

Subject Index

A

- ACID (Acidification Chemistry Information Data Base), 7, 8
 Environmental Protection Agency Storage and Retrieval (STORES), 8
 Acid deposition (*See* Acid rain)
 Acid neutralizing capacity (ANC), 67, 72, 74(table), 76(illus), 77(table)
 effects of ion exchange
 biological sulfate reduction, 80, 81(illus)
 Acid rain, 4, 17, 84
 aluminum salts
 in laboratory toxicity tests, 92, 96
 effects on aquatic biological systems, 1, 2, 4, 29, 39, 98
 monitoring, automated, 85, 88
 National Acid Precipitation Assessment Program (NAPAP), 88
 soft-water lake sediments, 67
 trends, study by National Academy of Sciences, 8
 Acidification, 18, 19, 29, 34, 35, 42
 automated biomonitoring, 85
 effect on benthic decomposition rates, 19
 experimental, 69
 on biomass, 28, 38
 analytical methods used, 31(table)
 continuous impact, 37(illus), 38, 39
 short-term impact, 36(illus), 38, 39
 streams, 2, 29
 watershed characteristics in relation to, 10(illus)
 Algae (*See also* Ecosystems), 17, 42, 44
 acidification, 35
 benthos grazing, 38
 controlled by phosphorous concentrations, 18
 periphytic, productivity of running water, 28, 35, 38
 Alkalinity, 2, 49
 in soft water lakes, 68, 69, 82
 effect of sulfate-reducing bacteria, 80
 Aluminum
 effects on aquatic life, 69, 93, 94
 experimental concentrations, 30, 39
 influence of temperature on toxicity, 95
 salts in laboratory toxicity tests, 2, 92, 96
 ANC (*See* Acid neutralizing capacity)
 Angiosperms, 22
 Anion effects (*See* Ion exchange)
 Aquatic biological communities (*See also* Ecosystems), 1, 2, 23, 24
 effects of acid deposition, 4, 39, 98
 comparison of acid alone to acid plus aluminum, 29
 environment, 94
 food chain, 44
 Autotrophic communities (*See also* Ecosystems), 2, 17
 Benthic, 19, 21, 38
 littoral, effects on ecosystems, 17, 22, 29

Autotrophic communities (*See also*
Ecosystems) (*continued*)
sediments, 74(table, illus)
macrophytes, 19, 22, 23
oligotrophic waters, 38, 47
pelagic linkages, 17
sediments, 74(table, illus)
vegetation, influence on fish com-
munities, 23, 24

B

Bacteria, 17
sulfate reducing, 80
Benthic autotrophic communities (*See*
Autotrophic communities)
Biological sensing systems
automated monitoring of water re-
sources
system design, 85, 89, 90
field trials, 87
Biomass (*See also* Ecosystems)
effects on fish communities, 18
experimental acidification on, 28, 35,
39
possible explanation for increase, 38
Biomonitoring, automated, 2, 84
system design, equipment and meth-
odology, 85, 89
field trials, 87
Biosensing (*See* Biomonitoring)
Biota (*See* Aquatic biological commu-
nities, Ecosystems)
Blue-greens (*See* Periphyton)
Breath detectors, fish, 85, 89, 90
Bryophyta, 22
Buffering, 67, 79(illus), 80, 82
metal ions in aquatic environment,
94

C

Carbon uptake, 42, 44, 45(illus), 49
of phytoplankton, 49, 51
Chlorophyll-a measurement, 38(illus)

Copper
in experimental acidification, 34

D

Data collection platform (DCP) sites,
87-89
Data retrieval, automated
receiving and processing, 90
system design
field trials, 87
remote data collection platforms
(DCP)
transmission to, from NOAA
Geostationary Operational
Environmental Satellite
(GOES), 86
Diatoms (*See* Periphyton)

E

Ecosystems, 20, 21(illus), 30, 39
effects of acidification in, 4, 68, 74
vegetation, 23, 24
Electrodes, 98
Emissions, 4
Environmental factors
biological systems as integrators of,
85
Eutricification, 2

F

Fish
aluminum toxicity to, 69, 95
bioassay, 92
breathing responses detector, 85, 89,
90
effects of acid deposition, 1, 2, 5, 9,
11, 13, 14(illus)
electrolytes, 94
measurement of physiological and
behavioral responses, 90
Fish Information Network, 9
Fish resources, 17, 23, 24

economic value of reduced re-
sources, 14, 15
Fulvic acid, 94

G

Groundwater flow, 43, 50, 51(illus)

H

Hydrogen electrode, 98
Hydrogen ions
 difficulty of separating from metals,
 30
Hydrology, 2, 42, 46
 model, 42, 43, 47, 52
 water chemistry gradients related to,
 49

I

Invertebrates, stream
 growth rates
 in acidified streams, 59(illus),
 60(illus)
 in laboratory conditions, 59(illus),
 62(illus), 63(illus)
 temperature related, 60(illus),
 61(illus), 63
mortality
 in laboratory conditions, 56, 57
 in relation to size, 59, 62
nutrients, 56
sensitivity
 to acidification, 65
 to PH depression, 54, 57, 58(illus)
Ion exchange, 2
 anion effects, associated with use of
 aluminum salts in laboratory
 toxicity tests, 92
 effects of ANC in soft water lakes,
 68, 69, 72, 75(table),
 76(illus), 78, 82

K

KCl (*See* pH measurement)

L

Lake/stream acidification (*See also*
 Autotrophic communities,
 Watershed communities, In-
 vertebrates, stream), 1,
 10(illus), 11, 30, 56
alkalinity levels, 49
biological productivities, 47
carbon dioxide, 49
carbon uptake rate, 43, 51
effects on fish populations, 17
groundwater flow, 43
limnological indicators, 47
littoral-pelagic linkages, 17, 19
monitoring, automated, 85
NAPAP research program, 4, 7
nutrient concentrations, 46(illus)
 under laboratory conditions, 56
rate of acidification, 11
sediments
 soft-water lakes in Florida, 67
Limnology, (*See also* Biomass, Eco-
systems, Lake/stream acidi-
fication, Water quality), 17,
19, 47
Littoral autotrophic communities (*See*
 Autotrophic communities)

M

Macrophytes (*See also* Autotrophic
communities, Ecosystems),
17, 19
Metal ions
 chemistry modified by fulvic acids,
 94
Metal salts
 toxicity inversely related to solubil-
 ity, 92

Meteorological conditions (*see* Watershed communities)

Mineral dissolution, 68, 69, 73

Models

acidification to eutrication, 52

N

NAPAP (U.S. National Acid Precipitation Assessment Program)

description of research program, 4–5

organization chart, 6

National Surface Water Survey (NSWS), 7

water quality parameters, 8(table)

Nitrite concentrations, 46(illus)

Nitrogen oxide emissions (*See* Emissions)

NOAA Geostationary Operational Environmental Satellite (GOES), 86

Nutrient concentrations

in lakes/streams, 46

O

Ocean and sea linkages (*See* Autotrophic communities)

Oligotrophic waters (*See* Autotrophic communities)

Osmoregulation, 94

in acid and acid/aluminum stressed fish, 95

P

Pelagic linkages (*See* Autotrophic communities)

Periphyton, 28, 35, 38

pH conditions, 18, 19, 23, 29, 39

affected by sulfate load, 45, 47

alkalinity, 47, 48(illus), 82

buffering capacity, 67, 74(table, illus), 95

depression, sensitivity of stream invertebrates, 54, 57, 58(illus)

effects on aquatic life, 93

influence of temperature on toxicity and metabolism, 95

pH measurement

electrodes with low-resistance sensing elements, 99

accuracy, 100

description of method development, 100

summary of method, 105–106

Ross model, 101, 102(table), 103(table)

provides fast and accurate measurement

standard hydrogen model, 100(table), 105(table)

response to temperature excursion, 101(illus)

in acid rain, 3, 11

method, 98

in laboratory streams, 55

in soft water lakes, 70, 71, 75(table), 77

reproducibility in calibration buffers, 103(table), 104(table)

improved by use of KCl to increase conductivity, 105

temperature dependence of calibration buffers, 104(table)

Phosphorous concentrations, 18, 22

Photosynthesis, 49

stimulation after short-term acidification, 38

Phytoplankton (*See also* Biomass, Ecosystems), 2, 17, 29, 47

carbon uptake, 49, 51

effects of acidification, 42, 47

Plankton (*See also* Ecosystems), 18

limited by lack of nutrients, 2, 19

Precipitation runoff, 50, 51(illus)
 Predation assessment
 by measurement of chlorophyll-a, 37

R

Real-time biosensing, 85
 Remote biosensing
 computer satellite data retrieval, 84, 89, 90
 water quality monitoring, 87
 Ross pH electrode, 3, 98, 101-103
 Running water (*See* Acidification, experimental)

S

Satellite data retrieval (*See* Biomonitoring)
 Sediments, 22
 laboratory experiments and methodology, 72, 73, 76
 in soft water lakes, 67, 68, 70(illus), 71(illus), 77(table)
 littoral-pelagic, 82
 reductions, 70
 Silt (*See* Sediments)
Sphagnum, 22
 Stream invertebrates (*See* Invertebrates, stream)
 Streams, acidification (*See* Lake/stream acidification)
 Stress responses of fish (*See also* Biomonitoring)
 osmoregulatory process, 94
 pH/aluminum, physiological effects, 93
 Sulfate concentrations, 8
 reduction, 67, 68, 69, 78(illus), 80, 81(illus), 82
 Sulfur emissions, 4
 Sulphuric acid

experimental acidification, 31
 Surface water chemistry, 9, 10

T

Toxicity tests, 95
 salt free aluminum hydroxide precipitate for, 96
 use of aluminum salts, potential problems
 associated anion effects, 2, 92
 effects on fish, 69
 Trophic-level interactions, 17
 Turkey Lakes watershed (*See* Watershed communities)

U

Ultraoligotrophic waters (*See* Aquatic biological communities)
 U.S. National Acid Precipitation Assessment Program (*See* NAPAP)

V

Vegetation (*See* Algae, Ecosystems)

W

Water chemistry, 2, 4, 7, 10(illus), 11
 algal growth tied to, 42
 littoral zone influence on, 22
 linked to fish presence/absence, 11, 12, 13(illus)
 Water quality, 7, 9, 19, 20
 remote monitoring, automated, 84, 85, 87(illus), 89
 Watershed communities, studies
 acidification, 52
 Adirondak Mountains, 7, 9
 effects of acidification, 11
 fish resources related to acidification, 13, 14(illus)

Watershed communities, studies (*continued*)

Blue Ridge Province, 7

Florida, 67

New England, 7

New York, 7

Pennsylvania

sampling stations, 44(illus)

Turkey Lakes, Canada, 42, 43, 48, 51

Upper Midwest, 7

Watershed hydrology (*See* Hydrology)

Wildlife management, 11

Z

Zinc

in experimental acidification

Zooplankton (*See also* Aquatic biological communities, Ecosystems), 17, 22, 23