

Chart 1. Selectivity of Annual Broadleaf Weeds to Herbicides Registered in Alfalfa in California

	Preemergent Herbicides											Postemergent Herbicides								
	benefin (Balan [®])	diuron (Karmex [®] , Direx [®])	eptc (Eptam [®])	flumixazin (Chateau [®])	hexazinone (Velpar [®])	imazomox (Raptor [®])	imazethapyr (Pursuit [®])	norflurazon (Solicam [®])	pendimethalin (Prowl H ₂ O [®])	pronamide (Kerb [®])	trifluralin (Treflan TR-10 [®])	bromoxynil (Buctril [®])	clethodim (SelectMax [®])	glyphosate (Roundup [®] , etc.)	halosulfuron (Sanda [®])	imazomox (Raptor [®])	imazethapyr (Pursuit [®])	paraquat (Gramoxone Inteon [®])	sethoxydim (Poast [®])	2,4-DB amine (Butyrac [®])
C = Controlled																				
P = Partial control																				
N = No control																				
--- = No information																				
Annual broadleaves																				
Cheeseweed	N	P	N	C	P	C	C	P	P	P	N	P	N	P	--	C	C	P	N	P
Chickweed	C	C	C	C	C	C	C	P	C	C	C	N	N	C	C	C	C	C	N	N
Clovers	N	P	N	--	C	N	N	N	N	N	N	N	N	P	N	N	N	P	N	N
Cocklebur	N	C	N	N	C	P	P	C	N	N	N	P	N	C	C	P	P	C	N	C
Dodder	N	N	N	---	N	P	P	N	C	N	C	N	N	P	N	P	P	P	N	N
Fiddleneck	P	C	C	C	C	P	P	P	C	C	C	C	N	C	N	P	P	P	N	P
Filaree	N	C	P	C	C	C	P	P	P	N	N	N	N	P	N	C	P	P	N	C
Goosefoot	C	C	C	C	C	C	P	C	C	C	C	C	N	C	C	C	P	C	N	C
Groundcherry	N	C	C	C	C	C	C	C	N	C	N	C	N	C	N	C	C	N	C	
Groundsel, common	N	N	C	C	C	N	P	P	N	N	N	C	N	C	C	N	P	C	N	N
Hairy fleabane	N	P	C	P	C	--	N	P	N	N	N	C	N	P	N	--	N	P	N	C
Henbit	N	C	C	C	P	P	P	P	P	C	C	P	N	C	N	P	P	C	N	P
Horseweed	N	P	C	C	C	--	N	P	N	N	N	C	N	P	N	--	N	P	N	C
Knotweed, common	C	C	P	N	C	P	C	P	C	C	C	P	N	P	--	P	C	P	N	P
Lambsquarters	C	C	C	C	C	C	P	P	C	C	C	C	N	C	C	C	P	C	N	C
London rocket	N	C	C	P	C	P	C	P	P	C	N	C	N	C	C	P	C	C	N	C
Miners lettuce	P	C	P	--	C	C	C	P	--	P	C	C	N	C	--	C	C	C	N	N
Morningglory	N	C	C	C	C	P	P	C	P	--	P	C	N	P	P	P	P	P	N	P
Mustard	N	C	N	C	C	C	C	P	P	C	N	C	N	C	C	C	C	C	N	C
Nettle	N	C	C	C	C	P	P	C	P	C	N	P	N	N	C	P	P	P	N	P
Nightshade	N	C	P	C	C	C	C	C	N	C	N	P	N	C	N	C	C	C	N	C
Pigweed	C	C	C	C	C	C	C	P	C	C	C	P	N	C	C	C	C	C	N	P
Pineappleweed	N	C	C	P	P	--	--	P	N	N	N	P	N	C	--	--	--	C	N	P
Prickly lettuce	N	C	C	P	C	N	N	P	N	N	N	C	N	C	C	N	N	P	N	C
Puncturevine	P	P	N	C	C	P	C	C	P	N	P	C	N	C	N	P	C	C	N	P
Purslane	C	C	C	C	C	P	C	C	C	C	C	N	N	C	P	P	C	C	N	P
Redmaids	C	C	C	C	C	N	C	--	C	C	C	N	N	C	--	N	C	C	N	C
Russian thistle	P	P	P	C	C	P	P	C	P	P	P	C	N	C	--	P	P	C	N	P
Shepherd's-purse	N	C	P	C	C	C	C	P	P	C	N	C	N	C	P	C	C	C	N	C
Sowthistle	N	C	C	P	C	P	N	P	N	N	N	C	N	C	C	P	N	P	N	C
Spotted spurge	N	N	N	C	C	P	P	P	P	P	P	C	N	C	N	P	P	C	N	C
Swinecress	N	C	N	P	C	P	C	--	N	N	N	N	N	C	P	P	C	C	N	N
Wild radish	N	C	N	C	C	C	P	N	N	P	N	C	N	C	C	C	P	C	N	C

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 Kurt Hembree, UCCE, Fresno County (<http://cefresno.ucdavis.edu>). September 2014.

Chart 2. Selectivity of Annual Grass and Perennial Weeds to Herbicides Registered in Alfalfa in California

	Preemergent Herbicides											Postemergent Herbicides								
	benefin (Balan [®])	diuron (Karmex [®] , Direx [®])	epic (Eptam [®])	flumiazin (Chateau [®])	hexazinone (Velpar [®])	imazomox (Raptor [®])	imazethapyr (Pursuit [®])	norflurazon (Solicam [®])	pendimethalin (Prowl H ₂ O [®])	pronamide (Kerb [®])	trifluralin (Treflan TR-10 [®])	bromoxynil (Buctril [®])	clethodim (SelectMax [®])	glyphosate (Roundup [®] , etc.)	halosulfuron (Sanda [®])	imazomox (Raptor [®])	imazethapyr (Pursuit [®])	paraquat (Gramoxone Inteon [®])	sethoxydim (Poast [®])	2,4-DB amine (Butyrac [®])
C = Controlled																				
P = Partial control																				
N = No control																				
--- = No information																				
Annual grasses																				
Annual bluegrass	C	C	C	C	P	P	N	C	C	C	C	N	C	C	N	P	N	P	N	N
Barnyardgrass	C	C	C	C	C	P	P	C	C	C	C	N	C	C	N	P	P	P	C	N
Bromes	C	C	C	N	P	C	N	C	C	C	C	N	P	C	N	C	N	C	P	N
Canarygrass	C	C	C	N	C	P	P	C	C	C	C	N	C	C	N	P	P	P	C	N
Crabgrass, large	C	C	C	C	C	P	P	C	C	C	C	N	C	C	N	P	P	C	C	N
Fall panicum	C	N	C	C	C	--	P	C	C	C	C	N	P	C	N	--	P	P	P	N
Fescues	C	C	C	N	P	--	P	C	C	C	C	N	P	C	N	--	P	C	P	N
Foxtail, yellow	C	C	C	C	C	C	C	C	C	C	C	N	C	C	N	C	C	C	C	N
Goosegrass	P	C	C	C	--	--	N	C	C	C	C	N	C	C	N	--	N	P	C	N
Junglerice	C	C	C	P	C	P	P	C	C	C	C	N	C	C	N	P	P	P	C	N
Lovegrass	C	C	C	C	P	--	N	C	C	C	C	N	C	C	N	--	N	P	C	N
Rabbitfootgrass	C	C	C	---	C	--	N	C	C	C	C	N	C	C	N	--	N	C	C	N
Rescuegrass	C	--	C	---	P	--	N	C	C	C	C	N	C	C	N	--	N	C	C	N
Ripgut brome	C	C	C	N	P	P	N	C	C	C	C	N	P	C	N	P	N	C	P	N
Ryegrass, Italian	C	C	C	N	C	C	P	C	C	C	C	N	C	C	N	C	P	P	C	N
Sandbur	P	C	C	N	C	--	P	C	C	C	C	N	C	C	N	--	P	P	C	N
Sprangletop	P	N	C	N	P	--	N	C	C	C	C	N	C	C	N	--	N	N	C	N
Wild barley	C	C	C	N	P	C	P	C	P	C	C	N	C	C	N	C	P	P	C	N
Wild oats	P	P	C	N	P	C	P	C	P	C	C	N	C	C	N	C	P	P	C	N
Witchgrass	C	C	C	N	P	C	--	C	C	C	C	N	C	C	N	C	--	P	C	N
Perennials (seedling plants)																				
Bermudagrass	C	N	C	N	P	--	P	C	C	C	C	N	C	C	N	--	P	P	C	N
Dallisgrass	C	C	C	N	C	--	P	N	C	C	C	N	C	C	N	--	P	N	C	N
Johnsongrass	C	C	C	N	C	P	P	C	C	C	C	N	C	C	N	P	P	C	C	N
Field bindweed	P	C	N	N	C	--	--	P	P	N	P	P	N	C	N	--	--	P	N	N
Perennials (established plants)																				
Bermudagrass	N	N	C	N	N	--	N	P	N	N	C	N	P	C	N	--	N	N	C	N
Dallisgrass	N	N	N	N	P	--	N	N	N	N	N	N	N	C	N	--	N	N	P	N
Johnsongrass	N	N	N	N	N	N	P	C	N	N	N	N	C	C	N	N	P	N	C	N
Field bindweed	N	N	N	N	N	N	N	N	N	N	P	N	N	P	N	N	N	N	N	N
Nutsedge, purple	N	N	P	N	N	P	P	P	N	N	N	N	N	P	P	P	P	N	N	N
Nutsedge, yellow	N	N	P	N	N	P	P	P	N	N	N	N	N	P	C	P	P	N	N	N

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Kurt Hembre, UCCE, Fresno County (<http://cefresno.ucdavis.edu>). September 2014.

**Chart 3. Herbicide Use Rates, Timings, and Other Label Recommendations
In Alfalfa Before Planting and in New Stands**

Herbicide	Use rate/acre	Mode-of-Action	PHI	Application Information
Before planting or crop emergence				
glyphosate (Roundup Weathermax®)	22 - 44 fl oz (4.1 qt/season)	Group 9 (WSSA)	5 days	Weeds are <6" tall; AMS added at 8 lb/100 gal; applied by air or ground in 5 – 40 gpa.
paraquat (Gramoxone Inteon®)	1 – 2 pt (2 pt/season)	Group 22 (WSSA)	70 days	Weeds are <6" tall; NIS or COC adjuvant is used; applied by air or ground in 5 – 40 gpa.
Preplant incorporated				
benefin (Balan®)	2 – 2.5 lb	Group 3 (WSSA)	NA	Incorporated 2" deep in 4 hours with off-set disk 2X or PTO-driven mulcher; not on high organic soils; soils well-drained; 3 - 5 months residual; rotation restrictions.
eptc (Eptam®)	2.25 – 4.5 pt	Group 8 (WSSA)	14 days	Low rate sandy soils; incorporate 3 - 4" deep after treatment with off-set disk or PTO mulcher; can water run after planting; 1 - 2 months residual.
New seedling stand				
bromoxynil (Buctril® 2E, Buctril® 4E)	1 – 1.5 pt (2E) (1.5 pt/season) 0.5 – 0.75 pt (4E) (0.75 pt/season)	Group 6 (WSSA)	3 days	Alfalfa 2 - 4 trifoliolate leaves; 60 gpa, don't use an adjuvant; higher rate for chemigation; weeds <4 leaves; temperature below 80°F; can tank-mix.
clethodim (Select Max®)	9 – 32 fl oz (64 fl oz/season)	Group 1 (WSSA)	15 days	Grassess not tillered and annual bluegrass <4 leaves; COC or NIS used; alfalfa 1 trifoliolate leaf; 30 – 40 gpa repeated use needed on perennials with 14 day interval.
glyphosate (Roundup Weathermax®)	22 – 44 fl oz (4.1 qt/season)	Group 9 (WSSA)	5 days	Approved Roundup Ready® varieties; initial treatment timing best at 3 trifoliolate stage; weeds small and succulent; AMS added first at 8 lb/100 gal; applied by air or ground in 5 – 40 gpa.
imazamox (Raptor®)	4 – 6 fl oz (6 fl oz/season)	Group 2 (WSSA)	30 days	Weeds <3" tall; COC or NIS adjuvant plus an N-based fertilizer is added; alfalfa has at least 2 trifoliolate leaves; can tank-mix; crop rotation restrictions.
imazethapyr (Pursuit®)	3 – 6 fl oz (6 fl oz/season)	Group 2 (WSSA)	30 days	Weeds <3" tall; COC or NIS adjuvant added; alfalfa has at least 2 trifoliolate leaves; can tank-mix; crop rotation restrictions.
paraquat (Gramoxone Inteon®)	1 – 2 pt (2 pt/season)	Group 22 (WSSA)	70 days	Weeds are <6" tall; NIS or COC adjuvant used; applied by air or ground in 5 – 40 gpa; may reduce stand.
pendimethalin (Prowl H ₂ O®)	1.1 – 2.1 pt (4.2 qt/season)	Group 3 (WSSA)	28 days <2qt 50 days >2qt	Applied to stands which were planted in the fall or spring and <u>has not</u> gone through a cutting or mowing. Alfalfa 2 nd trifoliolate to <6" growth; crop rotation restrictions; dodder suppression. The 28-day PHI is limited to one treatment per season.
pronamide (Kerb®)	1 – 4 lb (4 lb/season)	Group 3 (WSSA)	25 – 45 days	Alfalfa 1 trifoliolate leaf; adjuvant if weeds emerged and <2" tall; air temp >55°F and sprinkler irrigation or rainfall occurs after treatment. Higher rates for dodder.
sethoxydim (Poast®)	2.5 pt (6.5 pt/season)	Group 1 (WSSA)	14 days	Grassess not tillered; COC used; alfalfa has at least 1 trifoliolate leaf; 30 – 40 gpa.
trifluralin (Treflan TR-10®)	20 lbs (40 lbs/season)	Group 3 (WSSA)	21 days	Applied in Jan – Feb (plus 60 days later for dodder control); incorporate if no rain within 10 days; crop rotation restrictions.
2,4-DB amine (Butyrac®)	1 -3 qt (3 qt/season)	Group 4 (WSSA)	30 days	Alfalfa 2 - 4 trifoliolate leaves; weeds <3" tall; air temp 40 - 90°F; no rainfall or irrigation within 4 days.

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Kurt Hembree, UCCE, Fresno County (<http://cefresno.ucdavis.edu>). September 2014

**Chart 4. Herbicide Use Rates, Timings, and Other Label Recommendations
in Established Alfalfa**

Herbicide	Use rate/acre	Mode-of-Action	PHI	Application Information
Established stand				
clethodim (Select Max [®])	12 – 32 fl oz (64 fl oz/season)	Group 1 (WSSA)	1 day	Grasses not tillered; annual bluegrass <4 leaves; COC or NIS used;. alfalfa 1 trifoliolate leaf; 30 – 40 gpa repeated use on perennials with 14 day interval.
diuron (Karmex XP [®])	1.5 – 3 lb (3 lb/season)	Group 7 (WSSA)	30 days	Alfalfa 1 year old; dormant before Feb 1; do not replant within 1 year; add paraquat if weeds emerged; irrigation or rainfall occurs within 2 weeks; permit if used in a GWPA.
eptc (Eptam [®])	2.25 – 3.5 pt (14 pt/season)	Group 8 (WSSA)	14 days	Water run in 1 application per cutting; gives 1 - 2 months residual.
flumioxazin (Chateau WDG [®])	4 oz (8 oz/season)	Group 14 (WSSA)	25 days	After final cutting before dormancy when alfalfa has <6” regrowth; at least ¼” rainfall after treatment; at in least 30 gpa; tank-mix with paraquat if weeds are emerged; may be used between cuttings, but without a surfactant, and may cause temporary reduction in crop regrowth..
glyphosate (Roundup Weathermax [®])	22 – 44 fl oz (4.1 qt/season)	Group 9 (WSSA)	5 days	Approved Roundup Ready [®] varieties; applied between cuttings; weeds <6” tall; AMS added first at 5 – 10 lb/100 gal; applied air or ground in 5 – 40 gpa.
halosulfuron (Sanda [®])	0.75 – 1 oz (2 oz/season)	Group 2 (WSSA)	14 days	Alfalfa at >6 months old; nutsedge is main weed with <4 leaves; applied in 20 – 40 gpa; use 0.75 oz rate when multiple treatments made to nutsedge; expect slight yield reduction following application so do not apply before 1 st or 2 nd cutting.
hexazinone (Velpar [®] L)	2 - 6 pt (6 pt/season)	Group 5 (WSSA)	30 days	Alfalfa 1 year old; dormant; rainfall of ½ - 1” needed within 14 days of treatment; do not apply during last year of stand; can tank-mix with contacts; crop rotation restrictions.
imazamox (Raptor [®])	4 – 6 fl oz (6 fl oz/season)	Group 2 (WSSA)	30 days	Alfalfa has <3” regrowth; weeds <3” tall; COC or NIS adjuvant plus an N-based fertilizer must be added; can tank-mix; crop rotation restrictions.
imazethapyr (Pursuit [®])	3 – 6 fl oz (6 fl oz/season)	Group 2 (WSSA)	30 days	Weeds <3” tall; COC or NIS adjuvant added; alfalfa has at least 2 trifoliolate leaves; can tank-mix; crop rotation restrictions.
metribuzin (Metribuzin [®] 4F)	0.75 – 2 pt (2 pt/season)	Group 5 (WSSA)	28 days	Alfalfa 1 year old; dormant; in counties north of Interstate 80; weeds <2” tall; can be tank-mixed with paraquat; crop replant restrictions.
norflurazon (Solicam [®])	1.25 lb (2.5 lb/season)	Group 12 (WSSA)	28 days	Alfalfa >5 months old; dormant; weeds not emerged; 1” rainfall or irrigation after treatment; permit if used in a GWPA. Cotton can be planted 16 months later and bioassay other crops.
paraquat (Gramoxone Inteon [®])	1 – 2 pt (2 pt/season)	Group 22 (WSSA)	60 days	1 application/year; weeds are <6” tall; NIS or COC adjuvant used; applied by air/ground 5 – 40 gpa; may reduce stand.
pendimethalin (Prowl H ₂ O [®])	1.1 – 4.2 qt (4.2 qt/season)	Group 3 (WSSA)	28 days <2.1 qt 50 days >2.1 qt	Applied to stands which were planted in the fall or spring and <u>has</u> gone through at least 1 cutting or mowing. Dormant alfalfa or with <6” regrowth between cuttings; crop rotation restrictions; dodder suppression.
sethoxydim (Poast [®])	2.5 pt (6.5 pt/season)	Group 1 (WSSA)	14 days	Grassess not tillered; COC used; alfalfa has at least 1 trifoliolate leaf; 30 – 40 gpa.
trifluralin (Treflan TR-10 [®])	20 lbs (40 lbs/season)	Group 3 (WSSA)	21 days	Applied in Jan – Feb (plus 60 days later for dodder control); incorporate if no rain within 10 days.

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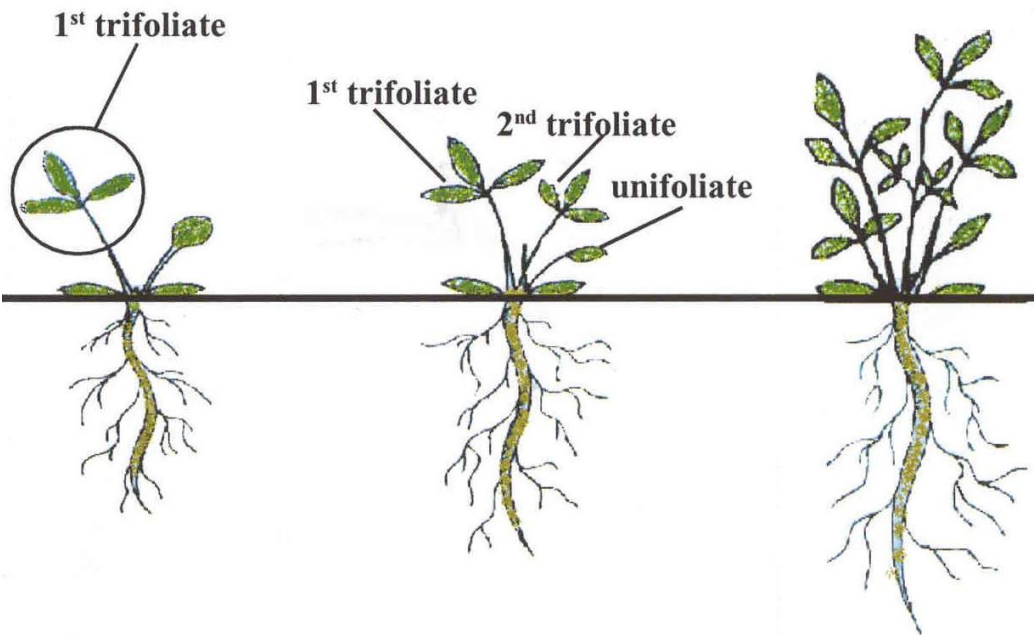
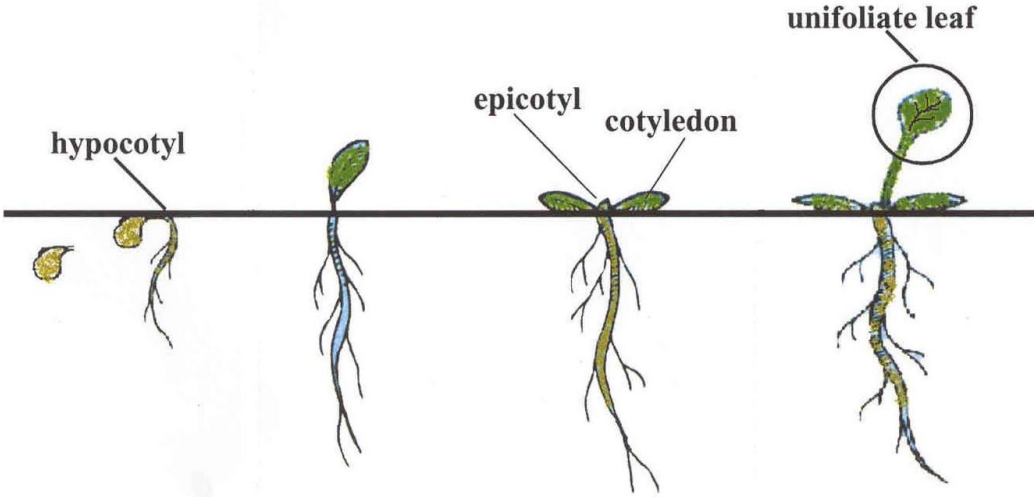
Table 1. Herbicide Timing for Fall Planted Alfalfa in the Central San Joaquin Valley

Treatment timing based on alfalfa growth stage	Before planting	Preplant incorporate	1 st Trif.	2 nd Trif.	3 rd Trif.	4 th Trif.	1 st Cut	4 th Cut	Dormant	Between cuttings
glyphosate (Roundup Ready [®])										
paraquat (Gramoxone Inteon [®])										
benefin (Balan [®])										
eptc (Eptam [®])										
clethodim (Select Max [®])										
sethoxydim (Poast [®])										
pronamide (Kerb [®])										
bromoxynil (Buctril [®])										
2,4-DB amine (Butyrac 200 [®])										
Buctril [®] + Butyrac 200 [®]										
imazamox (Raptor [®])										
imazethapyr (Pursuit [®])										
Raptor [®] + Pursuit [®]										
Raptor [®] + Buctril [®]										
Pursuit [®] + Buctril [®]										
Raptor [®] + Butyrac 200 [®]										
Pursuit [®] + Butyrac 200 [®]										
pendimethalin (Prowl H ₂ O [®])										
halosulfuron (Sanda [®])										
flumioxazin (Chateau [®])										
trifluralin (Treflan TR-10 [®])										
norflurazon (Solicam [®])										
diuron (Karmex [®] or Direx [®])										
trifluralin (Treflan [®])										
hexazinone (Velpar [®])										
Treatment timing based on alfalfa growth stage	Before planting	Preplant incorporate	1 st Trif.	2 nd Trif.	3 rd Trif.	4 th Trif.	1 st Cut	4 th Cut	Dormant	Between cuttings

 = registered treatment timing  = may delay harvest and/or reduce yield

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Alfalfa Seedling Development



1st Trifoliate Leaf Stage

2nd Trifoliate Leaf Stage

4th Trifoliate Leaf Stage