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Ecology and Management of Common Tansy (*Tanacetum vulgare* L.)

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Figure 1. A dense population of common tansy growing along a creek in Gallatin County, Montana.

Abstract

Common tansy is a robust perennial forb that grows up to five feet (1.5 m) tall from large woody rhizomes. It produces large, aromatic, fern-like leaves and clusters of small button-like yellow flowerheads. It is a member of the sunflower family (Asteraceae) with origins in Eurasia and is normally found along roadsides and railroads, fields and pastures, ditch banks, riparian areas, and other moist places. Volatile oils produced in the leaves and flowers deter grazing by cows and horses. Historically, the oils have been used medicinally and the literature is fairly rich in common tansy's pharmacological characteristics, but scant in its invasive ecology. Escaped cultivated plants brought to North America as early as the 1600's are most likely the original sources of common tansy infestations. Populations often grow in thick clumps that crowd out grasses, forbs, and shrubs resulting in reduced livestock forage and wildlife habitat (see Figure 1). It is listed as a Category 1 noxious weed in Montana and as a noxious weed in Wyoming.

Metsulfuron and clorsulfuron are the most effective herbicides for controlling common tansy when applied to actively growing plants before bloom at 0.5 oz./acre (Escort®, Cimarron®, or Telar®) or metsulfuron plus chlorsulfuron (0.5 oz. Cimmeron® X-tra). Tillage will control common tansy on cropland in rotation but follow-up tillage or herbicide applications (glyphosate: 2 qts./acre) may be needed to control plants regenerating from seeds or rhizomes. Tillage will also spread rhizomes. Persistent hand pulling and grubbing that removes the rhizomes will reduce small-scale populations. Mowing before bloom and repeated whenever plants initiate flowering will reduce seed production and over time may reduce populations where there are competitive grasses. One study suggests common tansy populations can be reduced using sheep or goat grazing, but animals should be removed four to six weeks before breeding to avoid reproductive problems. There are no biological control insects available for management of common tansy. Applying practices that encourage competitive desired plants such as forage harvest management, nutrient management, and prescribed grazing will improve control procedures and reduce the spread of common tansy.

PLANT BIOLOGY

Taxonomy

Common tansy is in the sunflower taxonomic family (Asteraceae). The genus name, *Tanacetum* was applied by Linnaeus in the eighteenth century and is believed to be derived from the Greek root *athanotos* which can be broken down to 'without death', implies immortality, and was likely a reference to the medicinal qualities and preservative uses of plants in this genus. The name *Tanacetum* can also be traced back to the Romans. Medieval Latin referred to common tansy as *tanazetum* or *athanacetum*, from which Old French changed it to *tanesie* (*tanaisie* in modern French) which sounds similar to tansy. The species name *vulgare* is from Latin and is often applied to weeds and usually used to mean 'ordinary' or 'common'. Thus the common name is very closely related to the scientific name. Synonyms include *Chrysanthemum vulgare* and *Tanacetum boreale*. Another common name is golden buttons.

There are about 50 annual or perennial, herbaceous or sub-shrub species in the *Tanacetum* genus mostly from the Old World. Current taxonomic classification lists seven *Tanacetum* species in the U.S. (USDA-NRCS Plants Database). Two species are native; *T. bipinnatum* (L.) Schultz-Bip. (Lake Huron tansy) and *T. camphoratum* Less. (camphor tansy). Lake Huron tansy grows in Michigan and Wisconsin where it is listed as threatened, in Maine where it is a species of special concern, and in Alaska, and Canada (also Siberia and Russia). Lake Huron tansy can be distinguished from common tansy by its low-growth habit (generally less than one foot or 10 to 20 cm) and larger flowerheads (up to 3/4-inch or 2 cm). Camphor tansy is found in California, Oregon, and Washington, and while it is not listed as threatened, the habitat in which it grows is considered threatened. The leaves of camphor tansy are pinnately dissected, but the ultimate sections and teeth are rounded, giving the leaf a less jagged appearance than common tansy. Also, camphor tansy only grows up to two feet (60 cm) tall. There are four non-native *Tanacetum* species reported in the U.S. other than common tansy. Two can be found in Montana and Wyoming; *T. balsamita* (L.) commonly called costmary, and *T. parthenium* (L.) Schultz-Bip. (feverfew). The leaves of costmary are not finely-pinnately dissected, and the flowerheads of feverfew have white petal-like ray flowers. Neither species are considered invasive. Sexual hybrids between *T. parthenium* and *T. vulgare* have been documented. Common tansy is closely related taxonomically to oxeye daisy (*Leucanthemum vulgare*).

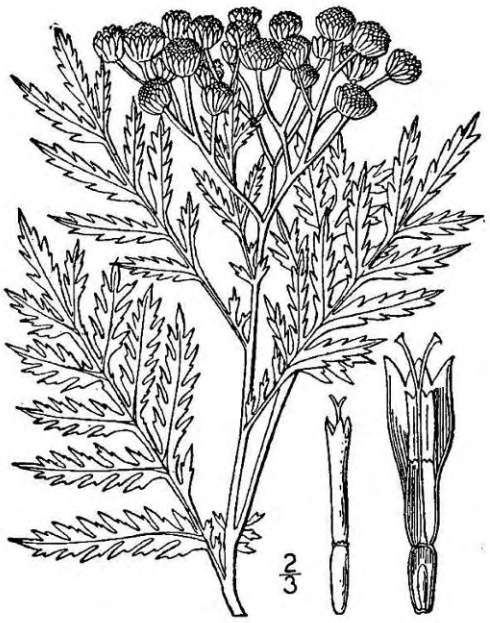

Figure 2. Common tansy leaf, flowering stem, and seed depiction (USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 522).

Identification

Common tansy is an erect herb that grows from two to five feet (0.6 to 1.5 m) tall. It has dark brown, stout, creeping rhizomes. Rhizomes of common tansy plants in Gallatin County measured 1/2 - 3/4 inch (5 to 19 mm) thick. Buds along the rhizomes can grow into shoots or roots. The roots are coarse, wiry, and have minimal development of fine roots or root hairs. The roots are shallow but extensive, and can occupy most of the upper two feet (60 cm) of the soil profile beneath a plant making common tansy competitive for soil moisture and nutrients.

Basal and stem leaves are large, up to one foot long (30 cm) and six inches wide (15 cm), deeply pinnately dissected, the sections (pinnae) pinnately dissected again with deeply lobed or toothed segments (pinnules) so the leaf appears fern-like (see Figures 2 and 3). The central leaf vein (rachis) is winged with leaf tissue (see Figure 3). The leaves are hairless (glabrous, or nearly glabrous), glandular, dotted with minute depressions (punctate). Stems have numerous leaves (up to 20) arranged alternately from short petioles or sessile. When crushed, the leaves have a strong and distinctive menthol- or camphor-like smell from volatile oils.

Figure 3. A common tansy leaf showing the toothed pinnules on the deeply lobed pinnae along the winged rachis.

The flowerheads are numerous (commonly 20 to 200) and arranged in a dense compound inflorescence that is somewhat flat-topped with the outer flowerheads developing before the inner flowerheads (corymb, see Figure 4). Individual flowerheads are made up of yellow disc flowers. There are no petal-like ray flowers. The flowerheads are about 1/4- to 3/8- inch (5 to 10 mm) wide and often described as button-like. The bracts below the flowerheads are green with dry, thin, membranous, and translucent (scarious) margins and tips. The bracts overlap each other like shingles on a roof (imbricate).

The individual flowers on the flowerhead are numerous (sometimes over 100) on a flat to low conic, naked (without bracts, bristles, or scales) receptacle. The flower has a short, five-lobed, yellow corolla tube with a short, crown-like pappus (often absent) at the base (see Figure 2, the pappus is absent in the illustration). The outer flowers on the flowerheads produce seeds and the inner flowers produce both pollen and seeds. The achene (seed) is very small (1.2 to 1.8 mm), five-ribbed with scattered sessile, transparent, non-mucilaginous glands on the outer surface (epicarp).

Figure 4. The "button-like" flowerheads of common tansy blooming in mid-August.

Life history

Common tansy is a short to long-lived perennial forb that reproduces vegetatively by rhizomes and sexually by seed. Aging by counting annual growth rings on rhizomes (herbchronology) from five populations in Gallatin County, showed the average age of rhizomes was 5.4 years (n=14, sd=2.5). Longevity varied depending on site. Dryer sites tended to support more long-lived plants, up to ten years old. Live and dead rhizomes from a moist stream bank site showed rhizomes survived about three to four years.

The seed biology of common tansy has not been studied, but the potential seed production is large. Stem densities in Montana averaged 100 stems/m^2 and each stem had one inflorescence at the apex. The inflorescence can have many flowerheads each with many flowers. In Gallatin County, Montana, a survey of five populations indicated the average number of flowerheads per inflorescence was 67 (n=12, sd=38.7). The mean number of flowers per flowerhead was 144 (n=10, sd=44), and the estimated number of flowers per stem was 9,966 (n=10, sd=4,642). However, a large number of the achenes appeared unfilled. The estimated number of filled achenes per plant was 2,553 (n=10, sd=1978) and estimated achenes per square meter of area infested was 198,625 (n=10, sd=209,280). No information was found on the viability, germination, seedling growth, or rhizome development. However, about 75% of seeds collected in October germinated after one month of cold stratification indicating high viability and the ability to germinate upon seed set. The small size of the achene suggests that seedlings are small and not competitive. Common tansy most likely needs moist, disturbed soil for seedling establishment.

Information on the timing of the vegetative and reproductive life history stages and their transitions is observational. Stem development from rhizome buds was observed in November, however, shoots usually emerge in spring after many perennial grass species have emerged. Leaf

expansion was observed in mid-May and by mid-June; plants can reach heights of three or more feet (1 m). Flower bud formation begins in June, the late-bud stage was observed in late-June, and plants bloom throughout most of August. Flowering, but not seed formation was observed in late October and early November along roadsides. Information on seed-set was not found. Flowers are reported to be pollinated by insects; however, common tansy has also been reported to deter pollinating insects in gardens. Stems and leaves die when soil moisture is depleted as early as August, but leaves will remain green through October and into November where moisture is available. Flowerheads remain intact and hold seeds through the fall unless mechanical action dislodges seeds from dried flowerheads. There are no obvious physical or morphological mechanisms of seed dispersal aside from the leverage action of tall, stiff, dried stems.

Competitive Interactions

A competition study conducted in Germany compared the biomass production and cover of bush grass (*Calamagrostis epigejos*), a tall rhizomatous grass, Canada goldenrod (*Solidago canadensis*), a tall rhizomatous forb, and common tansy. They were grown for five years in monocultures and mixtures on three soils representing a productivity gradient; top soil, "ruderal soil" (a mixture of top soil and subsoil), and sand. When growing in mixtures, average plant cover of common tansy was greater than either of the other species in all soil types in all years with a few exceptions. The exceptions were; the high productivity topsoil in the fifth year when slugs selectively defoliated the common tansy, and when growing in combination with Canada goldenrod in the mid-productivity ruderal soil in each of the five years. However, replacement diagrams suggest that common tansy and bush grass were equally competitive in sand and ruderal soil but bush grass was more competitive in the topsoil where common tansy was selectively defoliated by slugs. Similarly, slugs reduced common tansy's ability to compete with goldenrod in the high productivity topsoil. However, on the ruderal soil, Canada goldenrod was more competitive than common tansy and the reverse was the case on the low productivity sand. There was evidence of niche separation between common tansy and the other species only on the ruderal soil, and when common tansy grew with Canada goldenrod on topsoil.

The results suggest common tansy was a strong competitor on low productivity soils where it was better at acquiring nutrients than the other species. This could explain why common tansy populations grow in near-monocultures on sandy soils of riparian areas. On the high productivity experimental soil, common tansy was more productive than the other species, but was also susceptible to predation, presumably because of high nitrogen content in the leaves. This suggests selectively defoliating common tansy growing on productive soils will shift competition to favor rhizomatous grasses and forbs. On less productive soils, management targeting shoots and rhizomes may be needed to shift competition.

Habitat

Native habitats of common tansy are sub-alpine mountain river valleys in Siberia. Most occurrences in Europe are associated with humans. This is also true of populations in North America. In Montana, common tansy was first reported in 1931 from a sawmill site on the Gallatin National Forest in Madison County. It has since been reported from gardens, along streams, rivers and lake shores, along roads and railroads, in swamps and marshes, irrigated pastures, moist valley bottoms, rangeland, dry hillsides, and vacant lots. It prefers open sites with moist soils for at least part of the growing season. All the common tansy populations surveyed in Gallatin County were growing with smooth brome (*Bromus inermis*).

Spread

Common tansy traveled from Europe to North America with the early settlers. It was recommended as a necessary plant for colonial herb gardens where it was reportedly cultivated in New England in 1638 and 1663. Escaping cultivation, it was considered naturalized throughout the northeast by 1785. It was reported from Iowa and Kansas by 1912, and was well documented in California by 1951.

How common tansy escapes cultivation is not completely clear. Individual common tansy plants spread short distances by creeping rhizomes to form dense clumps. Seeds disperse by the mechanical action of dried stems flicking seeds from dried flowerheads. The small, light-weight seeds may also be carried long distances on water currents. It is doubtful seeds are blown long distances unless on the snow surface over winter. Seeds can be moved in the fur of animals, soil on animal hooves and paws, and on the clothes and footwear of people. Seeds can also be moved when inflorescences become attached to vehicles or equipment, and in mud on tires. It is possible that seeds are consumed by birds and spread *via* droppings. Rhizomes can be spread by tillage equipment, construction equipment, and in soil. Flowerheads baled in hay will disperse seeds when the hay is moved and fed to livestock.

Impacts

Common tansy infestations reduce livestock forage. The volatile oils in the leaves of common tansy deter grazing by cattle and horses during most of the growing season and plants are generally avoided. Elk have been observed to browse common tansy, but it is generally considered to reduce wildlife habitat. Dense clumps crowd out native plants and large infestations may reduce bio-diversity particularly in riparian areas. Common tansy infestations may reduce the habitat of pollinating insects.

The essential oils from the leaves and flowers of common tansy have been the subject of a great deal of modern research. Extracts from European populations have identified 57 compounds divided into four groups; 1,8-cineole, *trans*-thujone, camphor, and myrtenol. There is variability in the amounts and ratios of the groups of oils produced depending on population, habitat, and time of year.

The list of biological activities of 1,8-cineole (a monoterpene cyclic ether) is long and includes allelopathy, anesthetic, antibacterial, carcinogenic, fungicide, herbicide, insectifuge, nematicide, sedative, and testosterone hydroxylase inducer, to name a few. It is a toxin produced by leaves to defend against herbivory. Possums on a diet of cineole ceased feeding when bio-available blood levels saturated pre-systemic metabolism. This suggests ungulates have a certain tolerance for this chemical regulated by metabolism. Humans and rats metabolize cineole in the liver and excrete metabolites in the urine.

Thujone is a monoterpene with a menthol-like aroma. In the nineteenth century, it was mixed in liquor (absinthe) and consumed by notable artists (and others), including Vincent Van Gogh, to increase brain activity, develop new ideas, expand imagination, cause hallucinations, and as an aphrodisiac. These effects have been proven mythic. It is a GABA receptor antagonist that allows neurons to fire more easily and cause spasms. Mice exposed to doses of 60 mg/kg experienced convulsions and death in one minute (Van Gogh reportedly experienced fits of convulsions).

Camphor is a terpene used in the manufacture of plastics, in lacquers and varnishes, in explosives and pyrotechnics, as a moth repellent, and as a preservative in pharmaceuticals and cosmetics. It relieves itching, pain, and creates the feeling of coolness when applied to the skin where it is readily absorbed. It is used as an antibacterial injection for infected root canals in dentistry. It is metabolized in the liver and eliminated in the urine. It is one of the active ingredients in Vicks VapoRub®. It is also used as a flavor enhancer in cooking, particularly in India.

Myrtenol is an oxygenated monoterpene. Although it is not classified as an insect pheromone, it does attract pine bark beetles and has been used to enhance bait in insect traps. It has also been used as a beverage preservative, a flavoring, and as a fragrance.

MANAGEMENT

Herbicidal Control [1/]

Common tansy can be managed using metsulfuron, chlorsulfuron, or metsulfuron plus chlorsulfuron. The herbicide labels indicate a rate of 1 to 2 oz./acre or 1 to 3 oz./acre using metsulfuron (Escort®) or chlorsulfuron (Telar®), respectively. However, herbicide trials showed metsulfuron applied at a broadcast rate of 0.5 oz. product (Escort® or Cimarron®) per acre at the late bud stage of development (late June) provided nearly 100% control of a population growing on moist soil one year after treatment. Similar results were found using 0.25 oz. metsulfuron plus 0.25 oz. chlorsulfuron (similar to 0.5 oz./acre Cimarron® X-tra). A non-ionic surfactant at 0.5% volume/volume or methylated seed oil (MSO) at 2% volume/volume in the spray solution is needed for these herbicides to be effective. Visible effects of the herbicides were not apparent until 45 days after treatment. These chemicals will also affect many shrub species. They can be applied to plants growing up to the edge of water, but cannot be applied directly to water or areas where surface water is present. Read herbicide labels for complete details of use restrictions.

Where high water tables are not present, picloram (1 qt./acre Tordon® or Picloram 22K®) plus dicamba (1-2 qt./acre Clarity®) applied to actively growing plants in the bud to bloom stage can be used to control common tansy. However, reports indicate this treatment is less effective than the metsulfuron treatment and may be cost prohibitive. Picloram (2 qts. /acre) combined with dicamba (1 pt. /acre) applied to plants at bud stage provided 98% control of common tansy 24 months after treatment. Where common tansy is growing in water, imazapyr applied at 1 qt./acre (Habitat®) will provide some control. Label restrictions should be carefully followed when applying herbicides to water. On cropland, glyphosate applied at 2 qts. product/acre to actively growing plants in combination with tillage may help control common tansy.

Table 1. Chemical and product name, recommended application rate, soil residual half life, and eco-toxicity of herbicides commonly used to control common tansy. The eco-toxicity is the lethal concentration of the herbicide when applied in a single dose kills 50 percent of the tested organism (the lower the number the more toxic the herbicide). Follow label guidelines for rangeland use and all other label requirements when applying herbicides to avoid damage to desirable plant species.

Chemical name	Product name	Rate per Acre	Half life (days)	Eco-toxicity (LC_{50}/EC_{50})
Dicamba	Clarity/Banvel	1 pt.	10	>100 mg/L
Chlorsulfuron	Telar	0.5 oz.	45	>150 mg/L
Glyphosate	many names	2 qts.	32	8.2 mg/L
Metsulfuron	Escort/Cimarron	0.5 oz.	14-180	>150 mg/L
Picloram	Tordon/Picloram 22K	1-2 qts.	90	10-100 mg/L

[1/] Any mention of products in this publication does not constitute a recommendation by the NRCS. It is a violation of Federal law to use herbicides in a manner inconsistent with their labeling.

Hand Pulling

Hand pulling, digging, grubbing, and hoeing may be practical on small populations of common tansy and if applied persistently can reduce populations. Pulling and grubbing should remove the rhizome to be effective. Follow-up treatments will be necessary where a persistent rhizomes and seed banks exists. Seeding soil disturbances with competitive plants may help reduce re-establishment of common tansy.

Mowing

Mowing, if applied before bloom, will reduce flowering and seed production. It is recommended to mow to a four-inch or greater stubble height to maintain the vigor of native and desirable plant species which may replace common tansy over time with repeated mowing. Mowing after flowering when seeds have set may increase the spread of common tansy seeds. Mowing can be used to reduce litter cover before herbicide application and thereby increase herbicide contact with foliage when applied to re-growth.

Tilling

Common tansy is not normally a problem in cultivated crop fields because it is controlled by tillage procedures that clean crop fields of weeds. However, because the rhizome has regenerative buds, it is possible to spread common tansy within a crop field and between fields. Seeds are also believed to be spread with the movement of soil. Repeated tillage or an application of glyphosate to common tansy plants that regenerate from rhizomes or seeds following tillage will reduce common tansy spread on tilled fields. Cleaning tillage equipment of soil that may contain seeds or rhizomes is recommended after use on fields where common tansy has been growing and before use on weed-free fields.

Prescribed Burning

There is no indication that prescribed burning by itself will control common tansy, predominantly because it can regenerate from rhizomes not affected by heat. However, dense

patches of common tansy with dried litter buildup can burn hot and fast and pose a potential wildfire danger. Therefore, prescribed burning can be used to control undesirable dead vegetation buildup and reduce wildfire hazards. Prescribed burning can also be used to prepare sites for herbicide application by removing dead plant litter blocking herbicide coverage on actively growing vegetation. Prescribed burning should be integrated with other practices such as herbicide management, grazing management, and planting riparian herbaceous cover.

Grazing Control

Common tansy is reported to be toxic to livestock and abortions in cattle were reported from the mid-west United States. However, in Montana most classes of livestock and some wildlife have been observed to eat common tansy with no known adverse effects. The potentially toxic volatile oils produced by the leaves and inflorescences of common tansy can be metabolized by mammals and the metabolites excreted in the urine. Research indicates that herbivores have a toxin blood-level feedback mechanism for some of the oils produced by common tansy that, when threshold levels are reached, deters further grazing. This natural feedback mechanism may be sufficient to prevent poisoning as long as alternative forages are available to the herbivores.

Sheep have been used to manage common tansy in Montana. Clipping data from grazing enclosures paired with grazed plots suggest sheep consumed up to 90% of the aboveground bio-mass of common tansy while consuming a slightly greater or lesser quantity of perennial grass bio-mass depending on the availability of each forage class (where more common tansy than grass was available, more common tansy relative to grass was consumed). Long-term impacts of repeated sheep grazing on common tansy population size and plant community dynamics are not known, but observations suggest common tansy populations may be decreased and grass populations increased with consecutive years of season-long sheep grazing (see Figure 5). While no toxic effects of eating common tansy were reported from the flock used in the study, it is recommended to remove sheep from common tansy infestations four weeks prior to breeding to avoid reproductive problems. Similar grazing recommendations most likely apply to goats.

a. **b.**

Figure 5. Photos of a common tansy population in western Montana grazed by sheep for two years; a. the plant community in 25 June 2004 before sheep grazing started and b. the plant community in 15 May 2007 after three seasons of grazing. The difference in season between photos does not provide an accurate comparison considering grasses may initiate growth in the spring before common tansy. However, it appears that grasses are increasing where sheep have grazed.

Cultural Control

Plant competition reduces the invasiveness of common tansy and increases the effectiveness of control applications. Therefore, practices that increase the competitiveness of desirable plant species such as conservation crop rotation, nutrient management, irrigation water management, forage harvest management, critical area planting, and prescribed grazing will make the environment less hospitable for common tansy to survive and spread.

Biological Control

Currently, no biological control agents are available for management of common tansy. There are numerous insects and diseases that attack common tansy in its native range and several biological control insects have been identified: *Isophrictis striatella* is a moth that mines the flowerhead, stem, and rhizome; *Microplonus millefolii* is a stem-mining weevil; moths in the *Dichrorampha* genus feed on rhizomes; *Cassida stigmatica* beetles feed on leaves; and the gall midge *Rhopalomyia tanaceticola* attacks the rosette, stem, and flowerhead. A joint United States and Canadian consortium is currently funding a program of insect biological control of common tansy.

Re-vegetation

Species selected for re-vegetating disturbed sites and common tansy infestations should be appropriate for management objectives, adapted to site conditions, and competitive with the weed. Management objectives will determine if introduced or native species are seeded and the combination of species in the seed mix. The environmental conditions of the site including precipitation, soil texture and depth, slope and aspect, will affect species establishment. Refer to Montana Plant Materials Technical Note 46, 'Seeding Rates and Recommended Cultivars,' and Extension Bulletin EB19 'Dryland Pasture Species for Montana and Wyoming' for seeding rate guidance and re-vegetation species selection. State, Area, and Field Resource Specialists can help determine the most appropriate, site-specific species mix and timing of seeding.

In most cases, herbicidal suppression of common tansy is needed for re-vegetation of infested areas. The herbicides listed in Table 1 will control common tansy and reduce competition during the establishment period with little or no injury to emerging grass seedlings. This is especially important for species that are slow to establish like many of the native grasses. However, where herbicides have been applied, chemical carryover should be assessed prior to planting permanent vegetation particularly where shrubs and forbs are being used. Common tansy is often found in all the hydrologic zones of stream banks and riparian areas. Conservation practices that address riparian restoration, such as Channel Bank Vegetation (Code 322), may be needed after common tansy control to maintain hydrologic cycles and prevent soil and water resource concerns such as erosion and sedimentation.

Integrated Pest Management

Integrated pest management is the application of two or more management alternatives that are complimentary in weed suppression, reduce the environmental risks of pesticides, increase the longevity of control procedures, and improve crop production, or conservation of resources. The integration of multiple management practices should be designed based on the stage of common tansy invasion. On small populations in the early phase of invasion, aggressive herbicidal

control should be combined with cultural practices that strengthen the competitiveness of the plant community, such as prescribed grazing and forage harvest management. In areas with large scale infestations in the later phases of invasion, first priority should be given to herbicide application to eradicate small satellite populations and to reduce spread along the invasion front of the parent population. Second priority should be given to reducing the parent population using herbicide management, grazing with sheep or goats, and re-vegetation with competitive plants where needed. On dense populations of common tansy, prescribed burning, mowing, or intensive grazing will reduce plant litter and may improve herbicidal control by increasing chemical contact on actively growing leaves. On grazing lands, prescribed grazing management should be timed to maintain the vigor of rangeland plants and prevent common tansy seed spread. On crop and hay land in rotation, tillage combined with herbicide treatment will be more effective than either treatment applied alone. On disturbed sites, pastures, and rangeland where competitive plants have been lost, re-vegetation following common tansy control will improve the longevity of the control application. Monitoring before and after management will allow evaluation of management effectiveness and locate regenerating populations.

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