

General Study Materials:

1. **Core Test:** [National Pesticide Applicator Certification: Core Manual](#) This national training resource for Core certification is available for free online. Arizona Department of Agriculture will begin using this as the Arizona training resource as of August 1, 2009.
2. **Right of Way Test:**
 - a. [ROW test study guide from Arizona Pest Management Division](#) (also attached to this packet)
 - b. [Model Certification Training Manual for Right-of Way Pesticide Applicators](#) from Purdue University
 - c. [Herbicide Resistance Weeds Training Module](#) from the Weed Science Society of America.
 - d. Arizona plants to know (see table below)

Plants to Know for the Arizona Right-of-Way Herbicide Applicator Test			
Common Name	Lifecycle	Scientific Name	Links
Trees			
Saltcedar	perennial	<i>Tamarix spp.</i>	p.6 of ADOT Construction Noxious and Invasive Species Guide p.58 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Saltcedar ID
Tree of heaven	perennial	<i>Ailanthus altissima</i>	p.3 of ADOT Construction Noxious and Invasive Species Guide p.64 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Tree of heaven ID
Grasses			
Buffelgrass	perennial	<i>Pennisetum ciliare</i>	p.18 of ADOT Construction Noxious and Invasive Species Guide p.4 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Buffelgrass ID
Fountaingrass	perennial	<i>Pennisetum setaceum</i>	p.19 of ADOT Construction Noxious and Invasive Species Guide p.8 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Fountaingrass ID
Giant reed	perennial	<i>Arundo donax</i>	p.11 of ADOT Construction Noxious and Invasive Species Guide p.12 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Giant reed ID
Johnsongrass	perennial	<i>Sorghum halepense</i>	p.20 of ADOT Construction Noxious and Invasive Species Guide p.251 of Weed chapter in UA Handbook on Pests of the Desert Southwest ; p.16 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Johnsongrass ID
Lehmann lovegrass	perennial	<i>Eragrostis lehmanniana</i>	p.17 of ADOT Construction Noxious and Invasive Species Guide p.20 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Lehmann lovegrass ID
Bermudagrass	summer annual	<i>Cynodon dactylon</i>	p.15 of ADOT Construction Noxious and Invasive Species Guide p.248 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Cheatgrass	summer annual	<i>Bromus tectorum</i>	p.6 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Cheatgrass ID
Crabgrasses	summer annual	<i>Digitaria spp.</i>	p.16 of ADOT Construction Noxious and Invasive Species Guide p.243 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Jointed goatgrass	summer annual	<i>Aegilops cylindrica</i>	p.9 of ADOT Construction Noxious and Invasive Species Guide p.18 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Jointed goatgrass ID
Red brome	winter annual	<i>Bromus rubens</i>	p.242 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.28 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Red brome ID
Sandbur	winter annual	<i>Cenchrus spp.</i>	p.13 of ADOT Construction Noxious and Invasive Species Guide p.247 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.34 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Sandbur ID

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Common Name	Lifecycle	Scientific Name	Links
Foxtail barley, hare barley	winter annual	<i>Hordeum spp.</i>	p.240 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Knapweeds			
Diffuse knapweed	annual or biennial	<i>Centaurea diffusa</i>	p.28 of ADOT Construction Noxious and Invasive Species Guide p.96 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Diffuse knapweed ID
Spotted knapweed	biennial	<i>Centaurea stoebe, C. maculosa</i>	p.120 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Spotted knapweed ID
Russian knapweed	perennial	<i>Acroptilon or Centaurea repens</i>	p.23 of ADOT Construction Noxious and Invasive Species Guide p.114 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Russian knapweed ID
Thistles			
Russian thistle or tumbleweed	annual	<i>Salsola tragus</i>	p.37 of ADOT Construction Noxious and Invasive Species Guide p.237 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.78 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Russian thistle ID
Musk thistle	annual or biennial	<i>Carduus nutans</i>	p.104 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Musk thistle ID
Maltese starthistle	annual	<i>Centaurea melitensis</i>	p.29 of ADOT Construction Noxious and Invasive Species Guide p.184 of Invasive Plants and Weeds of the National Forests in Region 3
Yellow starthistle	annual	<i>Centaurea solstitialis</i>	p.30 of ADOT Construction Noxious and Invasive Species Guide p.212 of Invasive Plants and Weeds of the National Forests in Region 3
Bull thistle	biennial	<i>Cirsium vulgare</i>	p.90 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Bull thistle ID
Scotch thistle	perennial	<i>Onopordum acanthium</i>	p.36 of ADOT Construction Noxious and Invasive Species Guide p.116 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Scotch thistle ID
Other broadleaf plants			
Buffalo gourd	perennial	<i>Cucurbita foetidissima</i>	Wildflower.org - Buffalo gourd Pestweb.com - Buffalo gourd
Camelthorn	perennial	<i>Alhagi maurorum</i>	p.10 of ADOT Construction Noxious and Invasive Species Guide p.50 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Camelthorn ID
Dandelion	perennial	<i>Taraxacum officinale</i>	p.255 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Silverleaf nightshade	perennial	<i>Solanum elaeagnifolium</i>	p.38 of ADOT Construction Noxious and Invasive Species Guide p.257 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Purple nutsedge	perennial	<i>Cyperus rotundus</i>	p.253 of Weed chapter in UA Handbook on Pests of the Desert Southwest
White clover	perennial	<i>Trifolium repens</i>	p.256 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.156 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - White Clover ID
Common mullein	biennial	<i>Verbascum thapsus</i>	p.40 of ADOT Construction Noxious and Invasive Species Guide p.208 of Invasive Plants and Weeds of the National Forests in Region 3
Black medic	winter annual	<i>Medicago lupulina</i>	p.217 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.164 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Black medic ID
Black mustard	winter annual	<i>Brassica nigra</i>	p.26 of ADOT Construction Noxious and Invasive Species Guide p.166 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Black mustard ID

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Common Name	Lifecycle	Scientific Name	Links
Other broadleaf plants			
Burclover	winter annual	<i>Medicago polymorpha</i>	p.218 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.168 of Invasive Plants and Weeds of the National Forests in Region 3
Cheeseweed or Malva	winter annual	<i>Malva spp.</i>	p.225 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Chickweed	winter annual	<i>Stellaria media</i>	p.226 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Prickly lettuce	winter annual	<i>Lactuca serriola</i>	p.220 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Prostrate knotweed	winter annual	<i>Polygonum arenastrum</i>	p.226 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Redstem filaree or stork's-bill	winter annual	<i>Erodium cicutarium</i>	p.227 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.112 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Filaree ID
Sahara mustard	winter annual	<i>Brassica tournefortii</i>	p.27 of ADOT Construction Noxious and Invasive Species Guide p.222 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.196 of Invasive Plants and Weeds of the National Forests in Region 3
Shepherd's purse	winter annual	<i>Capsella bursa-pastoris</i>	p.223 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Sow thistle	winter annual	<i>Sonchus spp.</i>	p.221 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.188 of Invasive Plants and Weeds of the National Forests in Region 3
Yellow sweet clover	winter annual	<i>Melilotus officinalis</i>	p.35 of ADOT Construction Noxious and Invasive Species Guide p.214 of Invasive Plants and Weeds of the National Forests in Region 3
Camphorweed	summer annual	<i>Heterotheca subaxillaris</i>	p.33 of ADOT Construction Noxious and Invasive Species Guide
Carelessweed or Palmer's amaranth	summer annual	<i>Amaranthus palmeri</i>	p.24 of ADOT Construction Noxious and Invasive Species Guide p.235 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Common sunflower	summer annual	<i>Helianthus annuus</i>	p.32 of ADOT Construction Noxious and Invasive Species Guide
Dalmatian toadflax	summer annual	<i>Linaria dalmatica</i>	p.34 of ADOT Construction Noxious and Invasive Species Guide p.172 of Invasive Plants and Weeds of the National Forests in Region 3
Field bindweed	summer annual	<i>Convolvulus arvensis</i>	p.31 of ADOT Construction Noxious and Invasive Species Guide p.230 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.142 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Field bindweed ID
Stinknet (Globe chamomile)	summer annual	<i>Oncosiphon piluliferum</i>	p.178 of Invasive Plants and Weeds of the National Forests in Region 3
Halogeton	summer annual	<i>Halogeton glomeratus</i>	p.72 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Halogeton ID
Horseweed or maretail	summer annual	<i>Conyza spp.</i>	p.232 of Weed chapter in UA Handbook on Pests of the Desert Southwest
Kochia or burningbush	summer annual	<i>Bassia scoparia</i>	p.25 of ADOT Construction Noxious and Invasive Species Guide Forest Service - Kochia ID p.74 of Invasive Plants and Weeds of the National Forests in Region 3
Prostrate spurge	summer annual	<i>Chamaesyce (Euphorbia) spp.</i>	p.234 of Weed chapter in UA Handbook on Pests of the Desert Southwest

Plants to Know for the Arizona Right-of-Way Herbicide Applicator Test			
Common Name	Lifecycle	Scientific Name	Links
Other broadleaf plants			
Puncturevine or goathead	summer annual	<i>Tribulus terrestris</i>	p.39 of ADOT Construction Noxious and Invasive Species Guide p.231 of Weed chapter in UA Handbook on Pests of the Desert Southwest p.192 of Invasive Plants and Weeds of the National Forests in Region 3
Common cocklebur	summer annual	<i>Xanthium strumarium</i>	p.68 of Invasive Plants and Weeds of the National Forests in Region 3 Forest Service - Cocklebur ID
Lambsquarters or goosefoot	summer annual	<i>Chenopodium spp.</i>	North Carolina Extension – <i>Chenopodium album</i>

Study materials for plants:

- University of Arizona Handbook on Pests of Community Environments of the Desert Southwest – <http://cals.arizona.edu/apmc/Handbook.html>
Download Chapter 11, Weeds: [Weed chapter in UA Handbook on Pests of the Desert Southwest](#)
- US Forest Service Region 3 Invasive Species –
 - Invasive Plants and Weeds of the National Forests and Grasslands in the Southwestern Region - http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3802006.pdf
 - Region 3 Invasive Species Info online - <https://www.fs.fed.us/r3/resources/health/invasives/toc.shtml>
 - Region 3 Field Guides for Treating Invasive Species - <https://www.fs.usda.gov/detail/r3/forest-grasslandhealth/invasivespecies/?cid=stelprd3813522>
 - US Forest Service Handbook: New Invaders of the Southwest – https://www.fs.fed.us/foresthealth/technology/pdfs/FHTET-2014-13_SW_New_Invaders.pdf
- ADOT Construction Noxious and Invasive Species Guide – <https://azdot.gov/sites/default/files/2019/04/noxious-species-identification-guide.pdf>
- UC Davis Weed photo gallery - http://ipm.ucanr.edu/PMG/weeds_intro.html

Right-of-Way Pest Management

Test Plan Development

I. Pest Identification

- a. Bi-annuals
- b. Annuals
- c. Perennials
- d. Desirable vs. Pest (selective control)
- e. Monocot
- f. Dicot
- g. Insect – growth stage, appropriate time for control (thresholds)
- h. Rodent
- i. Scouting/ Monitoring/ Trapping for Pests
- j. Growth Regulators

Pests

- k. Ants
 1. Southern fire ant
 2. Red Imported fire ant (Qualified Applicator)
 3. Harvester ant
- l. Cockroaches
- m. Beetles
 1. Flat-head borer
 2. Palo Verde
 3. Bark Beetles
 4. Bill Bugs
 5. Long-Horned Beetles
 6. Agave Weevils
 7. Yuccas
- n. Pests of Public Health concern
 1. Ticks
- o. Scorpions
 1. Bark scorpion
- p. Wasps/Bees
- q. Noctuid moths/insects that come to lights/occasional invaders
 1. Aphids
 2. Whiteflies
 3. Psyllids
 4. Stink bugs
 5. Mealy bugs
 6. False chinch bugs
 7. Leaf hoppers
- r. Vertebrates
 1. Gophers

Weeds

- a. Clovers
 - 1. Black medic
 - 2. Bur clover
 - 3. Annual sweet clover
- b. Mustards
 - 1. London rocket
 - 2. Mustards (Sahara, Black, Wild Radish)
 - 3. Shepherds purse
 - 4. Swine cress
- c. Composites
 - 1. Groundsel
 - 2. Sow thistle
 - 3. Prickly lettuce
- d. Other
 - 1. Cheeseweed
 - 2. Red Stem Filaree
 - 3. Chickweed
 - 4. Knotweed
- e. Summer annual broadleaves
 - 1. Spurge
 - 2. Horseweed
 - 3. Pigweed
 - 4. Common purslane
 - 5. Russian thistle
 - 6. Puncturevine
 - 7. Toadflax
 - 8. Thistles
 - 9. Globe Chamomile
 - 10. Hairy Fleabane
 - 11. Camphorweed
- f. Winter annual grass weeds
 - 1. Hare Barley
 - 2. Red brome
- g. Summer annual grass weeds
 - 1. Goosegrass
 - 2. Southwestern cupgrass
 - 3. Crabgrasses
 - 4. Sandbur
 - 5. Bermudagrass
- h. Perennial weeds
 - 1. Purple Nutsedge
 - 2. Yellow Nutsedge
 - 3. Kyllinga
 - 4. Silverleaf nightshade
 - 5. Johnsongrass

6. Buffelgrass
7. Fountaingrass
8. Camelthorn
9. Hogpotato

II. Read and Comprehend Label and Labeling

- a. Safety Issues
 1. Spray Drift
 2. Run Off
 3. Surface Waters (lakes, rivers, washes)
 4. Groundwater Protection List – A.I.
- b. Worker Safety – PPE
- c. Calculate chemicals
 1. Application Rates
 - i. Site
 - ii. Pests
- d. Types of Applications
 1. Pre-emergent
 2. Post-emergent
 - i. Spray to Wet
 - ii. Broadcast
 - iii. Spot spray
 - iv. Spray to run-off
 3. Injection
 - i. Stump treatment
 4. Drench
 5. Baits
 6. Traps
 7. Use of Adjuvants
- e. Tank Mixes
- f. Growth Regulators

III. Planning and Implementing a Vegetation /Pest Management Plan

- a. Appropriate Product formulations
- b. Secondary poisoning
- c. Application Timing
 1. Weather
 2. Life Stage
- d. Pesticide Resistance Issues
- e. Monitoring after Application
- f. Mowing
- g. IPM
- h. Bio/cultural controls
 1. Beneficial Insects

2. Bacillus Thuringiensis

IV. Laws and Rules

- a. Ground water protection reporting
 1. A.A.C. R3-8-505
 - i. Reporting Requirements
 - ii. Where to find the list (QA)
 2. QA Responsibilities

V. Equipment Types, Uses, Maintenance and Calibration

- a. Nozzles
- b. Pumps
- c. Hoses
- d. Hand Sprayers
- e. Backpack Sprayers
- f. Broadcast Sprayers
- g. Granular Spreaders

Resources – *Rights-of-Way Management (Washington State University Extension)*; *Weeds of California and other Western States Vol. 1 & 2 (University of California)*; *Truman's Scientific Guide to Pest Management Operations Seventh Edition*; [Handbook on Pests of Community Environments in the Desert Southwest United States](#); [UC IPM](#); [US Forest Service Region 3 Invasive Weeds](#); [Arizona Revised Statute Title 3 Chapter 20 – Pest Management Division](#); [Arizona Administrative Code Title 3 Chapter 8 – Pest Management Division](#); and [National Pesticide Applicator Certification Core Manual](#)