A REVIEW OF EXOTIC PLANTS IN WILDERNESS

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Extent of the Problem of Exotic Plants in Wilderness

An extensive search of the existing data base for exotic plants, introduced plants, imported plants, forest, plant ecology, weeds, wilderness and the United States produced very little information on problem plants in wilderness areas. The importance of exotic species in wilderness is emphasized by Marion et al. (1985). These authors express major concerns about how the exotic plants are introduced, dispersed, how widespread they are and how managers may be able to control exotics.

Exotic plants are those foreign to an area, that have been introduced and are able to flourish in the new environment. In many cases (but not always) exotic or introduced plants are able to survive in the new location because they have weedy characteristics. A weed, by definition, is an "unwanted plant" or "any plant that is a hazard, nuisance, or causes injury to man, animals or the desired crop (Gaines and Swan 1972). , It follows then, that an exotic plant in the wilderness will be an introduced "weed" according to the above definition. Introduced or exotic can mean from another country or another region of the same country where it did not: formerly grow.

The scarcity of literature on exotic plants in wilderness is not an indication of the importance of the problem, however. The American wilderness spans nearly every type of major ecosystem in the United States, from swamp lands with Hydrilla sp. to barren mountain peaks with introduced grasses. Exotic plants have made inroads into most, if not all, of our wilderness areas (Marion et al. 1985). Campground areas and trails are frequent places where invasion by plants begins.

Because many of the plants that are accidentally introduced into wilderness areas are weedy by nature and spread rapidly, they are irritating to man because their vigorous competitive abilities enable then to occupy areas formerly inhabited by more desirable native species. Often, exotic plants are attractive and able to occupy niches not presently filled by native plants, but occasionally they are obnoxious, toxic or unsightly.

One reason that exotics appear infrequently in the wilderness literature is the lack of funding to study plants that are weedy and not endangered. Another is the scarcity of complete ecological life history information on most exotics. Rarely do we know how a species responds to fire or if its, seeds require after-ripening or bare mineral soil. What is known about life histories of exotic species is usually gleaned from scattered theses and dissertations. Some introduced species are obscure enough to go unnoticed (particularly grasses), while others may have been around for so long that they are not recognized as introduced. Table 1 at the end lists some exotics, many of which are so common that they are accepted as native. Some exotics, like Pacific meadow foxtail, have been given common names in this country that suggest that they are native.

Some exotics have proven useful in their new habitat. Slender hairgrass (Deschampsia elqngata) for example, grows on dry soils where native species have difficulty surviving and quack grass (Agropyron repens) for all of its bad habits, can bind soil efficiently with its strong rhizomes. Other plans are damaging to animals, either because of burs, poisons or their ability to outcompete more valuable native plants.

Because some exotics are damaging and others are beneficial, wilderness managers are faced with the dilemma of excluding all exotics or developing an ecologically sound selective strategy that will "naturalize" desirable "exotics." The problem with the naturalization process is that we rarely know enough about the life history and autecology of exotic species in their new habitat to make intelligent decisions. It is easy to decide to allow a particular grass to spread because control is difficult, if not impossible, and the plant has some value, only to find that in five years, it has adapted so well that it has become uncontrollable.

Another consideration is that exotic plants may be defined as "plant species ...that are not indigenous to the area and have been either intentionally or unintentionally introduced" (Marion et al. 1985). This definition implies that an exotic plant may exist within the conterminous United States,

but spread after introduction into a portion of the country where it is not indigenous. A fine point of. interpretation comes into play here. If a plant could have eventually migrated to the new site on its own (through normal dispersal mechanisms not involving man) and become established, then its introduction into the new area has only speeded up the invasion process and it possibly should not be considered an exotic. By contrast, a plant brought from Europe that could not reasonably have arrived here through wind, animal or water transport, should properly be considered an exotic.

The introduction of a foreign plant into American wilderness often creates a disharmonious situation where the natural enemies of the exotic plant are weak or absent, allowing the introduced plant to overcome less aggressive native plants.

Exotics with Weedy Potential That Can or Do Exist in Wilderness

Table 1 lists grasses and other plants that are considered to be "weedy" in nature. This list is only a sample and may represent about two-thirds of the more important weeds in North America. It has predominantly plants recognized as weeds in the western United States. It was compiled from various sources (Crockett 1977, Goines and Swan 1972, Hitchcock and Cronquist 1973, McDonald and Tappeiner 1986 and others). For this reason, common names and in some cases species names may not be in agreement with local usage in different parts of the country. The list is included for several reasons:

1. To show that there are large numbers of exotic plants in the United States that have the potential to invade wilderness.
2. To show that not all exotic plants are detrimental to natural ecosystems where they have been introduced. Both harmful and beneficial plants make up the exotic flora of this country.
3. To provide insight into the complexity of the question of across-the-board control of exotics in wilderness versus selective or no control.
4. To show that the question of exotic species in wilderness is not a minor problem. Although many exotic species have the potential of invading wilderness areas, not all of those listed in Table 1 have become established in wilderness. Some plants that are not yet prominent in. wilderness may appear in the near future as wilderness invaders, even though most of the recognized weedy plants in Table 1 are most common in agricultural lands or where there has been disturbance.
5. To show that potential weeds differ widely in their susceptibility to control and ability to spread through diverse ecosystems. Some plants are far more aggressive than others. These differences in aggressiveness must be taken into account when planning activities in wilderness management that call for creating bare mineral soil; or any type of vegetation disturbance.
6. To emphasize the fact that some exotic plants have been in this country so long that some are considered "native" or "naturalized citizens" by virtue of familiarity. One could hardly imagine a hay field without timothy or a garden not plagued by orchard grass. Yarrow, dandelions and wooly mullein are as American as apple pie. Furthermore, any attempt to control these widespread species would be likely to severely disrupt natural ecosystems, and the U.S. Treasury for a long time to come.

Autecology and Control of Exotics

In places where exotic plants have become well established, or where they form continuous stands, control measures would leave the sites vulnerable to erosion from wind and water, causing further disruption.

The Wilderness Act directs managers to maintain the "primeval character and influence" of these environments and to "preserve (their).natural conditions" (Marion et al. 1985). This means that the wilderness visitor should be able to view native vegetation along the trail, not the introduced weeds that are also common in their gardens or yards. It also means that managers, in theory, must prevent exotics from dominating native vegetation In practice, control of exotics is an awesome task.

Changes in species composition of wilderness areas because of massive plant invasion can result in altered soil microbiology, mineralization rates, productivity and ecosystem stability (Marion et al. 1985). Heavy grazing of native species often facilitates the invasion of exotic species. Some wilderness areas have exotic plants that invaded around campsites and homesites before the area was designated as wilderness. Vegetation changes brought about by the invasion of exotics may persist for many years. Exotic grasses are particularly bad since they often form sod that prevents the reinvasion of native forests. Some exotic species are disturbance adapted and some are not. Those that are not disturbance dependent can cause the greatest harm since they can move freely into native vegetation without any man-made or natural disturbance. These species are particularly aggressive and often outcompete the native vegetation. When exotics such a spotted knapweed, produce allelopathic chemicals that inhibit the growth or reproduction of other species, they can dominate an undisturbed site in only a few years' time. Another example of a non-disturbance dependent allelopathic plant exotic is goutweed (Aegopodium sp.), of the northern lakes region. Exotics are most common at elevations below 7000 feet (Marion et al. 1985). Plants enter wilderness in a variety of ways:

a. In feed, hay
b. Planted prior to wilderness use
c. In feces of pack animals
d. On the feet of man, animals
e. By natural dispersion, mechanisms
f. By water, wind, gravity, forceful expulsion of seeds
g. With human gear, food, on or in packs
h. Animals, bur in fur or on human clothing

The Great Smoky Mountains National Park has 20% of its flora or 288 species represented by exotics (White 1982). Some areas of the backcountry that have been highly disturbed have as much as 30% of the flora represented by exotics. The Boundary Waters Canoe Area is reported to have 11% of its flora consisting of introduced plants (Ahlgren and Ahlgren 1984). Other areas such as the Bob Marshall of western Montana have reports of 27 exotic species (Cole 1983) with most exotic species occurring at the lower elevations.

Different ecosystems show different susceptibility to invasion by exotic plants. Islands, temperate and high elevation grasslands are highly susceptible to plant invasion. Many native meadows are now dominated by exotic species (grasses and forbs). Gravel banks and river banks are easily invaded by introduced plants. In the Southwest, Tamarix sp. has moved successfully into riparian habitats in the Grand Canyon National Park and Big Bend National Park. Cold or severely dry environments normally are less open to plant invasion. Undisturbed temperate desiduous forest and tropical rain forest are not easily invaded by exotic plants because of vigorous competition (Marion et al. 1985).

The type of use also influences the chance that a particular area will have exotic species. Campsites used mainly by backpackers have fewer exotic species than campsites used mainly by horse caravans (Cole 1983).

Not all introduced plants that are classed as weeds have the ability to adapt to the varied conditions found in wilderness areas. Table 2 lists plants that are known to occur in wilderness areas and to constitute a problem. The list is in no way complete.

Few studies have examined the successional roles of introduced species in wilderness, but some address closely related concepts (Amen 1966, Bello 1980, Billings and Mooney 1968, Bliss

1958, 1971, Brown et al. 1978, Griggs 1956, Peet and Christensen 1980). Schreiner (1982) examined the autecology of two grasses: Poa pratensis, an exotic, and the native Poa incurva to better understand how these two grasses would interact in succession in the Olympic National Forest. Severely disturbed sites were invaded by native and exotic species while the moderate and least disturbed sites became dominated by P. pratensis and Festuca idahoensis respectively. Each species had autecological characteristics that favored invasion of these particular sites. Native pioneer species may share disturbed sites if the exotic pioneer species have similar autecological characteristics. More studies of this type are needed for major aggressive exotics to develop an understanding of the consequences of management of exotic species.

Brief mention is made of the management of exotic species in "Issues in Wilderness Management" (Frome 1985), but hard decisions must be made that will work for all wilderness.

Control Measures and Rehabilitation

In order to control exotic species, it is essential to inventory the area, noting which exotic species are present, how extensive each population is, how rapidly each is-expanding and what each life history and reproductive strategy is. Marion et al. (1985) proposed the following classification for management purposes:

1. Common disturbance - associated species - exotics with ruderal characteristics that are common on and restricted to campsites, trails and grazed meadows.
2. Uncommon relict species - exotics that were intentionally planted around home sites and resorts prior to wilderness designation and were not removed during site restoration work, or rare species only established in a few places.
3. Competitive "pest" species - exotics that are able to displace native undisturbed vegetation.

Once the wilderness vegetation has been inventoried (sampled), life histories are known, and the plants classified, then management strategies can be developed to minimize the introduction of more propagules or other exotic species in the future (West 1968). Management strategies can include minimizing disturbances, using only pure native seeds for rehabilitation, requiring the use of pelletized animal feed, reduction of use and compaction in sensitive areas, visitor concentration (Cole 1981), reduce grazing, burning, mowing, herbicides, bulldozing, hand removal, cutting and biological control. Marion et al. (1985) discuss the advantages and limitations of various management and control measures. Timing of treatments and understanding the reproductive strategies of 'the plants is essential to effective control, but physically keeping the plant out of. an area is a good place to start. Also, the intensity of treatment (fire temperature, herbicide formulation, drift and concentration) are all important to successful control. Species with strong ability to invade may need to be removed and replaced with equally aggressive native vegetation. Species that sprout readily may require the repeated use of herbicides with reseeding of native plants. Regardless of the methods used, the control of exotic plants is bound to be expensive. Repeat treatments and monitoring for success and failure are essential.

Endangered species (Hamilton and Lassoie 1985) should also be located and identified. It would be futile to treat an area to remove an exotic plant, only to find that an endangered species or other native plants have also been lost.

Rehabilitation

Rehabilitation of sites should use mainly native species. Naturalized species cannot be used because we recognize the risk of adding a new plant into a disturbed ecosystem. The US Forest Service Handbook (24.1-24.2) recommends the use of only indigenous species in rehabilitation and instructs wilderness managers to strive to decrease the risk of exotic plants entering wilderness.

Rehabilitation measures must minimize compaction, soil erosion, and siltation of streams. Endemic plants are to be protected from damage. No one has addressed the situation where endemics and exotics may coexist on the same area, but this could present a difficult problem since the handbook directs the manager to protect the former and control and replace the latter.

Whatever rehabilitation measures are used, they must be carefully planned and not of themselves damaging to any part of the natural ecosystem or its processes. This philosophy limits the use of herbicides, but would not exclude the enlightened use of fire.

Agency Policy on Exotics

The US Forest Service presently identifies "naturalized species" as "any non-indigenous species of flora or fauna that is close genetically or resembles an indigenous species and that has become established in the ecosystem as if it were an indigenous species. Exotic species are defined as, "Any species that is not indigenous, native, or naturalized."

The Bureau of Land management defines "naturalness" in much the same manner as the US Forest Service, but adds the statement that epidemic populations that are not in balance with the wilderness ecosystem are not considered as naturalized.

All federal agencies use as their guidelines The Wilderness Act of 1964 which states (Sec. 4(b): "Except as otherwise provided in this Act, each agency administering an area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purpose for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the purposes of recreational, scenic, scientific, educational, conservation and historical use." The goal of the Act has been interpreted to provide protection to wilderness and preservation of the "wilderness character" (US Dept. of Interior 1981).

The National Park Service treats the introduction of exotic plants according to specified use zones within the park: natural, historic, development and special use. The philosophy is that introduced plants cannot be used in natural zones, but may be used in other zones if they are close relatives of rare or extirpated native species, or if they are essential to maintaining the historic character of an area. Criteria for selection of exotic species for purposeful introduction into the parks are rigid and require that no appropriate native species are available, the plant does not have the potential of becoming a pest, and that the introduction will not disrupt desirable native plant and animal communities. Other criteria are that the exotic plants cannot be detrimental to human health, disrupt the historic scene, threaten other natural species, or hamper management of park or adjacent lands. Control is addressed briefly and is not presented as an on-going program.

Conclusions

It seems reasonable that policy statements on exotic species should be consistent with the spirit of The Wilderness Act. From the previous discussion, we can conclude that:

1. There are many weedy species with the potential to invade wilderness.
2. There are many exotic plants that have invaded wilderness and are now recognized as "naturalized."
3. There are some exotic. plants that have reached unacceptable population levels in wilderness (some grasses, Tamarix kudzu, spotted knapweed, Hydrilla.
4. It is unrealistic economically to attempt to remove all exotic plants from wilderness.
5. Some exotic plants have positive benefits to wildlife and man, and provide scenic beauty in the wilderness.
6. The literature indicates wide concern over the spread of certain aggressive exotics.

On the basis of these conclusions, the following suggestions are made concerning policy toward exotic plants in wilderness:

1. Naturalized plants that were exotic but are now adapted to wilderness, whose populations are in balance and do not produce toxic by-products that endanger man, animals or other native species should be allowed to exist. Their spread should be monitored and their autecology studied. These are naturalized species with or without weedy characteristics that are acceptable to wilderness users.
2. Plants whose populations are in epidemic growth, or that produce toxic chemicals should be controlled wherever possible, as long as the control measure is not harmful to native plants, animals or the balance of the ecosystem. Cost of control may dictate against absolute control.
3. The introduction of new exotic species into wilderness can best be reduced through education of the user public at the trailhead and elsewhere. Newly escaped individuals should be controlled before population levels increase to a size that discourages control. This is particularly important if the exotic is able to invade undisturbed native vegetation.
4. Rehabilitation should use native species and control and rehabilitation measures must not be detrimental to existing natural ecosystems or ecosystem processes.

* * *

Table 1. Exotic Species Capable of Damaging Wilderness -- A Sample.

Family **SPECIES**	**COMMON NAME**	**ORIGIN**	**KNOWN PROBLEMS, BENEFITS**
Polygonaceae			
Polygonum aviculare	Prostrate knotweed	Europe	Common on trails, hard, dry soil
Polygonum connvolvulus	Wild Buckweat	Europe	
Polygonum persicaria	Ladysthumb	Europe	
Rumex acetosella	Red Sorrel	Europe	Edible leaves
Rumex crispus	Curly dock	Europe	Reproduces by seed
Chenopodiaceae			
Bassia hyssopifolia	Fivehook	Europe, Asia	
Chenopodium album	Lambsquarters	Eurasia	Edible leaves
Chenopodium ambrosinides	Mexican tea	Mexico?	
Kochia scoparia	Kochia	Eurasia	Colorful
Salsola kali	Russian thistle	Europe	Grows in dry alkaline soils
Portulacaceae			
Portulaca oleracea	Common portulaca	S. Europe	Hard to eradicate
Caryophyllaceae			
Agrostemma githago	Corn cockle	Europe	Seeds poisonous
Cerastium vulgatum	Chickweed	Europe	
Gypsophila paniculatum	Babysbreath	Eurasia	Attractive
Hollosteum umbellatum	Jagged Chickweed	Europe	
Lychnis alba	White Cockle	Europe	
Saponaria officinalis	Bouncing Bet	Europe	Can poison some animals
Scleranthus annuus	Knawel	Europe	Rapid spread by seed
Silene conoidea	Conical Catchfly	Europe?	
Silene cucubalus	Bladder Campion	Europe	Attractive
Spergula avensis	Corn Spurry	Europe	
Stellaria media	Chickweed	Europe	Widespread
Vaccaria segetales	Cow Cockle	Europe	Attractive
Ranunculaceae			
Ranunculus testiculatus	Testiculate Buttercup	Eurasia	Attractive, in dry soils
Papaveraceae			
Papaver argemone	Pinnate Poppy	Europe	
Cruciferae			
Brassica kaber	Wild Mustard	Europe	Useful oil
Brassica nigra	Black Mustard	Europe	Table mustard
Camelina microcarpa	Smallseed Falseflax	Europe	
Capsella bursa-pastoris	Shepherds Purse	Europe	Common, prolific
Cardaria pubescens	Hairy Whitetop	Siberia	
Chorispora tenella	Blue Mustard	Siberia	Taproot
Descurainia pinnata	Tansy Mustard	Eurasia	Several similar species
Erysimum repandum	Bushy Wallflower	Europe	

SPECIES	COMMON NAME	ORIGIN	KNOWN PROBLEMS, BENEFITS
Euclidium syriacum	Syrian Mustard	Europe	
Lepidium latifolium	Perennial Pepperweed	Europe	Weed in wet places
Lepidium perfoliatum	Yellowflower Pepperweed	Europe	
Lepidium virginicum	VA Pepperweed	Spread from W. US	Possible tumbleweed
Sisymbrium altissimum	Jim Hill Mustard	Europe	Tumbleweed habit
Sisymbrium officinale	Hedge Mustard	Europe	Widespread
Thlaspi arvense	Field Pennycress	Europe	Unpleasant odor
Leguminosae			
Lupinus species	Lupinus	?	Widespread
Medicago lupulina	Black Medic	Europe	Common
Trifolium dubium	Small Hop Clover	Europe	Widespread
Trifolium procumbens	Low Hop Clover	Europe	Common in meadows
Vicia villosa	Hair Vetch	Europe	Colorful
Geraniaceae			
Erodium cicutarium	Redstem Filaree	Eurasia	Agressive
Zygophyllaceae			
Tribulus terrestris	Puncturevine	Eruasia?	Seeds damage animals' feet
Euphoriaceae			
Euphorbia cyparissias	Cypress Spurge	Eruasia	Colorful, spreading root system nearly impossible to control
Euphorbia escula	Leafy Spurge	Europe	Poisonous to animals
Malvaceae			
Malva neglecta	Common Mallo	Europe	Grazed
Hypericaceae			
Hypericum perforatum	St. Johnswort	E. US spread to West	Blisters animals' mouths
Umbelliferae			
Anthriscus scandicina	Bur Beakchervil	Europe	
Cicuta douglasii	W. Waterhemlock	W. spreading	Moist sites, very poisonous
Conium maculatum	Poisonous Hemlock	Eurasia	Moist places, very poisonous
Daucus carota	Wild Carrot	Eurasia	Taproot
Asclepiadaceae			
Asclepias fascicularis	Mexican Mildweed	NW USA	Poisonous to some animals
Convolvulaceae			
Convolvulus arvensis	Field Bindweed	Eurasia	Showy, aggressive
Convolvulus sepium		E. US to W.	Showy
Cuscutaceae			
Cuscuta species		Unknown	Often species specific, parasitic

SPECIES	COMMON NAME	ORIGIN	KNOWN PROBLEMS, BENEFITS
Cirsium vulgare	Bull Thistle	Eurasia	Widespread, rapid spread
Lactuca pulchella	Blue Lettuce	US	Hard to control, spreading roots
Lactuca serriola	Prickly Lettuce	Europe	Spreads rapidly by seeds
Matricaria matricarioides	Pineappleweed	US	Spread to Europe, agressive
Onopordum acanthium	Scotch Thistle	Europe	Spreads easily
Senecio vulgaris	Common groundsel	Europe	Disturbed sites
Sonchus arvensis	Perennial Sowthistle	Europe	Spreads by roodt, seeds
Sonchus asper	Spiny Sowthistle	Europe	Wet places, poisonous
Sonchus oleraceus		Europe	Spreads readily
Tanacetum vulgare	Tansy	Europe	Wet places, poisonous
Taraxacum officinale	Dandelion	Europe	Edible, vigorous spread
Tragopogon species		Europe	Spreads readily
Xanthium spinosum	Spiny cocklebur	S. America	Poisonous, burs harm animals
Xanthium pennsylvanicum	Cocklebur	Eurasia	Bur plant
Others			
Lonicera japonica	Japanese honeysuckle	Eurasia, Cent. America	Wetter sites
Vicia cracca	Wild vetch	Eurasia	Vine, aggressive
Allium vineale	Wild onion	Europe	Spreading
Artemisia vulgaris	Magwort	N. Cent. Asia	Sometimes on limey soils
Lysimachia mummularia	Moneywort	Europe	Spreading
Hieracium pratense	Field Hawkweed	Europe	Spreading in eastern US
Tussilago farfara	Cotsfoot	Europe	Wet places, clay soils
Solidago canadensis	Goldenrod	USA	Spreading west, north
Verbascum blattaria	Moth Mullein	Europe	Spreading through N. America
Ranunculus acris	Butterflower	Europe	Widespread
Lotus corniculatus		Europe	Widespread
Pastinaca sativa	Wild Parsnip	Europe	Widespread, moist soils
Potentilla canadensis	Cinquefoil	US	Spreading, ruins grasslands
Mollugo Verticillata	Carpetweed	Africa, C. Am	Sandy soils, spreading in E. US
Trifolium repens	White Clover	Europe or US	Good forage
Phytolacca decandia	Pokeberry	Europe	Poisonous roots
Melilotus alba	White Sweet Clover	Eurasia	Widespread in US
Trifolium pratense	Red Clover	Europe	Widespread in US
Vinca minor	Periwinkle	Europe	Widespread in US
Arctium lappa	Great Burdock	Europe	N.E. & central US
Pueraria lobata	Kerdyu		S.E. USA
Boraginaceae			
Asperugo procumbens	Madwort	Eurasia	Spreading
Cynoglossum officinale	Houndstongue	Europe	Moist meadows
Echium vulgare	Blue Thistle	Europe	Has potential for rapid spread
Lithospermum arvense	Stoneseed	Eurasia	Seeds have long viability
Labiatae			
Lamium amplexicaule	Henbit	Eurasia, N. Africa	
Marrubium vulgare	White Horehound	Europe	Hooked spikes cling to animals
Salvia aethiopis	Mediterranean Sage	Africa	Rapid spread

SPECIES	COMMON NAME	ORIGIN	KNOWN PROBLEMS, BENEFITS
Physalis longifolia	Groundcherry	E. US, Spreading W.	Vigorous roots, hard to control
Solanaceae			
Solanum dulcamara	Bitter Nightshade	Europe	Berries mildly poisonous, red
Other *Solanum* spp.		S. America, elsewhere	Many are poisonous
Scrophulariaceae			
Linaria dalmatica	Palmatian Toadflax	SE Europe	Widespread
Linaria vulgaris	Butter and Eggs	Europe, Asia	Extensive roots, hard to control
Verbascum thapsus	Wooley Mullein	Eurasia	Unattractive after flowering
Veronica hederaefolia	Speedwell	Europe	
Plantagenaceae			
Plantago lanceolata	Plantain	Europe, Asia	Widespread, aggressive
Plantago major	Broadleaf Plantain	Europe	Widespread, aggressive
Dipsacus sylvestris	Teasel	Europe	
Campanulaceae			
Campanula rapunculoides	Creeping Bellflower	Europe	Heavy taproot, hard to control
Compositae			
Archillea millefolium	Yarrow	US, spreading	Undesirable forage
Anthemis cotula	Mayweed	Eurasia, Africa	Found along trails
Arctium minus	Burdock	Europe, Africa	Burs mat animal fur
Artemesia absinthium	Absinth Wormwood	Eurasia	
Centaurea cyanus	Cornflower	Mediterranean	Widespread, colorful
Centaurea maculosa	Spotted knapweed	Europe?	Taproot, allelopathy, hard to control
Centaurea diffusa	Diffuse Knapweed	Europe	
Centaurea repens	Russian Knapweed	Asia or Europe	Virgorous weed
Chondrilla juncea	Rusk Skeleton weed	Eurasia	Rapid Spread
Chrysanthemum leucanthemum	Oxeye Daisy	Europe	Showy
Cichorium intybus	Chicory	Europe	Taproot, spreads easily
Cirsium arvense	Canadian Thistle	Eurasia	Hard to eradicate
Gramineae			
Aegilops cylindrica	Jointed Goatgrass	Europe	Possible damage to mouth of grazers
Agropyron repens	Quackgrass	Europe	Spreads rapidly from rhizomes
Alopecurus mysuroides	Pacific Meadow Foxtail	Europe	
Avena fatua	Wildoat	Europe	Seeds are edible
Bromus rubens		Europe	Widespread
Bromus secalinus	Cheat	Europe	
Bromus tectorum	Downy Brome or Cheatgrass	Europe	Awns can injure stock, spreads rapidly, dries early, fire hazard
Cenchrus longispinus	Longspine Sandbur	S. North America	Spines injure man, animals

SPECIES	COMMON NAME	ORIGIN	KNOWN PROBLEMS, BENEFITS
Deschampsia elongta	Slender Hairgrass	W. US, has moved E.	
Digitaria sanquinalis	Large crabgrass	Europe	Grows on compacted soils
Echinochloa crusgalli	Barnyard grass	Europe	Seeds used by native Americans for food
Hordeum jubatum	Foxtail Barley	NW US, spread E.	Awns damage animals
Hordeum leporinum	Wild Barley	S. Europe	
Poa annua	Annual Bluegrass	Europe	
Poa bulbosa	Bulbous Bluegrass	Europe	
Schlerochloa dura	Tufted Hardgrass	S. Europe	Poor forage
Secale cereale	Common Rye	S.E. Asia	Wildlife value
Setaria lutescens	Yellow Foxtail	Europe	
Setaria viridis	Green Foxtail	Europe	
Sorghum halepense	Johnsongrass	Turkey?	Rapid spread, hard to control
Taeniatherum asperum	Medusahead	Europe	Rapid spread
Ventenata dubia	Ventenata	Europe, Asia, Africa	
Phleum pratense	Timothy	Europe	Extremely common
Lolium perenne	Perennial Rylegrass	Europe	Widespread
Eleusine indica	Goosegrass	Asia	Widespread in S. US
Dactylis glomerata	Orchardgrass	Europe	Widespread in mesic sites
Phragmites communis	Read Grass	Europe	Wet places
Other Monocots			
Hemerocallis fulva	Day lilly	Europe	Spreading in NE US
Commelina communis	Dayflower	Asia	Creeping stems

Table 2. Herbaceous exotic plant species reported on wildland recreation sites.*

Species	Citation
Achillea millefolium	Marion (1984); Lindsay (1978)
Agropyron repens	Cole (1983); Marion (1984)
Agrostis alba	Cole (1977,1983); Marion (1984); Lindsay (1978)
Arabia glabra	Cole (1983)
Arenaria serpyllifolia	Cole (1977)
Artemesia vulgaris	Cole (1977)
Bromus brizaeformis	Cole (1977)
Bromus inermis	Cole (1983); Marion (1984)
Bromus rubens	Cole (1985)
Bromus tectorum	Cole (1977,1983,1985)
Capsella bursa-pastoris	Cole (1977,1983); Marion (1984)
Cerastium vulgatum	Marion (1984)
Cichorium intybus	Lindsay (1978)
Chenopodium album	Cole (1983); Marion (1984)
Cirsium arvense	Cole (1977); Marion (1984)
Cirsium vulgare	Cole (1977)
Chrysanthemum leucanthemum	Marion (1984); Lindsay (1978)
Cynoglossum officinale	Cole (1977)
Dactylis glomerata	Sutton (1976); Cole (1977,1983); Lindsay (1978)
Daucus carota	Lindsay (1978)
Erodium cicutarium	Cole (1985)
Festuca rubra	Marion (1984)
Filago arvensis	Cole (1983)
Galinsoga ciliata	Lindsay (1978)
Hieracium aurantiacum	Marion (1984)
Holcus lanatus	Lindsay (1978)
Hordeum leporinum	Cole (1985)
Hypericum perforatum	Cole (1977)
Lactuca serriola	Cole (1977)
Lappula echinata	Cole (1977)
Lepidium virginicum	Cole (1977)
Lychnis alba	Cole (19.83)
Matricaria matricarioides	Cole (1983); Marion (1984)
Medicago lupulina	Cole (1977,1983)
Phleum pratense	Cole (1977,1983); Marion (1984), Lindsay (1978)
Plantago lanceolata	Sutton (1976); Saunders (1979); Ranz (1979); Lindsay (1978)
Plantago major	Cole (1977,1983); Ranz (1979); Fichtler (198 0 ; Marion (1984); Lindsay (1978)
Poa annua	Ranz (1979); Fichtler (1980); Cole (1982,1983); Saunders (1979); Lindsay (1978)
Poa palustris	Cole (1983); Marion (1984)
Poa pratensis	Dale and Weaver (1974); Sutton (1976); Cole (1977,1983); Saunders (1979); Fichtler (1980); Marion (1984)
Polygonum aviculare	Cole (1983); Marion (1984)

Species	Citation
Polygonum cilinose	Saunders (1979)
Potentilla argentea	Cole (1983)
Prunella vulgaris	Sutton (1976); Marion (1984); Lindsay (1978)
Ranunculus acris	Saunders (1979); Marion (1984)
Rumex acetosella	Cole (1977,1983); Ranz (1979); Lindsay (1978)
Rumex crispus	Cole (1983)
Rumex obtusifolius	Lindsay (1978)
Sisymbrium altissimum	Cole (1977)
Spergularia rubra	Ranz (1979); Cole (1982)
Taraxacum officinale	Cole (1977,1983); Saunders (1979); Ranz (1979); Fichtler (1980); Marion (1984); Lindsay (1978)
Thlaspi arvense	Cole (1977,1983)
Tragopogon dubius	Cole (1977,1983,1985)
Trifolium pratense	Sutton (1976); Cole (1!377,1983); Marion (1984); Lindsay (1978)
Trifolium procumbens	Marion (1984)
Trifolium repens	Dale and Weaver (1974); Sutton (1976); Cole (1977,1983); Ranz (1979); Saunders (1979); Marion (1984); Lindsay (1978.)
Verbascum thapsus	Cole (1977,1983)
Veronica serpyllifolia Marion (1984)	

*Taken from Marion et al. 1985

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