Subject Index

Acarina. 41, 301
Aeration, oil spill, 403
Alaska, freshwater habitats, 23
Albedo, snow and ground, 32-33
Algae. See also Phytoplankton;
  Benthic algae
  benthic. See Benthic algae
  biomass compared to bacteria, 6
  biomass limitation, 449
  effect of temperature, 14, 201-202, 222-223
  factors controlling, 201
  in model, 434
  light inhibition, 206, 208
  nutrient limitation, 211
  P limitation, 212
  replacement of species, 14, 222
  seasonal succession, 180
  secrete DOC, 161
  uptake of N, 211
  uptake of P, 11
  zooplankton affect species, 14, 219
Alkalinity, seasonal cycle, 87
Ammonia
  effect of plants, 102
  in melt water, 102
  in rainfall, 106
  in water, 100
  interstitial water, 102, 104, 108
  supply rate, 13
  uptake, 13, 107
  uptake by roots, 109
Ammonification, 110, 211
Amphibia, 14, 22
Anaerobic metabolism, 353
Aquatic plants. See Carex;
  Arctophila
Arctic
  adaptions of plants, 38, 236
  adaptations of small organisms, 14, 381
  adaptations to, 14
  coastal plain, 25
  definition, 21
  effect on bacteria, 354
  effect on decomposition, 359
  effect on metazoans, 14, 381
  effect on P concentration, 151
  effect on plants, 242
  effect on ponds, 13
  effect on protozoans, 14
  foothills, 25
  lakes
    history of studies, 21
    and ponds, characteristics, 22
    experimental studies, 22
    limnology, results, 21
    ponds, unique properties of, 14
Arctic study, advantages of, 1
Arctophila fulva, 4, 102, 153, 224, 301
  life history, 228
  primary production, 231
Assimilation efficiency, zooplankton, 218
Autoradiography, phytoplankton, 188, 221
Bacteria
  affected by grazing, 8, 382
  and exudates, 350
  and sediment grazers, 354
  attached, 340, 351
carbon content, 341
control by DOC supply, 350, 355
comparison with temperate zone, 14
control by grazing, 8, 354, 356, 379, 380, 382
control by substrate, 356
control by zooplankton, 354
effect of freezing, 354
effect of temperature changes, 355
grazing and activity, 383
grazing by protozoa, 379
growth rate, 344
heterotrophic activity, 345
in benthic model, 431
in model, 446
interactions with protozoa, 9
meltwater, 344
numbers, 340, 344
oil pond, 395
overwinter mortality, 344
P cycling, 9, 11 133-134
primary production relation, 346, 355
production, 351, 353
protection of attached forms, 351
respiration, 351
resuspension, 341
simulation of biomass, 450
soils, 41
specific types and oil, 395
temperature effect, 346
uptake of DOC, 160, 346, 353
Barrow, site description, 25
Benthic algae. See also Algae, 193-200, 219-221
biomass, 4, 193-194
burial, 208
chlorophyll, 193
control by burial, 17, 221
control by grazers, 219, 380
daily Ps patterns, 199
grazing by microbenthos, 380
in model, 431
light adaptation, 206
model, 414
N uptake, 108
oil pond, 397
photosynthetic capacity, 207
primary production, 196, 198-199
respiration, 352
seasonal Ps, 198
silica interaction, 223
simulation of Ps, 449
species, 193
vertical distribution, 195
Benthic animals.
community, 22
respiration, 352
Benthic microalgae. See
Benthic algae
Benthic model, 413
Benthic respiration, 98, 363-372
Benthos. See also Midges, 303
Char Lake, 299
effect of temperature, 299
emergence, 301
habitats, 301
in arctic, 299
species at Barrow, 299
Bicarbonate, 80
Birds, 40
Bioassay for P limitation, 215
Biomass, control by nutrients, 217
Bioturbation.
chironomids, 297
in model, 431
tadpole shrimp, 333
Blue-green algae, 187
N fixation, 13, 112, 393
Bottom, movement, 69
Branchinecta, 256
Brooks Range, 25
Bryophytes, 38
Budget, nitrogen, 106
Caddisfly, 301
Calcium, 80
immobilization, 41
in Carex, 362
in plants, 233
interstitial water, 84
immobilization, 41
Carbon, total inorganic, 88
interstitial water, 96
Carbon dioxide
comparison of losses, 367
centration, 91
evasion rate, 95-96
factors affecting, 94
flux, 8
gadients, 93
in sediment respiration, 366
partial pressure, 90
release from soil 41, 97
respiration effects, 93-94
shallow lake, 93
total loss, 352
transfer rate, 93
Carbon flux
general description, 5
protozoa, 378
Carbon-14 dates,
Barrow soils, 26
lakes, 52
Carbon-nitrogen ratio
algae, 108
aquatic plants, 108
Carbohydrates in plants, 233,
235
Carex aquatilis, 4, 5, 9, 13, 15,
37, 41, 99, 102, 108, 134,
154, 161, 224, 301, 355,
357, 383, 401
decomposition, 5, 41, 134,
355, 357, 362
effect of arctic, 15, 242
effect on redox potential, 99
leaching, 359
leaf color defined, 357
leaves, 224
life history, 224
loss of P, 383
nutrient content, 231, 362
P uptake, 15
primary production, 230
releases DOC, 161
releases P, 134
resistance to decomposition,
355
source of DOC, 154
temperature adaptation, 15
uptake of N, 13, 108
Carnivores, tundra, 40
Cell turnover, planktonic algae,
6
Char Lake (IBP) study, 22
Chemistry
affected by oil, 392
arctic lakes, 22
effect of freezing, 80
effect of ocean, 84
pond water, 24, 79
Chironomidae, 15, 248, 299, 301
305, 405
Chironomus pilicornis,
300-302, 305-306, 310,
320
C. riparius, 301, 306
Chironomids. See also Midges
burrows affect oxygen, 372
consume microbenthos, 382
effect on sediment respiration,
371
food for birds, 40
generation time, 15
grazing, 219, 352
in benthic model, 432
mix sediment, 221, 297
oil pond, 403, 405
simulation of biomass, 449
temperature effects, 15
Chloride, 80
Chlorophyll, seasonal cycle, 179
Chromulina, 179–180, 184, 187, 190, 221
Ciliates
  distribution and abundance, 373, 375
  feeding on algae, 220
  functional types, 375, 377
  temperate comparison, 380
Circadian rhythm, 273
Climate
  description, 32
  during IBP study, 53
Cold temperatures, effect on ecosystem processes, 14
Cold climate, effect on P cycling, 136
Coleoptera, 14, 299
Colloidal P, 116–117
Colloids, and humic compounds, 157
Color of water, 153, 155
Comparative natural history approach, 1
Competition, 243
  in crustacea, 274
  tadpole shrimp, 335
Condensation, 411
Condensation, 36
Consumers
  in benthic model, 432
  in planktonic model, 444
tundra, 39
Control of bacteria, 9
Copepods
  abundance, 255
  calanoid, 256
  control of generation number, 276
cyclopoid, 255
egg production, 257
harpacticoid, 374, 378, 381
oil pond,
Corynoneura, 298, 301, 302, 305–306, 309, 319
Cricotopus, 298, 306–307, 315
Cyclops, 4, 251, 403
  strenuus, 252, 263
  vernalis, 255, 257
Currents
  caused by wind, 3, 72
  convective, 54
  measurements, 71
Daphnia
  assimilation efficiency, 269
  brood size, 259–260, 278, 282
  critical photoperiod, 253
  density limits, 254
  egg production, 259
  fairyshrimp interactions, 284
  feeding activity, 271
  feeding rate, 265, 267
  feeding rate controls, 267, 269
  feeding rates in model, 430
  food affects brood size, 260, 279
  food and growth, 269
  food controls, 278, 282
  generation number control, 276
  growth efficiency, 281
  hatching synchrony, 271
Heterocope interactions, 285
in model, 444
life history, 257
middendorffiana, 6, 14, 132–133, 217, 251, 353, 403
P excretion, 133
pattern of control, 284
population control, 274
predation by Heterocope, 257
predation control, 285
production limits, 254

*Pulex*, 251, 261, 271–272, 290

oil pond, 14, 403

reproduction, 252, 277, 279

reproduction control, 253

respiration rate, 269

simulation, 278

simulation of biomass, 449

size, 273

swarms, 254

switch in production, 253

synchrony, 271

temperature effects, 277, 280

Data bank, 408

Daylight, duration, 32

Dead storage, 65

Death rate, in model, 430

Decapoda, 299

Decomposition, 41

affects P supply, 151

*Carex*, 134, 355, 357

changes in chemistry, 362

coefficients, 360

control in tundra, 41

controls primary production, 43

detritus, 351

effect of low temperature, 151

effect of slow rate, 22

hydrolysis, 360

immersion effect, 234

in benthic model, 431

in planktonic model, 446

leaching, 359

*Lepidurus* affects, 371

litter bags, 153, 357

N cycle, 115

photo-oxidation, 163

stimulation by grazing, 9

three phases, 359

time course, 361

trituration, 359

Denitrification, sediments, 104

Deoxygenation, 98

Description of ponds, 2

Deterministic model, 15, 409

Detritus

as biological buffer, 290

decomposition, 351

dilutes zooplankton food, 271, 288

food chain, 4, 7–8

in model, 433

in plankton model, 446

quantity, 8

Diatoms, 187

control, 223

silica needs, 84

Discharge. See Runoff, 35

Dissolved organic carbon

affects light, 70

algal secretion, 161

and bacteria, 350

composition, 151

control, 159, 163

control by bacteria, 159

effect of rainfall, 155

formation by bacteria, 353

from *Carex*, 154

from plants, 161

from zooplankton, 163

humic compounds, 155

in model, 433

in planktonic model, 446

in rainwater, 155

input, 154,163

labile compounds, 159

leachates from plants, 153

leaches from sediment, 153

percent humics, 158

origin, 151

refractory, 362

resistant to breakdown, 154

re-solution from sediments, 153

seasonal cycle, 152

sources, 8, 153, 161

sources of labile fraction, 161
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>turnover</td>
<td>160</td>
</tr>
<tr>
<td>Dissolved organic nitrogen</td>
<td>precipitation, 106</td>
</tr>
<tr>
<td>sediments, 102</td>
<td></td>
</tr>
<tr>
<td>water, 102</td>
<td></td>
</tr>
<tr>
<td>Dissolved reactive phosphorus</td>
<td>equilibrium concentration, 142</td>
</tr>
<tr>
<td>errors in analysis, 115, 119</td>
<td></td>
</tr>
<tr>
<td>interstitial water, 121</td>
<td></td>
</tr>
<tr>
<td>relation to sorbed P, 142</td>
<td></td>
</tr>
<tr>
<td>temporal variations, 116</td>
<td></td>
</tr>
<tr>
<td>variations among ponds, 145</td>
<td></td>
</tr>
<tr>
<td>Dissolved total phosphorus</td>
<td>interstitial water, 121</td>
</tr>
<tr>
<td>Dissolved unreactive phosphorus</td>
<td>116, 132</td>
</tr>
<tr>
<td>diel and seasonal variations, 117</td>
<td></td>
</tr>
<tr>
<td>from sediments, 132</td>
<td></td>
</tr>
<tr>
<td>in snow, 116</td>
<td></td>
</tr>
<tr>
<td>interstitial water, 121</td>
<td></td>
</tr>
<tr>
<td>Diversity, 1</td>
<td></td>
</tr>
<tr>
<td>DOC</td>
<td>See Dissolved organic carbon</td>
</tr>
<tr>
<td>DON</td>
<td>See Dissolved organic nitrogen</td>
</tr>
<tr>
<td>DRP</td>
<td>See Dissolved reactive phosphorus</td>
</tr>
<tr>
<td>DTP</td>
<td>See Dissolved total phosphorus</td>
</tr>
<tr>
<td>DUP</td>
<td>See Dissolved unreactive phosphorus</td>
</tr>
<tr>
<td>Dytiscid beetles</td>
<td>22, 299, 301</td>
</tr>
<tr>
<td>Eh</td>
<td>See Redox potential, 98</td>
</tr>
<tr>
<td>Emergence, benthos</td>
<td>301</td>
</tr>
<tr>
<td>Energy cycling, tundra</td>
<td>42</td>
</tr>
<tr>
<td>Energy, input</td>
<td>42</td>
</tr>
<tr>
<td>Endogenous rhythm, photosynthesis</td>
<td>210</td>
</tr>
<tr>
<td>Ephemeroptera</td>
<td>14, 299</td>
</tr>
<tr>
<td>Epipelic algae</td>
<td>See Benthic algae</td>
</tr>
<tr>
<td>Ephippial eggs</td>
<td>252</td>
</tr>
<tr>
<td>Eriophorum</td>
<td>38, 41, 229</td>
</tr>
<tr>
<td>Esatkuat Creek</td>
<td>64</td>
</tr>
<tr>
<td>Evaporation</td>
<td>factors affecting, 36</td>
</tr>
<tr>
<td>measurement techniques, 67</td>
<td></td>
</tr>
<tr>
<td>pan, 67</td>
<td></td>
</tr>
<tr>
<td>rates, 36, 67</td>
<td></td>
</tr>
<tr>
<td>Evasion coefficient, carbon dioxide, 96</td>
<td></td>
</tr>
<tr>
<td>Excretion, in model</td>
<td>430</td>
</tr>
<tr>
<td>Fairyshrimp</td>
<td>control of generation number, 276</td>
</tr>
<tr>
<td>egg production, 259</td>
<td></td>
</tr>
<tr>
<td>excretion, 133</td>
<td></td>
</tr>
<tr>
<td>food limitation, 282</td>
<td></td>
</tr>
<tr>
<td>life history, 14, 256</td>
<td></td>
</tr>
<tr>
<td>oil pond, 403</td>
<td></td>
</tr>
<tr>
<td>reproductive groups, 254</td>
<td></td>
</tr>
<tr>
<td>Feces, lemming, 362</td>
<td></td>
</tr>
<tr>
<td>Fertilization, 110</td>
<td></td>
</tr>
<tr>
<td>artificial ponds, 115</td>
<td></td>
</tr>
<tr>
<td>photosynthesis effects, 212</td>
<td></td>
</tr>
<tr>
<td>plants, 237</td>
<td></td>
</tr>
<tr>
<td>with P, 212</td>
<td></td>
</tr>
<tr>
<td>Filtering rates, Daphnia, 218</td>
<td></td>
</tr>
<tr>
<td>Food chain</td>
<td>grazing, 8</td>
</tr>
<tr>
<td>protozoan and micrometazoan, 9</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>14, 22</td>
</tr>
<tr>
<td>Food quality, zooplankton, 288, 292</td>
<td></td>
</tr>
<tr>
<td>Food supply, temperature effect, 13</td>
<td></td>
</tr>
<tr>
<td>Freeze-thaw description, 3, 60</td>
<td></td>
</tr>
<tr>
<td>Freezing, effect on ion concentration, 80</td>
<td></td>
</tr>
<tr>
<td>Freshwater habitats</td>
<td>23</td>
</tr>
<tr>
<td>Fungi</td>
<td>compared to bacteria, 397</td>
</tr>
<tr>
<td>in ponds, 356</td>
<td></td>
</tr>
<tr>
<td>in soils, 41</td>
<td></td>
</tr>
</tbody>
</table>
Gastropoda, 299
Gastrotrichs, 378
Geology of Barrow area, 26
Grazing
affects algae and bacteria, 218–219, 382
affects bacterial activity, 356
affects benthic algae, 219
affects P turnover, 134
chironomid, 352
enhances algae activity, 207, 218
food chain, 8
in model, 445
microbenthos, 352, 379
protozoa, 354
zooplankton, 188, 217, 353
Grazing rates, protozoans and
micrometazoans, 9
Half-saturation, light, 205, 206
Harpacticoid copepods, 374, 378, 381
Hatching, synchrony in
Daphnia, 272
Heat balance, seasonal, 33
Hemiptera, 14, 299
Heterocope, 4, 251, 256, 263, 403
infant killer, 288
predator of Daphnia, 285
Herbivores, 4
Hirudinea, 299
Histophagous ciliates, 377
History, pond site, 51
Humic compounds
composition, 155
concentration, 157
light extinction changes, 70
percent of DOC, 158
water budget effects, 158
Hydrology, description, 33
Hydrolysis, 360
Ice
effect on plants, 243
formation time, 22, 95
melt time, 33, 34
Ice cover, lakes and ponds, 22
Ice wedges, 28, 52
Ikroavik Lake, 20, 24, 25
ammonification and
nitrification, 110
benthic algal productivity, 199
DRP, 119
interstitial water, 85
light extinction, 71
N concentrations, 100, 102
nutrient uptake, 108
oxygen, 98
phytoplankton productivity, 199
PP, 120
temperature, 57
zooplankton, 251
Imikpuk Lake, 24, 25
temperature in sediments, 58
thaw dates, 61
Infant killer, Heterocope, 288
Ingestion, in model, 429, 432
Insects. See Chapter 7
oil pond, 403
soils, 42
International Biological
Program, description, 19
Interstitial water
ammonia, 108
inorganic carbon, 96
inorganic ions, 85
N concentration, 104
P concentration, 121
Invertebrates, factors affecting
in soil, 41, 42
Iron
dissolved in water, 82
extractable, 141
in Carex, 362
interstitial water, 84
mobilization, 138
relation to P, 121, 137, 139
sediment enrichment, 138
sorbs P, 11, 121
source in plant zone, 138
Isopoda, 299
Lakes
northern Alaska, 23, 24
origin, 24
P concentration, 119
Leaching
Carex, 82, 359
lemming feces, 82
potassium, 82
Lead, 86
Leaves, color defined, 153
Lemmings, 39
affect plants, 38-39, 234
chemistry of feces, 362
cycle of cycles, 39, 40
nutrient effects, 45
Lepidurus, 132, 221, 298, 302,
323, 371
P excretion, 133
sediment respiration effects, 371
Libertia, 300-302, 403
Lichens, 38
Light
extinction in sediments, 71, 198
extinction in water, 70
half-saturation, 205-206
in model, 414
inhibition in algae, 208
limits plants, 235
photosynthesis effects, 205
Litter, from plants, 153
Low temperature, biological effects, 14
Magnesium, 80
mating behavior, 311
mortality, 316, 321
overwintering, 311
parasitism, 307
predators, 315
production, 318–322
production variations, 321
recruitment, 321
respiration, 311, 313
selection, 311
species, 15, 307
synchronous emergence, 307
temperature acclimation, 312
temperature and growth, 313
trophic structure, 315
vertical distribution, 315
Mites, 41, 301
Model
abiotic input variables, 414
as management tool, 410
benthic, 413
benthic algae photosynthesis, 15
block diagram, 414
change in algae biomass, 414
comparison of deterministic and stochastic, 453
deterministic, 16, 409
deterministic framework, 447
general formulation, 412
Monte Carlo simulation, 452
notational convention, 412
planktonic, 413
planktonic carbon flow, 434
positive aspects, 453, 455
processes, 413
requirements, 408
restrictions, 454
simulation, 449
state variables, 413
stochastic, 17
stochastic framework, 451
test of hypotheses, 17
tuning and calibration, 451
value to project, 410
variability effects, 17
Modeling
advantages, 15, 16
and scientists, 409
assumption, 15
conclusions, 15, 17
general description, 410
steps, 407
Modeling process, steps, 412
Molting in Daphnia, rhythm, 273
Monovoltine, 252
Monte Carlo simulation, 452
Mosquitos, 299
Moss, dominates ponds, 158
Nannoplankton. See also Phytoplankton
dominate algae, 22
numbers, 182
relation to net plankton, 180
Naval Arctic Research Laboratory, 19, 25
Nematodes, 373–375, 378, 381
Nemoura, 300–302, 403
Nitrate
interstitial water, 104
sediments, 102
uptake, 107
water, 100
Nitrification, 110
Nitrite, 102
Nitrogen
algal uptake, 211
annual budget, 13, 106
budget for tundra, 46
Carex, 362
exchangeable, 109
fertilization, 110, 111
forms, 13
input, 13, 106
interstitial water, 13
limits plants, 241
Subject Index

meltwater, 107
oil pond, 392
particulate, 110
plants, 233
primary production effects, 13
rainfall, 106
relative to C, 13
relative to P, 115
root absorption, 240-242
sediment, 13
soil, 43
turnover in water, 13
uptake, 13, 107-108
Nitrogen fixation, 13, 104
oil pond, 393
P effects, 13, 112
Nitrogen gas, 105
Nitrogenase activity. See N fixation, 104
Nitrous oxide, 105
Nutrients
bioassay and uptake, 24, 215, 217
biomass control, 217
control photosynthesis, 24, 217
limit algae, 211
limit plants, 45
regeneration, 188
retention within plants, 43
soil organic content, 43
uptake in model, 429

Oil
aeration and toxicity, 403
algae, 14, 219
bacterial effects, 395
benthic algae effects, 397
chemistry, 392
composition changes, 394
insects affected, 403
loss rate, 390, 393
N and P content, 392
N fixation, 393

oxygen changed, 392
phytoplankton affected, 187, 222, 397
rooted plants affected, 401
sediment respiration effects, 395
seston effects, 292
spill of 1970, 388
spill of 1975, 391
temperature effects, 391
volatization and degradation, 393
water soluble fraction, 395, 399, 403
zooplankton affected, 14, 188, 218, 403

Oligochaetes
as grazers, 219
consume microbenthos, 382

Organic matter
accumulates in soil, 43
sediments, 8, 78
Oriented lakes, 24, 28
Ostracods, 344, 378
Oxalate extraction, 12, 137, 145
Oxygen
arctic lakes, 22, 98
oil pond, 392
ponds, 97

Particulate organic carbon. See also Seston, 290
composition, 271
control, 164, 168
defined, 163
living percentage, 164, 271
meltwater, 164
sedimentation, 166-168
zooplankton grazing, 168, 289

Particulate organic nitrogen
water, 102

Particulate phosphorus, 117, 119
Permafrost
Barrow area, 26
Subject Index

biological effects, 28
pond freezing, 61
pH
seasonal cycle, 87
sediments, 98
Phalaropes, 283
Phosphatase, 117, 132
Phosphate sorption index (PSI), 137, 144, 149
relation to algae, 149
Phosphorus
addition, 111, 212
alga limited, 212
algal bloom, 213
algal cycling, 216-217
available, 131
bacteria, 133
bacterial cycling, 9
budget, 124
buffering, 143-144
Carex, 134-135, 362
chemical factions, 120
colloidal, 130-131
concentration prediction, 12
controlled by sediments, 213
cycling rates, 11, 127, 130
decomposition losses, 41
distribution, 145
equilibrium concentration, 143
exchange, sediment-water, 136
excretion, 130, 132, 133
flux, 126
fractionation, 120-121, 139
in model, 431, 444
input, 10, 13
interstitial water, 11, 124
iron relationship, 11, 137, 139
iron sorption, 11, 121
leaching, 125
luxury storage, 129
meltwater, 125
microcosm cycling, 383
N fixation stimulation, 112
oil pond, 392
organic transformation, 130-131
output, 10
oxalate extractable, 137, 145
particulate, 132
photosynthesis control, 12
plants, 233
plant cycling, 43
plants limited, 45
primary production affected, 11
protozoa, 9, 133
rainfall, 10, 13, 126
release by Carex, 134-135
resin exchangeable, 141
root uptake, 136, 240
sediment buffering, 150
sediment control, 146, 150, 213
sediments, 10, 120, 124, 136, 138, 141
sediments of trough, 124
soil, 43, 141, 239
soil exchange, 126
soil microbes, 239
soil water, 126
 sorption, 11, 135-136, 138
 sorption controls, 141
 sorption isotherms, 137
 supply rates, 150
total, sediment, 124
total, water, 124
turnover times, 11, 130, 135
uptake by biota, 11
water, control, 150
XP (low molecular weight pool), 130, 217
zooplankton cycling, 132-133, 286
Photic zone, sediment, 71
Photoinhibition, temperature effect, 210
Photo-oxidation, phosphorus,
Subject Index

117, 132, 163
Photosynthesis
  benthic algae, 6, 207
  biomass related, 189, 235
  efficiency, 210, 236
  fertilization effects, 111, 212
  in model, 429, 444
  inorganic carbon changes, 87, 89
  light inhibition, 14
  light limitation, 205, 235
  nutrient limitation, 112, 217
  P effects, 111
  P cycling, 131
  per cell, 207
  temperature effect, 15, 235
  water column, 6
Photosynthetic capacity, phytoplankton, 207

Physa, 300-303, 403

Phytoplankton
  arctic vs. temperate, 14
  autoradiography, 189
  biomass, 8, 180, 182, 189
  blue-green algae, 187
  control of species, 222
  daily changes, 182
  description, 180
  diatoms, 187
  endogenous rhythm, 210
  oil pond, 187, 397
  P excretion controls, 286
  P excretion, 130
  primary production, 188, 189
  photosynthetic capacity, 207
  silica interactions, 223
  species number, 14
  species replacement, 400
  spring bloom, 213
  zooplankton, control, 400

Planktonic model, 413

Plants, See also Rooted plants, 108

  arctic adaptations, 38, 242
  biomass, 228, 235
  carbohydrate, 233, 235
  carbon flux, 5
  competition, 243
  controls on productivity, 238
  DOC secretion, 161
  DOC source, 153
  genetic differences, 243
  growth rate, 235
  habitat description, 224
  ice effects, 243
  in model, 434
  iron in beds, 138
  light conditions, 235
  N uptake, 240
  nutrient analyses, 231
  nutrient limitations, 237, 241
  oil effects, 401
  P uptake, 239
  photosynthesis control, 235
  ponds, favorable, 234
  reproduction, 224
  retranslocation, 233
  root respiration, 96
  roots and rhizomes, 228-229
  sun angle effects, 235
  temperature control, 236
  variability, 243

Plecoptera, oil pond, 403

Polygona/ground, 28, 52

Ponds
  bulk sediment density, 77
  description, 51
  dimensions, 51
  dry up, 36
  evaporation affects chemistry, 81
  formation, 52
  history of the site, 51
  ice melt, 34
  location of study site, 25
  northern Alaska, 23-24
  origins, 29
  phosphorus, 119
polygon and trough, 53
sediment description, 76
temperature, 54
water chemistry, 79
Pond studies, description, 20
Pond water, N, 100
Potassium
Carex, 362
decomposition loss, 41
interstitial water, 84
PP. See Particulate phosphorus
Precipitation. See Rainfall, 32, 36, 53, 63
Predators, 4
Predation
bacteria, 352
controls Daphnia, 285
controls microfauna, 382
controls zooplankton, 264
fish, 251
invertebrate, 274
midge, 322
tadpole shrimp, 332
tundra, 40
zooplankton, 263
Primary production. See also Photosynthesis
Arctophila
benthic and planktonic, 200
by species, 190
calculation, 190
Carex, 230
controls, 149, 180
distribution, 6
freshwater, 22
general, 4
N uptake, 108
P interaction, 131
ponds, 24, 188–189, 192
roots and rhizomes, 38
seasonal effect, 13
sediment control, 213
terrestrial, 38, 230
Procladius, 298, 301, 315, 322
Production
bacteria, 351, 353
midge, 319, 322
tadpole shrimp, 328
zooplankton, 218, 264
Protozoa, 9
arctic adaptation, 14, 380
bacteria interactions, 9
carbon flux, 378
feeding rates, 379
food control, 381
generation time, 381
grazing, 9, 354, 379
P cycling, 9, 133, 383
predation control, 382
resistant stages, 14
yield, 379
Ps. See Photosynthesis
Psectrocladius, 298, 305–307, 309
PSI. See Phosphorus sorption index
Q10
algal Ps, 202
in model, 429
Rainfall
annual, 32, 53, 63
chemistry, 82
DOC affected, 155
N concentration, 13, 106
P concentration, 10, 13, 126
Redox potential, plant beds, 99
Replacement, phytoplankton species, 400
Resource limitation, Daphnia and fairyshrimp, 278
Respiration
affects inorganic carbon, 87, 89
affects oxygen, 97
bacteria, 351
Subject Index

307, 315
Trituration, 359
Trough ponds, 77
DOC, 157
DRP, 119
origin, 29
Tundra Biome study, 19
Turbellarians, 374, 378

Ultraviolet absorbance, as DOC measure, 157-158
Uroglena, 14, 188, 222, 400

Vegetation. See also Plants
Barrow area, 37
growth on land, 38

Water
budget, 69
level, 63, 67
movement, 3, 72
runoff, 33
temperature, 3

Wind
affects currents, 72
causes resuspension, 341
effect on ponds, 32
speed and direction, 32, 72

Whole system models, 409
Worms, Enchytraeidae, 41

XP (a phosphorus fraction), 116-117

Zinc
in Carex, 362
in water, 86
Zooflagellates, 374

Zooplankton
assimilation efficiency, 218
C content, 261
control, 288, 292
control algae, 14, 219, 284, 400
detritus feeding, 289
distribution, 251, 254
effect of arctic environment, 15
egg production, 257
energy limited, 290
grazing, 6, 168, 188, 217, 353
growth rates, 262, 287
interaction with seston, 168, 289, 291-292
life cycle, 22
mortality, 252
nutrient cycling, 188, 284, 293
oil effects, 188, 403
overwintering strategy, 15
P excretion, 132, 286-287
predation, 263-264
production, 8, 15, 218, 264, 288-293
production and seston, 292
release DOC, 163
reproduction, 252
size in Arctic, 22
species in ponds and lakes, 24, 251
standing crop, 8, 254
Subject Index

benthic algae, 352
description, 76
benthic animals, 352
disturbance by animals, 221,
in model, 434
297
lake vs. pond, 94
freezing, 61
midges, 31
light extinction, 71, 198
roots, 96, 352
midge distribution, 315
sediment, 100, 364
midge habitat, 303
soils, 41
N concentrations, 102, 115,
temperature effects, 14
238
Resuspension, bacteria, 341
nutrients in plant beds, 238
Retranslocation, 233
organic matter, 78, 362
Rhodomonas minuta, 14,
or oxygen diffusion, 371
179-180, 185, 188, 190,
221-222, 400
239
Rhizopods, 377
particle size, 76, 373
Rivers, northern Alaska, 23-24
protozoan carbon flux, 378
Rooted plants. See Plants
release DUP, 132
Rhizopods
respiration, oil pond, 395
ammonia uptake,
sourced of DOC, 153
109 biomass, 38
temperature, 57
Carex, 228-229
thaw depth, 61
oxygen affects, 109
thaw-lake cycle, 37
P uptake, 136, 239
respiration, 352
production, 38
Rotifers, 251, 375
sediment, 352
Runoff
ammonia uptake,
Barrow watersheds, 36
carex, 228-229
Rivers, northern Alaska, 23-24
description, 35
measurement, 63
measurement, 65
ponds, 36
seasonal pattern, 65
Sediments
Secretion, in model, 430
algal control, 13, 213
description, 14,
biofilm, 8
bioturbation, 221, 297
control, 373
buffer P, 150
control P, 13, 213
bulk density, 77
control photosynthesis, 13,
control P, 13, 213
control photosynthesis, 13,
Snowcover, duration, 32
Snowfall, Barrow, 62
Sodium
interstitial water, 84
water, 80
Soils
Barrow area, 37
chemistry, 37
moisture content, 37
P concentrations, 141
temperature, 37
Solar radiation, 32–33, 54
Sorption, controls P
concentration, 141
*Spartina alterniflora*, 109, 135
Sponges, 14
Springs, northern Alaska, 23, 25
Springtails (Collembola), 41
Stability
in stochastic model, 456
of system, 411
State variable
defined, 410
of model, 413
Stochastic model, 17
results, 451
Streams
Barrow area, 25
northern Alaska, 23–25
Sulfate, 84
SUNDAY, simulation, 278
Synchrony, midge emergence, 307
Tadpole shrimp
abundance, 323, 325
as predators, 332
bioturbation, 333
egg production, 323, 334
factors affecting density, 334–335
food for nauplii, 330
growth efficiency, 330
length and temperature, 326
life history, 323
mix sediment, 221, 333
mortality, 334
production, 328
reproductive strategy, 334
respiration, 328
Tanytarsini, 298, 301, 315, 405
*Tanytarsus inaequalis*, 300–302, 305, 308, 311
*Tanytarsus gregarius*, 300–301, 305–307, 311
Tardigrades, 378
Temperature
air, 32, 53, 56
and algae, 223
effect on algae, 201–202, 223
effect on *Daphnia*, 277
effect on photoinhibition, 210
Ikroavik Lake, 57
in model, 414
lakes and ponds, 22, 56
midge growth, 314
oil pond, 391
P uptake, 240
ponds and lakes, 57, 391
seasonal pattern, 56
sediment, 57
soils, 37
water and air, 54, 56
Temkin isotherm, 142
Thaw
depth in soil, 26
factors affecting, 60
sediments, 61
Thaw-lakes, 61
Thaw-lake cycle, 28, 37, 43, 52
Trace metals
sediment, 87
water, 86
Trajectory, of vectors, 411, 413
Trichoptera, 14, 229
oil pond, 403
*Trichotanypus*, 300–302, 305,