

Index

Photographs are indicated with *italicized* page numbers. Tables are indicated by the letter “t.”

- abiotic damage, 231, 258–259
 - drought, 259, 259
 - frost, 260, 260
 - hail, 259, 260, 260
 - herbicide damage, 261
 - winter needle and shoot desiccation, 260–261, 261
- acetolactate synthase (ALS) inhibitors, 148
- Adams, Ronald S., 1, 3
- adjuvants, 164
- aerial herbicide applications, 157, 164
 - project implementation, 166–167
 - project planning, 165–166
 - targeting vegetation, 164–165
- air separator, 90
- ALS. *See* acetolactate synthase (ALS) inhibitors
- animal pest protection materials/methods, 198–199, 199
- annual cone crop survey, 73–77, 75, 76
- AOSA. *See* Association of Official Seed Analysts (AOSA)
- artificial shading device, 197–198
- aspirator, 90
- assessing damage, 230, 230–231
- Association of Official Seed Analysts (AOSA), 92
- bare-root seedling, 115, 122, 187–188
- bare-root stock, 115
- bark beetles, 234
- basal-bark treatments, 171–172
- baseline/alternative scenario, 24–25
- batch kiln, 88, 88–89
- bears, 258, 258
- biological control, 133, 141, 145
- biomass
 - chipping, 130
 - energy, 12
 - removal, 142
- biotic damage, 231
- black-stain root diseases, 242–244, 243, 244
- broadcast burning method, 133, 133–134
- broadcast hand treatments, 169–170
- brush-field conversions, 41, 136, 136
- budgeting process, 31–32
- buffers, 150–151, 151
- burning site preparation method, 33, 35, 133
 - broadcast burning, 133, 133–134
 - fire behavior and prescriptions, 133
 - piles, 134, 134–135
- CAL FIRE. *See* California Department of Forestry and Fire Protection (CAL FIRE)
- California, reforestation, 1–3
 - forestland ownership in, 8t
 - forest nurseries in, 10–11
 - history of, 3–4
 - needs in, 4–11
 - plant forest, 6–7
 - private and public conifer forestlands, 2
 - private forests, 8–9, 9
 - public and tribal lands, 10
 - public forest tree nurseries in, 5t
 - seed zones and site variability, 10
 - timberlands, forest types on, 7t
 - wildfire perimeters, 5
- California Coast Range forests, precommercial thinning, 214–215, 216
 - bear damage and thinning intensity, 218
 - density management in, 216
 - redwood stump sprouts in, 216–217
 - tanoak, reducing competing, 217–218
 - thinning shock in Douglas-fir, 216
 - wood quality, 218–219, 219
- California Department of Fish and Wildlife, 52
- California Department of Forestry and Fire Protection (CAL FIRE), 16–17, 26, 30, 41, 240
 - Forest Health Grant Program, 18, 19t
 - forest management plan, 32
- California Department of Tax and Fee Administration, 20–21, 21t
- California Environmental Quality Act (CEQA), 32
- California Forest Improvement Program (CFIP), 17–18
- California Native Plant Society, 52
- California physiographic and climatic regions, 64
 - 090 series–North Coast Redwood Belt, 64–65
 - 100 series–Central Coast, 65
 - 300 series–North Coast Interior, 65
 - 500 series–Western Slope Cascades and Sierra, 65
 - 700 series–Modoc Plateau, Eastern Slope Cascades and Sierra, 65
 - 900 series–four separate areas, 65–66
- California Reforestation Advisory Committee, 4
- California tree seed zone map, 64, 64
- cankers, 249, 249
- cellulose biosynthesis inhibitors (CBI), 148
- CEQA. *See* California Environmental Quality Act (CEQA)
- CFIP. *See* California Forest Improvement Program (CFIP)
- chemical control method, 159
 - conifer tolerance, 159
 - cost, 159
 - effectiveness, 159
 - liability, 160
 - logistics, 160
 - project scope, 160
- chemical release treatments, 152–153
 - aerial, 157
 - glyphosate, 158
 - growth regulator, 158
 - spot-gun treatments, 158–159
- chemical site preparation, 35, 152–153, 153t
 - postharvest, 155–157
 - preharvest, 153–155
 - vs. release treatments, 152–159
- chemical treatment, thinning, 210
- chemical vegetation control, 141, 160
 - brush-field conversion, 136, 136
 - herbicide formulations, 161–162
 - postharvest site preparation, 135–136
 - preharvest site preparation, 135
 - soil type, 161
 - spray application technology, 162–164
 - timing, 161

- topography, 161
 weather, 160–161
 chemical weed control, 147, 147t
 degradation, 149
 forestry, herbicides types in, 147–148
 herbicide behavior in environment, 149
 mobility, 149–150
 nonsynthetic herbicides, 149
 soil- vs. foliar-active herbicides, 149
 toxicity, 150, 150t
 chipping method, 130
 chlorophyll florescence, 112
 Civilian Conservation Corps, 3, 4
 Clarke-McNary Act, 3
 climate data, 48–49
 climate projections, 67–68
 cold hardiness, 112
 cone and seed development, biology, 68
 annual cone crop survey, 73–77, 74t, 75
 assess seed lots, 92–98
 collecting and banking programs, 72–101, 73t
 collection, 79–87
 cone-bearing age, 72
 formation, reproductive buds, 68, 68–69, 69
 harvest trees, 77–79
 humans, 71–72
 impediments, 69–72, 70
 insects, 69–70
 long-term seed, 72–73
 losses, 84, 85t
 mammals and birds, 71
 manage inventory, 100–101, 101
 pathogens, 70–71
 processing, 87, 87–92
 store seed long-term, 98–100
 cone-bearing age, 72
 cone crop periodicity, 73, 74t, 75
 cone curing, 87–88, 88
 conifer tolerance, 159, 164
 container seedlings, 113, 113–114, 187
 container stock, 113, 113–114
 contour lines, 47
 controlled mass pollination, 103–104
 convention basal treatment, 171
 cost and revenue estimation, 15–16
 cost-share programs, state/federal, 17
 CAL FIRE's Forest Health Grant Program, 18
 CFIP, 17–18
 EQIP, 18
 generalized 2019 reforestation cost, 18–19, 20t
 crop rating, 76–77
 crop-tree release thinning method, 209
 cross-lot contamination, 92
 crown thinning method, 209
 cut-stump treatments, 171
 cutting method, 144
 decision-making, precommercial thinning, 206
 cost considerations, 210–211
 health, vigor, form, and defects, 208
 implementation methods, 209–210
 intensity, thinning, 207
 species selection, 207–208, 208
 thinning methods, 208–209
 thinning timing, 206–207, 207
 degradation process, 149
 density management, 211
 California's eastside forests, 219–220, 220, 220t
 diagrams, 212–213, 213
 in mixed stands, 216
 density metrics, 211–212
 dewinging process, 89, 89–90
 directed hand-spraying applications, 168–169
 disk nozzles, 163
 Dole meter, 93
 Douglas-fir, 77
 bark beetles, 234
 bigcone, 77
 thinning shock in, 216
 tussock moth, 239–240, 240
 drift mitigation, 151–152
 drought, abiotic damage, 259, 259
 D-series disk nozzles, 163
 dwarf mistletoes, 55, 244, 244–246, 245
 effective monitoring, 36
 Elytroderma needle diseases, 247–248, 248
 Environmental Quality Incentives Program (EQIP), 17–18
 fall vs. spring planting, 180–182, 182
 fire, cultural treatment, 146–147
 flat-fan nozzles, 162
 FM-44 form, 86, 86
 foliar-active herbicides, 149, 161
 foliar chemical site preparation, 35
 foliar treatments, 154
 FORECON financial analysis, 23–24, 23t
 Forest Inventory and Analysis program, 7–8
 forestlands, 8
 ownership, 8t
 private and public conifer, 2
 forest management plan, 32
 forest nurseries, 10–11
 Forest Practice Rule, 4
 forestry, families, 103–104
 forestry, herbicide type in, 147
 ALS inhibitors, 148
 CBI, 148
 growth regulators, 147–148
 photosynthesis inhibitors, 148
 PPO inhibitors, 148
 Forest Service, 1–2, 4, 28
 free-form thinning method, 209
 frost, abiotic damage, 260, 260
 fuels, 31
 reduction treatment, 37
 genetics, 99
 geographic information systems (GIS), 45–46, 152, 166
 germination
 capacity, 97
 laboratory, seeds preparation for, 95–96
 percentage, 94–95
 protocols for California conifers, 95t
 retest schedule, 100

- seed laboratory and nursery, 97
standards, 96t
- giant sequoia, 83, 83, 86
- GIS. *See* geographic information systems (GIS)
- global positioning system (GPS), 47, 77, 152, 166
- glyphosate, 158
- gouty pitch midge (*Cecidomyia piniinopsis*), 237, 237
- GPS. *See* global positioning system (GPS)
- grasshoppers, 237–238
- gravity table process, 91, 91–92
- grazing method, 146
- Greenhouse Gas Reduction Fund, 18
- ground squirrels, 254, 254–255
- growth regulators, 147–148, 158
- grubbing method, 132
- G-space model, 222
- hack-and-squirt treatment, 154, 154–155, 170–171
- hail, abiotic damage, 259, 260, 260
- hand applications, 157–158, 167
basal-bark treatments, 171–172
broadcast hand treatments, 169–170
cut-stump treatments, 171
directed hand-spraying, 168–169
glyphosate, 158
growth regulators, 158
hack-and-squirt, 170–171
spot-gun applications, 172
spot treatments, 158–159
- hand-cleaning process, 92
- hand-grubbing method, 143–144
- hand-piling, 133
- hand treatment, thinning, 209–210
- herbicides, 135, 154
abiotic damage, 261
behavior in environment, 149
conifer tolerance, 156, 156t, 159
formulations, 161–162
nonsynthetic, 149
soil- vs. foliar-active, 149, 156, 159, 161
types in forestry, 147–148
- Heterobasidion (*Annosus*) root diseases, 241, 241–242, 242
- hoedad planting, 189–190, 190, 191, 192
- hydrophobic soils, 126–127
- imazapyr, 153–154, 165
- immature/insect-damaged cones, 82, 82
- inbreeding, 78, 78t
- insect pests attack, mitigating damage, 232
foliage, 237–240
inner bark and cambium, 233–234
roots and lower stem, 232–233
shoot, 234–237
- insects, evidence, 82, 82
- integrated pest management (IPM), 232
- International Seed Testing Association (ISTA), 92
- interplanting, 200
- IPM. *See* integrated pest management (IPM)
- ISTA. *See* International Seed Testing Association (ISTA)
- kiln drying, 88, 88
- Koc, soil adsorption coefficient, 149
- landowners, 18
postwildfire loss responses, 17
private forests, 8–9, 9
types, 8
- large ownerships, 8–9
- locational attributes, pre-field site assessment, 48
climate data, 48–49
fire risk, 52
imagery, 51
on-site vegetation, 49–51
sensitive species and sites, 51–52
silviculture, 51
site history, 51
soils data, 49, 50, 50t
topographical information, 48
vegetation mapping, 51
- logging method, 128, 128–129
- long-term seed storage, 98, 186
orthodox/recalcitrant, 98
proper storage conditions, 99, 99–100, 99t, 100
seed longevity, 98–99
- Long Term Soil Productivity Study, 142
- low thinning method, 208–209
- low-volume basal treatment, 171
- manual site preparation, 35
- manual vegetation control, 132, 141
biological control, 133
grubbing, 132
hand-piling, 133
mulching, 132
release treatments, 143–145
- mastication method, 129–130, 130, 142–143
- mechanical site preparation, 35, 265
- mechanical treatment, thinning, 210
- mechanical vegetation control, 128, 141
chipping, 130
logging, 128, 128–129
mastication, 129–130, 130
mounding, 131
piling, 129, 129
spot cultivation, 130–131, 131
spyder, 131, 131
subsoiling, 129, 129
terracing, 131
V-blading, 130, 131
- megametophyte, 69, 81
- meter-jet applications, 172
- mitigating damage, 232
abiotic damage, 258–261
diseases, 241–249
insect pests, 232–240
vertebrate pests, 249–258
- mixed-conifer forest, 7
- mobility, 149–150
- moist pre-chilling process, 95
- moisture content, 92–93
thresholds and potential effects, 99t
- mounding, 131
- mountain beavers (*Aplodontia rufa*), 256, 256–257
- mulching, 132
- mulch mats method, 144–145, 198, 198

- National Environmental Policy Act (NEPA), 1, 32
 Natural Resources Conservation Service (NRCS), 16–17, 19t
 NEPA. *See* National Environmental Policy Act (NEPA)
 nonchemical weed control methods, 141
 biological, 145
 cultural, 145–147
 manual, 143–145
 mechanical, 141–143
 nonsynthetic herbicides, 149
 NRCS. *See* Natural Resources Conservation Service (NRCS)
 nursery
 cultural practices, 116
 dormancy, 111
 evaluating and working with, 115–116
 facilities, 116, 116–117, 117
 growing practices, 117, 117t, 118, 118t
 location, 116
 packing, 118–120
 seed availability, 117–118
 seedling crop monitoring, 118t
 seedlings from, 185–186
 nutrient status, 112
 off-center nozzles, 162–163
 on-site field assessment, 52
 attributes, 52–53
 fire risk, 56
 pests, insects, and disease, 55
 sensitive areas, 55
 silviculture, 54–55
 vegetation, 53–54
 on-site vegetation, 49–51, 54
 open-pollinated seed orchards, 103
 ordering seedlings, 120–121
 organogenesis, 104–105
 oven-dry method, 92
 pathogens, 70
 pitch canker (*Fusarium circinatum*), 71
 seedborne, 71
 sirococcus blight, 70–71
 sudden oak death (*Phytophthora ramorum*), 71
 Western gall rust (*Endocronartium harknessii*), 71
 pest complexes, 231
 pesticides, resource protection from, 150
 buffers, 150–151, 151
 drift mitigation, 151–152
 project layout and planning, 152
 weather guidelines, 152
 pest triangle, 230, 230
 photosynthesis inhibitors, 148
Phytophthora ramorum, 249
 piling method, 129, 129, 142
 pine needle sheathminer (*Zelleria haimbachi*), 238,
 238–239, 239
 pine reproduction weevil (*Cylindrocopturus eatoni*), 233,
 233–234
 pitch canker, 249
 plant forest, 6–7
 planting, 178, 178–179
 central and northern coastal areas, 179
 fall vs. spring in Sierra Nevada, Cascades, and eastside,
 180–182, 182
 follow-up, 199–201
 hoedads, 189–190, 190, 191, 192
 inspection, 196–197, 197
 installing protection measures in conjunction with, 197–199
 machine planter, 191–193, 193
 methods, 188–189, 189
 organizational needs, 195–196
 power auger, 190–191
 scheduling activities, 264
 season, 179
 seedling handling during, 188
 shovels, 190
 species, stock types, and spacing, 182–185
 tarp, 187
 west and east sides, Sierra Nevada and Cascade ranges,
 179–180, 180t
 planting contractors, 36, 193
 crew, 193
 enforceable inspection guidelines, 194
 experience, reputation, and references, 194
 foreman, 194
 payment methods and rates, 195
 penalties and incentives, 194
 production and timing, 194
 production targets, 194
 plant moisture stress, 112
 plant seedlings, 36
 plug-1 (P-1) stock, 115
 plug seedlings, 113–114
 pneumatic separator process, 90, 90–91
 pocket gophers, 249–251, 250
 ponderosa pine tip moth (*Rhyacionia zozana*), 235, 235–237, 236
 porcupine (*Erethizon dorsatum*), 253, 253–254, 254
 Port-Orford-cedar root disease, 244
 post-green-timber harvest reforestation project, 40, 42
 postharvest project, 40, 42
 postharvest site preparation, 135–136, 155–157
 postwildfire project, 40–41, 43
 potential revenue estimation, 20–21
 green tree stumpage values (1977–2019), 21–22, 22
 stumpage values (2019), 21
 Powers, Robert F., 6
 precommercial thinning, 36–37, 203
 in California Coast Range forests, 214–219, 216
 in California's eastside forests, 219–220, 220, 220t
 decision-making, 206–211
 density management, 211–213, 213
 density metrics, 211–212
 and establishment density, 213–214
 fire and fuels management, 206
 growth enhancement, 203
 insect and disease impacts, 205, 205t
 in Sierra Nevada and southern Cascades, 220–222
 stock improvement, 203
 understory vegetation development, 206
 wood quality, 204–205
 pre-field site assessment, 45
 baseline maps, regional data sets for, 47
 effective decision-making, and on-site data, 46, 46t

- GIS, 45–46
 locational attributes, 48–52
 making and utilizing maps on, 46
 mapping operational units, 46–47
 site map making, 47
 preharvest site preparation, 135, 153–155
 preharvest vegetation management, 34
 prescribed fire, thinning, 210, 210
 prescription process, 31
 preventing damage, 231–232
 processing variations, cone/seeds, 88–89
 protoporphyrinogen oxidase (PPO) inhibitors, 148
 pruning method, 204
- QMD. *See* quadratic mean diameter (QMD)
 quadratic mean diameter (QMD), 207, 211–214, 216–217, 220, 222
- rabbits/hares, 252–253, 253
 rapid assessment of vegetation condition (RAVG), 264
 rapid method, 92
 RAVG. *See* rapid assessment of vegetation condition (RAVG)
 red belt damage, 260, 261
 redwood stump sprouts, thinning in, 216–217
 reforestation, 3
 economic analysis tools for, 22, 22–25
 investing, 15–25
 lands, 4
 needs in California, 4–11
 planning large scale, 263–264
 project timing, 11
 scheduling planting activities, 264
 tax treatment of, 16–17
 unitizing site, 264
 workflow, 27
 reforestation investing, 15
 assessing financing options, 16–17
 cost/revenue estimation, 15–16
 economic analysis tools, 22–25
 potential revenue estimation, 20–22
 state and federal cost-share programs, 17–20
 tax treatment, 16–17
- Reforestation Practices for Conifers in California* (Schubert and Adams), 1, 1
- reforestation project planning, 26
 appropriate seed, availability, 28–29
 budgeting process, 31–32
 burning permits, 33
 conducting site preparation, 35
 control vegetation and fuel loading, 36
 defining project type, 27–28
 forest management plan, 32
 goals and funding strategy, 28
 green-timber and salvage harvesting permits, 32–33
 harvest operations, 34
 implementation, 32
 monitoring and follow-up treatments, 36
 objectives, 29–31, 29t
 obtain appropriate seed, 33
 pesticide application permits, 33
 planting conditions and outcomes, 31
 planting contractors, 36
 plant seedlings, 36
 precommercial thinning, 36–37
 preharvest vegetation management, 34
 prescription process, 31
 pruning, 37
 receive and store seedlings, 36
 seedling packing and delivery, 35
 seedlings and cold storage, 34
 selecting reforestation forester, 26–27
 site assessment, 29
 site preparation contractors, 35
 site preparation methods, 34–35
 water quality permits, 33
- Reforestation Trust Fund, 28
 Registered Professional Foresters, 26–27
 rehabilitation project, 41, 44
 release treatments, 34, 36
 resprouting brush, 155
 ripeness indicators, 79–81, 80t, 81
 root diseases, 241
 black-stain, 242–244, 243, 244
 dwarf mistletoes, 244, 244–246, 245
 Heterobasidion (*Annosus*), 241, 241–242, 242
 rooted cuttings, 104
 root growth potential, 111
 rotary kiln, 88, 88
 row thinning method, 208
- scalping process, 89
 Schubert, Gilbert H., 1, 3
 screening process, 89, 89
 SDI. *See* stand density index (SDI)
 sediment transport in wildfire units, 269, 269–270
 seedborne pathogens, 71
 seed cutting test, 81, 81–82
 seed dormancy, 95, 111–112
 seedlings, 6, 145
 bare-root, 115, 122, 187–188
 care in transport, handling, and field storage, 186–188
 cold storage, 34, 121, 121
 container, 113, 113–114, 187
 crop monitoring at nursery, 118t
 deliveries, 195
 delivery from nursery to roadside, 266–268, 267t
 extraction, 119, 119
 freezer storage, 121–122
 freezing, 266–268
 handling during planting, 188
 morphology, 112–113
 in North Coast region, 184–185
 from nursery and cold storage, 185–186
 nutrition, 146
 ordering, 120–121
 packing and delivery, 35
 packing bare-root, 119–120
 packing container, 118–119, 119, 120
 physiology, 111–112
 plant, 36
 plug, 113–114
 receive and store, 36
 reforestation, 112
 refrigerated vans, 267–268

- from roadside to field/planting, 268, 268–269
- shipping and handling, 122
- in Southern California mountains, 185
- species/stock types/spacing, 182–185
- use quality, 178
- seed longevity, 98–99
- seed lot assessment, 92
 - germination percentage, 94, 94–95, 95t
 - laboratory germination, seeds preparation for, 95–96
 - moisture content, 92–93
 - percentage filled (by X-ray), 93–94, 94
 - sampling, 92
 - seed dormancy, 95
 - seed laboratory germination, 97
 - seed purity and seeds per pound, 93
 - testing and trials, 97–98
 - variations among species, 96–97
- seed lot identification, 86
- seed lot selection tool, 67
- seed maturity, 79
- seed orchards, 11
- seed origin, 64
 - California physiographic and climatic regions, 64–66
 - California tree seed zone map, 64, 64
 - climate projections, 67–68
 - seed transfer guidelines, 66–67
- seed production areas, 102–103
- seed purity test, 93
- seed source, species and, 108, 110–111
 - climatic conditions, 109
 - forest health, 109–110
 - historical composition, 108
 - natural range, 109
 - site conditions, 108–109
- seeds per pound, 93
- seeds/propagules, genetic quality, 102
 - family forestry, 103–104
 - natural stands, 102
 - open-pollinated seed orchards, 103
 - seed production areas, 102–103
 - varietal forestry, 104–105
- seeds upgrade, 90
 - gravity table, 91, 91–92
 - hand-cleaning, 92
 - pneumatic separator, 90, 90–91
 - vibratory feeder, 91, 91
- seed tree, 76
- selection thinning method, 209
- serotiny, 83
- shovel planting, 190, 192, 192
- Sierra, Cascades, and eastside
 - fall vs. spring planting in, 180–182, 182
 - seedling spacing, 183–184
 - species selection in, 182–183
 - stock types in, 183
- silvicultural treatment, 47, 51, 54–55
- siroccoccus blight, 70–71
- site assessment, 29
 - on-site field, 52–56
 - pre-field, 45–52
 - reforestation, project plan, 60–61
- template, 59
 - Timber Harvest Plan, 32
- site preparation methods, 34–35
 - animals, 127
 - compaction, 127
 - conducting, 35
 - costs, 127
 - definition, 124
 - disease, 127
 - hydrophobic soils, 126–127
 - safety, 127–128
 - slash loads and fuels loading, 124–125
 - soil type, 125–126
 - temperature, 127
 - topography, 126
 - vegetative competition, 125
 - vs. release treatments, chemical, 152–159
- slash loading, 124–125
- small ownerships, 9
- soil(s)
 - data, 49, 50, 50t
 - hydrophobic, 126–127
 - mobility, 150
 - texture, 161
 - type, 125–126, 161
- soil-active herbicides, 149, 156, 159, 161, 266
- somatic embryogenesis, 105
- sourcing seed, 265
- Southern Pacific Land Company, 2
- split booms, 151, 151, 152
- spot cultivation, 130–131, 131
- spot-gun applications, 172
- spot treatments, 158–159
- spray application technology, 162
 - adjuvants, 164
 - application volume, 163
 - drop size, 162
 - nozzle characteristics, 162–163, 163t
 - rates, 163–164
- spyder site preparation, 131, 131
- stand density index (SDI), 211–214, 214t, 217, 219, 221–222
- State Forestry Commission, 3
- stock, types, 113
 - bare-root, 115
 - container, 113, 113–114
 - container size, 114, 114–115, 114t
 - definition, 111
 - plug-1, 115
- stocking survival surveys, 199–200, 200
- stratification process, 95
- subsoiling method, 124, 127, 129, 129, 142, 265
- sudden oak death (*Phytophthora ramorum*), 71
- surfactants, 157, 164
- temperature inversion, 160
- terracing, 131
- thin-line treatment, 171
- thinning methods, 208–209
- thinning timing, 206–207, 207
- tilling method, 129
- topography, 48, 52, 126, 161
- toxicity, herbicides, 150, 150t

- tractor/off-road vehicle applications, 172
 tree density, 30
 tree improvement program, 101–102
 tree squirrels, 255
 tumbling, 89
 ungulates (deer, elk, livestock), 257, 257
 unitization, 31
 unit planning information sheet, 58
 USDA Forest Service, 9–10, 16, 28, 72
 USDA Pacific Southwest Research Station, 1
 U.S. Geological Survey, 47
 variable-density thinning method, 209
 V-blading, 130, 131
 vegetation
 chemical management, 135–136
 competing, 54, 266
 development, understory, 206
 management, 34, 265–266
 mapping, 51
 natural regeneration, 53–54
 on-site, 49–51, 54
 and pest problem surveys, 200
 site quality, 53
 targeting, 164–165
 vegetation control methods, 128–136
 benefits of, 139
 biological, 141
 chemical, 141
 choosing, 140–141
 manual, 132–133, 141
 mechanical, 128–132, 141
 See also specific vegetation control method
 vegetative competition, 125, 139
 control, 178–179
 environmental considerations, 140
 fuel loading and fire risk, 140
 postharvest site-preparation, 155
 types, 266
 vertebrate pests, 249–250
 bears, 258, 258
 ground squirrels, 254, 254–255
 mountain beavers (*Aplodontia rufa*), 256, 256–257
 pocket gophers, 249–251, 250
 porcupine (*Erethizon dorsatum*), 253, 253–254, 254
 rabbits and hares, 252–253, 253
 tree squirrels, 255
 ungulates (deer, elk, livestock), 257, 257
 voles, 251–252, 252
 woodrats, 255–256, 256
 VH Mulcher, 130, 131, 143
 vibratory feeder process, 91, 91
 volatilization, 160
 voles, 251–252, 252
 water quality, 33
 weather guidelines, 152
 Web Soil Survey data, 49
 western conifer seed bug (*Leptoglossus occidentalis*), 70, 70
 western gall rust (*Endocronartium harknessii*), 71, 247, 247, 248
 western pine shoot borer (*Eucopina [Eucosma] sonomana*), 234, 234–235, 235
 white fir sawfly moth, 239, 239–240, 240
 white pine blister rust, 246, 246–247
 wildfires, 155
 wildlife, 30
 woodrats, 255–256, 256
 X-ray radiograph, 90–91
 Z'Berg-Nejedly Forest Practice Act (1973), 2