INDEX

INDEX

academic/academia, 260 allowable biological catch, Assistant to the President, 80–81, aquaculture support, 333 277-278, 279, 280, 287 114, 449, 475 Alvin, 418, 419 data management, 437 Atlantic Coastal Fisheries socioeconomic research, 383, American Samoa, 34, 70, 135, Cooperative Management Act, 384 170, 321, 325 284 research community linkages, Animal and Plant Health Atlantic States Marine Fisheries 49, 124, 125, 129, 130, 132, Inspection Service, 254, 260 Commission, 284, 298 133, 135–136, 137, 139, 335, animal feeding operations, 39, atmosphere/atmospheric (see also 347 206, 211 (see also concenair pollution) acoustic research programs, trated animal feeding operadeposition of pollutants, 39, 315-316, 377 tions) 210, 211, 223-224 Act to Prevent Pollution from aquaculture monitoring, 229, 230, 232, Ships, 266 coordinated action, 66, 100, Administrative Procedures Act, 101, 333-334, 336 pollution control, 223-224 287 environmental impacts, 40, Australia, ocean policy, 79, 288, Agreement to Promote 331-332, 336 308 fishery impacts, 40, 331–332, Compliance with **International Conservation** bacteria, 35, 39, 210, 229, 241, and Management Measures by health concerns, 346, 349 341, 346 (see also human Fishing Vessels on the High infrastructure, 330 health) Seas, 300, 301, 446 international cooperation, ballast water discharges, 41, 253, 254, 255, 256, 257-258, 259, agriculture (see also U.S. 302, 336 Department of Agriculture) and invasive species, 40, 256, 260-261, 345 conservation programs, 213, 257, 258, 261, 331–332, 336 barrier islands, 155, 165, 187 214, 219 management structure, beaches and shorelines economic value compared to 332-333 cleanups, 265, 268 oceans, 31 offshore, 33, 54, 100, 101, closings and advisories, 39, pollution from, 39, 54, 159, 332, 336 210, 217, 226, 264, 349-350 183, 206, 213, 214, 215, 216, permitting and leasing system, debris management, 264, 265, 219 101, 332, 334 268 air pollution (see also atmosregulatory regime, 101, economic value, 35 erosion, 42, 44, 163, 166, 167, phere/atmospheric) 332–333 from vessels, 244-245 research and development 168 and water quality, 64, 206 needs, 335, 380 nourishment, 150, 157, Alaska, 282, 299, 317 sustainable management, 163–164, 181, 184, 186, 187, Community Development 333-335 307, 369 Quota Program, 288, 289 value of, 32, 330-331 water quality monitoring, Marine Conservation Council, aquariums, 35, 125, 136, 143, 233, 349-350 298 144, 151, 316 Beaches Environmental mineral deposits, 368 Aquatic Nuisance Species Task Assessment and Coastal oil and gas development, 354, Force, 253, 259, 259-260, 478 Health Act, 213, 229, 266 357, 359, 365 archaeology, 37, 102, 387 Bering Sea, 49, 73, 288 Synthetic Aperture Radar Arctic Ocean, 73, 364 best management practices, 151, Facility, 430 Argo float program, 395, 414 211, 214, 215, 218, 219, 221, 232, 335 vessel pollution, 241, 242 artificial reefs, 33, 99 albatross, 299, 308 Ash Council, 109, 116 biodiversity algal blooms (see harmful algal Asrar, Ghassem, 404 coral ecosystems, 37, 307, 321, 326-327 blooms) assessments (see ecosystem assessments; evaluation)

ment, 62, 66-67, 104, 473 (see CALFED) Coastal and Ocean Resource ecosystem diversity, 66, 379 Canada, ocean policy, 79, 87, 93, Economics Program, 382 223, 224, 261, 275, 284, 301, education needs, 136, 138, 140 coastal areas (see also beaches and and human health, 33, 35, shorelines) cancer, 33, 35, 340, 341, 342 339-340 defining, 34, 35 Capital Construction Fund, 275, genetic diversity, 66, 379 dune ecosystems, 307 human impacts, 66-67, 206 290, 291 economy, 31, 32, 34-36, 150, 151, 382-384 international convention, 54 carbon sequestration, 33, 37, and marine animal models for 67-68, 450 monitoring, 176–177, human research, 339 Caribbean Sea 231-232 in marine protected areas, 104 coral reefs, 41, 323 population pressures, 36, microbial, 341 41-42, 43, 150-152 pollution management, 223, monitoring, 228 224, 270, 455 real estate, 36, 37 public support for, 309 Carter administration, 117 water quality, 233, 204-205, research needs, 66, 379, 380 Centers for Disease Control, 339, 349-350 species diversity, 66, 379 341, 347 watersheds, 31, 32, 34, 154 bioproducts Centers for Ocean Sciences Coastal Barrier Resources Act, economic value, 33, 35, 339 Education Excellence, 124, 155, 163 industrial uses, 340-341 129, 130, 132, 134 Coastal Barrier Resources System, investments in, 340 channels, 186, 196, 200 153, 155 managing discovery and chart/charting (see mapping and coastal habitats, 170-179 (see also development, 54, 341, 343 charting activities) habitat restoration; wetlands; molecular probes, 340 Chesapeake Bay, 41, 86-87, 88, other specific habitats) nutrients, 33, 340 89, 159, 171, 173, 209, 223, Coastal and Estuarine Land pharmaceuticals, 33, 339, 261, 332, 422 Conservation Program, 172 340, 341 Childers, Dorothy, 298 conservation programs, bioprospecting, 100, 343 cholera, 43, 346-347 (see also 155-156, 171-172, 176 Bush (G.H.W.) administration, 54, human health) ecosystem-based approach, 173, 175, 176, 177 178, 354 CITES, 303, 326-327, 448 Bush (G.W.) administration, 56, Clean Air Act, 157, 224, 245, 366 funding for, 172, 176 93, 475 Clean Vessel Act, 243 inventories and assessments, business (see employment) Clean Water Act, 73, 101, 171, 176-177 bycatch (see also fishery manage-214, 224, 241, 243, 266, 324, losses, 40-41, 151, 170, 172 ment), 40, 264, 287, 288, regional coordination, 177 366 298-299, 302, 303, 306-307, amendments, 156, 157, 160, research needs, 380 308, 314, 317, 318 213 restoration, 156, 172-176 NPDES program, 207, 211, threats to, 151, 170-171 value of, 36, 170, 173 Caldwell, Jack C., 178 221 CALFED, 89, 159 vulnerability to natural haz-Section 319 program, 218, California 219-220 ards, 42, 165 beach-related activities, 35, Section 404 program, coastal planning and management, 151, 182 178-179 150-161 (see also develop-State Revolving Funds, 207, coastal economy, 151 212, 217, 219 boundary/jurisdictional concoastal zone, 154 siderations, 153-154, 155, 157 invasive species, 41, 256, 257, climate (see also global climate change) consolidation and coordinamineral resources, 368 Global Climate Observing tion of programs, 156-157, offshore management, 160, System, 414 173, 175 354, 357, 358 global system studies, 387, decision-making layers, water management projects, 395 152-153, 184 182 and oceans, 37, 387 existing programs, 152, wetlands, 40, 170 Clinton administration, 54, 72, 354 153-155, 158-159

California Bay-Delta Authority

Coastal America, 84, 173

ecosystem-based manage-

federal area-based programs, 34, 150, 152–157, 159 funding, 152, 153, 154, 156, 157 goal setting, 155 hazards-related programs and, 150-151, 157, 162, 163, 169 incentives for participation, 155, 158 information needs and sources, 157, 159-160 obstacles to, 157 offshore management linked to, 158, 160 performance measures and evaluations, 155 permitting and planning delays, 184 resource assessments, 154 state-federal relationship, 153, 158-159 watershed approaches, 150, 154, 157, 159–160, 169 coastal states (see also individual states) defined, 34, 462 education and outreach, 124-125, 127, 132 federal partnerships with, 153, 158–159, 311, 357, 360, fishery management, 292, 332, 334 GDP, 32 jobs, 32 jurisdiction, 49, 284, 332, 334, 352-354 offshore management, 99, 101, 102, 158, 332, 334, 352-354, 361 recommendations to, 473-474, 479 revenue sharing on energy resources, 359-360 seaward boundaries, 70-71 coastal watershed counties, 31, 32, 36, 41-42, 150 Coastal Wetlands Planning, Protection, and Restoration Act (Breaux Act), 175 coastal zone, defined, 153-154

coastal zone counties, 34 Coastal Zone Management Act, amendments, 54, 154-155, 160, 214 Coastal Energy Impact Program, 354, 360 Coastal Zone Management Program, 53, 54, 153-155, 156, 163, 181, 228, 459 definition of coastal state, 34 enactment, 50 federal consistency provisions, 51, 54, 153, 158–159, 160, 362, 367 goals, 172 and offshore energy development, 353, 354, 360, 366 Reauthorization Amendments, 214, 218, 219

214, 218, 219
Code of Conduct for Responsible
Fisheries, 293, 302, 303, 336
collaborative approaches (see also
partnerships)
education and outreach network, 124–130, 132, 133,
134, 144
international research, 454
watershed management, 222
Coloma–Agaran, Gilbert, 269

commercial fishing industry (see also fisheries; fishery management; fishing gear) adversarial relationship with government, 275-276 cooperative research, 281-282 cultural value, 32 debris from, 264, 265, 267, 268, 269–270 economic value, 31 impacts of, 295-297, 306-307, 308 longline, 303, 308 overcapitalization of fleets, 275, 290-291 safety issues, 287, 288, 292,

Commission (see U.S.

Commission on Ocean Policy)
Commission on Marine Science,
Engineering and Resources
(see Stratton Commission)

293

Commission on the Limits of the Continental Shelf, 390, 445
Committee on Ocean Resource Management (proposed), 83–84, 166, 198, 313, 326, 476
Committee on Ocean Science, Education, Technology, and Operations, 82–83, 126, 127, 375–376, 437, 475
Commonwealth of the Northern Mariana Islands, 34, 170, 321, 325

community quotas, 288
Comprehensive Environmental
Response, Compensation and
Liability Act, 183
concentrated animal feeding oper

concentrated animal feeding operations (see also animal feeding operations), 211

Congress, 55, 87, 219, 266–267 (see also legislation; individual statutes) information analysis for, 391–392 and OCS revenue sharing, 360 recommendations to, 222, 246, 284, 286, 290, 310, 348, 368, 474, 475

Connaughton, James, 41
Conservation Security Program
(see also U.S. Department of
Agriculture), 159, 214
consolidation of ocean and coastal

programs, 112–115 Consortium for Oceanographic Research and Education, 139, 420

contiguous zone, 72, 73
continental shelf, 72–73, 103, 390
Convention Concerning the
Protection of World Cultural
and Natural Heritage, 448
Convention on Biological

Convention on Biological Diversity, 54, 448

Convention on International Trade in Endangered Species of Wild Fauna and Flora (see CITES)

Convention on Long–Range Transboundary Air Pollution, 224 Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, 301 Convention on the Conservation of Antarctic Marine Living Resources, 447 Convention on the Continental Shelf, 72-73 Convention on the Law of the Sea (see LOS Convention) Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (see London Convention) Convention on the Territorial Sea and the Contiguous Zone, 70 Convention on Wetlands of International Importance, Especially as Waterfowl Habitat, 448 Cooksey, Sarah, 153 Coral ecosystems, 320–328 biodiversity, 37, 307, 321, 326-327 bleaching, 41, 44, 322 climate change and, 44, 320, 325, 327 debris management, 264, 266, deep-water (cold-water), 320, 321-323, 326 distribution, 320-321 federal agency roles and responsibilities, 323-324 fisheries, 37, 322, 323 interagency and intergovernmental initiatives, 87, 324-325 International Coral Reef Action Network, 451 International Coral Reef Initiative, 327 international initiatives, 326-327 legislation, 323-324, 325-326 management, 323-326 monitoring, 324, 327-328 research needs, 327-328, 380 restoration, 323, 324

shallow-water (warm-water), 171, 321 status, 41, 171, 320-323 sustainable harvesting practices, 327 threats to, 41, 186, 208, 210, 322-323, 324, 325, 326, 450 value, 35, 37, 41, 321-322, 325 white band disease, 263, 323 Coral Protection and Management Act, 326 Coral Reef Conservation Act, 323, 325 Coral Reef Task Force (see U.S. Coral Reef Task Force) COSEE (see Centers for Ocean Sciences Education Excellence) COSETO (see Committee on Ocean Science, Education, Technology, and Operations) cost-benefit analyses, 164, 179, 185-188, 295, 382-385 costs (see also economic issues; funding) beyond scope of report, 463 deferred, 462-463 implementation of USCOP recommendations, 459-462 Council on Environmental Quality, 41, 77, 84, 96, 476 Cousteau, Jean-Michel, 125 cruise industry, 31, 32, 35, 151, 194, 236, 241-243, 244, 264 cultural heritage/resources coral reefs, 322, 325 exploration of submerged sites, 387 fishery management and, 32, 282 ownership of submerged resources, 102 promotion through education, 136, 141 value of oceans, 32, 36, 37 curriculum (see also education and outreach) field and laboratory experiments, 125, 130, 135-136 graduate school, 123, 124,

134, 136, 137, 138-139

K-12 programs, 37, 122, 124, 127, 128, 129, 130-136, 144 remote-access technologies, science literacy, 69, 123, 125, 131-132 teacher preparation, 124, 125, 128, 130, 133-135 undergraduate programs, 124, 125, 127, 133, 136-141 CZMA (see Coastal Zone Management Act) Danson, Ted, 65 data (see also information) academic research, 437 classified, 431, 435, 437-438 communication networks, 33, 99, 396, 428 defined, 428 long-term time series, 435, 438 raw, 436-437 redundant, 389, 390 visualization tools, 433, 436-437 data centers discipline-based world collections, 431 distributed active archive, 433 military, 432, 433 national civilian, 431, 432 types, 431–433 data management, 428-438 (see also information) analysis, 266, 268-269, 384 challenges, 428-429, 438 collection of data, 163, 164-166, 266, 268-269, 276, 280-281, 292-294, 295, 298, 384, 389, 396, 429-431 computer hardware, 433 coordination of, 389, 429-431 distribution to users, 230, 234, 266, 268–269, 384, 386, 432, 434, 435-437 growth of data holdings, 432 human resources, 433-434 improvements in, 432–438

incorporating data in national

data centers, 433, 437-438

infrastructure, 433-434, 438

integration of multiple sources, 234, 384, 389, 390, 406, 428-429, 431, 433, 434, 436, 438 interagency planning, 432-435 Intergovernmental Oceanographic Data Exchange program, 437 IOOS and, 405, 407-408, 434, 435, 437 maps and charts, 436 national monitoring system and, 230, 234, 434, 435 ocean and coastal, 431 OPeNDAP technology, 436 research needs, 384 review and declassification, 437-438 software and modeling, 89, 433, 435 standardized procedures, 233 structure, 429-431 terminology, 429 DDT, 223, 264, 349 dead zones, 39, 87, 206 Dearry, Allen, 349 debris, marine, 264-271 cleanups, 264, 265, 268 coral reef damage, 264, 266, community involvement, 268 data management, 266, 268-269 derelict fishing gear, 264, 265, 267, 268, 269-270 education and outreach, 266, 267-268, 269, 270 and endangered species, 264, 307 existing programs, 265-266 funding for programs, 266 impacts, 264-265, 266, 267, incentive-based management, industry cooperation, 268 interagency coordination, 269 international cooperation, 265-266, 270 monitoring and identification of sources, 266, 268-269 national programs, 265-269

plastic materials, 264–265, 266, 267, 307 port reception facilities, 270 research needs, 380 sources, 264-265, 270 dedicated access privileges (see also fishery management), 288-290, 293 deep ocean environments carbon sequestration, 33, 37, 67-68, 450 coral communities, 320, 321-323, 326 hydrothermal vents, 33, 37, 341, 387 mining, 53, 54, 444, 446 oil and gas production, 357, 363–364, 387, 445 technology, 387, 417-418 Deepwater Port Act, 358 Delaware, 88, 153, 154, 159, 252 Department of Natural Resources prior proposals, 116, 117, 310 recommended, 109, 115 development (see also coastal planning and management) disincentives, 155, 157, 163 environmental impacts, 40, 41-42, 43, 94, 150, 151-152, 175, 182, 215, 307, 308 in high-hazard areas, 150, 162, 163–164, 165, 167–169, 184 floodplain, 165, 166, 167, 168 inappropriate federal incentives for, 157, 163-164, 167, 168, 186, 210 infrastructure policies and programs, 163-164 land subsidence, 40, 166, 174 low-impact, 220 sustainable redevelopment, 169, 184 tradable rights, 172 urban sprawl, 152 and water quality, 42, 151, 215, 216-217 DeVoe, Richard, 384 dioxins, 223, 346, 349 disaster assistance, 168-169 Disaster Mitigation Act, 168–169 dolphins, 303, 306-307, 308, 316,

DOT (see U.S. Department of Transportation) dredging Action Agenda, 188 beneficial uses of materials from, 181, 186, 187 contaminated sediments, 183, 186, 187 coordination of programs, 99, 184-185 cost-benefit analysis, 185-188 delays in planning and permitting, 186 disposal of materials, 181, 182, 187 expenditures, 196 national and regional teams, 187-188 navigational, 181, 183, 185–186, 187, 196, 217 outer Continental Shelf, 369 drinking water, 38, 211, 215, 217 (see also water quality; water supply) Earle, Sylvia, 387

445, 448 ECOHAB (see Ecology and Oceanography of Harmful Algal Blooms) Ecology and Oceanography of Harmful Algal Blooms, 339, 345 economic issues bioproducts, 33, 35, 339 coastal, 31, 32, 34-36, 150, 151, 382-384 data management, 383-384 energy and mineral resources, fishery management, 31, 32-33, 289, 296-297, 382 impact of human activities, 38-44, 382 marine transportation system, 31, 32, 192–193, 194, 195, 200 pollution-related, 38-40, 204, 206, 209, 211, 217 research needs, 31, 382-384 tourism and recreation, 31, 35-36, 150, 151, 264

Earth Observation Summit, 409

Earth Summit, 54, 79, 300, 301,

350

value of oceans, 30-36 ecosystem assessments, 96, 99, 104, 157, 316, 350, 379, 381, 459 ecosystem-based management (see also large marine ecosysadaptive approach, 62, 64, 65-66, 104, 226, 232, 317, 473 biodiversity considerations, 62, 66-67, 62, 66-67, 104, 473 climate change and, 67-68 coordination of decision making, 64-65, 67, 84, 99-100, 103, 173 of endangered species, 310, 311, 315, 316-318 of fisheries, 280, 295-299 geographic boundaries for, 63-64, 90 goals and objectives, 66, 296 governance, 62, 68, 473 guiding principles, 62, 103, 472-473 habitat preservation, 173, 175, 176, 177 hazards component, 169 international coordination, 318, 473 marine transportation system, 196, 249–250 monitoring component, 226 multiple–use perspective, 62, 66, 67, 80, 92, 97, 100-101, 105, 249, 296–297, 333, 369, 473 precautionary approach, 65-66, 80 reorganization of federal agencies for, 108, 118 science-based decision making, 62, 65-66, 67-68, 94, 97-98, 104, 242, 248-249, 276-282, 473 sediment management, 184 watershed approach, 150, 154, 157, 159–160, 169, 205,

213

education and outreach, 122-146 (see also curriculum; National Sea Grant College Program; Ocean.ED) biodiversity, 136, 138, 140 collaborative network, 124-130, 132, 133, 134, 144 coordination of, 83, 90, 124, 125-128, 134, 143-144, 258 cross-cutting themes, 124 cultural/ethnic considerations, 136, 141 debris management, 266, 267-268, 269, 270 endangered species, 316 exploration program and, 387, evaluation and assessment of efforts, 128-129, 130 existing efforts, 125-126, 145 federal programs, 124-125, 126-128, 136, 137, 139-141, 143, 144 fishery management, 136, 291 funding, 125, 128, 129-130, 136-142, 143, 144, 214 habitat restoration, 173, 176 health-related, 350 informal, 122, 124, 125, 127, 142-145 invasive species, 255, 258-259 for leadership of ocean workforce, 122, 123, 136, 137, 143 of managers and decision makers, 220 mentoring, 135, 141 message design and delivery, 128, 143-144 natural hazard risks, 163, 164-166 outreach, 130, 136, 137-138, 139, 143, 144–145, 221 participants, 124-125, 132 and public awareness, 68–69, 90, 122–124, 130, 142–143, 213, 220 recruitment of students, 137-138 research community linkages, 124, 125, 129, 130, 132, 133,

135-136, 139, 335

scientists' roles, 132, 133-136 standards, 131-132, 144 state initiatives, 124-125, 127, and stewardship, 69, 123, 142, 144, 173, 176 underrepresented and underserved groups, 130, 136, 141-142, 145 value of oceans, 37, 122, 130 vessel pollution, 243, 248 water pollution control, 69, 138, 213, 214, 220, 221, 243, 248, 350 workforce training, 69, 123, 136-142 EEZ (see exclusive economic zone) El Niño-La Niña, 275, 296, 395, 408, 409, 424, 453 emergency preparedness, 200-201 (see also hazard management; natural hazards) employment (see also economic issues; jobs; socioeconomic considerations; workforce) data needs, 139, 384 economic value, 30-32 endangered species, 306-319 (see also marine mammals; individual species) behavior, 312, 314-315 coordination of programs, 311 domestic action, 316-318 debris threats, 264, 307 ecosystem-based management, 310, 311, 315, 316-318 education and outreach, 316 fishery management and, 298-299, 306-307, 308, 314, 317, 318 funding for, 311 habitat losses, 308 human impacts, 307, 314, 315-316 international coordination, 303, 308, 318 jurisdiction and authority, 306, 309, 310-311 legislation, 309-310 permitting and review standards, 311-314

programmatic permitting, 312-314 protection gaps, 310-314 research needs, 314-316, 380 state-federal cooperation, 311 takes, 311-312 threats to, 264, 306-308, 314-315-317 Endangered Species Act, 73, 101, 118, 306, 307, 309-310, 316, 318, 324, 343, 366, 367 energy and mineral resources, 48 (see also natural gas; oil, offshore) bonus bid and royalty payments, 33, 103, 359 deep-water production, 357, 363-364, 387, 445 economic value, 33 environmental issues, 51, 174, 353-354, 361-364, 366, 369 exploration and development process, 51, 354-357 federal consistency provision, 158, 362, 367 federal revenues from, 33, 102-103, 357, 359-360 federal-state partnerships, 158, 357, 360, 361 incentive-based approach, 357 IOOS information and resource sharing, 364 jurisdiction, 49, 70, 71, 72, 352-352, 367, 445 leases, 49, 53, 54, 71, 353-357, 359, 366, 369 legislation, 49, 353-354, 360, 366 management, 99, 100, 158, 352-364, 368 methane hydrates, 33, 341, 364-365, 450 offshore development, 53, 98, 100, 343, 352-370 production trends, 353, 357 renewable, 33, 105, 182, 365-368 research needs, 365, 381 resource rents, 102-103, 359, 366 state revenue sharing, 359-360 state decision-making role, 361

sustainable development, 360 technology, 417 enforcement fishery management, 288-289, 291-295, 297, 300, 301 of permitting for marine mammals, 312 pollution control measures, 212, 218, 220, 238, 239, 242-243, 257 vessel pollution, 238, 239, 242-243, 257 vessel safety and security, 236, 237-240 entanglement of marine animals, 264, 266–267, 306–307, 331 environmental impacts assessments, 189, 295, 363-364, 366 of aquaculture, 40, 331–332, of coastal development, 40, 41-42, 43, 94, 150, 151-152, 175, 182, 215 commercial fishing, 295-297, 306-307, 308 cumulative, 96, 242, 267, 295, 363 energy and mineral resource development, 51, 174, 353–354, 361–364, 366, 369 invasive species, 41, 252-253 marine debris, 264-265, 266, of nutrient pollution, 39, 175, 206, 208–209, 210, 215, 216 of offshore oil and gas production, 366 of population growth, 41-42, 43, 170 of tourism and recreational activities, 42 of vessel pollution, 242 weather-related, 42 environmental movement, 51-52, **Environmental Protection Agency** (see also individual programs) aquaculture responsibilities, 334 budget support, 112

coordination efforts, 125

creation, 115 debris management, 266, 267, educational programs, 124, 125 **Environmental Monitoring** and Assessment Program, 229 existing ocean and coastal programs and responsibilities, 78, 114 habitat conservation/restoration programs, 88, 113, 153, 171, 173, 177 health-related activities, 339, 341 Gulf of Mexico Program Office, 89 international contributions, invasive species control, 256, 257, 260 mapping and charting activities, 389, 390 marine transportation-related programs, 196, 197, 245 monitoring programs, 228, 229, 230, 231, 424 Office of Water, 113 Office of Wetlands, Oceans, and Watersheds, 113, 220 offshore responsibilities, 358, 361-364, 366 recommendations, 478 regional boundaries, 92-93, 94 reorganization proposals, 116, 117 research infrastructure, 416, 422 sediment management, 113, 181, 182, 183, 186, 188, 189, 190 socioeconomic research, 382-383, 384 vessels, 422 water quality management, 101, 113, 182, 183, 204-205, 206, 207, 210, 211, 212, 213, 214, 217, 220, 221, 222, 224, 241, 295, 324, 326, 449 watershed focus, 113, 159 EPA (see Environmental Protection Agency)

erosion, 40, 182 FAO (see Food and Agriculture Fish Stocks Agreement, 300–302, beaches, 42, 44, 163, 166, Organization) 446 167, 168 farm (see agriculture; aquaculture) fisheries Farm Service Agency, 215, 260 control, 150, 157, 163-164, aquaculture impacts, 40, 181, 183, 184, 186, 187, 307, Federal Aviation Act, 366 331-332, 334 369 Chignik salmon, 40, 288 Federal Aviation Administration, runoff and, 216 197, 366 collapse, 40, 275 estuary/estuarine federal consistency provisions (see coral reef, 37, 322, 323 depletion, 38, 40, 49, 54, 275, nutrient overenrichment, 39 Coastal Zone Management sanctuaries, 103-104, 153, 155 Act), 51, 54, 153, 158-159, 299 water quality, 38, 204-205 160, 362, 367 economics, 32-33 Estuary Habitat Restoration Federal Emergency Management flounder, 276, 281 Council, 173, 175, 176, 177 Agency, 157, 162, 163, halibut/sablefish, 287, 288, Estuary Restoration Act, 173 165-166, 168-169, 201, 389, 289, 297 European Community, 245, 409, 477 international, 298, 299-303 413 Federal Energy Regulatory invasive species, 41, 331-332 evaluation Commission, 358, 367 monkfish, 282 of coastal management Federal Geographic Data New England groundfish, programs, 155 Committee, 166, 389, 478 276, 287-288, 290, 296 of restoration programs, Marine and Coastal Spatial North Atlantic cod, 40, 275 Data Subcommittee, 390 Peruvian anchoveta, 275 176-177 of education programs, Federal Highway Administration, pollock, 288 128-129, 130 197, 199, 260 recovery, 276, 277, 281 of hazard mitigation Federal Insecticide, Fungicide, regime shifts, 296 programs, 165 and Rodenticide Act, 256 striped bass, 276, 281 Evans, Christopher J., 232 Federal Land Policy and surf clam/ocean quahog, 288, exclusive economic zone, 53, 443 Management Act, 365 289 exploration of, 387-388 Federal Oceanographic Facilities whiting, 288 defined, 72, 73 Committee, 82, 375, 417 world stocks, 40 fishery management in, 275, Federal Power Act, 367 wreckfish, 288 283, 291, 300 federal waters (see offshore) fishery management, 274-304 (see also fisheries; commercial foreign research in, 72, 454 FEMA (see Federal Emergency invasive species control in, 256 Management Agency) fishing; Regional Fishery mineral production in, 352, Fenical, William, 340 Management Councils) 368 fertilizers, 206, 216 (see also nutriallocation decisions, 277, 278, pollution permits, 101 ent pollution) 279 size of U.S. territory, 30-31 FHA (see Federal Highway allowable biological catch, 277-278, 279, 280, 287 Executive Office of the President, Administration) assessment decisions, 277, leadership and coordination fish role, 77-79, 81-82, 389 diseases, 331-332 278 exploration, 386-388 habitat protection, 39, 99, authority, 52, 283-285 education and outreach 104, 295, 323 bycatch, 40, 264, 287, 288, harvests, 274-275 298-299, 302, 303, 314, 317, through, 387, 388 energy and mineral resources, and human health, 32, 183, 51, 354-357 catch-and-release programs, 210 of exclusive economic zone, kills, 206, 344 migratory species, 283-285, closures, 39, 99, 104, 284, 387-388 funding, 388 291, 293, 294, 299, 314 national program, 387-388 conservation, 51–52, 54, 63, ornamental/aquarium trade, technology, 419 31-32, 41 101, 297-299, 302 unexplored areas, 35, 122, 387 Fish and Wildlife Coordination cooperative research, 281-282 value of, 37, 386, 387 Act, 367

coordination and cooperation research priorities, 40, invasive species, 259 in, 100, 284-285, 288, 291, 280-283, 295, 380 mineral deposits, 368 292-293, 301-303 safety issues, 287, 288, 292, offshore management, 160, data collection and sharing, 354, 368 276, 280–281, 292–294, 295, science-based, 276-282 recreation and tourism, 151 298 socioeconomic consideraseaward boundary, 70 dedicated access privileges, tions, 289, 296-297, 382 water quality issues, 210 288-290, 293 state role, 292, 332, 334 Florida Keys, 151, 322 ecosystem-based approach, stock assessments, 276-277, food (see seafood) 280, 295-299 279, 282, 296–297 Food and Agriculture education and outreach, 136, subsistence harvesting, 282 Organization, 269, 450, 451 291 trade sanctions, 303 Code of Conduct for and endangered species, traditional approaches, Responsible Fisheries, 293, 298-299, 306-307, 308, 314, 287-288 302, 303, 336 317, 318 sustainable, 104, 276-282 Committee on Fisheries, 300 enforcement of restrictions, Vessel Monitoring System, Compliance Agreement, 300, 288-289, 291-295, 297, 300, 291, 293-294 fishing gear Fish Stocks Agreement, funding, 291, 292 circle hooks, 299 300-302 global climate change and, 43, derelict, 265, 268, 269-270, International Plans of Action, 296 302, 303 governance, 283-287 entanglement of marine ani-Food and Drug Administration, habitat protection, 295, mals in, 264, 266–267, 332-333, 339, 341, 347, 349, 297-298 306-307 351, 477 history of, 274-276 Framework Agreement on Climate research needs, 282, 299 incentive-based approaches, sensors on, 293 Change, 54, 445, 448 275, 287, 303 turtle excluder devices, 308 Freely Associated States of indigenous knowledge, 282 fishing industry (see commercial Micronesia, 409-410 international cooperation, fishing; recreational fishing) funding (see also costs) 284, 291, 293, 298, 299-303, Fishing Vessel Obligation budget assessment and review, 469-470 318, 445, 446, 451 Guarantee Program, 275, 290, interstate commissions, 277, 291 national ocean policy frame-278, 279, 283, 284, 299 flag state, 236, 238-239, 300 work, 463-464 jurisdiction, 49, 51-52, 53, flame retardants, 183, 209, 234 nonfederal authorities and, 275, 283-285, 300 Fletcher, Madilyn, 420 466-467 lawsuits, 276, 279, 286, 317 flood control, 42, 88, 89, 113, Ocean Policy Trust Fund, leadership, 284–285 163–164, 165, 166, 174, 175, 468-469 legislation, 51-52, 54, 275 179, 182, 184, 369 partnerships, 418 management areas, 63, 295 flood insurance, 155 (see also with revenues from ocean monitoring, 291, 293-294, National Flood Insurance uses, 467-469 298, 408 Program) overcapitalization of fishing floodplain development, 165, 166, GAO (see General Accounting fleets, 275, 290-291 167, 168 Office) flooding, 40, 42, 44, 165, 217 partnerships, 292–293 gas (see natural gas) Florida, 89, 316 permits, 287–288 General Accounting Office, 93, political pressures, 277, 278, coastal planning and manage-238, 246, 259, 392 General Agreement on Tariffs and ment, 152, 160 "race for the fish" approach, Trade, 303 coastal zone, 34, 154 287-291 coral reefs, 41, 321 Georges Bank, 51, 297 recreational fishing, 275, 281 endangered species, 307 Georgia, 358, 368 regional concerns linked to, Everglades, 173, 175 global climate change 295-297 habitat losses, 41, 171 abrupt, 44, 67, 378

coral ecosystem effects, 44,	coastal zone, 34	habitat restoration, 89
320, 325, 327	coordination of regional	coastal programs, 156,
costs of, 40, 43-44, 307	approaches, 87, 90, 92, 93	172–176
and fishery regime shifts, 43,	fisheries, 252	coastal Louisiana, 173,
296	habitat restoration, 173	174–175
and human health, 43, 338,	International Joint	coordination of activities, 173,
346–347	Commission, 93	175, 176, 177, 179, 295
Intergovernmental Panel on	invasive species, 41, 252, 254,	coral reefs, 323, 324
Climate Change, 43	257	education and outreach, 173,
and invasive species, 253	national lakeshores, 104	176
and marine transportation	pollution, 28, 223	Florida Everglades, 173, 175
system, 197	population density, 38	Heeia State Park, 177
monitoring, 229, 408, 409,	value of, 35, 38	funding, 172, 176, 177
453	Great Lakes Commission, 93, 159	large–scale efforts, 172–175
polar melting, 44, 450	Great Lakes Fishery Commission,	legislation, 175
process, 378	93, 283, 284	monitoring, 177
÷		
regional coordination, 87, 94	Great Lakes Interagency Task	public–private partnerships,
research needs, 44, 67–68,	Force, 92, 93	173
378–379, 380, 453	Griffin, Robert, 185	small–scale efforts, 177
sea level rise, 40, 42, 44, 54,	gross domestic product, 31, 32,	tools, 171–172
171, 378	192	training program, 138
and sediment flows, 181	Guam, 34, 70, 321, 325	habitats (see coastal habitats; habi-
temperature increases, 43,	guiding principles	tat restoration; marine habi-
338, 346–347	in ecosystem-based approach,	tats; wetlands; other specific
vulnerability of coastal areas,	62, 103, 472–473	habitats)
162, 171	international ocean policy,	Hanna, Susan, 288
Global Environmental Affairs	444, 448, 473	harbors, 186, 196, 200
Policy Coordinating	national ocean policy, 60–69,	harmful algal blooms
Committee, 449	97	causes, 206, 208, 344
Global Ocean Observing System,	offshore management, 97–98	costs of, 39, 344
397, 409–410, 414, 425, 434,	for recommendations,	and human health, 39,
453	472–473	338–339, 344–345, 346, 349
Global Positioning System, 195,	stewardship, 61, 472	management, 165, 344–345,
293, 385, 389	sustainability, 61, 472	349
Global Program of Action for the	watershed management, 63	and marine mammal mortal-
Protection of the Marine	Gulf of Maine, 296, 297	ity, 307, 315
Environment from	Council on the Marine	monitoring, 228, 344,
Land-Based Sources, 222,	Environment, 87, 159	345–346
447, 451, 455	Gulf of Mexico	nature of the problem, 204,
governance (see also National	atmospheric deposition, 223	338–339
Ocean Council)	coastal watershed counties, 34	outbreak trends, 54, 344, 345,
framework, 61, 68	chemosynthetic communities,	346
guiding principles, 62, 473	387	research needs, 344
international structure,	coral reefs, 323	Hartwig, William F, 259
449–450, 451	debris management, 268, 270	Hawaiian Islands
national coordination and	hypoxia ("dead zone"), 39,	aquaculture, 332, 335
leadership, 76–84	87, 206, 216	coastal management program,
participatory, 62, 68, 102, 473	oil and gas development, 354,	160
timeliness, 62, 473	357, 363	coastal zone, 154
Great Lakes	U.S. continental margins, 73	coral reefs, 35, 41, 264, 321,
beach–related activities, 35	Gulf States Marine Fisheries	323, 325
coastal watershed counties, 34	Commission, 284	debris management, 264, 270
coastal watershed counties, 37	Commission, 207	acons management, 207, 270

Department of Education bioproducts related to, 33, incentive-based approaches initiative, 135 339-343 agriculture, 219 endangered species, 264 coordination of federal procoastal planning and managehabitat restoration, 177 grams, 339, 348, 350 ment, 155, 158 mineral deposits, 368 education and outreach, 350 debris management, 270 monk seals, 264, 266 funding, 339, 341 education, 270 offshore management, 160 global climate change and, 43, fishery management, 275, recreation and tourism, 151 338, 346-347 287, 303 water quality issues, 210 harmful algal blooms and, 39, inappropriate, 157, 162, hazard management (see also 338–339, 344–345, 346, 349 163-164, 167, 168, 186, 210, weather; individual types of interdisciplinary biomedical 275, 287 hazards) research, 341, 343 oil and gas production, 357 vessel pollution, 243, 245 beach erosion mapping and links between oceans and, rating, 167 338-339 vessel safety and security, 237, in coastal areas, 150-151, microbiological testing and 157, 162-169 monitoring, 229, 233, 344, water pollution control, 212, 214, 217, 218, 219–220, 243, costs, 162, 163, 164, 165 347-348, 349-350 data collection and analysis, pathogenic marine microor-163, 164-166 ganisms and, 343–348, individual fishing quotas, 288, disaster assistance, 168-169 349-350 289 ecosystem-based approach, Oceans and Human Health individual transferable quotas, 169 Initiative, 339, 462 288, 289 education and outreach, 163, Pfiesteria piscicida, 344 informal education, 122, 124, 125, 164-166 protection of, 229, 348-351 127, 142–145 federal programs, 163-169 regional dimensions, 183, information (see also data; floodplain development, 165, 350-351 research needs) 166, 167, 168 research and development accessibility to users, 434 infrastructure policies and needs, 344, 345, 346, coastal ecosystems, 157, programs, 163-164 347-348, 381 159-160, 176-177 mapping and charting, seafood contamination, coordination of, 159-160, 32-33, 210, 39, 222, 346, 176, 386, 390 165-166 mitigation planning, 163, 348-349, 350 defined, 428 168-169 sediment contamination and, fishery-related, 276, 280-281, 183, 348-349 292-294, 295, 298 National Flood Insurance Program, 163, 166-168 Vibrio cholerae, 346-347 geospatial, 390 offshore, 99 water pollution and, 206, 210, hazards-related, 163, 164-166 repetitive-loss properties, 213, 217, 340-341, 344, 346, IOOS end products, 95, 167-168 349-350 405-406 products and forecasts, 160, health (see human health) hurricanes heavy metals, 183, 210, 223, 229, 234, 249–250, 386, 390, 406, Andrew, 42, 164 340-341 Betsy, 165 428, 435-436 Hilltops to Oceans (H2O) initia-Hugo, 164 regional needs, 94-95, 157, tive, 222-223, 455 Floyd, 164 159-160, 176, 386 Hogarth, William T., 104 Isabel, 201 sharing, 177, 240, 268-269, horseshoe crab, 33, 342 losses, 42, 164 293, 295, 389, 392-393, 436, human health, 338-351 hydrothermal vents, 33, 37, 341, animal models for human workforce supply and research, 339 hypoxia, 39, 87, 204, 208 demand, 139 aquaculture and, 346, 349 infrastructure (see also research bacteria and viruses and, 39, IFQ (see individual fishing quota) infrastructure and technology) 341, 346 IMO (see International Maritime aquaculture, 330 biodiversity and, 33, 35, Organization) marine transportation system, 339-340 186, 193-196, 198-199, 200

oil, 236, 246, 362-363 science and technology components, 416-425 wastewater treatment, 207, 211-212, 219-220 inland waterways, 186, 196, 200 **Integrated Ocean Drilling** Program, 414, 417, 454 **Integrated Ocean Observing** System, 394-410 capacity building, 409-410 coastal and ocean systems, 395-396 commitment to creation of, 396-397 components, 82, 269, 396 cost estimates, 407-408 data management, 405, 407-408, 434, 435, 437 design elements 397, 400-406 Earth Observation Summit, 409 end product development, 95, 405-406 environmental variables, 400-402 existing systems, 327, 328, 394, 395–396, 409, 420 fishery data, 281, 408 funding, 397, 404, 406-408, 459, 462 governance structure, 397-399 implementation steps, 396-397 international cooperation, 396 397, 403, 409-410, 453 national planning, 397-398 as national monitoring system component, 231-232, 234 Ocean.US and, 127, 398, 375, 397, 398–399, 400, 402, 407 offshore infrastructure and, outreach to user community, 399-400 partnerships, 396 397, 405, 406, 409–410 potential benefits, 164–165, 394-395, 408 product development, 95, 110 397, 406

regional structure, 95, 398–399, 400, 405–406, 436 research observatories and, 402 satellite observations, 395, 403-405, 407-408, 423, 424, 425 sensors, 346, 364, 402–403, 423 space-based observation missions, 403-404 user input for planning, 405-406 value of, 395-396, 408 Interagency Committee for the Marine Transportation System, 84, 197-198, 478 Intergovernmental Oceanographic Commission, 449–450, 451, 453 intermodal connections, 196, 198-199, 200 internal waters, defined, 70 International Coastal Cleanup, 264, 266, 268 International Convention for the Conservation of Atlantic Tunas, 445, 446 International Convention for the Control and Management of Ships' Ballast Water and Sediments, 261 International Convention for the Prevention of Pollution from Ships, 244, 245, 265, 270, 447 International Convention for the Regulation of Whaling, 448 international cooperation, 90 (see also international ocean policy; LOS Convention) aquaculture, 302, 336 biodiversity convention, 54 conservation, 327 coral reef management, 326-327, 451 debris management, 265-266, in ecosystem-based approach, 318, 473 endangered species, 303, 308, 318 fishery management, 284, 291, 293, 298, 299-303, 318, 445, 446, 451

Great Lakes region, 87, 93 invasive species control, 261-262 on IOOS, 396 397, 403, 409-410, 453 pollution control, 222-223, 224 port state control, 240 on research, 380, 454 on trade policy, 445, 451 vessel pollution control, 239, 244, 245, 247, 451 vessel safety and security, 237, 238, 239, 240, 451 International Maritime Organization, 237, 238, 239, 244, 247, 261, 450, 451 international ocean policy (see also international cooperation; LOS Convention) agreements and treaties, 444-449 capacity building, 453, 454-455 challenges, 442-443, 449, 450, 452 collaboration, 291, 449-450 developing and implementing, 443-452 Earth Summit and, 445, 448 evolution of, 443 freedom of the seas, 53, 72, 99, 105, 443, 450, 454 funding issues, 449 GOOS and, 453 governance structure, 449-450, 451 guiding principles, 444, 448, recommendations, 479 responsible international bodies, 451 science programs, 452-454 U.S. coordination, 300, 449-450, 451 U.S. research contributions, 454 interstate fisheries commissions, 277, 278, 279, 283, 284, 299, 334, 479 intracoastal waterways, 186, 196, 200

invasive species, 252–263 jobs (see also employment; worklarge marine ecosystems, 63–64, aquaculture and, 40, 256, 257, force) 90, 295 (see also 258, 261, 331–332, 336 ocean-related, 31, 32, 322, ecosystem-based managein ballast water discharge, 41, 353 ment) 253, 254, 255, 256, 257–258, losses, 40, 41 Law of the Sea Convention (see 259, 260-261, 345 John H. Chafee Coastal Barrier LOS Convention) Caulerpa taxifolia, 41, 259 Resources System, 155, 156 lease/leasing, offshore, 382 climate change and, 253 Johnson administration, 50, 53 for aquaculture, 101, 332, 334 costs of, 252, 259 jurisdictions oil and gas, 49, 53, 54, 71, coordination of programs, 353-357, 359, 366, 369 baseline, 70 258, 260-261 and coastal planning and legislation (see also individual Crassostrea ariakensis, 261 management, 153-154, 155, statutes) defined, 253 conservation, 51-52, 54, 63, detection and response, 177, contiguous zone, 72, 73 101 259-260 continental shelf, 72-73 coral reef management, domestic port-to-port conendangered species, 306, 309, 323-324, 325-326 debris management, 266 tamination, 257 310-311 endangered species, 101, education and outreach, 255, energy and mineral resources, 258-259 49, 70, 71, 72, 352–352, 367 309-310 European green crab, 41, 253 exclusive economic zone, energy and resource minerals, federal and state programs, 30-31, 72, 73, 454 49, 353–354, 360, 366 255-256, 260-261 fishery, 49, 51-52, 53, 275, environmental protection, 51, funding for control, 252, 255, 283–285, 300 54, 222 256, 258, 259 high seas, 73, 454 fishery management, 51–52, hydrilla, 252, 259 54, 275 inconsistencies and ambiguiguiding principles, 62, 473 impacts, 41, 252-253, 308, ties in laws, 73 and land use planning, 152 345 invasive species control, marine mammal and endan-253-255 intentional introductions, 256, 261 gered species protection presidential reorganization international partnerships, offshore energy and mineral authority, 114, 115 resource development, 52 261–262 resources, 49, 70, 445 legislation, 253-255 primer on, 70-73 territorial jurisdiction, 52 management, 253-256, sediment management, 181 Leinen, Margaret, 418 state, 49, 70-71, 284, 332, levees (see flood control) 260-261 monitoring, 260, 262 334, 352-354 London Convention, 265-266, pathways for introduction, 41, territorial sea, 53, 72, 73 446 253, 254, 256-257, 264 LOS Convention, 53, 54, 300, prevention, 257-259 Kennedy administration, 49, 53, 444-445, 390, 446, 451, 454 regional approach, 254, 255 88 jurisdictional definitions, 70, research needs, 255, 262, 380 72, 73 trade in marine organisms laboratories and instrumentation, Louisiana, 89 and, 31, 41, 256, 257, 258 flood control measures, 165, Lacey Act, 254-255, 324 IOC (see Intergovernmental 174, 369 Oceanographic Commission) Lake Erie, 206, 344 (see also Great habitat restoration, 173, IOOS (see Integrated Ocean 174-175, 369 Lakes) Lake Michigan, 34, 183 (see also Observing System) offshore oil and gas produc-ITQ (see individual transferable Great Lakes) tion, 353, 358 vulnerability to natural hazquotas) Land and Water Conservation Fund, 172, 359 ards, 164, 165, 168 Japan, 274, 301, 340, 409, 413, land use planning, 217, 220-221, wetlands, 40, 165, 174, 178 Loy, James M., 200 395 (see also development) 418 Jason II, 418-419 Landsat satellite system, 395, 425,

431

Magnuson–Stevens Fishery status of stocks, 309 information needs, 199-200, Conservation and strandings, 315 390 Management Act, 51–52, 54, threats to, 266-267, 306-307, interagency committee, 197-198, 199 63, 101, 275, 277-279, 331 intermodal connections, 196, 283-286, 289-291, 296, 297, marine operations 323, 366, 382 coordinating and consolidat-198-199, 200, 384 Maine, 152, 160, 332 ing, 388-391 National Advisory Council, Malone, Thomas, 397 defined, 388 198, 199 mammal (see marine mammals) federal mapping and charting, national interests, 238 manatees, 307, 309, 313, 317 390-392 navigational aids, 195, 390 mangrove forests, 41, 44, 171 mapping and assessing personnel, 196 mapping and charting activities, ports, 186, 193-194, 196, resources, 389 Marine Plastic Pollution Research 198, 200-201 118 continental shelf, 390 and Control Act, 266, 269 security, 32, 200, 238 Electronic Navigational marine protected areas (see also services provided, 193 shipbuilding and repair, Charts, 195 National Marine Sanctuary erosion risks, 167 Program) 194-195, 198 federal, 389-392 biodiversity in, 104 vessel characteristics, 194 flood hazards, 165-166, 167 defined, 103 Maritime Administration, 51, 199, funding, 177, 189, 213, 228, federal efforts, 103-104, 171 358 229, 231, 465 fishery management and, 295 maritime domain awareness, integrated maps and assessinternational agreements, 450 249-250 ments, 388, 389, 436 as management tool, 103-106 MARPOL (see International value of, 388 national interests and, 105 Convention for the Prevention stakeholder input, 90, 99, 106 MARAD (see Maritime of Pollution from Ships) research in, 343 Marshall Islands, 44, 321, Administration) marine debris (see debris) role, 104 409-410 Maryland, 88, 344, 358 marine habitats (see also coastal Marine Protection, Research, and habitats; marine protected Sanctuaries Act, 266, 325, 353 Smart Growth and Marine Resources and Neighborhood Conservation areas) areas of particular concern, **Engineering Development** Initiative, 152 297 Massachusetts, 160, 236, 358, 367 Act, 50 losses, 40, 308 marine sanitation devices, 241, McCreary, Richard, 239 protection, 104, 295, 297-298 mentoring, 135, 141 243 value of, 37 Marine Transportation Security Merchant Marine Act (Jones Act), Marine Mammal Commission, 84, Act, 238 194, 195 267, 309, 310 marine transportation system, mercury, 223, 224, 346, 348, 349 Marine Mammal Protection Act, 192-201 (see also heavy metals) 101, 309, 310, 311–313, 316, components, 193-196 MERHAB (see Monitoring and 317, 353, 366, 367 coordination of, 196, Event Response for Harmful marine mammals, 48 (see also 197-198, 200 Algal Blooms) endangered species; individual economic value, 31, 32, metadata, 429, 436 192-193, 194, 195, 200, 236 methane hydrates, 33, 341, species) commercial harvesting, 307 ecosystem-based manage-364–365, 387, 450 Methane Hydrate Research and harassment, 312 ment, 196 Development Act, 365 interactive education proemergency preparedness, grams, 316 200-201 Mexico, 224, 261, 358, 454 legislation, 101, 309 federal roles, 197-198 Mineral Leasing Act, 359 noise effects, 307, 315-316 global climate change and, minerals, non-petroleum (see also permitting and review stan-197 energy and mineral resources) dards, 312-314 harbors, channels, and watercommercial interest in, 352 research, 312, 380 ways, 186, 196, 200

common heritage of mankind, health-related, 229, 349 education programs, 124, 127, interagency coordination, 128, 132, 140, 142, 220 deep seabed mining, 53, 54, 230-231 existing ocean and coastal 444, 446 responsibilities, 78, 112, 114, invasive species, 260, 262 economic value, 33 land-cover characteristics, 395 management, 368-369 228 hazards-related role, 164 Minerals Management Service, local efforts, 177, 228 mission, 404 113, 124, 181, 199, 246, 260, marine debris, 266, 268-269 recommendations, 478 268, 314, 316, 341, 347, 354, needs, 104, 177, 189, National Aquaculture Act, 333, 361, 362, 363, 364, 369, 382, 231-232 334 383, 389, 390, 424, 431, 477 nonpoint-source pollution, National Atmospheric Deposition 217, 220, 213, 214, 220, 221 Program, 229, 230 **Environmental Studies** offshore, 294, 382 National Coastal Condition Report, Program, 363-364 minorities, education of underreppathogens, 344-345, 346 204-205 priority pollutants, 234 resented and underserved National Dredging Team, 84, 188, groups, 130, 136, 141-142, sampling protocols, 233 satellites, 294, 345, 346, 424 National Environmental Policy minority-serving institutions, 141 sediment, 189, 229 Act, 51, 73, 77, 96, 157, Mississippi River Basin, 39, 87, ship-based, 423 286-287, 295, 313, 324, 353, 174, 206, 216, 229 shortcomings in programs, 354, 366, 367, 379 Mississippi Sound, habitat losses, 229-230 National Environmental Satellite, 41, 171 state-based, 229 Data, and Information Service, MMS (see Minerals Management stations and buoy arrays, 424 110, 118 Service) streamflow, 228, 229 National Estuarine Research monitoring, 89 (see also Integrated stressor-based, 233 Reserve System, 103–104, Ocean Observing System; 153, 155, 156, 171 Vessel Monitoring System, national monitoring network; 293-294 Coastal Training Program, individual programs) visual environments, 229 138, 220 atmospheric deposition, 229, water quality, 165, 177, 213, Graduate Research Fellowship 230, 232 214, 217, 221, 224, 228, 229, Program, 140 baseline, 230 230-231, 233 System-wide Monitoring biodiversity, 228 weather, 228 Program, 228 climate change, 229, 409 Monitoring and Event Response National Estuary Program, 153, coastal margin, 176–177, for Harmful Algal Blooms, 156, 171, 229 231–232 228, 345 National Flood Insurance Program museums, 35, 125, 136, 143, 144 erosion mapping and rating, compliance-related, 213, 294, 298 167 conservation and restoration NACOA (see National Advisory flood hazard mapping, efforts, 177 Committee on Oceans and 165-167 Atmosphere) incentives for development, contaminants, 228, 229, 230, 232 NASA (see National Aeronautics 168 coral ecosystems, 324, and Space Administration) premiums, 167 National Academy of Sciences, 58, 327-328 repetitive-loss payments, 165, costs of, 298 167-168 National Geographic Society, 132, effects-based, 233 National Advisory Committee on federal programs, 227-230 Oceans and Atmosphere, 81, fishery-related, 291, 293-294, 84, 117, 387–388 National Geophysical Data Center, 298 National Aeronautics and Space 430, 437 Administration, 50, 341, 347, funding, 177, 189, 213, 228, National Geospatial-Intelligence 229, 231 402, 403, 410, 419 Agency, 199, 389, 390 harmful algal blooms, 228, data collection, 429-431 National Historic Preservation 344-345 Earth Science Enterprise, 113 Act, 359, 367

National Ice Center, 402, 424, 430 National Institute of Environmental Health Sciences, 82, 339, 341, 347, 348, 477 National Institutes of Health, 82, 137, 140, 341, 347 National Invasive Species Act, 253 National Invasive Species Council, 84, 254, 259-260 National Marine Educators Association, 125, 132, 136 National Marine Fisheries Service, 101, 110, 117, 118, 181, 267-269, 414, 424 Cooperative Enforcement Program, 292, 414 endangered species jurisdiction, 309, 311 fishery management, 275, 276, 278–283, 286, 290–299, 366 recommendations, 476 socioeconomic research, 379-380 National Marine Sanctuaries Act, 323, 325 National Marine Sanctuary Program, 99, 103, 104, 144, 153, 155–156, 171, 343, 382 national monitoring network (see also monitoring) coordination of existing programs with, 230-232, 346 critical factors tracked in, 227 data accessibility and usefulness, 230, 234, 434, 435 design, 233 goals and objectives, 189, 232 IOOS linked to, 231-232, 234, 327, 328, 346, 347 new contaminants, 209, 233, review and modification, 233-234 stakeholders, 227 technical coordination, 233, 347-348 user input, 234 value, 226-227

National Ocean Council (proposed) Committee on Ocean Resource Management, 83-84, 166, 198, 313, 326, 476 Committee on Ocean Science, Education, Technology, and Operations, 82–83, 126, 127, 375-376, 437, 475 composition, 79 Ocean.ED, 126-128, 139, 160, 475 Ocean.IT, 375, 476 Ocean.US, 82, 364, 375, 476 functions, 79-80 interagency team, 313-312 International Committee, 302, 303, 476 recommendations, 475 research strategy, 384 structure, 129 National Ocean Economics Project, 31, 382-383 national ocean policy, 48-55, 60-69 (see also international ocean policy) accountability in, 63, 197, 473 activism and, 51-52 consensus for change, 55 developing and implementing, enclosure of the oceans, 48 exploitation, 48, 53 formative years, 48-49 fragmentation, 50-51, 52, 55, 65, 77-78, 93, 109-110, 112, 114, 125, 197 framework, 61, 76-118 guiding principles, 60-69, 97 international cooperation, 53, 63, 473 post-World War II period, 49-50 science and, 49-50, 54, 67-68 Soviet Union and, 49 stewardship ethic, 51 Stratton Commission and, 50-51, 52, 274 USCOP mandate, 55-56 vision, 60-61 National Ocean Research

Leadership Council, 82, 126

National Ocean Service, 110, 117, 118, 382, 414, 435 National Oceanic and Atmospheric Administration, 79, 159, 197, 199, 306 aquaculture programs, 332-335 biotoxin program, 345 budget support, 54, 112 Bureau of Commercial Fisheries, 51 coastal management program, 153-155, 181 coral reef programs, 266, 321, 323, 324, 326, 327 creation, 50, 55, 115 data collection, 139, 164, 364, 389, 390, 429-432, 435-435 debris research and management programs, 266, 267, 269, 270 defining coastal watershed counties, 34 education role, 124, 127-128, 134, 137, 138, 139–140, 141, 142, 143, 144, 221, 222 endangered species programs, 309-315, 317, 318 energy resource management, 362 exploration programs, 388 fellowships, 140 fishery management, 279, 282, 285, 286, 291, 297, 302 (see also National Marine Fisheries Service) habitat conservation programs, 101, 103-104, 153, 155-156, 171, 177 human health initiatives, 339, 341, 345, 347–349, 351 international contributions, 222 invasive species management, 253, 255, 258, 259-260 line offices, 110 (see also individual offices) marine protected areas, 103-104, 153, 449 mission and responsibilities, 110 397-398, 431, 449

monitoring programs, 228, 230, 231, 345, 349, 395, 399, natural hazards management, 163, 164 navigation products, 195 observing system, 163, 402-406, 410 (see also **Integrated Ocean Observing** System) Office of Oceanic and Atmospheric Research, 110, 117, 118 Office of Program Planning and Integration, 110 prior proposed changes in, 116-118 recommendations, 476 research funding, 137, 379 research capabilities, 416–418, 420, 422 Science Advisory Board, 382 sediment management, 181, 189 socioeconomic research, 382-384 status and authority, 51, 52 structural strengthening, 110–112, 115, 117, 156 successful programs, 110 water pollution control, 205, 214, 215, 217, 220, 221 weather forecasting, 163 workforce development, 139, 142 National Oceanographic Data Center, 430, 437 National Oceanographic Partnership Act, 82, 127 National Oceanographic Partnership Program, 82, 125, 126-128, 375, 414, 417, 436 National Park Service, 104, 113, 124, 159, 260, 343 National Parks and Seashores, 171, 229 National Pollutant Discharge Elimination System, 101, 207, 210, 211, 212, 221

National Research Council, 39, 49, 54, 77, 94–95, 104, 123, 131, 133, 134, 157, 164, 178, 183, 186, 187, 189, 197, 206, 229, 238, 246, 248, 261, 267, 268, 276, 278, 289, 309-310, 312, 317, 332, 339, 341, 349, 361, 362, 365, 390, 418, 419, 452 National Science and Technology Council, 77, 82, 125, 231 Joint Subcommittee on Aquaculture, 84, 333-334 National Science Education Standards, 131-132 National Science Foundation, 49, 50, 142, 181, 313–314, 316, 365, 376, 389 biomedical research funding, budget support, 112 data collection, 431 education programs, 127, 128, 129, 134, 137-142, 339 (see also Centers for Ocean Sciences Education Excellence) existing ocean and coastal responsibilities, 78, 112, 113, 124, 260, 334, 375 exploration program, 388 health-related programs, 339, 347, 348 infrastructure funding, 413, 419, 420 National Science Board, 413 observing initiatives, 402, 403, 420 recommendations, 478 socioeconomic research, 383,

384
National Science Teachers
Association, 125, 132
National Sea Grant College
Program, 50, 51, 53, 54, 95, 124, 129–130, 132, 134, 140, 220, 255, 335, 379, 385, 386, 476

National Security Council, 449 Global Environment Policy Coordinating Committee, 77 National Status and Trends Program, 228, 230 National Stream Quality Accounting Network, 228, 229, 230 National Streamflow Information Program, 228, 229, 395 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, 275, 281 National Virtual Ocean Data System, 436-437 National Water Quality Assessment, 228, 229 National Water Quality Monitoring Council, 230–231 National Weather Service, 110, 118, 163, 228, 394, 395, 398, 405, 406, 408, 435 National Wildlife Refuge System, 104, 171, 256 Native Americans (see also tribe/tribal), 183, 312 Miccosukee tribe, 175 Seminole tribe, 175 natural gas (see also energy and mineral resources) demand, 358 LNG ports, 33, 358 methane hydrates, 341, 364-365, 387, 450 offshore resource management, 353, 358 production trends, 33, 353, 357 royalty relief, 357 shallow-water supply, 357 natural hazards, 162-169 (see also hazard management) costs of, 162-163, 164, 165 and navigation and port operations, 200-201 and offshore management, 362 research needs, 381 vulnerability of coastal populations, 42, 165 navigation/navigational, 101 (see also mapping and charting)

aids, 195, 390

dredging, 181, 183, 185-186, major sources, 213, 215-217 Group on Earth Observations, 187, 196, 217 management tools, 213-214, 409 freedom of, 53, 72, 99, 105, 326 Long-term Ecosystem Observatory, 402 443, 450, 454 monitoring, 217, 220, 213, Marine Observation Network, impacts of projects, 179, 366 214, 220, 221 public education on, 69, 213, invasive species and, 41, 256 424 offshore activities and, 332 214, 220 Monterey Bay Aquarium safety requirements, 101, 200 State Revolving Funds, 217, 219 Research Institute Ocean Netherlands, ocean policy, 79, 223 stormwater runoff, 54, Observing System, 402 New Jersey, 88, 134, 187, 368 215-217, 220, 221 National Water Level debris management, 264 watershed approaches, 177, Observation Network, 424 213, 214, 219, 222 Division of Watershed NOAA system, 163, 402–406, North Atlantic right whales, 264, Management, 157, 159 410 New York, 88, 159, 187 298-299, 317 NSF initiatives, 402, 403, 420 Nichols, Mary, 92 North Carolina, 167, 368 Ocean Observatories NIEHS (see National Institute of NOS (see National Ocean Service) Initiative, 402, 420 Environmental Health NPDS (see National Pollutant weather, 228, 293, 394, 404 Discharge Elimination Ocean Dumping Act (see Marine Sciences) NIH (see National Institutes of System) Protection, Research, and Health) NPS (see National Park Service) Sanctuaries Act) NSF (see National Science ocean economy (see also economic nitrogen, 212, 219, 223, 224 (see *also* nutrient pollution) Foundation) issues) nitrogen oxide emissions, 224, nutrient pollution, 39, 88, 89 defined, 31 244 control, 205, 206, 208-209, service-oriented activities, 36, Nixon administration, 52, 109, 212 42 115, 353 ecological effects, 39, 175, ocean education (see curriculum; 206, 208-209, 210, 215, 216, education and outreach; NMEA (see National Marine 345, 346 **Educators Association**) Ocean.ED) ocean-land-atmosphere connec-NMFS (see National Marine monitoring, 229, 232 Fisheries Service) sources, 204, 210, 211, 216, tion, 37, 61-62, 387, 453, 472 no-discharge zones, 241, 243, 244 (see also global climate noise, 307, 315-316 tradable credits, 212, 219 change) Nonindigenous Aquatic Nuisance nutritional bioproducts, 33, 340 Ocean Policy Trust Fund (pro-Prevention and Control Act, NWS (see National Weather posed), 459, 468-469 253-254, 258 Service) Ocean Research Advisory Panel, 82, 125, 126-127 non-native species, 177, 252, 253, 256-257 (see also invasive observing systems (see also ocean science and technology (see species) **Integrated Ocean Observing** also exploration; marine opernonpoint source pollution System; monitoring; national ations; research infrastructure agricultural, 54, 213, 214, monitoring network; satellite and technology; research 215, 216, 219 observations) needs) coordination of programs, 90, Earth Observing System Data components, 374-375, 376 94, 214, 217-218, 222 and Information System, 431, defined, 374-375 enforcement programs, 212, exploration program, 357, 213, 218, 220 Earth Resources Observation 386-388 financial disincentives, 217, Systems Data Center, 430 federal leadership, 375–376 funding, 177, 189, 213, 228, and fishery management, 219-220 incentive-based controls, 214, 229, 231, 465 293-294 217, 218, 219-220 Global Climate Observing funding, 376-377, 379, international cooperation, System, 414 385-386 222-223 Global Ocean Observing guiding principles, 62 land use planning and, 217, System, 397, 409-410, 414, international programs, 425, 434, 453 452-454 220-221

jurisdiction issues, 72, 454 national strategy, 377-378 and ocean policy making, 54, 62 U.S. activities abroad value of, 374-375 Ocean Thermal Energy Conversion Act, 368 Ocean.ED (proposed), 160, 475 community outreach, 136, 145 evaluation of education programs, 129 funding for, 127, 459 recommendations, 475 responsibilities, 127, 128, 129 science literacy promotion, 132, 135 workforce preparation, 139, 142 Ocean.IT (proposed), 375, 434-435, 476 Ocean.US, 82, 127, 364, 398, 375, 397, 398–399, 400, 402, 407, 420, 434, 436, 476 description, 127, 398 Oceans Act of 2000, 55, 58, 59 Office of Education and Sustainable Development, 127-128, 140 Office of Management and Budget, 81, 112, 389, 476 Natural Resources Program, 112 Office of Naval Research, 113, 124, 128, 137, 138, 139, 141, 142, 181, 341, 347, 375, 377, 385, 388, 402, 418, 419, 477 Office of Ocean Policy (proposed), 459 description, 81-82 Office of Science and Technology Policy, 77, 82, 84 Office of Sustainable Marine Aquaculture (proposed), 334, 335 Office of Technology Assessment,

bioprospecting, 343 coastal management linked to, 158, 160 coordinating management in, 90, 98–106, 160, 332, 343, 361, 368 compensation for resources, 102-103 current authorities and responsibilities, 98, 100, 101 defined, 98 energy and mineral resources, 53, 98, 99, 100, 158, 174, 343, 352-369 hazard management, 99 international cooperation, 336 jurisdiction, 352, 355 leasing, 101, 332, 334, 353-357 movable activities, 100, 101 no-leasing buffer zones, 53 petroleum industry, 264, 268 planning areas, 355–356 site-specific activities, 100, states responsibilities, 99, 101, 102, 158, 332, 334, 352–354, 361

oil (see also energy and mineral resources) bioremediation of spills, 35 deep-water production, 357, 363 demand, 357 embargoes, 52, 353 environmental issues, 361-364 infrastructure aging, 246, 362-363 leases, 49, 53, 54, 71, 353–357, 359, 366, 369 offshore resource management, 99, 158, 174, 352-364 political issues, 353-354 pollution prevention and response, 39, 54, 236, 237, 245-248, 268, 362-363 production trends, 353, 357 from recreational vessels, 248 royalty relief, 357, 359 safety issues, 361

spills, 35, 39, 51, 54, 210, 236, 237, 245-248, 353, 361-363 tankers and barges, 39, 54, 194, 245-246 supplies, 33 Oil Pollution Act, 54, 246, 247 OMB (see Office of Management and Budget) Orbach, Michael, 435 Oregon, 152, 157, 160, 257, 354, 368 Outer Continental Shelf Lands Act, 49, 354, 355, 359, 362, 366, 369 Amendments of 1978, 53, 360, 361, 382 outreach (see education and outreach) overfishing (see also fishery management), 40, 41, 276, 281, 285, 297, 299, 308, 323, 452 oysters, 41, 252, 261, 332 Pacific Decadal Oscillation, 296, Pacific Freely Associated States, 135, 321 Pacific States Marine Fisheries Commission, 284 Panetta, Leon, 51 partnerships (see also National Oceanographic Partnership Program) conservation, 172 educational, 134, 141 in energy and mineral resource development, 158, 357, 360, 361 federal-state, 153, 158-159, 311, 357, 360, 361 in fishery management, 281-282, 292-293 funding, 418 industry-research community, information management,

435-436

409-410

454

international, 93, 223, 380,

IOOS, 396 397, 405, 406,

391-392, 413

332, 336

offshore (see also energy and min-

Continental Shelf Lands Act)

aquaculture, 33, 54, 100, 101,

eral resources; Outer

in marine transportation, 192–193, 237 NOAA–Navy, 435–436	sewer system overflows, 39, 208, 209–210, 211 wastewater treatment plants,	recommendations to Congress, 475 context for, 472–474
public–private, 172, 173, 176,	207, 208–209, 210, 211–212	to Executive Branch leader-
192–193, 222, 237, 242, 270,	Polar–orbiting Operational	ship, 475–476
323, 384, 405, 418	Environmental Satellites, 404,	to federal government agen-
research community and aca-	424	cies, 476–478
demia, 49, 124, 125, 129, 130,	polar regions, 297, 346–347, 364,	on international policy imple-
132, 133, 135–136, 139	365, 378, 387, 417, 450	mentation, 479
watershed management, 222	pollution (see nonpoint source	guiding principles for,
passenger ferries, 194, 236	pollution; point source pollu-	472–473
PCBs, 183, 210, 223, 264, 349	tion; water pollution)	index to, 475–479
peer review, 187, 278 Pennsylvania, 88, 159	population growth coastal pressures, 36, 41–42,	list, by appearance in report, 480–522
permitting	43, 150–152	to regional bodies, 479
aquaculture, 333, 335	environmental impacts,	to states, 473–474, 479
for bioprospecting, 343	41–42, 43, 170	recreation/recreational, 99, 105
coastal construction and	porpoises, 306, 309	boating, 32, 39, 66, 236, 241,
restoration, 184	ports	243, 245, 248, 264, 267
fishery, 287–288	closures, 200–201	debris, 267
for marine mammals,	commerce flows, 193-194	diving, 37
311–314	economic value, 31, 32,	economic value, 31, 32,
for offshore activities, 100,	193–194	35–36, 150, 151, 382
343	garbage reception facilities,	environmental impacts, 39,
pollution, 101, 207, 210, 211, 212, 221	270 infrastructure, 193–194	42, 248 fishing, 31, 217, 275, 281, 321
programmatic, 312–314	LNG, 33, 358	jobs, 31
for research, 343, 454	planning and management,	losses, 39
pesticides, 223, 234	186, 193–194, 196, 198,	shipwreck sites, 102
Pew Oceans Commission, 51, 55,	200–201	threats to, 183
77	pollution control, 245, 270	vessel pollution, 236, 241,
pharmaceuticals	security, 32, 200	243, 245, 248
bioproducts, 33, 339, 340,	sediment management, 187	water quality and, 213, 229,
341	stewardship programs, 196	349–350
pollutants, 209, 234, 349	precautionary approach, 65–66,	reefs (see artificial reefs; coral
phosphates, 33, 368 phytoplankton, 37, 229	80 President's Council of Advisors on	ecosystems) Regional Fishery Management
places of refuge, 247–248	Ocean Policy (proposed), 79,	Councils, 90, 101 (see also
Plant Protection Act, 254	80, 81, 87, 90, 102, 114, 115,	commercial fishing; fishery
plastic debris materials, 264–265,	476	management)
266, 267, 307	public awareness, education and,	authority and jurisdiction,
point source pollution	68–69, 90, 122–124, 130,	283–285
animal feeding operations,	142–143, 213, 220	creation, 52, 275
211	Puget Sound, habitat losses, 41,	delays in management plans,
enforcement programs, 212	171	279–280, 280
incentive–based controls, 212	Puerto Rico, 34, 70, 155, 164,	ecosystem–based approach,
industrial facilities, 207, 210	321, 325	295–297, 326
infrastructure investments, 211–212	Radonski, Gilbert, 281	government relationship with, 286, 291, 294
major sources, 208–211	Reagan administration, 53–54, 72,	Gulf of Mexico, 286
management tools, 207	354, 387	input on research, 280–281
septic systems, 210	,	membership, 285–286
1 /		1,

Mid-Atlantic, 276, 278, 288 previous proposals, 109-110, permits and licenses, 343 mission, 275 116-118 review process for grants, 386 multispecies plans, 295, 298 repetitive-loss properties, satellites, 424-425 National Bycatch Strategy, 299 surface vessels, 49, 117, 167-168 New England, 276, 278, 297 research infrastructure and tech-281-282, 416-417, 422-423, North Pacific, 278, 285, 288, nology, 33 (see also monitor-452 297, 326 ing; national monitoring nettelecommunications, 420-421 peer review programs, 278 work) undersea vessels, 417-418 recommendations, 479 academic community linkvirtual technology centers, ages, 49, 124, 125, 129, 130, scientific and statistical com-426 mittees, 277-278, 280, 479 132, 133, 135-136, 137, 139, research needs South Atlantic, 288 335, 347 aquaculture, 335, 380 successes, 285 airborne ocean science platbasic research, 385 training new members, forms, 419, 422-423 biodiversity, 66, 379, 380 286-287 collaboration to maximize coastal habitats, 380 Western Pacific, 285 resources, 281-282, 347-348, climate change, 44, 67-68, regional ocean councils (pro-414, 418, 419 378-379, 380, 453 posed) essential components, coral ecosystems, 327–328, boundaries, 90, 92-94 412-413, 416-425 377, 380 ecosystem assessments, 96, federal commitment to, 50, cooperative, 281-282 100, 160, 176, 350 data management, 384 existing initiatives, 86–87, funding for, 137, 335, 340, economic, 31, 382-384 88-89, 91, 93 376, 385–386, 418, 420, 424, endangered species, 314-316, federal agency coordination, 425, 459 380 92-93, 157, 160, 350 gaps in, 413 energy and mineral resources, health-related, 339, 340, national support and guide-365, 381 347-348 lines, 87 evaluation of programs, nature and functions, 90-91, interdisciplinary, 339, 376, 128-129, 130 102, 103, 106, 222 414, 426, 426 fisheries, 40, 280-283, 295, recommendations, 479 international cooperation, 380 377, 380 inventory of facilities, 413, research and information harmful algal blooms, 344 needs, 94-95, 160, 176, 234 414, 415-416 human health-related, 344, Reilly, William, 327 laboratories and instrumenta-345, 346, 347-348, 381 renewable energy, 33 tion, 420 interdisciplinary, 341, 343, hydropower, 367 land-based facilities, 423-424 385 management regime, 368 leadership and coordination, invasive species, 255, 262, thermal energy conversion 82, 89, 95, 105, 365 380 technology, 367-368 maintenance and upgrades, marine debris, 380 wave or tidal energy technolmarine mammal behavior, 380 ogy, 366-367 modernization, 137, 416-425 marine transportation, wind power, 99, 365-366, 367 monitoring station and buoy 199-200, 248-249 Reorganization Act of 1949, 115 arrays, 424 natural hazards, 381 reorganization of federal agencies national strategy, 414–415 regional ecosystem dynamics, Navy role, 49-50, 385, 390 96, 99, 104, 157, 316, 350, (see also specific agencies) 379, 381 consolidation of ocean and ocean exploration platforms, coastal programs, 112-115 419 sediment, 381 socioeconomic, 377, 379, for ecosystem-based Ocean Observatories approach, 108, 115 Initiative, 402, 420 381-384 NOAA, 108, 110-112 planning to support ocean vessel pollution, 248-249, presidential authority, activities, 425 381 114-115 periodic review and assesswater pollution, 381 ments, 415-416

revenues from resources, 33, Geostationary Operational marine transportation system, 102–103, 357, 359–360, Environmental Satellites, 404, 32, 200, 249, 390 467-469 424 sediment (see also dredging) Reynolds, John E., III, 314 climate change and, 181 National Polar-orbiting RFMC (see Regional Fishery Operational Environmental composition, 180 Management Councils) Satellite System, 425 contaminated, 39-40, 183, Rheault, Robert, 333 sensor development, 402–403, 186, 187, 189–190, 340–341, Rhode Island, 154, 414 414 348-349 Rivers and Harbors Act, 101, 366, Schwartz, Suzanne E., 267 disposal of dredged materials, science (see also ocean science and 181, 182, 187 royalty payments, 33, 103, 359 technology) dual nature, 180-181, 204, runoff (see also nutrient pollution; centers, 143 215 water pollution, nonpoint decision making based on, 62, federal management role, source pollution) 65-66, 67-68, 94, 97-98, 104, 181-182, 187-188, 189 agricultural, 39, 54, 159, 183, 242, 248-249, 276-282, 473 human activities and, 206, 213, 214, 215, 216, 219 for diplomacy, 452 182-183, 184, 215 development and, 42, 151, education standards, 131-132 legislation, 183 literacy, 69, 123, 125, monitoring, 189, 229 131-132 quality changes, 39-40, 183 impervious surfaces and, 151, 215, 216-217 peer-reviewed, 187, 278 quantity changes, 42, 151, management of, 213, 220 Scientific and Statistical 174, 182 stormwater, 39, 54, 151, 179, Committees (see also fishery regional management strate-206, 208, 209, 215-217, 220, management), 277-278, 280, gies, 181, 184-185, 212 221 479 remediation, 183 Scientific Committee for research, 181, 188-189, 381 safety (see also security) transport, 180, 215, 217 in oil and gas production, 361 Oceanographic Aircraft seafood, 346, 348-349, 350 Research, 419, 453 sensors, 293, 345, 346, 347, 364, vessel, 237-238, 292 Sea Grant (see National Sea Grant 388, 390, 396, 402-403, 414, salmon, 33, 40, 43, 87, 288, 306, College Program) 423, 426 308, 311, 318, 331–332, 335, sea hare, 35, 342 septic systems, 39, 210, 350 408 sea lamprey, 252, 284 sewer system sea lions, 309, 317 saltwater intrusion, 40, 44 construction funding, 155 salvage, 102, 423 sea level rise, 40, 42, 44, 54, 151, debris management, 268 San Francisco Bay, 41, 171, 253 166, 171, 174, 378 (see also overflows, 39, 208, 209-210, San Francisco Bay–Delta estuary, global climate change) 211, 350 sea sponge, 33, 342 shipbuilding and repair industry, 89, 173 sand and gravel resources, 368, sea turtles, 264, 266, 298-299, 194-195, 198 303, 306, 307–308 ships (see also vessel activities) seabirds, 299, 303, 306, 308 Automated Identification sanitary sewer systems, 210, 221, 350 seafood System, 249 Santa Barbara Channel oil spill, contaminated, 32-33, 210, collisions and groundings, 51, 353, 361 222, 39, 346, 348-349, 350 195, 200, 236, 237, 324, 362 Sartou, Cynthia, 295 demand for, 330 container ships, 194 satellite observations cruise liners, 194 safety measures, 346, civilian, 403-405 348-349, 350 domestic marine fleet, 194, collaborative, 425 seagrass beds, 39, 41, 88, 171, coordination with IOOS, 395, 208, 264, 307 foreign flag vessels, 194, 403-405, 407-408, 423, 424, seals, 307, 309 236-237, 239 425 seamounts, 326, 452 navigation aids, 195 data management, 390, 405, security, 105, 449 oil tankers and barges, 39, 54, 407, 438 energy supply, 53 194, 245-246 Earth observing, 404–405, and funding for other proopen registries, 239 407-408, 424-425, 438 passenger ferries, 194, 236 grams, 291

single-hull vessel phase-outs, Stratton Commission, 50–51, 52, telecommunications, 33, 99, 396, 54, 245-246 54, 55, 79, 81, 109, 117, 153, 428 shipwrecks, 37, 100, 102, 156, 274, 275, 414 Tennessee Valley Authority, 159, 246, 387 Our Nation and the Sea 334 Shore Protection Act, 266 (report), 50 territorial sea, 53, 72, 73 shrimp, 303, 308, 331, 335 Submerged Lands Act of 1953, 49, terrorism, 55, 200, 238, 249 (see shorelines (see beaches and shore-70, 353 also emergency preparedness; lines) subsidence, 40, 166, 174 security) Sikes Act, 324 sustainability Texas, 34, 70, 89, 168, 200, 248, Small Business Administration, aquaculture, 333–335 353 169, 334 coral harvesting practices, 327 TMDL (see Total Maximum Daily Smithsonian Institution, 83, 140, economic development, 89 Load Program) 260 fishery management, 104, Total Maximum Daily Load 274-304 Program, 207, 209, 217 socioeconomic considerations funding for, 360 in fishery management, 289, tourism 296-297 guiding principles, 61, 472 debris and, 264, 267 research needs, 381 international efforts, 223, 445, education role, 144 South Carolina, 164, 292, 368, economic value, 31, 35–36, 150, 151, 264 414 redevelopment in Soviet Union, 49, 52, 274 hazard-prone areas, 169, 184 environmental impacts, 42 Stahl, James, 168 resource management, 138, jobs, 31 State Fish and Wildlife 360 seafood poisonings and, 344 science-based, 276-282 losses, 39, 217, 264, 344, 349 Consumption Advisories, 349, Sustainable Fisheries Act of 1996, 350 water quality and, 349-350 54 toxic pollutants, 183, 204, 210, states (see also coastal states; indi-212, 223, 224, 232, 241, 242 vidual states) swamps (see wetlands) disaster assistance, 168-169 tradable Tampa Bay, 41, 171, 209, 223 development rights, 172 monitoring programs, 229 Taylor Grazing Act, 359 recommendations, 473-474, pollution credits, 212, 245 teachers quota program for fishing, water quality management, preparation, 124, 125, 128, 288 206, 207, 211, 217, 219 130, 133-135 trade, 105 (see also marine trans-Steller sea lion, 309, 317 professional development proportation system) conservation linked to, 303 stewardship grams, 134 coordination of decision mak-Teachers-at-Sea program, 134 coral, 327 unqualified, 133 ing and, 64 in endangered species, 303 education and, 69, 123, 142, technology (see also ocean science environmental policy and, 144, 173, 176 and technology; research 303, 451 infrastructure and technolexisting programs, 159, 196, international, 192-193, 194, 196, 244, 303, 327 214, 281 ogy) guiding principles, 61, 472 costs, 209, 294 in marine organisms, 31, 41, legislation, 51 deep ocean, 387 256, 257, 258, 291 enforcement, 293-294 local community involvement, ornamental fish, 31-32 177, 214 and jurisdictional definitions, projections, 32, 244 recreational fishing, 281 73 sanctions, 303 Stockholm Convention on sensor, 293, 388, 402–403 seafood, 330-331 traditional knowledge, 282, 325 Persistent Organic Pollutants, surface vessels for research, 49, 117, 281-282, 416-417, transportation (see also marine 224 storm surges, 42, 167 422-423, 452 transportation system) stormwater infrastructure, 155, 157 trawling, 52, 274 flooding, 166 undersea research vessels, management, 217, 220 417-418 treasure, 100, 102 runoff, 39, 151, 179, 208, 220 virtual centers, 426

treaty/treaties (see also agreement; convention) Antarctic Treaty, 447 Boundary Waters Treaty, 447 Pacific Salmon Treaty, 301 Yukon River Treaty, 301 tribe/tribal (see also Native Americans), 87, 95, 256, 380, 462, 466 aquaculture management, 333, 335 collaboration with state and federal governments, 92, 93, 94, 103, 104, 360, 389, 397 conservation, 171, 175, 178, 222 education and outreach, 81, 95, 104, 141 enforcement role, 291, 292 feedback, 59, 399 fisheries management, 277, 282, 284, 286, 289, 291, 292, 318 funding to, 468-469 health issues, 349 international cooperation, 444 monitoring role, 226, 228, 230-231, 232, 233, 234, 346 ocean observing, 397, 398, 399, 400 sovereignty, 90, 91, 286 water pollution control, 205, 207, 213, 222, 228 watershed management, 152, 159

Tropical Atmosphere Ocean, 395, 408, 424, 425 Truman administration, 49, 72 Trust Territories of the Pacific Islands, 34 tsunamis, 42, 165 turtles (see sea turtles)

UNCLOS (see LOS Convention)
UNEP (see United Nations
Environment Program)
United Nations (see also
Convention; Food and
Agriculture Organization;
Framework Agreement)
Atlas of the Oceans, 451
Commission on the Limits of

the Continental Shelf, 390, 445
Conference on Environment and Development, 300, 301, 445
Conference on the Human Environment, 51, 445
Convention on Law of the Sea (see LOS Convention)
Division for Ocean Affairs and Law of the Sea, 451

United Nations Educational, Scientific and Cultural Organization, 451

United Nations Environment Program, 222, 445, 450, 451, 453, 455

United Nations Development Program, 451 University–National

Oceanographic Laboratory System, 416, 417, 419, 420

U.S. Agency for International Development, 78, 113, 222, 326, 334, 454–455

U.S. Army Corps of Engineers, 88
Civil Works Program, 112,
113, 114, 117, 163–164, 179
coral reef management, 325,
326
cost–benefit analyses for proposed projects, 164, 179, 295
development projects, 155,
219
hazards–related programs,
157, 163–164
invasive species programs,
255–256, 260
mapping and charting, 389,
390
monitoring programs, 228
offshore responsibilities, 333,
366
permitting program, 65, 101,

366
permitting program, 65, 101, 171, 178, 179, 186, 366
project–by–project approach, 185, 189
reorganization proposals, 116, 117, 118
recommendations, 477
regional boundaries, 93, 94
research funding, 382, 420

sediment management, 181, 182, 183, 185, 187, 188, 189, 197, 199, 423 stewardship and restoration program, 171, 173, 177 vessels, 423 water pollution control, 205, 217, 219 wetlands protection, 65, 178, 179

- U.S. Coast Guard, 389 assets, 417, 421-422, 423, fishery management, 52, 291-294, 333 invasive species control, 253-254, 256 jurisdiction, 49, 72, 256 and marine transportation and commerce, 197, 199, 200, 390 offshore responsibilities, 52, 101, 358, 366 recommendations, 477 reorganization, 50, 55 vessel safety and environmental responsibilities, 101, 113, 236-238, 240, 241, 246, 248-250, 257-258, 260, 268, 269, 288, 408, 449
- U.S. Commission on Ocean Policy mandate, 55–56 members, 56 outreach efforts, 59 regional meetings, 56–58 report development, 59 science advisory panel, 58 working groups, 58
- U.S. Coral Reef Task Force, 84, 324–325, 326, 327, 328, 478
- U.S. Customs and Border Protection, 197, 199, 260
- U.S. Department of Agriculture
 Agricultural Research Service,
 260
 aquaculture responsibilities,
 332, 334
 budget support, 112
 conservation/restoration programs, 159, 171, 172, 173,
 177, 182, 214, 215, 219
 Cooperative State Research,
 Education, and Extension

- Service, 215, 260 Economic Research Service, 260 **Environmental Quality** Incentives Program, 214 existing ocean and coastal responsibilities, 78, 112, 113, 199 invasive species control, 252, 254, 258 monitoring programs, 228, 231 Natural Resources Conservation Service, 159, 182, 215, 260 proposed reorganization, 116, 117 recommendations, 476 socioeconomic research, 383, 384 water pollution control, 205, 211, 214, 215, 217, 219, 220, 324, 326
- U.S. Department of Commerce (see also National Oceanic and Atmospheric Administration), 51, 78, 112, 116–118, 258, 324, 334, 358, 362, 365, 476 Bureau of Economic Analysis, 383, 384 Bureau of Export Administration, 199 Bureau of the Census, 34, 383
- U.S. Department of Defense, 78, 112, 113, 116, 164, 260, 324, 325, 326, 365, 425, 431, 435, 477
- U.S. Department of Education, 124, 127
- U.S. Department of Energy, 78, 112, 113, 325, 326, 365, 429, 430 Federal Energy Administration, 116
- U.S. Department of Health and Human Services, 78, 112, 113, 334, 477
- U.S. Department of Homeland Security, 55, 78, 112, 113, 165–166, 200, 201, 258, 260, 358, 477
- U.S. Department of the Interior, 324

- aquaculture responsibilities, 332, 334 budget support, 112 Bureau of Indian Affairs, 260 Bureau of Land Management, 117, 260, 365 Bureau of Reclamation, 117, 182, 260 conservation/restoration funding, 33, 171, 177 endangered species management, 309, 315, 318 energy resource management, 53, 354, 358, 361, 362, 364, 365 existing ocean and coastal responsibilities, 78, 104, 112, 113, 114 exploration programs, 387-388 invasive species management, 254–255, 256, 258, 259, 260 recommendations, 477 reorganization proposals, 109, 116-118 research infrastructure, 416
- U.S. Department of Justice existing ocean and coastal responsibilities, 77, 78, 112, 113
- U.S. Department of Labor, 78, 112, 113, 139, 477 Bureau of Labor Statistics, 383
- U.S. Department of State, 52, 78, 112, 113, 260, 269, 270, 301, 302, 318, 326, 327, 390, 448, 449, 452, 454, 477
- U.S. Department of Transportation
 Bureau of Transportation
 Statistics, 199, 383, 384
 existing ocean and coastal
 responsibilities, 78, 112, 113,
 260, 358
 recommendations, 477
 reorganization proposals, 116
 Transportation Administrative
 Services Center, 118
- U.S. Department of the Treasury, 260
- U.S. Fish and Wildlife Service, 113, 124, 220, 389 Coastal Program, 153, 156

- coral reef initiatives, 326 endangered species management, 306, 309-312, 366 fishery management, 275, 281, 302 habitat conservation and restoration, 101, 104, 153, 155, 171, 173, 181 invasive species management, 253, 255, 260 natural hazards management, 163 recommendations, 477 regional boundaries, 93, 94 reorganization proposals, 117 sediment management, 181 vessel pollution management, 243, 244
- U.S. Forest Service, 116, 117, 159, 260
- U.S. Geological Survey, 113, 124, 420
 Coastal and Marine Geology program, 424
 data collection, 429–431
 exploration, 388
 hazards–related role, 164, 209
 mapping activities, 34, 389, 390
 monitoring programs, 228, 229, 230, 231, 260, 395, 424
 recommendations, 477
 reorganization proposals, 116, 117
 research assets, 422, 424
 sediment research, 181, 189
- U.S. Merchant Marine, 49, 198U.S. Navy, 112, 124, 199, 269, 314, 316, 385, 389, 390, 399

(see also Office of Naval Research) data management, 435–436,

437–438 education support, 137, 140, 141

Fleet Numerical Meteorology and Oceanography Center, 402, 430, 435

Meteorological and Oceanography Command, 113, 402

Oceanographic Office, 435

oceanographic research, vessel pollution innovative treatment tech-49–50, 375, 376, 402, 403, air emissions, 244-245 nologies, 242 ballast water discharge and, pumpout facilities, 243-244 41, 253, 254, 255, 256, recommendations, 477 re-use, 209 research vessels, 416 257-258, 259, 260-261, 345 stormwater discharges, 215, commercial ships, 244–245 technology transfer, 415 350 USACE (see U.S. Army Corps of cruise ships, 241–243, 244 tertiary treatment, 209 Engineers) debris, 264 tradable credits, 212, 245 USAID (see U.S. Agency for education and outreach protreatment plants, 39, 163, International Development) grams, 243, 248 206, 207, 208-209, 210, USCOP (see U.S. Commission on incentive-based controls, 243, 211-212, 219 Ocean Policy) vessel discharges, 41, 183, USDA (see U.S. Department of 187, 210, 241-248 infrastructure-related, 236, Agriculture) water pollution, 204-225 (see also 246 USFS (see U.S. Forest Service) international cooperation, nonpoint source pollution; USFWS (see U.S. Fish and 239, 244, 245, 247, 452 nutrient pollution; point invasive species introductions, source pollution) Wildlife Service) USGS (see U.S. Geological Survey) 41, 253, 254, 255, 256, aquaculture and, 331 257-258, 259, 260-261 atmospheric deposition, 39, vessel activities, 236-251 (see also no-discharge zones, 241, 243, 210, 211, 223-224, 349 commercial fishing industry; control measures, 151, 156, marine transportation system; oil releases, 39, 54, 236, 237, 205, 211-212, 217-222, 224, 245-248 ships) 295 benefits and risks, 236-237 oversight and enforcement, coordination of programs, 238, 239, 242–243 commercial, 236-237, 287, 205, 214, 215, 217-218, 222, places of refuge, 247-248 288, 292, 293 cruise industry, 194, 236 prevention and response, costs of, 38-40, 204, 206, debris from, 264-265 246-247 209, 211, 217 flag state responsibilities, 236, recreational vessels, 39, 241, education and training, 214, 238-239 243, 245, 248 220, 221 hazardous cargo, 200 research needs, 248-249, 381 and endangered species, 314 incentive-based controls, 237, single-hull vessel phase-outs, energy-related, 39, 54, 236, 240 54, 245–246 237, 245-248, 268, 362-363 extent of degradation, 38, 88, Sulfur Oxide Emission international controls, 237, 238, 239, 240 Control Areas, 244 151, 204–205 funding for programs, 207, and marine mammal mortaltradable credits, 245 ity, 307, 317 waste pumpout facilities, 208, 213, 214, 215, 218, 219 maritime domain awareness, 243-244 human health effects, 206, 210, 213, 217, 340-341, 344, 249-250 waste stream discharges, 41, 183, 187, 210, 241-248 346, 349–350 merchant fleet characteristics, Virgin Islands (U.S.), 34, 70, 155, incentive-based approaches, oversight and enforcement, 164, 321, 325 212, 214, 217, 218, 219-220, 236, 237–240, 291–295 viruses (see also human health), 243, 245 passenger ferries, 194, 236 33, 39, 342, 346, 349–350 international efforts, 222-223, port state control, 240 Volcker Commission, 109, 114 224 recreational boating, 236 management tools, 35, 101, safety culture, 237-238, 292 Walker, Sharon H., 139 207, 213-214 short sea shipping, 198 Washington, 152, 257, 354, 366, modeling, 224 monitoring, 165, 214, 217, third-party audits, 237, 239 traffic management, 249, 314 waste pumpout facilities, 243-244 221, 224 Vessel Monitoring System, permits, 101, 207, 210, 211, wastewater 293-294, 434 industrial, 209, 210, 221 212, 221

pharmaceuticals and antibiotics, 209 research needs, 381 thermal, 210 watershed approaches, 64, 151, 156, 206, 213, 214, 219, 222 water quality (see also debris; invasive species; national monitoring network; vessel pollution; water pollution) coastal areas, 233, 204-205, 349-350 development and, 42, 151, 215, 216-217 education needs, 138 funding, 211–212 and human health, [23] infrastructure improvement, 207, 211-212, 219-220 inventory of coastal waters, 204-205 monitoring, 177, 228, 233, 349-350 regional initiatives, 87, 88, 89, 156 standard setting, 213, 217 threats to, 38, 40, 183 water conservation and, 209 water supply, 38, 87, 88, 89 projects, 155, 163, 175, 182 watersheds (see also specific watersheds) airsheds corresponding to, 223 coastal management approach, 150, 154, 157, 159–160, 169 collaborative approaches, 222 defined, 154 existing management initiatives, 86-87, 88, 157, 158, 159, 184, 214 funding, 157, 159 guiding principles for management, 63 impervious areas in, 151, 215 information needs and sources, 159-160 mapping, 34 monitoring, 230

upland, 172 USACE boundaries, 93, 94 water pollution control, 64, 151, 156, 172, 177, 206, 213, 214, 219, 222 wave or tidal energy technology, 366-367 Wayland, Robert, III, 220 weather (see also global climate change) economic and environmental impacts, 42 observing and forecasting, 228, 293, 394, 404 West, Mary Beth, 445 wetlands, 151, 155 policy changes, 178 compensatory mitigation, 178 conservation and restoration, 171, 178–179, 181, 183, 187, 214, 369gol constructed, 220 defined, 178 inventory, 178 legislation, 178-179 losses, 40–41, 42, 165, 170, 174, 178, 180 National Wetlands Inventory Program, 178 permitting program, 65, 171, 178-179 sediments and, 180, 181, 183, 187 value and functions of, 178 whales and whaling, 264, 282, 298-299, 306-307, 309, 313, 316, 317 White, Robert, 55 White Water to Blue Water initiative, 223, 455 wind power, 99, 100 Withee, Gregory, 425 Wiygul, Robert, 361 WMO (see World Meteorological Organization) World Summit on Sustainable Development, 79, 222-223 World Trade Organization, 303, workforce (see also jobs; employment)

data management, 433–434
education of, 69, 123,
136–142
marine transportation system,
196
minority representation, 141,
142
needs assessment, 139
recruitment of students for,
137–138
professional development and
continuing education, 138
WTO (see World Trade
Organization)

zebra mussels, 41, 256, 259 (*see also* invasive species) zoos, 125, 143, 151