Index
Agricultural Computer Network (AGNET), 327
Agricultural Statistics, 33
agricultural surpluses, 42
Alaska, 12, 188
All-American Canal, 123
American Heart Association, 93
American Indians, 25, 181, 261
American Medical Association Advisory Panel on Toxic Substances, 98
Appalachian Mountains, 162
Argentina, 265
arid and semiarid lands:
alternative agriculture, 322
animals for, 263
basic and applied research, 19
definition of, 30
ground water (see ground water)
irrigation (see irrigation)
land area, 30
natural features of, 351
potential new crops, 258
regions of the United States, 3, 30
vegetation types, 37, 261
Arizona Department of Water Resources, 135
Arizona-Sonora Desert Museum, Tucson, Ariz., 322
Arkansas River, 60, 70, 73, 76, 189, 274
Arkansas, White, and Red River Basins, 364
Australia, 156, 266
“Blueprint for a Dryland Democracy,” 110
Bonneville Power Administration, 185
Brazil, 265
Brazes River, 75, 204
Bredehoeft, J., 73
California, 30, 31, 33, 34, 35, 37, 38, 39, 41, 56, 60, 70, 73, 74, 75, 76, 79, 87, 89, 99, 116, 121, 123, 130, 132, 134, 151, 156, 157, 161, 182, 263, 273, 282, 283, 307, 325
California Basins, 378
California Joint State-Federal River Forecast Center, 171
California Water Resources Control Board, 86
Canada, 60
carbon dioxide (CO₂), 63
Carter administration, 67
Cascade Mountains, 30, 40, 52, 53, 60, 61
Census of Agriculture, 33
Central Arizona Project (CAP), 124, 291, 293
Central Valley Project, Calif., 184, 291, 293, 352
Chile, 266
Cincinnati, Ohio, 97
cloud seeding (see weather modification)
Colorado, 30, 33, 35, 37, 38, 39, 56, 74, 75, 119, 120, 121, 123, 129, 130, 131, 132, 156, 157, 160, 161
Colorado-Big Thompson project, 12, 136, 188
Colorado Ground Water Commission, 131
Colorado Plateaus, 382
Colorado Rivers, 60, 62, 63, 66, 70, 71, 73, 76, 85, 124, 188, 274, 383
Colorado River Basin, 228, 370
Colorado River Basin Pilot Project Final Environmental Statement, 158
Colorado River Compact, 66, 120, 123, 124
Columbia Basin Irrigation Project, 131
Columbia Lava Plateau, 382
Columbia River, 60, 76, 79, 120, 134, 172
Columbia River Operation Hydromet Management System (CROHMS), 185
Columbia River Valley, 56
computers and information management:
agricultural extension services, 18
data bases, 22
Federal data storage systems, 22
Federal funds, 22
private sector, 22
recordkeeping, 18
Congress:
Congressional Budget Office (CBO), 25, 26, 347
General Accounting Office (GAO), 281, 291, 293
Office of Technology Assessment (OTA), 19, 66
Select Committee on Disadvantaged People and Renewable Resources, 25
Senate Select Committee on Water Resources, 67
congressional interest, 3, 18, 19, 20, 21, 22, 23, 24, 25, 26
issues and options:
achieving equity in water availability and distribution, 345
impacts of water pricing on the adoption of technology, 346
improving the effectiveness of water-related technologies, 347
need for an interdisciplinary program of basic and applied research, 334
need for a strong Federal role in water quality, 341
need to have reliable ongoing information about renewable natural resources, 335
need to integrate water-related agricultural activities in Government agencies, 21, 337
protecting and maintaining long-term productivity of rain-fed agricultural resources, 343
Cornell University, Department of Agronomy, 91
dalles Dam, 120
Department of Agriculture (USDA), 7, 20, 26, 33, 47, 69, 97, 261, 338
Agricultural Research Service, 48, 300, 338
Bureau of Agricultural Engineering, 172
Cooperative Extension Service, 328
field research stations, 24
Office of the Secretary, 22, 123, 338
Salinity Laboratory, 280
Secretary John R. Block, 42
Soil Conservation Service (SCS), 48, 81, 172, 173, 182, 230, 253, 300
Department of Commerce, 7, 47, 69
Bureau of the Census, 33
National Oceanic and Atmospheric Administration, 48, 69, 156, 172
National Weather Service, 48, 171, 172, 185
Department of Defense, 7, 47, 69
U.S. Army Corps of Engineers, 48, 172, 182, 185, 188, 189, 190
Department of Energy, 7, 69
Department of the Interior, 7
Bureau of Land Management, 48, 203, 313, 317, 339
Bureau of Reclamation, 48, 120, 131, 156, 172, 182, 185, 194, 228
National Water Data Exchange, 48, 68, 69
National Water Summary, 67
office of Water Policy, 67
Office of Water Research and Technology, 47, 67, 334
U.S. Fish and Wildlife Service, 48, 323
U.S. Forest Service, 48, 161, 163, 339
Department of Transportation, 7
Dust Bowl, 35, 42

economic values of Western water, 338-391
Environmental Data Information Service, 69
Environmental Protection Agency, 7, 48, 69, 86, 94, 98, 102, 135

farm marketing, cash receipts, 353
Federal institutions, preparedness, 18, 19
Federal Inter-Agency River Basin Committee, 67
Federal Water-Data Collection Agencies (table 1), 7
Federal Water Pollution Control Administration, 86
Fort McDowell Indians, 120
Fourth National Groundwater Quality Symposium, 89
future energy demands, 80-81

Galapagos Islands, 266
Gila Desert, 56
Gila River, 77, 98
Great Basin, 75, 76, 374
Great Plains, 24, 30, 31, 33, 35, 37, 38, 40, 41, 53, 54, 80, 256, 259, 301, 351
ground water:
  artificial recharge, 16, 275, 282, 283, 284
calcium, 16
contamination, 16, 17, 89, 90, 267
definition of, 56
depletion of, 14, 16, 41, 73, 274
development of, 62
dissolved minerals in, 279
effects of overdrafting, 291

energy costs for pumping, 286
improving withdrawal efficiency, 285, 287
increasing supplies, 282
law, 113, 116
magnesium, 16
mining, 6, 16, 73, 77, 81, 136, 274, 292, 293
municipal and industrial use, 17
public health, 17, 23
quality (see water quality)
recharge basins, cost of, 283
recharge wells, 283
relationship with surface water, 276
resource regions, 56, 59, 276, 277, 380
seepage, 50, 275
social costs, 17
special characteristics, 290
subsidence, 16, 293
table, 50
technologies affecting, 16, 273
upward capillary movement, 50
use, 273
water spreading, 282
well efficiency, 287, 288, 289
Gulf Coastal Plain, 56
Gulf of Mexico, 50

Hawaii, 30
hazardous waste sites by State, 384
High Plains Associates, 274
High Plains Underground Water Conservation District No. 1, 286
Hoover Dam, 123
hydroelectric generation (see water use)
hydrologic cycle, 3, 6, 9, 10, 11, 47, 48, 80, 113, 150, 164, 181, 309
atmospheric moisture, 53
data bases, 7
evaporation, 49, 230
evapotranspiration, 53, 54, 56, 57, 150
human intervention, 66
infiltration, 50, 56
measurement techniques, 64, 65, 66
percolation, 50, 56
plants, 243
precipitation, 49, 52, 53, 54, 56, 57
runoff, 50, 56, 60
soil water, 211
transpiration, 50, 230
variability, 61, 66
watershed, 50, 151, 160, 161
hydrologic zones, 52
Hydrometeorological Streamflow Prediction (HM), 172, 173
Idaho, 30, 33, 35, 37, 38, 39, 75, 119, 121, 129
Illinois, 97
Interior Basin, 351
International Agency for Research on Cancer, 92
International Boundary and Water Commission, 7, 69
irrigation, 5, 6, 9, 12, 13, 14, 16, 34, 79, 134, 287

acreage, 40
conservation, 230
definition of terms, 229
development in Great Plains, 37
economic values, 174, 388
energy costs, 141, 259, 285, 286
fuels used for, 287
impacts of, 130, 131
methods, 231, 232, 233, 234, 235, 236
onfarm reservoirs, 184, 191, 194
purposes, 38
quality of water, 87, 93
reuse of wastewater, 88, 309
scheduling, 17, 302, 303
social ramifications, 41
system management, 237
training, 195
water distribution procedure, 192, 193, 194
Israel, 18, 304
Kansas, 5, 30, 31, 34, 35, 38, 39, 75, 119
Kings River, Calif., 192
Land Institute, Salina, Kans., 322
land-use management technologies:
alternative agriculture, 18, 322, 323
animal mixtures on rangelands, 18, 321
brush management, 319, 320, 321
computers, 327, 328, 329
Federal efforts, 22
fisheries, 314
multiple use of croplands, 324, 325
multiple use on rangelands, 17, 313
nonforage plant products, 315
nonmeat animal products, 315
plants and animals, 317, 319
reclamation, 315, 316, 317
recreation, 315, 325
revenue from hunting and fishing, 325
wildlife, 314, 325
Lathrop, Calif., 99
legislation:
Arizona Groundwater Management Act, 386
Boulder Canyon Project Act of 1928, 123
California Limitation Act of 1929, 123
Carey Act of 1894, 110
Clean Water Act, 23, 102, 122, 123, 300, 342
Colorado River Basin Project Act of 1968, 191
Columbia Treaty of 1964, 124
Comprehensive Environmental Response, Compensation, and Liability Act, 102
Desert Land Act of 1877, 109
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 97
Federal Reclamation Act, 1902, 67, 111
Federal Water Pollution Control Act of 1972, 122, 300
Homestead Act of 1862, 109, 111
Mexican Water Treaty, 124
Multiple Use, Sustained-Yield Act of 1960, 153, 339
National Environmental Policy Act (Public Law 91-190), 135
Native Latex Commercialization Act of 1978, 263
Plant Variety Protection Act, 1970, 15, 254
Reclamation Safety of Dams Act of 1978, 191
Resource Conservation and Recovery Act (RCRA), 120
Safe Drinking Water Act, 102
Water Resources Development Act of 1976, 275
Water Resources Planning Act of 1965 (Public Law 89-90), 47, 67, 111
Water Resources Research Act of 1964 (Public Law 88-379), 67
Lower Colorado River Basin, 150, 174
method of OTA study, 393
Mexican Water Treaty, 191
Mexico, 123, 124, 263, 267, 310
Miami, Fla, 97
Minnesota, 256
Mississippi River, 50, 60
Missouri River, 12, 53, 61, 70, 71, 73, 76, 77, 97, 149, 188, 189, 274
Missouri River Basin, 362
Montana, 30, 35, 38, 39, 119, 120, 121, 129, 301
Montana River, 60
Montana Water Code, 117
National Academy of Sciences, 87, 97, 99, 261
national agricultural policy, 18
National Agricultural Research and Extension Users Advisory Board, 348
National Cancer Institute, 94
National Center for Atmospheric Research (NCAR), 20, 335
National Center for Water Resources Research, 19, 20, 334
National Conference of State Legislatures, 385
National Drinking Water Advisory Council, 89
National Interim Primary Drinking Water Regulation, 94
National Organic Reconnaissan Survey, 94
National Research Council, 64, 87, 93, 314
National Science Foundation, 258, 261, 335
National Stream Quality Accounting Network (NASQAN), 101, 102
National Water Commission, 47, 67, 69, 274
national water policy, 18
Navajo Indian Irrigation Project, 120
Nebraska, 5, 30, 31, 34, 35, 38, 39, 75, 77, 116, 119, 273
Nebraska Natural Resources Information System, 69
Negev Desert, 267
Nevada, 5, 30, 31, 33, 35, 38, 39, 73, 119, 120, 121, 129, 156
New Mexico, 30, 35, 38, 39, 74, 75, 90, 116, 119, 121, 123, 129, 130, 319
New Orleans, La., 97
New Zealand, 266
North Dakota, 30, 34, 35, 38, 39, 119, 156, 157, 256
North Platte River, 77, 78
Nuclear Regulatory Commission, 7, 69
Ogallala aquifer, 35, 130, 131, 132, 141, 181, 273, 274, 275, 382
Ohio River, 60
Oklahoma, 30, 35, 38, 39, 119, 156, 319
Olympic Peninsula, 53
Oregon, 30, 33, 35, 37, 38, 39, 56, 60, 79, 119, 120, 122, 161
Organic Gardening and Farming Research Center, Emmaus, Pa., 261
Orme Dam, 120
Ouachita River, 189
Pacific Northwest, 16, 50, 53, 56, 79, 75, 134, 151
Pacific Northwest Basin, 376
Pacific Northwest Water Resources Region, 79
Papago Indians, 170
payment-in-kind (PIK) program, 42
Peru, 266
Plans for Water Data Acquisition by Federal Agencies Through Fiscal year 1983, 48
plants and animals:
  animal breeding:
    artificial insemination, 254
    buffalo, 263
cattle industry, 256
capitalized recordkeeping, 15
  embryo storage and transfer, 15, 255
  feedlots, 15, 254
  "new" animals, 16, 259
  programs, 254
  rabbits, 263
  ruminant farm animals, 15, 254
  sheep and goats, 15, 254
biotechnologies:
bacterial osmoregulation, 251
genetic diversity, 14, 15
institutional constraints, 14, 247
private sector research, 15, 247
protoplasm fusion, 14, 246, 247, 250
recombinant DNA, 14, 246, 247, 248, 250, 251
tissue culture, 14, 246, 247, 248, 249, 266
drought-resistant plants, 14, 15, 252
germplasm, 15, 254, 257, 258, 267
halophytes, 265
legal barriers, 259, 261
plant breeding:
economic yield, 253
micro-organisms, 266
philosophical basis, 251
potential new crops, 257, 258
six steps, 251
  sunflowers, 256
  water stress, 15, 253
plants for biomass energy, 262
plants for industrial products, 263
  salt-tolerant organisms, 264, 265
promising crop candidates:
  amaranth, 16, 261
  buffalo gourd, 16, 258, 262
corn, 16, 261, 262
guar, 16, 263
guayule, 16, 258, 263
jojoba, 16, 258, 260, 263
mesquite, 16, 262
milkmilk, 16, 259, 263
saltbush, 16, 262
tepary bean, 16, 245, 258, 261
Population Reference Bureau, 129
Powell, John Wesley, 110
President's Scientific Advisory Committee, 98
Project Skywater Programmatic Final Environmental Statement, 158
Puerto Rico, 30
Pyramid Lake Paiutes, 120
rain-fed agricultural resources:
  congressional interest, 343
  conversion of rangeland, 24
  cultivating marginal or unsuited lands, 24
dryland and rangeland research, 24
research and development, 24
Reagan administration, 47
Reagan, President Ronald, 67
Red River, 60, 70, 73, 76, 189, 274
research and development (R&D), 3, 24, 174, 328
Resources for the Future, 293
Rhoades, J. D., 228
Rio Grande Basin, 368
Rio Grande River, 60, 70, 73, 76, 124, 274
Rio Grande Valley, 56
Rock Springs District, Wyoming, 203
Rocky Mountains, 56, 77, 81, 151
Rodale Research Center, 322
Sacramento River Forecast Center, 171
San Joaquin Valley, Calif., 40, 294
Seattle, Wash., 97
Sierra Cooperative Pilot Project Environmental Assessment, 158
Sierra Mountains, 52, 60
Six State High Plains-Ogallala Regional Resources, study, 188, 275
Snake River, 60, 61, 75, 273, 283
soil-water relationships:
  basin tilage, 217
capillary rise, 212
changing soil properties:
  chemical soil conditioner materials, 225
  harvester ants and termites, 226
  micro-organisms, 225
  mycorrhizae fungi, 226
  soil conditioners, 226
  contour furrowing, 217
crop considerations, 236
  deep plowing, 216
drip irrigation, 234, 236
  evapotranspiration, 212
Great Plains, 213
hydrologic cycle, 211, 212
infiltration, 211, 215
irrigated agriculture, 227, 229
irrigation terms, definition of, 229
land leveling, 218, 219
land-shaping practices, 216
leaching, 228
limited irrigation, 236
managing soil cover:
crop residues, 220, 223
fallow systems, 219
modification of plant canopies, 225
mulches, 219, 220
plant-barrier systems, 223
saline seeps, 221, 222, 223
mechanical land treatments, 216, 217
movement, 211
onfarm irrigation efficiencies, 232
onfarm salinity management, 229
site conditions, 211
soil salinity, 228, 229
soil textures, 213
sprinkler irrigation, 234, 235
subsurface irrigation, 235, 236
supplies, 211, 213
supplying full water needs to plants, 231
surface irrigation, 232, 233
technologies affecting, 13
application costs, 14
Federal/State restrictions, 14
terraces, 218
use of precipitation, 215
vegetation, 211
South African, 266
South Dakota, 30, 35, 38, 39, 119, 122, 256
South Platte River, 77, 78
Soviet Union, 256
Stegner, Wallace, 110
stream flow:
average for major rivers, 60
Colorado River, 66
data, 174
forecasting, 170, 172, 174
spatial pattern, 61
variability, 62, 63
Streamflow Synthesis and Reservoir Regulation (SSARR), 172
surface water (see also ground water):
law, 113, 114
monitoring, 101
nonconsumptive use, 79
quality (see water quality: ground water)
reuse, 75, 77
runoff, 50, 56, 60, 150
use, 273
watershed management, 159
Tennessee River, 60
Tennessee Valley Authority, 7, 69
Texas, 7, 16, 30, 34, 35, 38, 39, 90, 119, 129, 156, 157, 273, 319
Texas-Gulf Basins, 366
Texas-Gulf region, 7, 60, 70, 76, 81, 294
Texas-Gulf Water Resources Region, 72
Texas Natural Resources Information System, 69
Tulare Basin, California
Tijuana River, 124
Umatilla reservation, 120
University of California, Santa Cruz, 322
University of Nebraska, 324
Upper Colorado River Compact, 120, 123
Upper Colorado River Water Resources Region, 72
U.S. Public Health Service, 93
U.S. Supreme Court, 116, 120
U.S. Water Resources Council, 47, 50, 67, 70, 274, 334
Utah, 30, 33, 35, 37, 38, 39, 90, 119, 120, 122, 123, 129, 156, 157, 160
Utah Division of Water Rights, 69
van Schilfgaarde, J., Director, U.S. Salinity Laboratory, 228
Virgin Islands, 30
Wagon Wheel Gap, Col., 161
Washington, 30, 31, 35, 37, 38, 39, 56, 60, 71, 79, 119, 122, 131
Water Data Storage and Retrieval System, 69
water-management technologies:
aquiculture, 312
“Best Management Practices, “ 300
computerized agricultural models, 300
congjunctive use of surface and ground water, 17, 309, 311
crop-management model, 301
enclosures for plants and fish, 17, 43, 310, 312
Federal efforts, 17, 22
flexible cropping, 17, 300, 301
in Israel, 304
irrigation scheduling, 17, 302, 303
wastewater;
reuse of, 17, 304, 308
treatment, 305, 306, 307, 308
watershed, 175
Water Policies for the Future, report to the President, 1973, 47, 67
water quality:
algae “bloom,” 87, 91, 92, 94
agricultural chemicals, 8, 16, 86, 95, 97
“black alkali,” 88
boron, 88
brine disposal, 12
calcium, 88, 279
chloride, 88, 279
control of toxic and noxious substances, 16
criteria, 86
desalination, 12
dibromochloropropene (DBCP), 87

Streamflow Synthesis and Reservoir Regulation (SSARR), 172
drinking water, 23, 87, 90, 93, 97, 99, 278

Drinking Water and Health, 87

Federal role, 23
ground water, 16, 23, 274
dissolved materials in, 279

Drinking Water and Health, 87
drinking water, 278
effects of human activity, 281

Federal role, 23

monitoring, 281

ground water, 16, 23, 274
dissolved materials in, 279
drinking water, 278

salts, 278

technologies to improve, 284

virus contamination, 89

hardness, 279, 280, 281

heat, affects on, 90

high standards, need for, 23

industrial shopping, 23

integrated analysis of contamination, 8

law (see Western water law)
magnesium, 88

management practices, 8, 23

mining activities, 315

monitoring and control, 8, 23, 101, 102

pollution, 7, 16, 23, 63, 87

problems, 85, 86

radioactive substances, 90

regulations:

best management practices, 123

Federal involvement, 122

point and nonpoint source pollution, 122

riparian zones, 13

salinity level for livestock, 87

sodium, 88, 93, 279, 281

Sodium Absorption Ratio (SAR) index, 280

sulfate, 88, 279

suspended and dissolved solids, 85

trace element tolerances for irrigation waters (table 18), 89

treatment, 8, 9, 22, 94, 305

well water, 8

water-treatment:
carbon tetrachloride, 94
carcinogens, animal, 94, 97, 99
carcinogens, human, 92, 94
cyclodiene insecticides, 97, 98
chloroform, 94
epidemiological studies, 94
dioxin, 98
herbicides, 98
maximum contaminant level (MCL), 94
oxygen-demanding wastes, 94
toxic byproduct, 98

trihalomethanes, 94

water resources:

agricultural effects on, 91, 92, 93

analyses, 67, 68, 70, 138

climatic fluctuations, 7, 63, 64, 66

competition for, 5, 132, 133

conservation, 6, 9, 11, 12, 13, 25, 191, 215, 230

consumption, 8, 9, 72, 73, 139
data collection, 67, 68, 70

depletion, 5, 35

efficiency of plants and animals, technologies affecting, 14

(see biotechnologies)

energy and mining use, 132

estimate of supply, 6, 63, 72, 73

estimating water prices:

alternative cost, 139

cost of pollution, 139
direct observation of markets, 139

ex post statistical analysis of water-use behavior, 139

Federal data-collection agencies, 69

Federal involvement, 9, 18, 19, 25, 26, 67, 68, 69

Federal, State, and local spending for, 112, 184

ground water (see ground water)
habitat maintenance, 6, 22, 79

instream flow, 22, 72

major region of the United States, 67

mountain snowpack, 7, 10, 61, 71, 81, 150, 171

municipal use, 134

offstream uses, 6, 79

planning and management, 19, 67, 138, 387

precipitation, 9, 11, 13, 49, 149, 150, 155, 156, 176, 215

problems in setting water values:

annual rental value or future income, 140

changing values during crop production, 140

comparing values in place, form, time, 140

indirect effect from water development, 140

marginal v. total value, 139

measuring quantity, 140

quality (see water quality)

regional characteristics, 355

regional interaction, 19

regions of the Western United States (fig. 9), 51

return flow, 8

reuse, 8, 75, 77, 304, 305

scarcity, 137

State initiatives in planning, 385

storage facilities, 11, 62

subregions, 74, 76

surface runoff, 10, 11, 50, 56, 60, 61, 71, 149, 171

measurement, 65

volume in West, 7, 11, 66, 138

water market, 136

water measurement, 64, 65, 66

water value, 138, 139

waste assimilation, 6, 79

weather modifications, 7, 10, 26, 154, 155, 175

Water Resources Scientific Information Center, 69

Water Salinity Control Project, Yuma, Ariz., 124

watershed management, 22, 50, 149, 150

highland, 26, 152

alpine zone, 10, 151, 153, 159 160, 175

montane forest, 10, 151, 153, 159, 160, 175

impacts of management technologies, 151

lowland, 10, 151, 152, 164, 175

research, 161, 166
snowmelt, 159
transition zones, 153
vegetation management, 161, 163, 164
vegetation removal or replacement, 10
water yield, 163
wet and dry years, 62
wilderness values, 10
“Water Quality Criteria,” 86
water storage and delivery:
automated upstream control, 193
catchments, 168, 169
compartmented reservoirs, 13, 199, 200
dams, 182
delivery of surface water to irrigation users, 12
desalting plants, 188
desalination (see water quality)
downstream control systems, 194
environmental effects, 186
evaporation control:
mechanical covers, 13, 199, 200
reflective coatings, 13, 199
surface area reductions, 13, 199
surface films, 13, 199
facilities, 11, 169, 182
farm and ranch ponds, 11, 12, 184
Federal role, 11, 186
financing, 184, 186
imports and exports, 189
interbasin transfer, 12, 188
interstate transfer, 190
regulating reservoirs along irrigation canals, 194
reservoirs, 11, 13, 62, 182, 184, 186
rigid surface linings, 197
soil sealants, 197
surplus water, 12
technologies that conserve supplies:
flexible delivery systems, 12, 191
seepage and evaporation control, 12, 195, 196
vegetation management, 12
tradeoffs, agricultural and wildlife, 199
vegetation management, 13, 161, 163, 164
aquatic plants, 13, 202, 203, 204, 206
chemical use, 13, 165, 202, 205, 206
mechanical controls, 202, 203
pest control, 205
saltcedar, 204
water use:
adoption of technology, 8
agronomic WUE, 244, 246, 252
animals adaptation to limited water supply, 14, 244, 245, 246
beneficial use, 9, 281
biological WUE, 244
conjunctive use of surface and ground water, 17, 309, 311
conservation, 9, 25, 118
decisionmaking, 24
efficiency of, 9, 70
equity, 24
Federal reserved rights doctrine, 25
Federal subsidies, reduction of, 25
fish habitat, 79, 140
forecast models, 11
growing demands, 9
hydroelectric generation, 6, 22, 72, 73, 75, 79, 81, 140, 174, 390
Indian reserved water rights, 25
irrigation (see irrigation)
legal system, 8
local economics, 9
market system, 8, 135
nonconsumptive use, 140
off stream consumption by States, 71, 75
per capita consumption, 72
plants (see biotechnologies)
recreation, 6, 22, 79, 80, 136, 137, 140, 314
regional patterns, 47
resource protection, 135
States concern, 9
streamflow forecasting, 7, 11, 22
supply/use patterns, 75
user oversight groups, 26
wastewater, reuse of, 17, 304, 305
water-use rights, 8, 24, 25
Western history and development, 109, 110, 111
weather modification:
assessment of, 158
cloud seeding, 10, 154, 155, 175
cumulus air masses, 155
cumulus clouds, 156, 175
natural precipitation efficiency, 156
orographic air masses, 155
seedability potential, 157
silver iodide, 155
warm seeding, 155
Western agriculture:
agricultural chemicals, 95-99
agronomy, 9
animals (see plants and animals)
augmenting water supplies, 9
brush control, 165, 166, 168
Chaparral-dominated rangelands, 167
crop specialization, 31
dissolved salts, 92
diversity, 29
dryland, 5, 14, 24, 34, 35, 214, 219, 223, 317
High Plains area, 131
major producing areas, 37
“duty of water,” 135
economic efficiency and agricultural technology, 141
equity and fairness in decisionmaking, 5, 24
erosion, 17, 163
exports, 29, 34, 354
farm size and ownership, 39
Federal role, 3, 5
federally owned land, 5, 31
hydrology, 9
income, farming and ranching, 5, 31, 39
irrigation (see irrigation)
labor:
costs, 40
migrant workers, 41
minorities, 41
role of, 40
long-term future, 41
mesquite-dominated rangelands, 168
national context, 31
natural features, 31
Pinyon-Juniper dominated rangelands, 167
products of, 31
public land, 5
livestock grazing, 5
rangeland, 5, 14, 24, 34, 214, 223, 316
animal mixture, 321
brush management, 319
forage, 36
multiple products, 37
vegetation types, 36
related industries, 29, 34
resource base, long-term productivity
runoff agriculture, 168
rural economics, 129
sagebrush-dominated rangelands, 166
salt-tolerant crops:
algae, 16, 266
bacteria, 16, 267
blue-green algae, 16, 267
development of, 264, 265, 266, 267
schematic of, 36
seed and nursery stock, 29
selected major crops, 33
socioeconomic factors, 125, 127, 128, 129, 130
soil compaction, 17
soil salinization, 14, 264
sustainability, 9
systems approach to decisionmaking, 5
trends, 41
Western water law:
appropriation doctrine, 114
“basin of origin” statutes, 114
common law doctrines, 116
correlative rights, 114
document of prior appropriation, 116
doctrines, 9, 116
El Paso v. Reynolds, 116
Interstate and International Agreements, 123
Sporhase, et al., v. Nebraska, 116
State level, 113
summary of, 115
surface and ground water, 113
weather modification, 157
Western water rights:
Arizona v. California, 120, 123
atmospheric moisture, 125
contractual arrangements, 117
Federal doctrine, 118
irrigation, 117
permit system, 117
public trustee, 119
quantification, 119, 120
return flow, 117
State officer, 117
transfer of, 117
Western Indian, 119, 120, 121, 122, 132
Winters v. United States, 119
White River, 60, 70, 73, 76, 189, 274
Wild and Scenic Rivers System, 191
World Health Organization (WHO) United Nations, 89
Wyoming, 30, 33, 35, 38, 39, 119, 122, 123, 129, 201, 261
Wyoming Legislature, 117
Yellowstone River, 64, 77, 78
Yuma, Ariz., 187