES, BAYS, DIFFUSION, WATER TEMPERATURE, PUMPING PLANTS.

IDENTIFIERS:

CONCENTRATION, SLICK, WATERLOO(ONTARIO, CANADA).

ABSTRACT:

IN LAKE HURON AT DOUGLAS POINT, A STUDY WAS MADE OF THE WATER EXCHANGE MECHANISM BETWEEN THE SHORE ZONE AND THE MAIN MASS OF THE LAKE. EARLIER EXPERIMENTS HAD SHOWN A TENDENCY FOR THE TAGGED COOLING WATER OF THE DOUGLAS POINT NUCLEAR POWER STATION TO REMAIN TRAPPED IN THE SHORE ZONE SHUTTLEING BACK AND FORTH PARALLEL TO THE SHORE. A SATURATION RUN WAS ENVISAGED, CONSISTING OF A CONTINUOUS DISCHARGE OF THODAMINE B DYE FOR A PERIOD OF SOME THREE WEEKS. AFTER CONTINUOUS SAMPLING AND FLUOROMETRIC OBSERVATIONS DURING THESE THREE WEEKS, IT WAS CONCLUDED THAT NO DYE CONCENTRATION BUILD-UP WAS OBSERVED EXCEPT DYE RETENTION TO A VERY MINOR EXTENT IN BAYS AND OTHER SHELTERED POCKETS OF WATER. OWING TO THE FORTUNATE CHOICE OF LOCATION NEAR A DYNAMICALLY ACTIVE PART OF LAKE HURON, THE COOLING WATER EFFLUX FROM THE DOUGLAS POINT STATION MIXES READILY WITH THE MAIN LAKE MASS, SO THAT NO LONG-TERM BUILD-UP OF CONCENTRATIONS NEED BE FEARED. ON A SHORT-TERM BASIS, SHORE CONCENTRATIONS IN THE VICINITY OF THE STATION CAN BE ALMOST AS HIGH AS CONCENTRATIONS IN THE EFFLUX. (OSBORNE-VANDERBILT)

FIELD 02H, 05B

ACCESSION NO. W70-09606



MERCURY IN GREAT LAKES FISH,

BUREAU OF COMMERCIAL FISHERIES, ANN ARBOR, MICH.

HARRY L. SEAGRAN.

LINNO, VOL 3, NO 2, P 3-10, 1970. 2 FIG.

DESCRIPTORS:

HEAVY METALS, \*GREAT LAKES, \*PUBLIC HEALTH, WATER POLLUTION EFFECTS, WATER POLLUTION SOURCES, FISH HARVEST, INSPECTION, LEGAL ASPECTS, \*MONITORING, ON-SITE INVESTIGATIONS, INDUSTRIAL WASTES, PULP AND PAPER INDUSTRY, PULP WASTES, ECONOMIC IMPACT, LAKE HURON, LAKE ERIE.

IDENTIFIERS:

\*RECOMMENDATIONS, \*MERCURY, FISHING CLOSURES, CHLOR-ALKALI PLANTS, MINAMATA DISEASE, ST. CLAIR RIVER.

ABSTRACT:

THIS ARTICLE SUMMARIZES STATEMENTS BY PUBLIC AGENCIES AND THE PRIVATE SECTOR DEALING WITH MERCURY CONTAMINATION INTRODUCED BEFORE THE SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES AND THE ENVIRONMENT OF THE SENATE COMMITTEE ON COMMERCE. THE DEVELOPMENT OF THE CURRENT SITUATION, SOURCES OF CONTAMINATION, BACKGROUND ON MERCURY CONTAMINATION, ECONOMIC ASSESSMENT OF LOSSES DUE TO MERCURY CONTAMINATION, A DESCRIPTION OF CURRENT BCF RESEARCH, AND A LIST OF RECOMMENDATIONS ARE DISCUSSED. THE RECOMMENDATIONS STRESS THE NEED TO IDENTIFY ALL SOURCES OF MERCURY POLLUTION AND DETERMINE THE FATE AND TOXIC EFFECTS OF MERCURY IN THE ENVIRONMENT. (SEE ALSO W70-10322) (KATZ-WASHINGTON)

FIELD 05C

ACCESSION NO. W70-10321

EFFECTS OF ACID MINE WASTES ON PHYTOPLANKTON COMMUNITIES OF TWO NORTHERN  
ONTARIO LAKES,

ONTARIO WATER RESOURCES COMMISSION, TORONTO.

M. G. JOHNSON, M. F. P. MICHALSKI, AND A. E. CHRISTIE.

JOURNAL FISHERIES RESEARCH BOARD OF CANADA, VOL 27, NO 3, P 425-444, 1970. 5  
FIG, 6 TAB, 19 REF.

DESCRIPTORS:

\*ACID MINE WATER, \*PHYTOPLANKTON, \*LAKES, PRIMARY PRODUCTIVITY, WASTE  
TREATMENT, HYDROGEN ION CONCENTRATION, SULFATES, NITRATES, CALCIUM,  
CARBON DIOXIDE, PHOSPHORUS, SILICA, CHRYSOPHYTA, CYANOPHYTA, LAKE  
HURON, RADIOACTIVITY, RADIUM RADIOISOTOPES, PHYSICOCHEMICAL PROPERTIES,  
DEPTH, SAMPLING, BIOASSAY, IONS, CARBON RADIOISOTOPES, LIGHT  
PENETRATION, TEMPERATURE, DIATOMS, ECOSYSTEMS, CHLOROPHYCEAE, WATER  
POLLUTION EFFECTS, WATER POLLUTION SOURCES.

IDENTIFIERS:

\*ONTARIO(CANADA), \*URANIUM, INORGANIC CARBON, DUNLOP LAKE(CANADA),  
QUIRKE LAKE(CANADA), PECORS LAKE(CANADA).

ABSTRACT:

DIFFERENCES BETWEEN LAKES CONTAMINATED BY URANIUM-MILLING WASTES AND  
ONE UNAFFECTED LAKE WERE RELATED DIRECTLY TO URANIUM EXTRACTION  
PROCESSES AND SUBSEQUENT WASTE TREATMENT. LOW PH AND HIGH  
CONCENTRATIONS OF SULFATES, NITRATES, AND CALCIUM OCCURRED IN  
CONTAMINATED LAKES; LOW CONCENTRATIONS OF INORGANIC CARBON, APPARENTLY  
LIMITING PRODUCTION, RESULTED FROM REDUCED SOLUBILITY, LOSS, AND  
POSSIBLY INEFFICIENT REGENERATION OF CARBON DIOXIDE. OTHER MAJOR  
NUTRIENTS DID NOT APPEAR LIMITING, SINCE THERE WERE MORE NITRATES IN  
CONTAMINATED LAKES THAN IN CONTROL LAKE; PHOSPHORUS AND SILICA OCCURRED  
IN SIMILAR CONCENTRATIONS IN ALL LAKES. LOWER PHYTOPLANKTON POPULATIONS  
AND LOWER DIVERSITY INDICES WERE FOUND IN CONTAMINATED LAKES; MANY  
SPECIES OF BACILLARIOPHYCEAE, CHRYSOPHYCEAE, AND MYXOPHYCEAE DEVELOPED  
IN UNAFFECTED LAKE BUT WERE ABSENT OR OCCURRED RARELY IN CONTAMINATED  
LAKES, WITH AVERAGE PRIMARY PRODUCTIVITIES MUCH LOWER. BIOASSAYS  
CONFIRMED THE IMPORTANCE OF INORGANIC CARBON IN LIMITING PRIMARY  
PRODUCTIVITY. A POTENTIAL COMPENSATORY MECHANISM IN CONTAMINATED LAKES  
WAS DEEPENING OF THE EUPHOTIC ZONE. ALTHOUGH GREATER CONCENTRATIONS OF  
INORGANIC CARBON OCCURRED AND WERE ASSIMILATED IN HYPOLIMNETIC THAN IN  
EPI LIMNETIC WATERS, THIS DID NOT OVERCOME EFFECTS OF REDUCTION IN  
SPECIES DIVERSITY AND ABUNDANCE OF PHYTOPLANKTON ON AREAL PRIMARY  
PRODUCTIVITY. (JONES-WISCONSIN)

FIELD 05C

ACCESSION NO. W71-00114

KAVANAUGH V BAIRD (DISPUTE OVER TITLE TO RELICTION ON LAKE HURON).

241 MICH 240, 217 NW 2-7 (1928).

DESCRIPTORS:

\*BOUNDARY DISPUTES, \*MICHIGAN, \*LAKE HURON, \*ACCRETION(LEGAL ASPECTS), STATE GOVERNMENTS, ADMINISTRATIVE AGENCIES, LAND TENURE, REAL PROPERTY, OWNERSHIP OF BEDS, LAKES, NAVIGABLE WATERS, MEANDERS, BOUNDARIES(PROPERTY), DOCKS, EASEMENTS, LEGAL ASPECTS, JUDICIAL DECISIONS.

ABSTRACT:

PLAINTIFF RIPARIAN LANDOWNER BROUGHT ACTION AGAINST DEFENDANT STATE COMMISSIONER TO QUIET TITLE TO A RELICTION ON LAKE HURON. PLAINTIFF CLAIMED TITLE IN FEE TO THE RELICTION, WHEREAS DEFENDANT ASSERTED TITLE IN THE STATE IN TRUST FOR THE PEOPLE. THE COURT OBSERVED THAT A RIPARIAN OWNER HAS A RIGHT OF ACCESS TO THE NAVIGABLE WATERS EXTENDING FROM THE MEANDER LINE, ALTHOUGH THE INTERVENING SPACE HAS BECOME DRY THROUGH RELICTION, BUT THIS RIGHT DOES NOT ENTITLE THE RIPARIAN OWNER TO A FEE TITLE IN THE RELICTION. THE COURT FURTHERMORE NOTED THAT PLAINTIFF HAD THE INDEFEASIBLE RIGHT TO WHARF OUT TO THE NAVIGABLE WATERS. DETERMINING THAT CHANGES IN THE LAKESHORE BY ACCRETION AND RELICTION DO NOT AFFECT THE RIGHTS OF RIPARIAN OWNERS OR THE STATE, AND THAT TITLE TO THE LAKE BED WAS IN THE STATE WHEN IT WAS ADMITTED TO THE UNION, THE COURT HELD TITLE IN DEFENDANT. THE COURT REJECTED PLAINTIFF'S ASSERTION THAT THIS HOLDING VIOLATED THE FOURTEENTH AMENDMENT. (HART-FLORIDA)

FIELD 06E

ACCESSION NO. W71-03050

GREAT LAKES SHORELAND MANAGEMENT AND EROSION DAMAGE CONTROL FOR MICHIGAN.

MICHIGAN WATER RESOURCES COMMISSION, LANSING. DEPT. OF NATURAL RESOURCES.

DEPARTMENT OF NATURAL RESOURCES, WDS-4, JANUARY 1970. 18 P, 21 FIG. SUPPORTED BY A WATER RESOURCES COUNCIL GRANT.

DESCRIPTORS:

\*SHORE PROTECTION, \*EROSION CONTROL, \*GREAT LAKES, \*LITTORAL DRIFT, \*SOIL EROSION, \*FLOOD DAMAGE, BANK STABILITY, MICHIGAN, LAKE SHORES, LAKE ERIE, LAKE MICHIGAN, LAKE HURON, SEICHES, WIND TIDES, LAND MANAGEMENT, SEDIMENT CONTROL.

IDENTIFIERS:

\*SHORELAND MANAGEMENT.

ABSTRACT:

A PROGRAM HAS BEEN DEVELOPED AND INTRODUCED TO THE MICHIGAN LEGISLATURE TO PROVIDE FOR THE PROTECTION, EFFECTIVE MANAGEMENT, AND MAINTENANCE OF THE QUALITY OF THE GREAT LAKES SHORELANDS OF MICHIGAN. INCLUDED ARE PROVISIONS TO: REQUIRE ZONING OF SHORELANDS; ESTABLISH THE RESPONSIBILITIES OF THE DEPARTMENT OF NATURAL RESOURCES AND THE WATER RESOURCES COMMISSION; AUTHORIZE ENGINEERING AND SPECIAL STUDIES OF THE SHORELANDS; AND DEVELOP A COMPREHENSIVE PLAN FOR THE USE OF THE SHORELANDS. THE SHORELANDS OF SOME OF MICHIGAN'S SOUTHERN COUNTIES ARE OVER 80 PERCENT DEVELOPED. EROSION IS A NATURAL PROCESS; HOWEVER, WHEN WATER LEVELS ARE HIGH AND WHEN HIGH WINDS OCCUR, DAMAGE CAN BE SEVERE. IN ADDITION TO DAMAGES CAUSED BY NORMAL WEATHER DURING HIGH WATER, THERE IS A THREAT OF SHORT BUT VIOLENT FLUCTUATIONS FROM SEICHES THAT CAN INUNDATE LARGE AREAS WITHIN MINUTES. PRIMARY DAMAGE RESULTS FROM EROSION OF THE SHORELINE, CAUSING PHYSICAL LOSS OF LAND AREAS, TREES, STRUCTURES, DOCKS, HOMES, COTTAGES AND ROADS. ACCELERATED SEDIMENTATION IMPAIRS WATER QUALITY, INCREASES DOMESTIC WATER TREATMENT COSTS, DESTROYS AQUATIC LIFE AND HABITAT, AND FILLS RIVER MOUTHS. A SHORELAND MANAGEMENT PROGRAM SHOULD GIVE FIRST PRIORITY TO ASSURING THAT NEW DEVELOPMENTS ALONG THE GREAT LAKES WILL NOT BE SUBJECT TO EROSION EFFECTS. A PARTNERSHIP MANAGEMENT PROGRAM BETWEEN THE MICHIGAN STATE GOVERNMENT AND LOCAL GOVERNMENTS IS SUGGESTED. (POERTNER)

FIELD 02H, 02J

ACCESSION NO. W71-03908

FISH AND CRAYFISH MORTALITIES DUE TO AN INTERNAL SEICHE IN GEORGIAN BAY, LAKE HURON,

DEPARTMENT OF LANDS AND FORESTS, MAPLE (ONTARIO). RESEARCH BRANCH.

ALAN R. EMERY.

JOURNAL OF THE FISHERIES RESEARCH BOARD OF CANADA, VOL 27, P 1165-1168 1970.  
9 REF, 1 TAB, 1 FIG.

DESCRIPTORS:

\*THERMAL POLLUTION, \*FISH, \*GREAT LAKES, BEHAVIOR, SCULPINS, CRAYFISH, TROUT, PERCHES, \*SEICHES, FISHKILL, MORTALITY, TURBIDITY, LIGHT PENETRATION, TEMPERATURE.

IDENTIFIERS:

\*LAKE HURON, GEORGIAN BAY, \*ORCONECTES.

ABSTRACT:

FISH MORTALITY DUE TO AN INTERNAL SEICHE IS DESCRIBED. AN INTERNAL SEICHE IN GEORGIAN BAY, LAKE HURON, ALTERED WATER TEMPERATURES AND TRANSPARENCY IN LITTLE DUNKS BAY (A SMALL SHALLOW BAY). A SUDDEN DECREASE IN TEMPERATURE WAS THE PROBABLE CAUSE OF MORTALITIES IN SCULPINS (COTTUS BAIRDI) AND CRAYFISH (ORCONECTES PROPINQUUS) AS WELL AS OF MARKED CHANGES IN BEHAVIOR OF OTHER FISH SPECIES. TROUT-PERCH (PERCOPSIS OMISCOMAYCUS) APPEARED UNAFFECTED. (WAHTOLA-WASHINGTON)

FIELD 05C, 02H

ACCESSION NO. W71-05208

TWELFTH CONFERENCE ON GREAT LAKES RESEARCH,

MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.; AND BUREAU OF  
COMMERCIAL FISHERIES, ANN ARBOR. GREAT LAKES FISHERY LAB.

DAVID C. CHANDLER, AND GEORGE Y. HARRY.

PROCEEDINGS TWELFTH CONFERENCE ON GREAT LAKES RESEARCH, MAY 5-7, 1969,  
UNIVERSITY OF MICHIGAN, ANN ARBOR: INTERNATIONAL ASSOCIATION FOR GREAT  
LAKES RESEARCH, 1969. 923 P.

DESCRIPTORS:

\*CONFERENCES, \*LIMNOLOGY, \*GREAT LAKES, LAKE SUPERIOR, LAKE HURON, LAKE  
MICHIGAN, LAKE ONTARIO, LAKE ERIE, WATER POLLUTION EFFECTS, BOTTOM  
SEDIMENTS, SEDIMENTATION, SAMPLING, WATER QUALITY, WATER BALANCE, WATER  
RESOURCES DEVELOPMENT, WATER MANAGEMENT(APPLIED).

IDENTIFIERS:

GREAT LAKES RESEARCH CONFERENCE.

ABSTRACT:

THE TWELFTH CONFERENCE WAS HELD MAY 5-7, 1969, AT ANN ARBOR, MICHIGAN,  
CO-HOSTED BY THE GREAT LAKES FISHERY LABORATORY OF THE U.S. BUREAU OF  
COMMERCIAL FISHERIES AND THE GREAT LAKES RESEARCH DIVISION OF THE  
UNIVERSITY OF MICHIGAN. EMPHASIS IN THE GENERAL SESSIONS WAS ON THE  
RESOURCE VALUES OF THE GREAT LAKES AND THEIR ROLE IN THE NATIONAL  
PROGRAM OF MARINE SCIENCE. AUTHORITIES AT THE REGIONAL AND NATIONAL  
LEVELS FROM CANADA AND THE UNITED STATES WERE PARTICIPANTS IN THESE  
GENERAL SESSIONS. CONTRIBUTED PAPERS COVERED THE USUAL SCIENTIFIC  
DISCIPLINES IN ADDITION TO SPECIAL TOPICS SUCH AS: RESOURCE MANAGEMENT  
AND ECONOMICS; WATER MANAGEMENT; LIMNOLOGICAL ENGINEERING; AND PHYSICAL  
LAKE MODELS. THE SYMPOSIA WERE ON QUATERNARY HISTORY OF THE GREAT LAKES  
REGION, PESTICIDES AND THE GREAT LAKES, THE POTENTIAL APPLICATION OF  
REMOTE SENSING TO GREAT LAKES PROBLEMS, AND INSTRUMENTATION FOR STUDIES  
IN PHYSICAL LIMNOLOGY. (SEE ALSO W71-05562 THRU W71-05571)(KNAPP-USGS)

FIELD 02H, 02J, 05B

ACCESSION NO. W71-05561

PROFILES BETWEEN MANITOULIN ISLAND AND TOBERMORY (BRUCE PENINSULA),

HUNTEC LTD., TORONTO (ONTARIO).

J. W. PRIOR.

IN: PROCEEDINGS TWELFTH CONFERENCE ON GREAT LAKES RESEARCH, MAY 5-7, 1969,  
UNIVERSITY OF MICHIGAN, ANN ARBOR: INTERNATIONAL ASSOCIATION FOR GREAT  
LAKES RESEARCH, P 300-305, 1969. 6 P, 4 FIG, 3 REF.

DESCRIPTORS:

\*PROFILES, \*SOUNDING, \*SEISMIC STUDIES, \*BATHYMETRY, \*LAKE HURON,  
BOTTOM SEDIMENTS, TOPOGRAPHY, SEDIMENTATION, CORES, SAMPLING, GREAT  
LAKES.

IDENTIFIERS:

GEORGIAN BAY(LAKE HURON).

ABSTRACT:

TWO HYDROGRAPHIC AND SEISMIC PROFILES WERE RUN IN LAKE HURON BETWEEN  
TOBERMORY AND FITZWILLIAM ISLAND AS PART OF A PIPE LINE FEASIBILITY  
STUDY. THE STUDY SHOWED THAT THE SHORTEST COURSE WAS UNSUITABLE WITH  
MANY ROCK LEDGES ON LAKE BOTTOM. A MORE EASTERLY COURSE SHOWED A  
PREDOMINANTLY SEDIMENT COVERED LAKE FLOOR. A GORGE WITHIN THE BEDROCK  
EAST OF YEO ISLAND IS OBSERVED TO TREND AND DEEPEN TO THE NORTH EAST.  
(SEE ALSO W71-05561)(KNAPP-USGS)

FIELD 02H

ACCESSION NO. W71-05564

SURFACE WATER INPUTS OF IODINE, BROMINE, AND CHLORINE TO LAKE HURON,

MICHIGAN UNIV., ANN ARBOR. DEPT. OF METEOROLOGY AND OCEANOGRAPHY; AND  
MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.

MARY A. TIFFANY, AND JOHN W. WINCHESTER.

IN: PROCEEDINGS TWELFTH CONFERENCE ON GREAT LAKES RESEARCH, MAY 5-7, 1969,  
UNIVERSITY OF MICHIGAN, ANN ARBOR: INTERNATIONAL ASSOCIATION FOR GREAT  
LAKES RESEARCH, P 789-800, 1969. 11 P, 3 FIG, 10 TAB, 12 REF, 2 APPEND. AEC  
CONTRACT AT(11-1)-1705.

DESCRIPTORS:

\*WATER POLLUTION SOURCES, \*LAKE HURON, \*HALOGENS, \*GREAT LAKES,  
CHLORINE, CHLORIDES, PATH OF POLLUTANTS, WATER BALANCE, SALINITY,  
INDUSTRIAL WASTES.

IDENTIFIERS:

BROMINE, IODINE, SAGINAW RIVER.

ABSTRACT:

SURFACE WATERS WERE SYSTEMATICALLY SAMPLED AND ANALYZED FOR CHLORINE,  
BROMINE, AND IODINE BY NEUTRON ACTIVATION FOR MATERIAL BALANCE  
CALCULATION OF INPUTS AND OUTFLOWS FOR LAKE HURON. SAGINAW RIVER BASIN  
SAMPLES (42) FROM AUTUMN 1968 SHOWED MARKED HALOGEN POLLUTION, ALSO  
DETECTED IN 11 SAGINAW BAY SAMPLES. RIVER WATER FROM 16 NORTHERN  
MICHIGAN AND ONTARIO LOCATIONS WAS LESS POLLUTED. USING THESE AND  
PREVIOUSLY PUBLISHED ANALYSES, TOGETHER WITH AVAILABLE RAINFALL AND  
RIVER DISCHARGE DATA, TOTAL INPUT/OUTFLOW RATIOS FOR LAKE HURON ARE:  
CL, 1.04; BR, 1.73; I, 1.15. CL AND I ARE APPARENTLY NEAR A STEADY  
STATE, BUT INFLOW OF BR SIGNIFICANTLY EXCEEDS OUTFLOW. IF PRESENT  
INPUTS CONTINUE, THE BR CONCENTRATION WILL RISE IN LAKE HURON, BUT CL  
AND I WILL REMAIN ROUGHLY CONSTANT. REDUCING SAGINAW RIVER HALOGEN  
POLLUTION, WHICH SUPPLIES NEARLY HALF THE CL AND BR INPUT, SHOULD  
DECREASE LAKE HURON CL CONCENTRATION AND ARREST THE INCREASE OF BR  
CONCENTRATION. (SEE ALSO W71-05561) (KNAPP-USGS)

FIELD 05B, 02H

ACCESSION NO. W71-05882



DISSOLVED MINERAL QUALITY OF GREAT LAKES WATERS,

DEPARTMENT OF ENERGY, MINES AND RESOURCES, BURLINGTON (ONTARIO). CANADA  
CENTER FOR INLAND WATERS.

R. R. WEILER, AND V. K. CHAWLA.

IN: PROCEEDINGS TWELFTH CONFERENCE ON GREAT LAKES RESEARCH, MAY 5-7, 1969,  
UNIVERSITY OF MICHIGAN, ANN ARBOR: INTERNATIONAL ASSOCIATION FOR GREAT  
LAKES RESEARCH, P 801-818, 1969. 18 P, 5 FIG, 5 TAB, 15 REF.

DESCRIPTORS:

\*WATER QUALITY, \*WATER CHEMISTRY, \*WATER POLLUTION SOURCES, \*GREAT  
LAKES, TRACE ELEMENTS, SOLUTES, CHLORIDES, CALCIUM, MAGNESIUM, SODIUM,  
POTASSIUM, SULFATES, BICARBONATES, FLUORINE, SAMPLING, INDUSTRIAL  
WASTES, LAKE SUPERIOR, LAKE HURON, LAKE ERIE, LAKE ONTARIO, MONITORING,  
DATA COLLECTIONS, PATH OF POLLUTANTS.

IDENTIFIERS:

\*WATER QUALITY MONITORING.

ABSTRACT:

IN 1968 THE CANADA CENTER FOR INLAND WATERS (CCIW) UNDERTOOK A  
SYSTEMATIC MONITORING OF LAKES ONTARIO, ERIE, HURON AND SUPERIOR IN A  
STUDY OF THE MAJOR (CA, MG, NA, K, SO<sub>4</sub>, CL, HCO<sub>3</sub> AND F) AND TRACE (ZN,  
CU, PB, FE, NI, CR, MN AND SR) ELEMENTS. THE DATA GATHERED ON MAJOR  
ELEMENTS DURING THE PERIOD JULY TO NOVEMBER 1968 WERE EXAMINED AND THE  
RESULTS COMPARED ON A LAKE-WIDE BASIS WITH EARLIER COMPILATIONS TO  
APPRAISE RECENT TRENDS AND CHANGES IN THE COMPOSITION OF THESE WATERS.  
BECAUSE THE CONCENTRATIONS OF ALL MAJOR IONS FOR WHICH DATA ARE  
AVAILABLE IN LAKE SUPERIOR HAVE NOT CHANGED FOR THE LAST 70-80 YEARS,  
THEIR LEVELS ARE APPARENTLY CONTROLLED BY THE BALANCE BETWEEN THE  
AMOUNT OF DISSOLVED SUBSTANCES ADDED BY RUNOFF FROM THE DRAINAGE BASIN  
AND THAT LOST THROUGH ST. MARY'S RIVER. CHLORIDE AND SULPHATE HAVE  
INCREASED IN LAKES MICHIGAN AND HURON. THIS INCREASE IS MOST LIKELY  
CAUSED BY HUMAN ACTIVITIES. IN LAKES ERIE AND ONTARIO, ALL THE MAJOR  
IONS EXCEPT BICARBONATE AND MAGNESIUM HAVE SHOWN A DRAMATIC INCREASE  
SINCE 1910. PREVIOUS TO THAT, THE LAKES WERE ESSENTIALLY UNAFFECTED BY  
HUMAN ACTIVITIES. THE MEDIAN VALUES OF MINOR ELEMENTS (EXCEPTING SR) IS  
GENERALLY BELOW 10 MICROGRAMS/LITER IN THE GREAT LAKES. SORPTION BY  
OXIDES OF MANGANESE AND IRON AND BY SUSPENDED ORGANIC AND INORGANIC  
MATERIAL SEEMS A PLAUSIBLE MECHANISM FOR THE REMOVAL OF MINOR ELEMENTS  
FROM THE LAKES. (SEE ALSO W71-05561) (KNAPP-USGS)

FIELD 05A, 02K, 05B

ACCESSION NO. W71-05883

GEOCHEMICAL SYSTEMS IN ONONDAGA LAKE (CENTRAL NEW YORK STATE) COMPARED WITH THE GREAT LAKES,

SLIPPERY ROCK STATE COLLEGE, PA. DEPT. OF GEOLOGY.

JEFFREY C. SUTHERLAND.

IN: PROCEEDINGS TWELFTH CONFERENCE ON GREAT LAKES RESEARCH, MAY 5-7, 1969, UNIVERSITY OF MICHIGAN, ANN ARBOR: INTERNATIONAL ASSOCIATION FOR GREAT LAKES RESEARCH, P 357-363, 1969. 7 P, 6 FIG, 18 REF. FWQA GRANT WPRD 66-01-68.

DESCRIPTORS:

\*WATER CHEMISTRY, \*CLAY MINERALS, \*LAKES, SILICA, CALCIUM, SODIUM CHLORIDES, PHOSPHATES, LAKE HURON, LAKE ERIE, GREAT LAKES, EQUILIBRIUM, AQUEOUS SOLUTIONS, ION EXCHANGE, CARBONATES, KAOLINITE, MONTMORILLONITE.

IDENTIFIERS:

ONONDAGA LAKE(NY).

ABSTRACT:

ONONDAGA LAKE IS SHALLOW, EUTROPHIC, AND CONTAINS UNUSUALLY HIGH CONCENTRATIONS OF DISSOLVED CA, NA, CL, SIO<sub>2</sub>, AND PO<sub>4</sub>. INTERPRETATIONS OF CHEMICAL AND MINERALOGICAL DATA TESTED IN EQUILIBRIUM MODELS ARE COMPARED WITH THOSE FOR THE GREAT LAKES. THE AVERAGE ANNUAL CONDITION OF NEAR EQUILIBRIUM WITH CALCITE AND DOLOMITE IS INHERITED FROM INFLUENT STREAMS. LAKE ERIE IS IN EQUILIBRIUM WITH HYDROXYAPATITE, BUT ONONDAGA LAKE IS OVERSATURATED, APPROACHING EQUILIBRIUM IN WINTER ONLY. WHEREAS LOWER LIMITS OF SILICA IN THE NORTH CHANNEL AND LAKE HURON ARE PROBABLY ESTABLISHED THROUGH DISSOLUTION OF KAOLINITE, UPPER LIMITS UPON SILICA IN ONONDAGA LAKE MAY PARTLY BE A FUNCTION OF REACTION OF KAOLINITE TO FORM K FELDSPAR. CONCENTRATIONS OF SILICA IN SEDIMENT-ENCLOSED WATERS OF THE NORTH CHANNEL AND ONONDAGA LAKE APPROACH EQUILIBRIUM VALUES WITH AMORPHOUS SILICA. EQUILIBRIUM BETWEEN MONTMORILLONITE AND KAOLINITE MAY DEPEND UPON RATIOS OF CALCIUM TO SODIUM, AMONG OTHER FACTORS: IN CARBORATE MINERAL-BEARING GREAT LAKES SEDIMENTS KAOLINITE APPROACHES EQUILIBRIUM WITH CA MONTMORILLONITE, BUT IN ONONDAGA LAKE APPROACH TO EQUILIBRIUM WITH NA MONTMORILLONITE IS INFERRED. (SEE ALSO W71-05561) (KNAPP-USGS)

FIELD 02H, 02K

ACCESSION NO. W71-05888

WATER POLLUTION PROBLEMS AND CONTROL PROGRAMS IN MICHIGAN'S PORTION OF THE GREAT LAKES.

MICHIGAN WATER RESOURCES COMMISSION, LANSING.

EXCERPTED FROM CLEAN WATER...IT'S UP TO YOU. TYPESCRIPT, 10 P.

DESCRIPTORS:

\*MICHIGAN, \*GREAT LAKES, \*WATER POLLUTION CONTROL, \*WATER POLLUTION SOURCES, WATER QUALITY CONTROL, WATER RESOURCES DEVELOPMENT, POLLUTION ABATEMENT, LAKE ERIE, LAKE HURON, LAKE MICHIGAN, LAKE SUPERIOR, WASTE TREATMENT, ADMINISTRATIVE AGENCIES, STATE GOVERNMENTS, FEDERAL GOVERNMENT, THERMAL POLLUTION, STORM RUNOFF, OIL, SHIPS, IRRIGATION EFFECTS, RUNOFF, ACID MINE WATER, SEDIMENTS, ESTUARINE ENVIRONMENT, EUTROPHICATION.

ABSTRACT:

A SURVEY OF WATER QUALITY CONDITIONS OF THE GREAT LAKES SURROUNDING MICHIGAN SHOWS THAT THE LAKES ARE OF HIGH QUALITY AND RELATIVELY UNPOLLUTED, WITH THE EXCEPTION OF LAKE ERIE AND PORTIONS OF LAKE MICHIGAN. THE MICHIGAN WATER RESOURCES COMMISSION IS EFFECTIVE IN ANTI-POLLUTION EFFORTS, ESPECIALLY THROUGH VOLUNTARY POLLUTION ABATEMENT. THE COMMISSION SPECIFIES RESTRICTIONS ON WASTE DISCHARGES, AND A DEADLINE IS ESTABLISHED FOR MEETING THESE LIMITATIONS. WHERE VOLUNTARY COMPLIANCE IS INEFFECTIVE, THE COMMISSION DOES NOT HESITATE IN SEEKING COURT ACTION OR PURSUING THE PENALTY PROVISIONS OF THE LAW. A SURVEY IS MADE OF VARIOUS ENFORCEMENT CONFERENCES CALLED BY THE SECRETARY OF THE INTERIOR. THE TOP PRIORITY POLLUTION PROBLEMS REQUIRING DEVELOPMENT OF IMPROVED CONTROL TECHNIQUES INCLUDE: (1) THERMAL POLLUTION FROM POWER PLANTS AND INDUSTRY; (2) STORM WATER OVERFLOWS WHICH BYPASS SEWAGE TREATMENT PLANTS; (3) OIL SPILLS; (4) VESSEL POLLUTION IN HARBORS AND HEAVILY USED WATERWAYS; (5) IRRIGATION POLLUTION RESULTING IN CONCENTRATED SALTS AND MINERALS; (6) AGRICULTURAL RUNOFF; (7) ACID MINE DRAINAGE; (8) INCREASE IN SEDIMENT VOLUMES; (9) DESTRUCTION OF ESTUARIES BY POLLUTION, DREDGING, AND FILLING; AND (10) EUTROPHICATION BY ADDITION OF EXCESSIVE NUTRIENTS. A BRIEF SURVEY OF WASTE TREATMENT METHODS IS INCLUDED.  
(SMILJANICH-FLORIDA)

FIELD 05G, 06E

ACCESSION NO. W71-06053

THE ECOLOGY OF THE SECOND TROPHIC LEVEL IN LAKES SUPERIOR, MICHIGAN AND HURON,  
MINNESOTA UNIV., MINNEAPOLIS. SCHOOL OF PUBLIC HEALTH.

W. R. SWAIN, T. A. OLSON, AND T. O. ODLAUG.

AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE AS PB-199 938,  
\$3.00 IN PAPER COPY, \$0.95 IN MICROFICHE. MINNESOTA WATER RESOURCES  
RESEARCH CENTER, BULLETIN 26, OCT 1970. 151 P, 95 FIG, 43 TAB, 85 REF. OWRR  
PROJECT A-011-MINN(10).

DESCRIPTORS:

\*TROPIC LEVEL, \*LAKE SUPERIOR, \*LAKE MICHIGAN, \*LAKE HURON, \*PLANKTON,  
ECOLOGY, ZOOPLANKTON, \*EUTROPHICATION, ORGANISMS, AQUATIC ENVIRONMENT,  
LIMNOLOGY, VERTICAL MIGRATION, BIOGEOGRAPHY, PHYTOPLANKTON, CRUSTACEANS.

IDENTIFIERS:

\*CONTINUOUS PLANKTON RECORDER, MULTI-DEPTH PLANKTON INDICATOR, TWO-NET  
TECHNIQUE, GRIT GAUZE, SILK BOLTING CLOTH.

ABSTRACT:

A SERIES OF LAKE-LONG TRANSECT TOWS WERE MADE WITH THE CONTINUOUS  
PLANKTON RECORDER IN LAKES SUPERIOR, MICHIGAN AND HURON, 1966-68. ALL  
TOWS WERE MADE AT TEN METERS DEPTH WITH EITHER NO. 60 MESH GRIT GAUZE  
OR NO. 15 MESH SILK BOLTING CLOTH. INFORMATION WAS OBTAINED ON ORGANISM  
DISTRIBUTION IN BOTH SPACE AND TIME. THE DENSITY AND DISTRIBUTION OF  
ECOLOGICALLY RELATED GROUPS IN PLANKTON INDICATE THE RELATIVE TROPIC  
STATUS OF THE BODIES OF WATER SAMPLED. LAKE SUPERIOR IS THE MOST  
OLIGOTROPHIC, LAKE HURON THE MOST EUTROPHIC AND LAKE MICHIGAN MORE  
MESOTROPHIC. A MEAN OF 200 TO 300 ORGANISMS PER SECTION WAS SEEN IN  
LAKE SUPERIOR; A RANGE OF 5,000 TO 6,000 ORGANISMS PER SECTION WAS SEEN  
IN LAKE MICHIGAN AND FROM 20,000 TO 21,000 ORGANISMS WERE OBSERVED FROM  
ONE YEAR TO ANOTHER AND FROM ONE SEASON TO ANOTHER. MARKED VARIATIONS  
IN BOTH NUMBERS AND SPECIES OF ORGANISMS WERE EVIDENT IN THE LAKES.  
LIMITATIONS OF THE CONTINUOUS PLANKTON RECORDER METHOD ARE DESCRIBED.  
(WALTON-MINNESOTA)

FIELD 05C

ACCESSION NO. W71-08665

ORGANIC CARBON AND NITROGEN IN THE SURFACE SEDIMENTS OF LAKES ONTARIO, ERIE,  
AND HURON,

DEPARTMENT OF ENERGY, MINES AND RESOURCES, BURLINGTON (ONTARIO). CANADA  
CENTER FOR INLAND WATERS.

A. L. W. KEMP.

JOURNAL OF SEDIMENTARY PETROLOGY, VOL 41, NO 2, P. 537-548, JUNE 1971. 12 P, 5  
FIG, 4 TAB, 49 REF.

DESCRIPTORS:

\*ORGANIC MATTER, \*BOTTOM SEDIMENTS, \*GREAT LAKES, WATER POLLUTION  
SOURCES, BIODEGRADATION, LAKE ONTARIO, LAKE ERIE, LAKE HURON, MUD,  
NITROGEN, SEDIMENT-WATER INTERFACES, MUD-WATER INTERFACES, PATH OF  
POLLUTANTS, WATER CHEMISTRY, BENTHOS, SURVEYS, POLLUTANT IDENTIFICATION.

ABSTRACT:

ANALYSES OF 355 SURFACE SEDIMENT SAMPLES (TOP CM) FROM LAKES ONTARIO,  
ERIE AND HURON WERE CARRIED OUT FOR ORGANIC CARBON, CARBONATE CARBON,  
EH, PH, NITROGEN AND SEDIMENT TEXTURE. SIMILAR ANALYSES WERE CARRIED  
OUT ON A REPRESENTATIVE CORE FROM EACH LAKE AT CLOSE INTERVALS DOWN TO  
20 CM. THE DISTRIBUTION OF ORGANIC MATTER IN THE SEDIMENTS OF EACH LAKE  
WAS RELATED TO THE TOPOGRAPHIC FEATURES OF THE LAKES. ORGANIC CARBON  
CONTENT WAS FOUND TO BE DIRECTLY PROPORTIONAL TO THE CLAY CONTENT OF  
THE SEDIMENT, RANGING FROM LESS THAN 1% IN THE COARSE NEAR SHORE SANDS  
TO OVER 4% IN THE FINE CLAY MUDS WITHIN THE INDIVIDUAL LAKE SUB-BASINS.  
THE ORGANIC CARBON CONTENT OF LAKE ERIE SEDIMENTS WAS GENERALLY LOWER  
THAN THAT OF LAKES HURON AND ONTARIO, AND IS ATTRIBUTED TO DILUTION OF  
THE SEDIMENTS WITH COARSER NON-CLAY PARTICLES. NITROGEN WAS DIRECTLY  
PROPORTIONAL TO ORGANIC CARBON WITH CARBON-NITROGEN RATIOS RANGING FROM  
7 TO 13 IN THE SURFACE SEDIMENT. ORGANIC CARBON AND NITROGEN DECREASED  
SHARPLY FROM THE SURFACE DOWN TO ABOUT 10 CM IN EACH CORE. THE DECREASE  
IS DUE PARTLY TO MINERALIZATION OF ORGANIC MATTER BY BOTTOM ORGANISMS  
AND PARTLY TO AN INCREASING INPUT OF ORGANIC MATTER TO THE LAKES IN THE  
LAST 30 YEARS. (KNAPP-USGS)

FIELD 05A, 05B, 02H

ACCESSION NO. W71-10327

THE WATER RESOURCES OF THE LOWER LAKE HURON DRAINAGE BASIN.

MICHIGAN STATE WATER RESOURCES COMMISSION, LANSING. DEPT. OF CONSERVATION.

WATER RESOURCES COUNCIL GRANT. STATE OF MICHIGAN, WATER RESOURCES COMMISSION,  
DEPARTMENT OF CONSERVATION, LANSING, PL. 18, MAY 1968. 189 P, 27 FIG, 45  
TAB, 61 REF. PL. 18.

DESCRIPTORS:

\*WATER RESOURCES, \*MICHIGAN, \*PLANNING, \*WATERSHEDS(BASINS), WATER  
QUALITY, WATER UTILIZATION, WATER SUPPLY, GROUNDWATER, RIVER FLOW, SOIL  
CLASSIFICATIONS, AGRICULTURE, INDUSTRIAL WATER, RECREATION,  
ADMINISTRATION, REGIONAL ANALYSIS, GEOLOGY, CLIMATOLOGY, IRRIGATION,  
FLOOD CONTROL, DRAINAGE PRACTICES, EMPLOYMENT OPPORTUNITIES, WASTE  
WATER DISPOSAL, LAKE HURON.

IDENTIFIERS:

\*LAKE HURON DRAINAGE BASIN.

ABSTRACT:

THE FOLLOWING ARE PRESENTED: A COMPREHENSIVE VIEW OF THE EXISTING WATER  
USES ON THE LOWER LAKE HURON DRAINAGE BASIN, A SUMMARY OF RECENT TRENDS  
IN REGIONAL WATER USES, AND ANTICIPATED TRENDS AND FUTURE USES. A FEW  
SMALL AREAS IN THIS 9,730 SQUARE MILE REGION HOLD MOST OF THE MORE THAN  
1,100,000 PERSONS LIVING IN THE REGION. THESE HEAVILY POPULATED AREAS  
ARE ALSO HIGHLY INDUSTRIALIZED GIVING RISE TO CONCENTRATIONS OF WATER  
USE. THE INTENSIVE FARMING CARRIED ON IN THE REGION ALSO CONTRIBUTES  
SUBSTANTIALLY TO TOTAL WATER USE. THE AMOUNT OF ADDITIONAL WATER  
NECESSARY TO SUPPORT THE PREDICTED GROWTH OF THE POPULATION AND THE  
ECONOMY IN THE CLOSING DECADES OF THIS CENTURY IS CONSIDERABLE. THE  
MAGNITUDE OF THE RESOURCE, THE VAST QUANTITIES AVAILABLE FROM THE GREAT  
LAKES, THE LOCAL RIVERS AND INLAND LAKES, AND THE GROUNDWATER RESOURCES  
WILL BE ADEQUATE TO MEET THIS DEMAND IF DILIGENT EFFORTS ARE MADE TO  
PLAN AND MANAGE THE WATER RESOURCES FOR MAXIMUM MULTI-PURPOSE  
BENEFICIAL USE. DURING THE COMING DECADE AND BEYOND, IT IS PROBABLE  
THAT THE LOWER LAKE HURON DRAINAGE BASIN WILL EXPERIENCE INCREASES IN  
WATER USE FROM ADDITIONAL POPULATION, HIGHER PER CAPITA USE RATES, AND  
INDUSTRIAL GROWTH AND DEVELOPMENT. LAKE HURON ITSELF WILL BECOME THE  
NEW SOURCE OF SUPPLY FOR TWO OF THE THREE LARGEST METROPOLITAN AREAS IN  
THE STATE. (POERTNER)

FIELD 06D, 06B

ACCESSION NO. W71-10744

MERCURY POISONING (OR) THE FISH YOU CATCH CAN KILL YOU.

FIELD AND STREAM, VOL 75, NO 3, P 44-45, 49-51, JULY 1970.

DESCRIPTORS:

\*HEAVY METALS, \*FISH, LAKE HURON, LAKE ERIE, ST. LAWRENCE RIVER,  
COMMERCIAL FISHING, SPORT FISHING, TOXICITY.

IDENTIFIERS:

\*LAKE ST. CLAIR, \*ST. CLAIR RIVER, \*MERCURY, DETROIT RIVER, WABIGOON  
RIVER(CANADA), CLAY LAKE(CANADA), LAKE WINNIPEG(CANADA), SASKATCHEWAN  
RIVER(CANADA), CEDAR LAKE(CANADA), HOWE SOUND(CANADA), LAKE ST.  
FRANCIS(CANADA), BALL LAKE(CANADA), INDIAN LAKE(CANADA), GRASSY NARROWS  
LAKE(CANADA), LOUNT LAKE(CANADA), SEPARATION LAKE(CANADA), UMFREVILLE  
LAKE(CANADA), TETU LAKE(CANADA), SWAN LAKE(CANADA), EAGLENEST  
LAKE(CANADA), CANADA, BIOLOGICAL MAGNIFICATION.

ABSTRACT:

THE DISCOVERY IS TRACED OF MERCURY IN FISH IN LAKE ST. CLAIR AND IN  
MANY OTHER LAKES AND RIVERS IN CANADA AND THE UNITED STATES. THE  
SOURCES, LEVELS, EFFECTS OF, AND REACTIONS TO THE IDENTIFICATION OF  
MERCURY CONTAMINATION ARE ALSO REVIEWED. (LITTLE-BATTELLE)

FIELD 05B, 05C

ACCESSION NO. W71-11682

THE CRUSTACEAN PLANKTON COMMUNITIES OF LAKES,

FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.  
KAZIMIERZ PATALAS.

TRANSACTIONS OF THE AMERICAN MICROSCOPICAL SOCIETY, VOL 90, NO 1, P 118,  
1971. 3 REF.

DESCRIPTORS:

\*MARINE ANIMALS, \*CRUSTACEANS, \*PLANKTON, \*LAKES, BIOLOGICAL  
COMMUNITIES, ARCTIC, GREAT LAKES, COLORADO, LAKE HURON, TEMPERATURE,  
LAKE SUPERIOR, EUTROPHICATION, DAPHNIA, TROPHIC LEVELS, SPATIAL  
DISTRIBUTION, DOMINANT ORGANISMS.

IDENTIFIERS:

NORTH AMERICA, CANADIAN SHIELD, BRITISH COLUMBIA, CALANOIDS,  
CYCLOPOIDS, GREAT BEAR LAKE(NW TERRITORIES), GREAT SLAVE LAKE(NW  
TERRITORIES), LAKE WINNIPEG(MANITOBA), ONTARIO, MACKENZIE DELTA(NW  
TERRITORIES), POLAND.

ABSTRACT:

SUMMER PLANKTON COMMUNITIES OF SEVEN GREAT LAKES AND 257 SMALLER NORTH  
AMERICAN LAKES FROM ARCTIC ISLANDS THROUGH CANADIAN SHIELD AND BRITISH  
COLUMBIA TO THE COLORADO MOUNTAINS AND PLAINS, CONTAINED 62 PELAGIC  
CRUSTACEAN SPECIES (29 CLADOCERANS, 25 CALANOIDS, 8 CYCLOPOIDS).  
SPECIES NUMBER IN COMMUNITIES OF GREAT LAKES WAS POSITIVELY CORRELATED  
WITH DEPTH AND EPILIMNIC WATER TEMPERATURE. THERE WERE ONLY TWO TO FOUR  
DOMINANT SPECIES, NUMBER BEING UNRELATED TO TOTAL NUMBER OF SPECIES.  
FROM NORTH TO SOUTH, CALANOIDS TENDED TO DIMINISH AND CYCLOPOIDS AND  
CLADOCERANS INCREASED. BASED ON PERCENTAGE SPECIES IN COMMON PLUS THE  
SAME DOMINANT SPECIES, CERTAIN LAKES HAD HIGH COMMUNITY SIMILARITY.  
NUMBER OF SPECIES IN SMALLER LAKES OF A SINGLE LAKE REGION INCREASED  
PROPORTIONALLY TO LENGTH OF THE GROWING SEASON. ABOUT 30 SEEMS TO BE AN  
ASYMPTOTIC NUMBER OF PELAGIC CRUSTACEAN SPECIES IN ANY ONE REGION. VERY  
LOW AND VERY HIGH DISSOLVED SOLIDS CONCENTRATIONS LIMITED THE SPECIES  
NUMBER; WITH INCREASING EUTROPHICATION, CHANGES AT VARIOUS LEVELS OF  
ZOOPLANKTON ORGANIZATION COULD BE SEEN. IN THE RANGE FROM OLIGOTROPHIC  
TO EUTROPHIC LAKES, THESE SUBSPECIES CAN BE ARRANGED AS FOLLOWS:  
BOSMINA LONGISPINA, BOSMINA GIBBERA, BOSMINA CRASSICORNIS, BOSMINA  
KESSLERI, BOSMINA COREGONI, AND BOSMINA THERSITES. (JONES-WISCONSIN)

FIELD 05C, 02H

ACCESSION NO. W71-12083



SUMMARY OF WATER QUALITY STANDARDS FOR DESIGNATED USE AREAS IN MICHIGAN  
INTERSTATE WATERS.

MICHIGAN WATER RESOURCES COMMISSION, LANSING. DEPT. OF NATURAL RESOURCES.

NOVEMBER, 1968. 29 P, 10 MAP, 1 TAB.

DESCRIPTORS:

\*MICHIGAN, \*STANDARDS, \*WATER QUALITY CONTROL, \*WATER UTILIZATION, ENVIRONMENTAL ENGINEERING, DREDGING, WASTE DISPOSAL, REGULATION, ADMINISTRATIVE AGENCIES, LEGAL ASPECTS, LAKE MICHIGAN, LAKE HURON, LAKE ERIE, LAKE SUPERIOR, WATER POLLUTION, WATER POLLUTION CONTROL, INTERSTATE, CHANNEL IMPROVEMENT, EFFLUENTS, WATER POLLUTION SOURCES, RIVER BASINS, INTERSTATE RIVERS.

ABSTRACT:

INTERSTATE STANDARDS, WATER USE DESIGNATIONS, AND IMPLEMENTATION PLANS OF THE MICHIGAN WATER RESOURCES COMMISSION ARE HEREIN SUMMARIZED. DESIGNATED USE AREAS CONSIDERED BY THIS PUBLICATION INCLUDE: (1) THE ST. JOSEPH RIVER BASIN; (2) LAKE MICHIGAN; (3) LAKE HURON; (4) THE ST. CLAIR RIVER-LAKE ST. CLAIR, DETROIT RIVER-LAKE ERIE, MAUMEE RIVER BASIN; (5) LAKE SUPERIOR AND THE ST. MARYS RIVER; AND (6) THE MENOMINEE AND MONTREAL RIVER BASINS IN MICHIGAN AND OTHER MICHIGAN-WISCONSIN INTERSTATE BOUNDARY WATERS. STANDARDS WILL NOT APPLY DURING PERIODS OF AUTHORIZED DREDGING FOR NAVIGATION PURPOSES, BUT WILL APPLY TO AREAS AFFECTED BY THE DISPOSAL OF SPOIL FROM SUCH OPERATIONS. WHEN WATERS ARE CLASSIFIED UNDER MORE THAN ONE DESIGNATED WATER USE, IT IS INTENDED THAT THE MOST RESTRICTIVE INDIVIDUAL STANDARDS OF THE DESIGNATED USE SHALL BE ADHERED TO. IN AREAS ADJACENT TO OUTFALLS STANDARDS APPLY ONLY AFTER ADMIXTURE OF WASTE EFFLUENTS WITH THE PUBLIC WATERS, BUT IN NO INSTANCE SHALL THE MIXING ZONE ACT AS A BARRIER TO FISH MIGRATION OR INTERFERE UNREASONABLY WITH THE DESIGNATED USES OF THE AREA. A SUMMARY OF THE LEGISLATIVE BASES OF MICHIGAN'S PROGRAM TO CONTROL AND ABATE POLLUTION IS SET FORTH. (JOHNSON-FLORIDA)

FIELD 05G, 06E

ACCESSION NO. W72-00199

GREAT LAKES POLLUTION,

J. D. DINGELL.

IN: THE GREAT LAKES--HOW MANY MASTERS CAN THEY SERVE. 11TH ANNUAL CONFERENCE, MICHIGAN NATURAL RESOURCES COUNCIL, LANSING, MICHIGAN, P 19-26, OCTOBER 1968. 8 P.

DESCRIPTORS:

\*WATER POLLUTION SOURCES, \*WATER POLLUTION CONTROL, \*POLLUTION ABATEMENT, \*GREAT LAKES, WATER POLLUTION, WATER POLLUTION EFFECTS, WATER QUALITY, WATER QUALITY CONTROL, POLLUTANTS, ENVIRONMENTAL SANITATION, WATER POLICY, LAKE ERIE, LAKE HURON, LAKE ONTARIO, LAKE MICHIGAN, LAKE SUPERIOR, FEDERAL GOVERNMENT, STATE GOVERNMENTS, LOCAL GOVERNMENTS, CITIES, STANDARDS, REGULATION.

ABSTRACT:

FEDERAL ACTION IS NECESSARY TO CONTROL AND ABATE POLLUTION: STATE AND LOCAL GOVERNMENTS DO NOT HAVE THE RESOURCES, AND POLLUTION IS NOT MERELY A LOCAL PROBLEM. THE FOLLOWING FACTORS CONSTITUTE THE MAJOR PROBLEMS FACING THE GREAT LAKES; (1) OVER-ENRICHMENT, (2) A BUILDUP OF DISSOLVED SOLIDS, (3) BACTERIAL CONTAMINATION, (4) CHEMICAL CONTAMINATION FROM INDUSTRIAL WASTE DISCHARGES, AND (5) OXYGEN DEPLETION. THE PRESENT STATE OF POLLUTION OF EACH OF THE GREAT LAKES IS EXPLAINED. WATER POLLUTION CAN BE CONTROLLED. ALL OF THE STATES AND TERRITORIES HAVE FILED LETTERS OF INTENT TO ESTABLISH WATER QUALITY STANDARDS. A LIST OF SIXTEEN IMMEDIATE ACTIONS NECESSARY TO SAVE THE GREAT LAKES IS SET FORTH. THE SECRETARY OF INTERIOR SHOULD HAVE THE AUTHORITY TO SET STANDARDS FOR INTRA-STATE WATERS AS WELL AS INTERSTATE. (ROBINSON-FLORIDA)

FIELD 05G, 06E

ACCESSION NO. W72-00247

TURBULENCE IN LAKE HURON,

SYDNEY UNIV. (AUSTRALIA). DEPT. OF MECHANICAL ENGINEERING.

I. S. F. JONES, AND B. C. KENNY.

WATER RESEARCH, VOL 5, NO 9, P 765-776, SEPTEMBER 1971. 8 FIG, 3 TAB, 10 REF.

DESCRIPTORS:

\*TURBULENCE, \*DIFFUSION, \*LAKE HURON, \*WATER POLLUTION,  
\*CURRENTS(WATER), CURRENT METERS, ANALYTICAL TECHNIQUES, HYDROLOGIC  
DATA, TRACERS, DYE RELEASES, PATH OF POLLUTANTS, MATHEMATICAL STUDIES.

IDENTIFIERS:

\*DIFFUSIVITY RATES.

ABSTRACT:

TO IMPROVE THE UNDERSTANDING OF DIFFUSIVE PROCESSES IN LARGE BODIES OF WATER, THE INSTANTANEOUS SPEED AND DIRECTION OF THE CURRENT AT A FIXED POINT TWO METERS BELOW THE SURFACE OF LAKE HURON WERE MEASURED DURING THE SUMMER OF 1967. THE ROOT MEAN SQUARE OF THE CURRENT FLUCTUATIONS, BOTH IN THE STREAMWISE AND LATERAL DIRECTIONS, WAS OF THE ORDER OF 0.05 OF THE MEAN CURRENT BUT VARIED SUBSTANTIALLY FROM DAY TO DAY. BASED ON THREE HOUR RECORDS, THE EULERIAN TIME SCALES WERE FOUND TO BE OF THE ORDER OF 10 MIN WHILE THE LAGRANGIAN TIME SCALES, CALCULATED FROM DIFFUSION STUDIES IN THE SAME AREA THE PREVIOUS SUMMER, WERE OF THE ORDER OF 40 MIN. (WOODARD-USGS)

FIELD 02H, 05B

ACCESSION NO. W72-00578

PROCEEDINGS THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH, PART I AND II.

GREAT LAKES RESEARCH CENTER, DETROIT, MICH.

AVAILABLE FROM TREASURER, P. O. BOX 640, ANN ARBOR, MICH. 48107. PRICE \$18.00  
A SET. 1970. 1063 P.

DESCRIPTORS:

\*GREAT LAKES, \*LAKES, EUTROPHICATION, ALGAE, \*LAKE SUPERIOR, \*LAKE MICHIGAN, \*LAKE HURON, \*LAKE ONTARIO, \*LAKE ERIE, WATER POLLUTION EFFECTS, WATER POLLUTION SOURCES, LIMNOLOGY.

ABSTRACT:

THE THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH WAS HELD 1-3 APRIL, 1970 AT BUFFALO, NEW YORK AND CO-HOSTED BY CORNELL AERONAUTICAL LABORATORY INC. AND THE GREAT LAKES LABORATORY OF THE STATE UNIVERSITY COLLEGE AT BUFFALO. (SEE ALSO W72-01095 THRU W72-01112)

FIELD 02H, 05C

ACCESSION NO. W72-01094

DRY WEIGHT OF THE MACROBENTHOS AS AN INDICATOR OF EUTROPHICATION OF THE GREAT LAKES,

CALIFORNIA STATE COLL., LOS ANGELES. DEPT. OF ZOOLOGY; AND MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.

WAYNE P. ALLEY, AND CHARLES F. POWERS.

INTERNATIONAL ASSOCIATION FOR GREAT LAKES RESEARCH, PROCEEDINGS 13TH CONFERENCE ON GREAT LAKES RESEARCH, PART 2, P 595-600, 1970. 3 FIG, 2 TAB, 16 REF.

DESCRIPTORS:

\*EUTROPHICATION, \*GREAT LAKES, \*BENTHOS, \*INDICATORS, BIOMASS, SAMPLING, AMPHIPODA, OLIGOCHAETES, LAKE SUPERIOR, LAKE MICHIGAN, LAKE HURON, LAKE ERIE.

IDENTIFIERS:

\*MACROBENTHOS, CHIRONOMIDS, SPHAERIIDS.

ABSTRACT:

THE EUTROPHICATION LEVELS OF FOUR GREAT LAKES WERE DELINEATED ON THE BASIS OF DRY WEIGHT OF MACROBENTHOS, INCLUDING AMPHIPODS, OLIGOCHAETES, SPHAERIIDS, AND CHIRONOMIDS. THE FOLLOWING GRAND AVERAGES IN G PER SQ M WERE ESTABLISHED: LAKE SUPERIOR - 0.9, LAKE HURON - 1.48, LAKE MICHIGAN - 3.40, AND LAKE ERIE - 4.63. IN TERMS OF RAWSON'S CLASSIFICATION OF CANADIAN LAKES, LAKE ERIE IS DEFINITELY EUTROPHIC, LAKE MICHIGAN - MODERATELY EUTROPHIC, LAKE HURON - MESOTROPHIC, AND LAKE SUPERIOR - TRULY OLIGOTROPHIC. (SEE ALSO W72-01094) (WILDE-WISCONSIN)

FIELD 05C, 02H

ACCESSION NO. W72-01105

RAPID FLUCTUATIONS OF CURRENT DIRECTION IN LAKE HURON,

WATERLOO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.

G. T. CSANADY, AND M. MEKINDA.

PROCEEDINGS THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH, APRIL 1-3, 1970,  
STATE UNIVERSITY COLLEGE, BUFFALO, NY, PART 1: INTERNATIONAL ASSOCIATION  
FOR GREAT LAKES RESEARCH, P 397-412, 1970. 18 FIG, 1 TAB, 4 REF.

DESCRIPTORS:

\*CURRENTS(WATER), \*LAKE HURON, \*WATER CIRCULATION, \*DENSITY CURRENTS,  
\*TURBULENCE, LIMNOLOGY, DIFFUSION, MIXING, TURBULENT FLOW, DISPERSION.

IDENTIFIERS:

CURRENT FLUCTUATIONS.

ABSTRACT:

CURRENT DIRECTION FLUCTUATIONS WERE RECORDED AT A FIXED POINT IN LAKE  
HURON DURING THE SUMMER OF 1969. AUTO-CORRELATIONS AND SPECTRA WERE  
OBTAINED, WITH SOME DATA ALSO AVAILABLE FOR THE CROSS-CORRELATION  
BETWEEN TWO DIFFERENT MEASURING POINTS. A SHARP CUTOFF WAS FOUND IN  
SPECTRAL INTENSITY, MOSTLY IN THE DECADE 1-10 CYCLES PER MINUTE. SOME  
RECORDS WERE MARKEDLY PERIODIC, OF A PERIOD TOO LONG TO BE ATTRIBUTABLE  
TO SURFACE WAVE ORBITAL MOVEMENTS, BUT UNEXPECTEDLY SHORT FOR INTERNAL  
WAVES, SUGGESTING THE PRESENCE OF SOME VERY SHARP DENSITY GRADIENTS.  
(SEE ALSO W72-01094 THRU W72-01112 AND W72-02878 THRU W72-02890)  
(KNAPP-USGS)

FIELD 02H

ACCESSION NO. W72-02883

DYE INJECTION IN THE VICINITY OF THE THERMOCLINE,

WATERLOO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.

A. M. HALE.

PROCEEDINGS THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH, APRIL 1-3, 1970,  
STATE UNIVERSITY COLLEGE, BUFFALO, NY, PART 1: INTERNATIONAL ASSOCIATION  
FOR GREAT LAKES RESEARCH, P 419-429, 1970. 14 FIG, 5 REF.

DESCRIPTORS:

\*THERMOCLINE, \*LAKE HURON, \*TRACERS, \*DYE RELEASES, TRACKING  
TECHNIQUES, CURRENTS(WATER), WATER CIRCULATION, GREAT LAKES,  
PHOTOGRAPHY, THERMAL STRATIFICATION, DATA COLLECTIONS.

ABSTRACT:

DURING THE SUMMER OF 1969 A NUMBER OF EXPERIMENTS UTILIZED RHODAMINE B  
DYE, CONTINUOUSLY INJECTED AT THE APPROXIMATE LEVEL OF THE THERMOCLINE  
IN LAKE HURON. ALL OF THE EXPERIMENTS WERE CONDUCTED WHEN THE WINDS  
WERE LESS THAN 15 KT. IN ALL CASES THE POSITION OF THE SOURCE FOR THE  
EXPERIMENTS WAS IN A REGION OF RELATIVELY STRONG TEMPERATURE GRADIENT.  
THE MAXIMUM TEMPERATURE GRADIENT MEASURED WAS 17 DEG C/M. THE GRADIENT  
WAS USUALLY IN THE RANGE 4 TO 12 DEG C/M. THE AVAILABLE CURRENT DATA  
INDICATE THAT THE REGION WAS A SHEAR ZONE AS WELL. (SEE ALSO W72-01094  
THRU W72-01112 AND W72-02878 THRU W72-02890) (KNAPP-USGS)

FIELD 02H, 07B

ACCESSION NO. W72-02885

A LIMNOLOGICAL TOWER FOR 40 M DEPTHS,

WATERLOO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.

A. M. HALE.

PROCEEDINGS THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH, APRIL 1-3, 1970,  
STATE UNIVERSITY COLLEGE, BUFFALO, NY, PART 1: INTERNATIONAL ASSOCIATION  
FOR GREAT LAKES RESEARCH, P 430-433, 1970. 1 FIG.

DESCRIPTORS:

\*LIMNOLOGY, \*EQUIPMENT, \*OFFSHORE PLATFORMS, \*LAKES, \*TOWERS,  
CONSTRUCTION, INSTRUMENTATION, DESIGN, DATA COLLECTIONS, GREAT LAKES.

ABSTRACT:

THE DESIGN DETAILS AND ERECTION PROCEDURE ARE GIVEN FOR A 47 METER LONG  
LAKE RESEARCH TOWER (WATER DEPTH 40 M), WHICH WAS INSTALLED IN LAKE  
HURON DURING 1969. FREE-FALL ANCHORS WERE EMPLACED FROM A BARGE. A  
HINGE IS LOCATED APPROXIMATELY 10 M BELOW THE SURFACE TO ALLOW THE  
STRUCTURE TO BE REMOVED FROM THE ICE-ACTIVE REGION AT THE END OF THE  
SEASON. (SEE ALSO W72-01094 THRU W72-01112 AND W72-02878 AND W72-02890)  
(KNAPP-USGS)

FIELD 02H, 07B

ACCESSION NO. W72-02886



SPECTRA OF MONTHLY MEAN WATER LEVEL IN THE GREAT LAKES,

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO). MARINE SCIENCES  
BRANCH.

L. F. KU.

PROCEEDINGS THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH, APRIL 1-3, STATE  
UNIVERSITY COLLEGE, BUFFALO, NY, PART 2: INTERNATIONAL ASSOCIATION FOR  
GREAT LAKES RESEARCH, P 844-861, 1970. 19 FIG, 6 TAB, 12 REF.

DESCRIPTORS:

\*WATER LEVEL FLUCTUATIONS, \*GREAT LAKES, \*VARIABILITY, \*FREQUENCY  
ANALYSIS, \*FOURIER ANALYSIS, ANNUAL, TIME SERIES ANALYSIS, STATISTICS,  
STATISTICAL METHODS.

ABSTRACT:

THE ANNUAL VARIATION AND ITS HARMONICS ARE SIGNIFICANTLY PARTS OF THE  
SPECTRA OF MONTHLY MEAN WATER LEVEL IN THE GREAT LAKES. THE ENERGY OF  
THE SPECTRA IS CONCENTRATED IN LOW FREQUENCIES AND THE PLOTS OF  
BACKGROUND IN THE SPECTRA AT ALL STATIONS ARE SIMILAR. THE COHERENT  
ENERGY BETWEEN LAKE SUPERIOR AND EACH OF THE OTHER LAKES IS RELATIVELY  
LOWER THAN THAT OF OTHER PAIRS. THE PHASE OF ANNUAL VARIATION INCREASES  
FROM EAST TO WEST. IN LAKE SUPERIOR IT LAGS ABOUT 2 MONTHS BEHIND THAT  
OF LAKE ONTARIO. THE AMPLITUDE DECREASES AS THE NUMBER OF POINTS  
INCREASES. FOR LAKES SUPERIOR, HURON, AND ERIE THE AMPLITUDES APPROACH  
6 CM WHEN 48 YEARS OF DATA ARE USED. THE AMPLITUDE IN LAKE SUPERIOR IS  
THE SAME AS THAT IN LAKE ERIE, AND ITS VALUE IN LAKE ONTARIO IS 12 CM  
LARGER THAN THAT IN LAKE HURON. OWING TO THE RELATIVELY SMALL  
CONTRIBUTION TOWARDS THE VARIANCE BY THE ANNUAL TERM AND ITS HARMONICS,  
IT IS NOT PRACTICAL TO PREDICT THE MONTHLY MEAN WATER LEVEL USING ONLY  
THE PERIODIC COMPONENTS. (SEE ALSO W72-01094 THRU W72-01112 AND  
W72-02878 THRU W72-02890) (KNAPP-USGS)

FIELD 02H

ACCESSION NO. W72-03123

WIND-GENERATED CIRCULATIONS IN LAKES ERIE, HURON, MICHIGAN AND SUPERIOR,

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO). MARINE SCIENCES  
BRANCH.

T. S. MURTY, AND D. B. RAO.

PROCEEDINGS THIRTEENTH CONFERENCE ON GREAT LAKES RESEARCH, APRIL 1-3, 1970,  
STATE UNIVERSITY COLLEGE, BUFFALO, NY, PART 2: INTERNATIONAL ASSOCIATION  
FOR GREAT LAKES RESEARCH, P 927-941, 1970. 8 FIG, 11 REF.

DESCRIPTORS:

\*GREAT LAKES, \*WATER CIRCULATION, WINDS, CURRENTS(WATER), LAKE ERIE,  
LAKE HURON, LAKE MICHIGAN, LAKE SUPERIOR, CLIMATOLOGY.

IDENTIFIERS:

\*LAKE CIRCULATION.

ABSTRACT:

THE WIND-GENERATED CIRCULATIONS IN LAKES ERIE, HURON, MICHIGAN, AND  
SUPERIOR WERE COMPUTED USING A STEADY STATE LINEAR MODEL WITH  
TOPOGRAPHY AND ROTATION TAKEN INTO ACCOUNT. THIS HOMOGENOUS MODEL  
APPLICABLE TO LATE FALL AND EARLY SPRING SITUATIONS ONLY. THE LAKE ERIE  
CIRCULATION PATTERN HAS THREE CELLS. AN ELONGATED CLOCKWISE CELL NEAR  
THE SOUTHERN SHORE TERMINATES AT ITS WESTERN BASIN. THIS CELL BECOMES  
STRONG TO THE EAST OF ERIE AND PERSISTS TO MIDWAY BETWEEN SILVER CREEK  
AND BUFFALO. THE SECOND CELL IS CLOCKWISE AND IS IN THE NORTHERN PART  
OF THE LAKE. THE THIRD CELL IS CLOCKWISE AND IT IS IN THE NORTHEASTERN  
PART OF THE LAKE. THE CIRCULATION PATTERN IN LAKE HURON HAS FOUR CELLS.  
IN THE EASTERN PART THERE IS A STRONG COUNTERCLOCKWISE CELL. IN THE  
WESTERN PART THERE IS A CLOCKWISE CELL. MOST OF THE GEORGIAN BAY IS  
OCCUPIED BY AN INTENSE COUNTERCLOCKWISE CELL. THERE IS A WEAK CLOCKWISE  
CELL IN THE WESTERN PART OF THE GEORGIAN BAY. IN LAKE MICHIGAN THERE  
ARE TWO CELLS: A CLOCKWISE CELL IN THE WESTERN PART AND A  
COUNTERCLOCKWISE CELL IN THE EASTERN PART. THE CIRCULATION IN LAKE  
SUPERIOR IS BY FAR THE MOST UNORGANIZED WITH GENERALLY COUNTERCLOCKWISE  
MOTION IN THE SOUTHERN PORTIONS AND WEAK CLOCKWISE MOTIONS IN THE  
NORTHERN PORTIONS. (SEE ALSO W72-01094 THRU W72-01112 AND W72-02878  
THRU W72-02890) (KNAPP-USGS)

FIELD 02H

ACCESSION NO. W72-03124

LITTORAL TRANSPORT AND ENERGY RELATIONSHIPS,

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, DETROIT, MICH.

L. BAJORUNAS.

IN: PROCEEDINGS OF THE TWELFTH COASTAL ENGINEERING CONFERENCE, SEPTEMBER 13-18, 1970, WASHINGTON, DC, VOLUME 2; AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK, NY, P 787-798, 1970. 4 FIG, 2 TAB, 10 REF.

DESCRIPTORS:

\*SEDIMENT TRANSPORT, \*GREAT LAKES, \*LITTORAL DRIFT, LAKE HURON, BEACHES, SANDS, STATISTICAL MODELS, STATISTICAL METHODS, WAVES(WATER), CURRENTS(WATER), SEDIMENTATION, EROSION, BEACH EROSION.

IDENTIFIERS:

ST. CLAIR RIVER.

ABSTRACT:

THE LITTORAL TRANSPORT RATES IN THE GREAT LAKES WERE OBTAINED BY USING LONG-TERM AVERAGES FROM DRIFT ACCUMULATIONS AND BY USING HOURLY AVERAGES IN THE ST. CLAIR RIVER WHICH RECEIVES SAND FROM LAKE HURON BEACHES. A COMBINATION OF ENERGY ELEMENTS AND ENVIRONMENTAL FACTORS CONSISTING OF WAVE POWER AND DURATION, CURRENT SPEED, AND LENGTH OF SHORELINE PRODUCES THE BEST CORRELATION WITH THE TRANSPORT RATE. DIMENSIONAL ANALYSIS EXPANDS THE PROCESS-RESPONSE MODEL BY INCLUDING SEDIMENT-SIZE AND SPECIFIC-WEIGHT PARAMETERS. (SEE ALSO W72-03078 THRU W72-03114 AND W72-03572 THRU W72-03607) (KNAPP-USGS)

FIELD 02J, 02H

ACCESSION NO. W72-03581

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART 4. ST. LAWRENCE RIVER BASIN, VOLUME 1. BASINS OF STREAMS TRIBUTARY TO LAKES SUPERIOR, MICHIGAN, AND HURON.

GEOLOGICAL SURVEY, WASHINGTON, D.C.

AVAILABLE FROM GPO, WASHINGTON, DC 20402 - \$3.50 (PAPER COPY). GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1911, 1971. 651 P, 1 FIG, 1 PLATE.

DESCRIPTORS:

\*DATA COLLECTIONS, \*SURFACE WATERS, \*LAKE SUPERIOR, \*LAKE MICHIGAN, \*LAKE HURON, STREAMFLOW, LAKES, RESERVOIRS, STREAM GAGES, STAGE-DISCHARGE RELATIONS, LOW FLOW, PEAK DISCHARGE.

IDENTIFIERS:

SURFACE WATER RECORDS, ST. LAWRENCE RIVER BASIN.

ABSTRACT:

ONE OF A SERIES OF 37 REPORTS PRESENTING RECORDS OF STAGE, DISCHARGE, AND CONTENT OF STREAMS, LAKES, AND RESERVOIRS IN THE UNITED STATES DURING THE 1961-65 WATER YEARS, THIS REPORT COVERS THE BASINS OF STREAMS TRIBUTARY TO LAKES SUPERIOR, MICHIGAN, AND HURON. THE DATA GENERALLY COMPRISE A STATION DESCRIPTION AND A TABLE SHOWING DAILY DISCHARGE AND MONTHLY AND YEARLY DISCHARGES. STATION DESCRIPTIONS GIVE THE LOCATION, DRAINAGE AREA, RECORDS AVAILABLE, TYPE AND HISTORY OF GAGES, AVERAGE DISCHARGE, EXTREMES OF DISCHARGE, AND GENERAL REMARKS. TYPE OF GAGE CURRENTLY IN USE AND DATUM OF THE GAGE ABOVE MEAN SEA LEVEL, AND A CONDENSED HISTORY OF THE TYPES, LOCATIONS, AND DATUMS OF PREVIOUS GAGES USED DURING THE RECORD PERIOD ARE LISTED. CONDITIONS AFFECTING NATURAL FLOW AND INFORMATION ON ACCURACY OF RECORDS ARE NOTED. TABLES GIVE DAILY, AVERAGE, AND EXTREME DISCHARGES AND YEARLY TOTALS AND PEAK DISCHARGES. (MYERS-USGS)

FIELD 07C, 02E

ACCESSION NO. W72-03910

EXPANDED PROGRAM FOR PESTICIDE MONITORING OF FISH,

BUREAU OF SPORT FISHERIES AND WILDLIFE, WASHINGTON, D.C.

A. INGLIS, C. HENDERSON, AND W. L. JOHNSON.

PESTICIDES MONITORING JOURNAL, VOL 5, NO 1, P 47-49, JUNE 1971. 1 FIG, 1 TAB,  
4 REF.

DESCRIPTORS:

\*PESTICIDE RESIDUES, \*MONITORING, \*LIPIDS, DDT, DIELDRIN, ALDRIN, ENDRIN, HEPTACHLOR, COLORADO RIVER, COLUMBIA RIVER, DELAWARE RIVER, HUDSON RIVER, MISSISSIPPI RIVER, MISSOURI RIVER, OHIO RIVER, RIO GRANDE, LAKE ERIE, LAKE HURON, LAKE MICHIGAN, LAKE ONTARIO, LAKE SUPERIOR, ST. LAWRENCE RIVER, TENNESSEE RIVER.

IDENTIFIERS:

DDE, TDE, BHC, HEPTACHLOR EPOXIDE, CHLORDANE, TOXAPHENE, MERCURY, ARSENIC, LEAD, POLYCHLORINATED BIPHENYLS.

ABSTRACT:

BEGINNING IN THE FALL OF 1970, 50 NEW STATIONS WERE ADDED TO THE ORIGINAL 50 STATIONS SAMPLED ANNUALLY BY THE BUREAU OF SPORT FISHERIES AND WILDLIFE FOR MONITORING PESTICIDE RESIDUES IN FISH. THE ORIGINAL 50 STATIONS, SAMPLED SINCE THE SPRING 1967, WILL BE RETAINED IN THE EXPANDED PROGRAM. THREE COMPOSITE SAMPLES, EACH CONTAINING 3-5 ADULT FISH OF A SINGLE SPECIES, WILL BE COLLECTED. ALL COMPOSITE SAMPLES WILL BE REPLICATED FOR A TOTAL OF 600 SAMPLES ANALYZED ANNUALLY. RESIDUE ANALYSES WILL BE PERFORMED FOR THE IDENTIFICATION AND QUANTITATION OF DDT, DDE, TDE, DIELDRIN, ALDRIN, ENDRIN, BHC, HEPTACHLOR, HEPTACHLOR EPOXIDE, CHLORDANE, TOXAPHENE, MERCURY, ARSENIC, AND LEAD. SAMPLES WILL BE SCREENED FOR THE PRESENCE OF INTERFERING POLYCHLORINATED BIPHENYL COMPOUNDS (PCB'S). FISH WILL BE COLLECTED AND HANDLED IN SUCH A MANNER AS TO PREVENT CONTAMINATION OF THE SAMPLE WITH EXTRANEIOUS CHEMICALS. (MORTLAND-BATTELLE)

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| TON, *PRIMARY PRODUCTIVITY, LAKE  | HURON, LAKE MICHIGAN, LAKE ERIE,  | W70-03311 |
| LP WASTES, ECONOMIC IMPACT, LAKE  | HURON, LAKE ERIE.: / INDUSTRY, PU | W70-10321 |
| PHY, LAKE ERIE, LAKE TROUT, LAKE  | HURON, LAKE ONTARIO, LAKE SUPERIO | W70-07138 |
| KE SUPERIOR, LAKE MICHIGAN, LAKE  | HURON, LAKE ERIE, WATER QUALITY.: | W70-02983 |
| *WHITECAPS, LAKE SUPERIOR, LAKE   | HURON, LAKE ERIE, DETROIT EDISON  | W70-06459 |
| N, GREAT LAKES, *LAKE ERIE, LAKE  | HURON, LAKE MICHIGAN, LAKE SUPERI | W68-00683 |
| HY, SUMMER, CLASSIFICATION, LAKE  | HURON, LAKE MICHIGAN, LAKE SUPERI | W68-00247 |
| , HYDROGEN SULFIDE, CITIES, LAKE  | HURON, LAKE ERIE, LAKE ONTARIO, L | W70-00667 |
| LAKE SHORES, LAKE MICHIGAN, LAKE  | HURON, LAKE SUPERIOR, BOUNDARIES( | W69-07636 |
| CURRENTS(WATER), LAKE ERIE, LAKE  | HURON, LAKE MICHIGAN, LAKE SUPERI | W72-03124 |
| VER, RIO GRANDE, LAKE ERIE, LAKE  | HURON, LAKE MICHIGAN, LAKE ONTARI | W72-04740 |
| N, LAKE ONTARIO, LAKE ERIE, LAKE  | HURON, MUD, NITROGEN, SEDIMENT-WA | W71-10327 |
| SEWERS, ST. LAWRENCE RIVER, LAKE  | HURON, NEW YORK, MICHIGAN, ILLINO | W70-06658 |
| *FISH, PERCHES, BULLHEADS, LAKE   | HURON, ONTARIO, CANADA, CARP, SUC | W69-07850 |
| , DAMAGES, WATER POLLUTION, LAKE  | HURON, OWNERSHIP OF BEDS, SUBMERG | W68-01329 |
| PERATURE, ECOLOGY, TROPHIC, LAKE  | HURON, OXYGEN.: / BATHYMETRY, TEM | W70-03315 |
| PERIOD.: *DIATOMS, *LAKE          | HURON, PALEOLIMNOLOGY, QUATERNARY | W69-05762 |
| A, CHRYSOPHYTA, CYANOPHYTA, LAKE  | HURON, RADIOACTIVITY, RADIUM RADI | W71-00114 |
| , LAKE ERIE, LAKE MICHIGAN, LAKE  | HURON, SEICHES, WIND TIDES, LAND  | W71-03908 |
| , LAKE ERIE, LAKE MICHIGAN, LAKE  | HURON, STAGE-DISCHARGE RELATIONS, | W69-02693 |
| SUPERIOR, *LAKE MICHIGAN, *LAKE   | HURON, STREAMFLOW, LAKES, RESERVO | W72-03910 |
| TIC, GREAT LAKES, COLORADO, LAKE  | HURON, TEMPERATURE, LAKE SUPERIOR | W71-12083 |
| S, STRONTIUM RADIOISOTOPES, LAKE  | HURON, TRACE ELEMENTS.: /OISOTOPE | W69-01139 |
| ES, *DIELDRIN, *DDT, CHLORINATED  | HYDROCARBON PESTICIDES, *PESTICID | W70-07138 |
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| Y PRODUCTIVITY, WASTE TREATMENT,  | HYDROGEN ION CONCENTRATION, SULFA | W71-00114 |
| POPULATION, POLLUTANTS, MAPPING,  | HYDROGEN SULFIDE, CITIES, LAKE HU | W70-00667 |
| SCHARGE RELATIONS, STREAM GAGES,  | HYDROGRAPHS.: /KE HURON, STAGE-DI | W69-02693 |
| T METERS, ANALYTICAL TECHNIQUES,  | HYDROLOGIC DATA, TRACERS, DYE REL | W72-00578 |
| E, EUTROPHICATION, GROUND WATER,  | HYDROLOGY, SMALL WATERSHEDS, WATE | W69-05160 |
| TEMPERATURE, THERMAL PROPERTIES,  | HYGROMETRY, ANEMOMETERS, BUBBLES. | W70-06459 |
| IO, LAKE ERIE, DISSOLVED OXYGEN,  | HYPOLIMNION, PLANKTON.: /KE ONTAR | W68-00247 |
| TRY, BENTHOS, SURVEYS, POLLUTANT  | IDENTIFICATION.: /S, WATER CHEMIS | W71-10327 |
| IO, DETROIT(MICH), CALUMET RIVER( | ILL), FOX RIVER(WIS), SAGINAW RIV | W70-06658 |
| LAKE HURON, NEW YORK, MICHIGAN,   | ILLINOIS, WISCONSIN, OHIO, INDIAN | W70-06658 |
| INDUSTRY, PULP WASTES, ECONOMIC   | IMPACT, LAKE HURON, LAKE ERIE.: / | W70-10321 |
| ION CONTROL, INTERSTATE, CHANNEL  | IMPROVEMENT, EFFLUENTS, WATER POL | W72-00199 |
| RIE, LAKE/ *RIVER FLOW, *CHANNEL  | IMPROVEMENT, *GREAT LAKES, LAKE E | W69-02693 |
| CARBON-14 MEASUREMENT, SHIPBOARD  | INCUBATION.:                      | W70-02983 |
| NCIS(CANADA), BALL LAKE(CANADA),  | INDIAN LAKE(CANADA), GRASSY NARRO | W71-11682 |
| IGAN, ILLINOIS, WISCONSIN, OHIO,  | INDIANA, PENNSYLVAN: / YORK, MICH | W70-06658 |
| N RECORDER, MULTI-DEPTH PLANKTON  | INDICATOR, TWO-NET TECHNIQUE, GRI | W71-08665 |
| IL CLASSIFICATIONS, AGRICULTURE,  | INDUSTRIAL WATER, RECREATION, ADM | W71-10744 |
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| UTANTS, WATER BALANCE, SALINITY,  | INDUSTRIAL WASTES.: /PATH OF POLL | W71-05882 |
| ITORING, ON-SITE INVESTIGATIONS,  | INDUSTRIAL WASTES, PULP AND PAPER | W70-10321 |
| UT, COMMERCIAL FISHING, PERCHES,  | INDUSTRIAL WASTES, WASTES.: / TRO | W70-05415 |
| NDUSTRIAL WASTES, PULP AND PAPER  | INDUSTRY, PULP WASTES, ECONOMIC I | W70-10321 |
| ADA/ *ONTARIO(CANADA), *URANIUM,  | INORGANIC CARBON, DUNLOP LAKE(CAN | W71-00114 |
| POLLUTION SOURCES, FISH HARVEST,  | INSPECTION, LEGAL ASPECTS, *MONIT | W70-10321 |
| , *LAKES, *TOWERS, CONSTRUCTION,  | INSTRUMENTATION, DESIGN, DATA COL | W72-02886 |

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| N, MUD, NITROGEN, SEDIMENT-WATER | INTERFACES, MUD-WATER INTERFACES, | W71-10327 |
| MENT-WATER INTERFACES, MUD-WATER | INTERFACES, PATH OF POLLUTANTS, W | W71-10327 |
| LUTION, WATER POLLUTION CONTROL, | INTERSTATE, CHANNEL IMPROVEMENT,  | W72-00199 |
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| EQUILIBRIUM, AQUEOUS SOLUTIONS,  | ION EXCHANGE, CARBONATES, KAOLINI | W71-05888 |
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| UTION, STORM RUNOFF, OIL, SHIPS, | IRRIGATI: /VERNMENT, THERMAL POLL | W71-06053 |
| ANALYSIS, GEOLOGY, CLIMATOLOGY,  | IRRIGATION, FLOOD CONTROL, DRAINA | W71-10744 |
| IN WAVES, WAVE VELOCITY, COASTAL | JETS.:                            | W69-09026 |
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| , ADMINISTRATIVE AGENCIES, STATE | JURISDICTION, ABATEMENT.: /WHARFS | W69-02019 |
| E BOUNDA/ *COUNTIES, *CONCURRENT | JURISDICTION, *ENFORCEMENT, *STAT | W69-07636 |
| TIONS, ION EXCHANGE, CARBONATES, | KAOLINITE, MONTMORILLONITE.: /OLU | W71-05888 |
| TAL JETS.:                       | KELVIN WAVES, WAVE VELOCITY, COAS | W69-09026 |
| , CHEMICAL CONDITIONS, TAXONOMIC | KEYS.: /, TAXONOMY, CORE ANALYSES | W70-03315 |
| T), CANADA, DOROSOMA CEPEDIANUM, | KINCARDINE(ONT), BRASENIA SCHREBE | W69-07850 |
| OTROPHIC, LAKE NIPIGON(ONTARIO), | LAKE ATHABASKA(ONTARIO), GREAT SL | W70-03315 |
|                                  | LAKE CIRCULATION.:                | W70-04099 |
| ES, ECONOMIC IMPACT, LAKE HURON, | LAKE ERIE.: / INDUSTRY, PULP WAST | W70-10321 |
| RIDR, LAKE MICHIGAN, LAKE HURON, | LAKE ERIE.: /GOCHAETES, LAKE SUPE | W72-01105 |
| ON, LAKE MICHIGAN, LAKE ONTARIO, | LAKE ERIE, WATER POLLUTION EFFECT | W71-05561 |
| LORIDES, PHOSPHATES, LAKE HURON, | LAKE ERIE, GREAT LAKES, EQUILIBRI | W71-05888 |
| ECTS, LAKE MICHIGAN, LAKE HURON, | LAKE ERIE, LAKE SUPERIOR, WATER P | W72-00199 |
| STES, LAKE SUPERIOR, LAKE HURON, | LAKE ERIE, LAKE ONTARIO, MONITORI | W71-05883 |
| HEAVY METALS, *FISH, LAKE HURON, | LAKE ERIE, ST. LAWRENCE RIVER, CO | W71-11682 |
| EVELOPMENT, POLLUTION ABATEMENT, | LAKE ERIE, LAKE HURON, LAKE MICH  | W71-06053 |
| S, BIODEGRADATION, LAKE ONTARIO, | LAKE ERIE, LAKE HURON, MUD, NITRO | W71-10327 |
| ULATION, WINDS, CURRENTS(WATER), | LAKE ERIE, LAKE HURON, LAKE MICH  | W72-03124 |
| MENTAL SANITATION, WATER POLICY, | LAKE ERIE, LAKE HURON, LAKE ONTAR | W72-00247 |
| RIDR, LAKE MICHIGAN, LAKE HURON, | LAKE ERIE, WATER QUALITY.: / SUPE | W70-02983 |
| ETES, SAMPLING, SEASONAL, DEPTH, | LAKE ERIE, LAKE ONTARIO, TUBIFICI | W70-03315 |
| CAPS, LAKE SUPERIOR, LAKE HURON, | LAKE ERIE, DETROIT EDISON VESSEL, | W70-06459 |
| TABILITY, MICHIGAN, LAKE SHORES, | LAKE ERIE, LAKE MICHIGAN, LAKE HU | W71-03908 |
| VITY, LAKE HURON, LAKE MICHIGAN, | LAKE ERIE, WATER POLLUTION EFFECT | W70-03311 |
| IGAN, LAKE SUPERIOR, LAKE HURON, | LAKE ERIE, LAKE ONTARIO, NITRATES | W70-07269 |
| , WATER QUALITY, EUTROPHICATION, | LAKE ERIE, LAKE ONTARIO, LAKE MIC | W70-06658 |
| KE MICHIGAN, GAS CHROMATOGRAPHY, | LAKE ERIE, LAKE TROUT, LAKE HURON | W70-07138 |
| AN, LAKE SUPERIOR, LAKE ONTARIO, | LAKE ERIE, DISSOLVED OXYGEN, HYPO | W68-00247 |
| ANNEL IMPROVEMENT, *GREAT LAKES, | LAKE ERIE, LAKE MICHIGAN, LAKE HU | W69-02693 |
| GEN SULFIDE, CITIES, LAKE HURON, | LAKE ERIE, LAKE ONTARIO, LAKE MIC | W70-00667 |
| I RIVER, OHIO RIVER, RIO GRANDE, | LAKE ERIE, LAKE HURON, LAKE MICH  | W72-04740 |
| , *GREAT LAKES, *LITTORAL DRIFT, | LAKE HURON, BEACHES, SANDS, STATI | W72-03581 |
| ID RIVER, RIO GRANDE, LAKE ERIE, | LAKE HURON, LAKE MICHIGAN, LAKE O | W72-04740 |
| IGHTS, DAMAGES, WATER POLLUTION, | LAKE HURON, OWNERSHIP OF BEDS, SU | W68-01329 |
| EAMFLOW, *DISCHARGE MEASUREMENT, | LAKE HURON.: / CHANNEL FLOW, *STR | W69-01137 |
| LAKES, LAKE ERIE, LAKE MICHIGAN, | LAKE HURON, STAGE-DISCHARGE RELAT | W69-02693 |
| SOUTH BAY,                       | LAKE HURON.:                      | W69-09057 |
| ON, *LAKE SHORES, LAKE MICHIGAN, | LAKE HURON, LAKE SUPERIOR, BOUNDA | W69-07636 |
| ICATION, LIMNOLOGY, GREAT LAKES, | LAKE HURON, CURRENTS(WATER), COAS | W69-09026 |
| , *LAKE MICHIGAN, *LAKE ONTARIO, | LAKE HURON, AESTHETICS, ECOLOGY,  | W70-01943 |
| LOSCOLEX, SAGINAW BAY(MICHIGAN), | LAKE HURON.: /KE, LIMNODRILUS, PE | W70-02972 |
| PPING, HYDROGEN SULFIDE, CITIES, | LAKE HURON, LAKE ERIE, LAKE ONTAR | W70-00667 |
| TERS, *FISH, PERCHES, BULLHEADS, | LAKE HURON, ONTARIO, CANADA, CARP | W69-07850 |
| OTROPHY, SUMMER, CLASSIFICATION, | LAKE HURON, LAKE MICHIGAN, LAKE S | W68-00247 |
| CATION, GREAT LAKES, *LAKE ERIE, | LAKE HURON, LAKE MICHIGAN, LAKE S | W68-00683 |



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| NDDED SO/ *ALUM, *FERRIC SULFATE, | LAKE HURON(MICH), SODA ASH, SUSPE | W70-01989 |
| ISIONS, *MICHIGAN, *GREAT LAKES,  | LAKE HURON, *RIPARIAN RIGHTS, BED | W69-02019 |
| OTOPES, STRONTIUM RADIOISOTOPES,  | LAKE HURON, TRACE ELEMENTS.: /OIS | W69-01139 |
| S, LAKE MICHIGAN, LAKE SUPERIOR,  | LAKE HURON, LAKE ERIE, LAKE ONTAR | W70-07269 |
| ISON/ *WHITECAPS, LAKE SUPERIOR,  | LAKE HURON, LAKE ERIE, DETROIT ED | W70-06459 |
| GY, *GREAT LAKES, LAKE SUPERIOR,  | LAKE HURON, LAKE MICHIGAN, LAKE O | W71-05561 |
| ATION, *GREAT LAKES, *LAKE ERIE,  | LAKE HURON, FISH, FISH POPULATION | W70-05415 |
| S, LAKE SUPERIOR, LAKE MICHIGAN,  | LAKE HURON, LAKE ERIE, WATER QUAL | W70-02983 |
| Y, PULP WASTES, ECONOMIC IMPACT,  | LAKE HURON, LAKE ERIE.: / INDUSTR | W70-10321 |
| SILICA, CHRYSOPHYTA, CYANOPHYTA,  | LAKE HURON, RADIOACTIVITY, RADIUM | W71-00114 |
| TOGRAPHY, LAKE ERIE, LAKE TROUT,  | LAKE HURON, LAKE ONTARIO, LAKE SU | W70-07138 |
| HORES, LAKE ERIE, LAKE MICHIGAN,  | LAKE HURON, SEICHES, WIND TIDES,  | W71-03908 |
| PLANKTON, *PRIMARY PRODUCTIVITY,  | LAKE HURON, LAKE MICHIGAN, LAKE E | W70-03311 |
| , TEMPERATURE, ECOLOGY, TROPHIC,  | LAKE HURON, OXYGEN.: / BATHYMETRY | W70-03315 |
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| NDS, CURRENTS(WATER), LAKE ERIE,  | LAKE HURON, LAKE MICHIGAN, LAKE S | W72-03124 |
| S, LAKE SUPERIOR, LAKE MICHIGAN,  | LAKE HURON, LAKE ERIE.: /GOCHAETE | W72-01105 |
| TATION, WATER POLICY, LAKE ERIE,  | LAKE HURON, LAKE ONTARIO, LAKE MI | W72-00247 |
| CE RIVER,/ *HEAVY METALS, *FISH,  | LAKE HURON, LAKE ERIE, ST. LAWREN | W71-11682 |
| GEORGIAN BAY(                     | LAKE HURON).:                     | W71-05564 |
| NDUSTRIAL WASTES, LAKE SUPERIOR,  | LAKE HURON, LAKE ERIE, LAKE ONTAR | W71-05883 |
| POLLUTION ABATEMENT, LAKE ERIE,   | LAKE HURON, LAKE MICHIGAN, LAKE S | W71-06053 |
| , ARCTIC, GREAT LAKES, COLORADO,  | LAKE HURON, TEMPERATURE, LAKE SUP | W71-12083 |
| M, SODIUM CHLORIDES, PHOSPHATES,  | LAKE HURON, LAKE ERIE, GREAT LAKE | W71-05888 |
| S, LEGAL ASPECTS, LAKE MICHIGAN,  | LAKE HURON, LAKE ERIE, LAKE SUPER | W72-00199 |
| DATION, LAKE ONTARIO, LAKE ERIE,  | LAKE HURON, MUD, NITROGEN, SEDIME | W71-10327 |
| ERIE, LAKE HURON, LAKE ONTARIO,   | LAKE MICHIGAN, LAKE SUPERIOR, FED | W72-00247 |
| BATEMENT, LAKE ERIE, LAKE HURON,  | LAKE MICHIGAN, LAKE SUPERIOR, WAS | W71-06053 |
| DA, ALIGOCHAETES, LAKE SUPERIOR,  | LAKE MICHIGAN, LAKE HURON, LAKE E | W72-01105 |
| TRATIVE AGENCIES, LEGAL ASPECTS,  | LAKE MICHIGAN, LAKE HURON, LAKE E | W72-00199 |
| S(WATER), LAKE ERIE, LAKE HURON,  | LAKE MICHIGAN, LAKE SUPERIOR, CLI | W72-03124 |
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| , *EUTROPHICATION, *GREAT LAKES,  | LAKE MICHIGAN, LAKE SUPERIOR, LAK | W70-07269 |
| RIMARY PRODUCTIVITY, LAKE HURON,  | LAKE MICHIGAN, LAKE ERIE, WATER P | W70-03311 |
| ICHIGAN, LAKE SHORES, LAKE ERIE,  | LAKE MICHIGAN, LAKE HURON, SEICHE | W71-03908 |
| AKES, LAKE SUPERIOR, LAKE HURON,  | LAKE MICHIGAN, LAKE ONTARIO, LAKE | W71-05561 |
| CATION, LAKE ERIE, LAKE ONTARIO,  | LAKE MICHIGAN, PHOSPHATES, PRODUC | W70-06658 |
| T LAKES, *LAKE ERIE, LAKE HURON,  | LAKE MICHIGAN, LAKE SUPERIOR, *FI | W68-00683 |
| MER, CLASSIFICATION, LAKE HURON,  | LAKE MICHIGAN, LAKE SUPERIOR, LAK | W68-00247 |
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| ES, *JURISDICTION, *LAKE SHORES,  | LAKE MICHIGAN, LAKE HURON, LAKE S | W69-07636 |
| TON, GREAT LAKES, LAKE SUPERIOR,  | LAKE MICHIGAN, LAKE HURON, LAKE E | W70-02983 |
| VEMENT, *GREAT LAKES, LAKE ERIE,  | LAKE MICHIGAN, LAKE HURON, STAGE- | W69-02693 |
| O GRANDE, LAKE ERIE, LAKE HURON,  | LAKE MICHIGAN, LAKE ONTARIO, LAKE | W72-04740 |
| KES, WINDS, VELOCITY, A/ *WAVES,  | LAKE MORPHOMETRY, LAKES, GREAT LA | W70-06459 |
| RGIAN BAY(ONTARIO), MESOTROPHIC,  | LAKE NIPIGON(ONTARIO), LAKE ATHAB | W70-03315 |
| KE ERIE, LAKE TROUT, LAKE HURON,  | LAKE ONTARIO, LAKE SUPERIOR, PEST | W70-07138 |
| RIOR, LAKE HURON, LAKE MICHIGAN,  | LAKE ONTARIO, LAKE ERIE, WATER PO | W71-05561 |
| SUPERIOR, LAKE HURON, LAKE ERIE,  | LAKE ONTARIO, NITRATES, WATER POL | W70-07269 |
| LITY, EUTROPHICATION, LAKE ERIE,  | LAKE ONTARIO, LAKE MICHIGAN, PHOS | W70-06658 |
| ING, SEASONAL, DEPTH, LAKE ERIE,  | LAKE ONTARIO, TUBIFICIDS, DISTRIB | W70-03315 |
| ERIE, LAKE HURON, LAKE MICHIGAN,  | LAKE ONTARIO, LAKE SUPERIOR, ST.  | W72-04740 |
| , CITIES, LAKE HURON, LAKE ERIE,  | LAKE ONTARIO, LAKE MICHIGAN, WATE | W70-00667 |
| N, LAKE MICHIGAN, LAKE SUPERIOR,  | LAKE ONTARIO, LAKE ERIE, DISSOLVE | W68-00247 |
| SUPERIOR, LAKE HURON, LAKE ERIE,  | LAKE ONTARIO, MONITORING, DATA CO | W71-05883 |
| LLUTION SOURCES, BIODEGRADATION,  | LAKE ONTARIO, LAKE ERIE, LAKE HUR | W71-10327 |
| R POLICY, LAKE ERIE, LAKE HURON,  | LAKE ONTARIO, LAKE MICHIGAN, LAKE | W72-00247 |
| AMAGE, BANK STABILITY, MICHIGAN,  | LAKE SHORES, LAKE ERIE, LAKE MICH | W71-03908 |
| AKE(CANADA), HOWE SOUND(CANADA),  | LAKE ST. FRANCIS(CANADA), BALL LA | W71-11682 |
| ON, LAKE ONTARIO, LAKE MICHIGAN,  | LAKE SUPERIOR, FEDERAL GOVERNMENT | W72-00247 |

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| ERIE, LAKE HURON, LAKE MICHIGAN,    | LAKE SUPERIOR, CLIMATOLOGY.: /KE  | W72-03124 |
| LORADO, LAKE HURON, TEMPERATURE,    | LAKE SUPERIOR, EUTROPHICATION, DA | W71-12083 |
| ERIE, LAKE HURON, LAKE MICHIGAN,    | LAKE SUPERIOR, WASTE TREATMENT, A | W71-06053 |
| MICHIGAN, LAKE HURON, LAKE ERIE,    | LAKE SUPERIOR, WATER POLLUTION, W | W72-00199 |
| MPLING, AMPHIPODA, ALIGOCHAETES,    | LAKE SUPERIOR, LAKE MICHIGAN, LAK | W72-01105 |
| ON, *GREAT LAKES, LAKE MICHIGAN,    | LAKE SUPERIOR, LAKE HURON, LAKE E | W70-07269 |
| TROUT, LAKE HURON, LAKE ONTARIO,    | LAKE SUPERIOR, PESTICIDE REMOVAL. | W70-07138 |
| ENCES, *LIMNOLOGY, *GREAT LAKES,    | LAKE SUPERIOR, LAKE HURON, LAKE M | W71-05561 |
| RIE, DETROIT EDISON/ *WHITECAPS,    | LAKE SUPERIOR, LAKE HURON, LAKE E | W70-06459 |
| DRES, LAKE MICHIGAN, LAKE HURON,    | LAKE SUPERIOR, BOUNDARIES(SURFACE | W69-07636 |
| ITY, PHYTOPLANKTON, GREAT LAKES,    | LAKE SUPERIOR, LAKE MICHIGAN, LAK | W70-02983 |
| TION, LAKE HURON, LAKE MICHIGAN,    | LAKE SUPERIOR, LAKE ONTARIO, LAKE | W68-00247 |
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| ON, LAKE MICHIGAN, LAKE ONTARIO,    | LAKE SUPERIOR, ST. LAWRENCE RIVER | W72-04740 |
| TUBIFICIDS, MIDGES, CADDISFLIES,    | LAKE TROUT, LAMPREYS, CHEMICAL AN | W68-00683 |
| , GAS CHROMATOGRAPHY, LAKE ERIE,    | LAKE TROUT, LAKE HURON, LAKE ONTA | W70-07138 |
| IVER(CANADA), CLAY LAKE(CANADA),    | LAKE WINNIPEG(CANADA), SASKATCHEW | W71-11682 |
| REAT SLAVE LAKE(NW TERRITORIES),    | LAKE WINNIPEG(MANITOBA), ONTARIO, | W71-12083 |
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