University of Nevada
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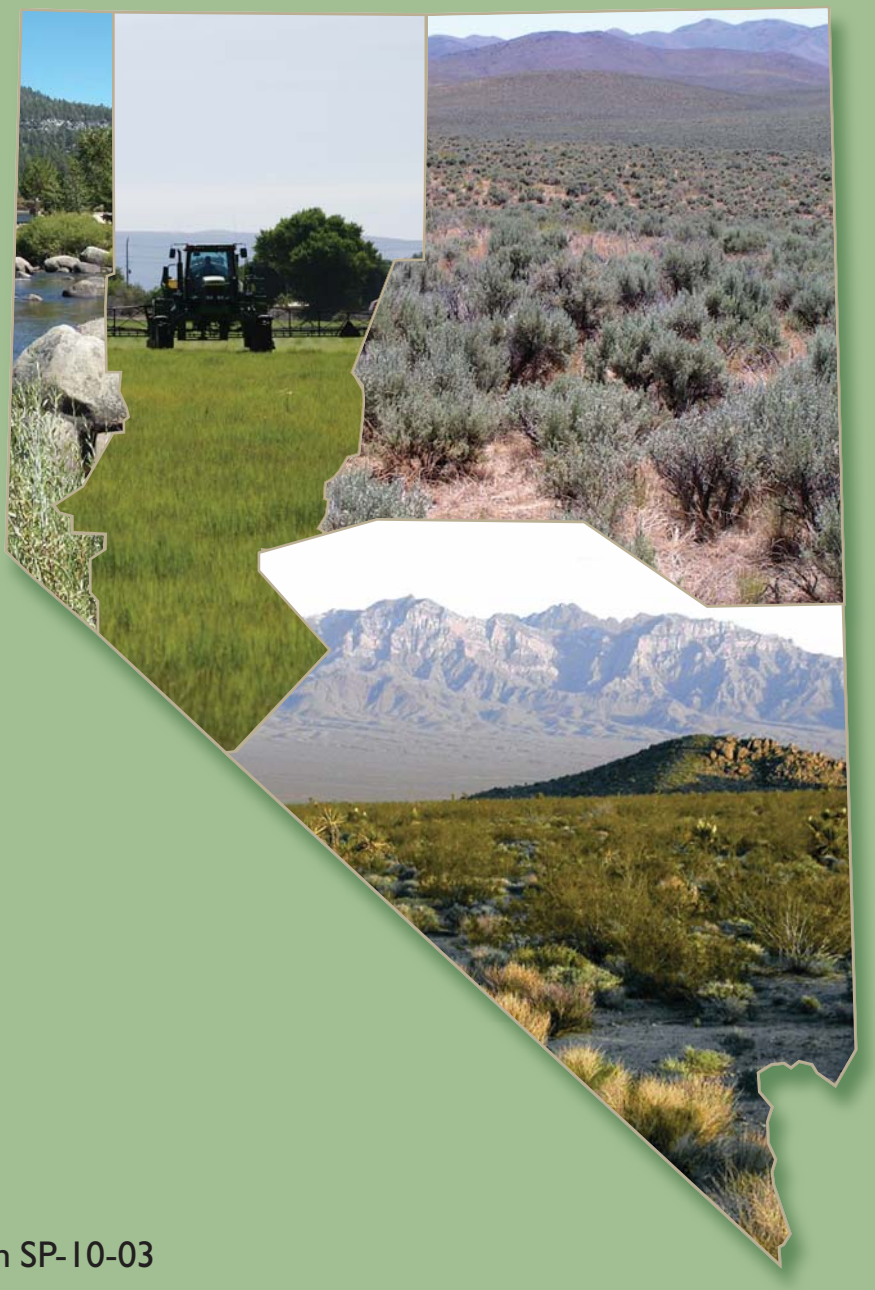
Nevada's 2008 Weed Management Extension Program Needs Assessment:

A Survey of Agricultural Producers and Public Land Managers



Special Publication SP-10-03

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Nevada's 2008 Weed Management Extension Program Needs Assessment:

A Survey of Agricultural Producers and Public Land Managers

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CHAPTER ONE

Introduction

For centuries, weeds have plagued land managers and agricultural producers across the United States. Over the years, substantial progress has been made in our ability to control weeds. Early settlers in the United States were primarily subsistence farmers who controlled weeds using a combination of manual control (i.e., hand pulling and hoeing) and cultivation with animals. In the 1920's, tractors were introduced and began to replace animal power. The first selective herbicide (2,4-D) was marketed in 1947; the success of which gave rise to the development of many new chemicals and ultimately made herbicides the major tool for weed control in the United States today.

Lorenzo D. Creel, Special Collections, UNR Library

Earl Creech, Utah State University

Weeds have long plagued land managers and agricultural producers. Significant progress has been made in weed-management technology, which has resulted in an increase in efficiency in agricultural operations.

A major achievement in weed control technology has been an increase in the efficiency of agricultural operations. Increased efficiency has enabled millions to leave the farm and pursue other occupations that improve their way of life (National Agricultural Statistics Service [NASS], 2009; Figure 1). In fact, a single farmer in the United States today feeds about 144 people per year – up from 19 in 1940 (American Farm Bureau Federation, 2008; Figure 2). As we look toward the future, further advances in technology and tactics will likely continue to increase the efficiency and effectiveness of weed control.

Figure 1
Percentge of United States labor force working on farms (adpated from National Agricultural Statistics Service, 2009).

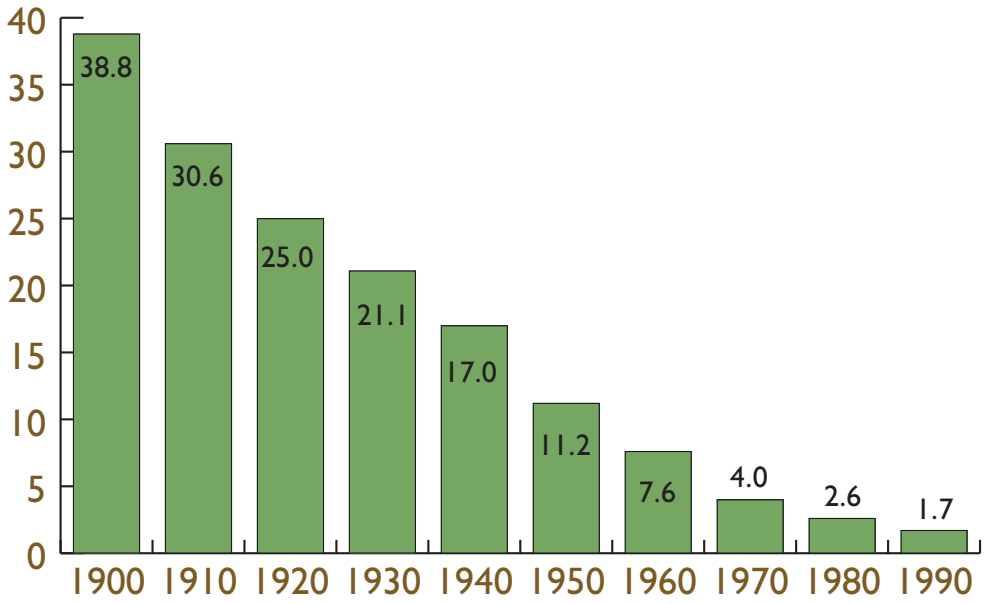
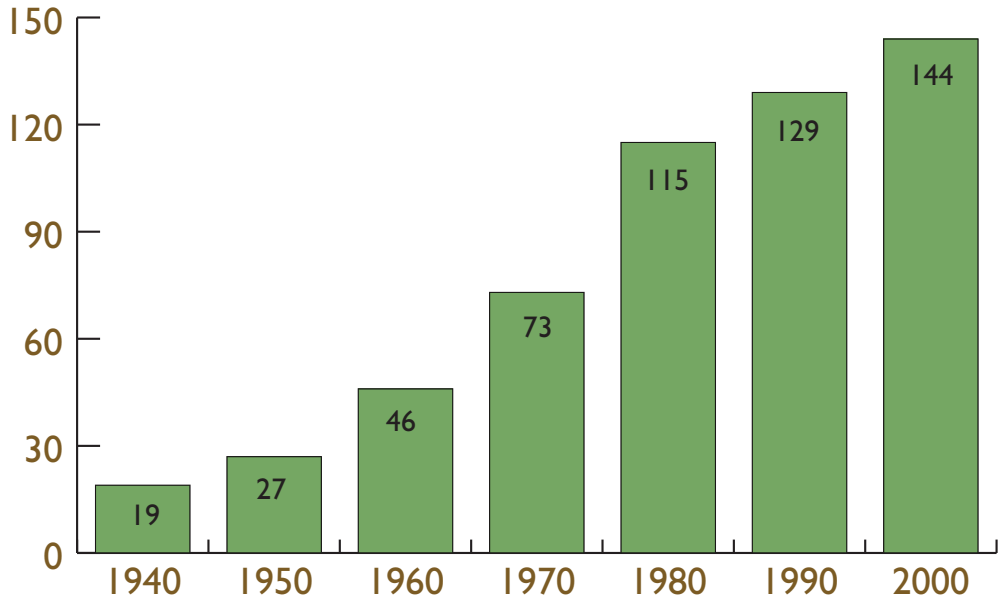


Figure 2
Number of people fed per farmer in the United States (adpated from American Farm Bureau Federation, 2008).



Impacts of Weeds in the United States

The impacts of weeds in the United States are as numerous and diverse as the plants that grow across this vast country. For example, in the southeastern United States, kudzu (*Pueraria montana*) is a rapidly-growing perennial vine and resembles a living, green quilt that smothers competing plants, buildings, overhead wires and other structures. Kudzu also displaces wildlife, reduces recreational use, impacts human safety by blocking visibility and access, and can serve as an over-wintering host for Asian soybean rust, a pest that can destroy soybean crops.

Giant ragweed (*Ambrosia trifida*) is one of the most common and problematic weeds in row crops of the midwestern United States. This weed can reduce soybean yields by 50 percent with a density of only one plant per 110 square feet (Johnson et al., 2007). Giant ragweed can also grow to a height of 17 feet, allowing it to tower over the standing crop and interfere with harvest. It can impact human health by producing large amounts of pollen that trigger allergic reactions in some people.

Jerry Asher, USDI-BLM, bugwood.org

Kudzu (*Pueria montana*) is a rapidly growing perennial vine that smothers plants, buildings, overhead wires and other structures.

J.Neal, © 2008 Regents of the University of California

Giant ragweed (*Ambrosia trifida*) is one of the most common and problematic weeds in the midwestern United States, reducing crop yields, interfering with harvest and triggering allergic reactions due to extensive pollen production.

In the southwestern United States, saltcedar (*Tamarix ramosissima*) contributes to large amounts of salt deposition on the soil surface, preventing the growth of native species, reducing plant diversity and increasing soil erosion. The development of dense stands of saltcedar can limit recreational use, displace wildlife and increase fire frequency. Perhaps the most important impacts of saltcedar, particularly in the desert Southwest, are its effects on water. The high evapo-transpiration rate of saltcedar leads to a depletion of ground and surface water. Dense stands of saltcedar can block

Nathan Belliston, Uinta County Weed Department

Salt cedar (*Tamarix ramosissima*) depletes ground and surface water supplies. Dense stands of saltcedar can block streams, canals and other water channels, which can promote flooding during periods of heavy rain.

streams, canals and other water channels, which can promote flooding during periods of heavy rain.

Infesting at least 15 million acres in the western United States, yellow starthistle (*Centaurea solstitialis*) causes chewing disease in horses, a condition that results in the loss of fine motor movements (particularly of the mouth) and ultimately leads to starvation or dehydration. It forms dense stands that can crowd out desirable plants, reducing wildlife habitat, forage quality, availability and soil-moisture reserves. Long, stiff spines on yellow starthistle flower heads can also cause mechanical injury to humans and animals.

The most common invasive weed in Nevada and throughout the west is downy brome (cheatgrass; *Bromus tectorum*). Large expanses of downy brome pro-

Joe DiTomaso, © 2008 Regents of the University of California

Yellow starthistle (*Centaurea solstitialis*) forms dense stands that can crowd out desirable plants, reducing wildlife habitat, forage quality and availability and soil moisture reserves.

mote frequent wildfires that can eliminate native plants, reduce the quality of wildlife habitat and cause substantial property damage and injury to humans and their animals. This weed can reduce forage availability in pasture and rangeland and can also facilitate permanent changes in soil conditions that promote erosion and obstruct the growth of desirable species. Feed intake and subsequent weight gain of livestock and wildlife are often reduced when long, stiff awns on downy brome seedheads puncture their mouths and throat tissue.

Cost of Weed Control in the United States

The most easily measured impact of weed infestation is the high cost of control. In U.S. agriculture, weeds are common on the nearly 500 million acres of cropland and 1 billion acres of pasture and rangeland. In 2005, it was estimated that invasive weeds[1] occur on nearly 110 million acres in the western United States. This acreage, depending on species, is increasing at rates between 1 percent and 29 percent per year (Duncan & Clark, 2005). On United States cropland, farmers spend about $7 billion each year for weed control (Pimentel et. al. 2000; Monaco et al., 2002). Another $5 billion is spent on pasture and rangeland, $1.5 billion on turfgrass and $100 million for aquatic weed control (Pimentel et al., 2000).

[1]The 15 species included in the estimate were downy brome, musk thistle, Russian knapweed, diffuse knapweed, spotted knapweed, yellow starthistle, Canada thistle, leafy spurge, hawkweeds, perennial pepperweed, sericea lespedeza, Dalmatian toadflax, purple loosestrife, medusahead, and saltcedar.

Ed Smith, University of Nevada Cooperative Extension

Downy brome (cheatgrass: *Bromus tectorum*) is the most common invasive weed in Nevada. It outcompetes native vegetation and promotes frequent wildfires.

Challenges for Weed Management in Nevada

In Nevada, a wide range of environmental conditions and land management practices influence the growth, spread and control of weeds. Nevada is the seventh largest state in the United States, covering 110,540 square miles. The topography, and consequently the climate, varies greatly across the state. On its western border, the Sierra Nevada and other mountains form a physical barrier that results in low precipitation across most of the state. Within Nevada, average elevation generally ranges from 5,000 to 6,000 feet in the east, 4,000 to 5,000 feet in the west, and 2,000 to 3,000 feet in the south (Desert Research Institute [DRI], 2008a). The highest point in Nevada is Boundary Peak (13,140 feet) in Esmeralda County, and the lowest point is the Colorado River (479 feet) in Clark County. Nevada is largely mountainous and most of the ranges are sepa-

Steve Blecker, US DOI- USGS

The typical landscape of Nevada consists of local variations in elevation caused by mountainous terrain separated by long, broad valleys. This results in widely disparate climates within relatively short distance.

National Park Service

Susan Donaldson, University of Nevada Cooperative Extension

Although Nevada is the driest state, precipitation varies greatly from one location to another. It is the lowest in the Mojave Desert of southern Nevada (left) with 4 to 6 inches per year, while it is the highest in the Lake Tahoe Basin (right), with nearly 40 inches. Climate is important because it affects weed growth as well as weed control measures.

rated by long, broad valleys. The local variations in elevation often result in wide variations in climate within relatively short distances.

Overall, Nevada is the driest state in the United States (Geraghty et al., 1973), but precipitation varies greatly from one location to another. For example, long term average annual precipitation in the Mojave Desert of southern Nevada is 4 to 6 inches per year, while at Mount Rose (near Reno), it is nearly 40 inches (DRI, 2008b). Similar variations can be observed with temperature. The frost-free growing season ranges from 70 days in the north to 225 days in the south (DRI, 2008a). Long-term average temperatures are about 20 F warmer in the south than the north (DRI, 2008a). Precipitation and temperature are directly correlated to the amount and type of weed growth. Climate can also impact the effectiveness of weed control measures, particularly herbicide activity, which can be reduced or eliminated by dry conditions and/or extreme temperatures.

Until recently, Nevada experienced very rapid population growth. Between 1980 and 2006, its population increased nearly 212 percent from 800,493 to 2,495,529 (United States Census, 2008). Most of Nevada's population growth occurred in urban areas: 72 percent of the state's population resides in Clark County (Las Vegas) and 20 percent in Washoe (Reno), Carson City and Douglas counties (Hardcastle, 2008). In other words, 92 percent of Nevada's population resides within four counties that comprise less than 14 percent of the total land area. These urban counties have a larger tax base and access to more resources. In contrast, rural counties cover 86 percent of Nevada's land area; this places a heavy weed-management burden on a relatively small percentage (8 percent) of the state's population and the federal agencies that manage those lands.

The lack of precipitation combined with a rapidly growing population places a tremendous strain on the ground and surface water supplies in the state. A

Lisa Blecker, University of Nevada Cooperative Extension

Susan Donaldson, University of Nevada Cooperative Extension

Ninety-two percent of Nevada residents live in urban areas and reside in Clark, Washoe, Carson City and Douglas Counties. The remaining 8 percent of the population resides in rural areas, which comprise over 86 percent of the total land area, placing a heavy weed-management burden on a relatively small percentage of the state's population and the federal agencies that manage those lands.

recent trend, and one that is likely to become more common in the future, has been the purchase of agricultural water rights by individuals and the government (both local and federal) for nonagricultural uses. Since precipitation rates across the arable lands of Nevada are too low for the production of dryland crops, abandoned agricultural lands (from which water either has been transferred or will be transferred) become havens for noxious weed invasion.

Another feature unique to Nevada is its federal land base – greater than any other state. The breakdown of land ownership in Nevada is 86.1 percent federal government, 11.5 percent private, 1.6 percent tribal, and 0.8 percent local and state government (Nevada Division of Conservation and Natural Resources, 2008). From a weed-management perspective, Nevada's large amount of federal land has both benefits and drawbacks. On the plus side, the control of noxious weeds is an important issue for the federal government, so that each government agency office usually has a well-trained and knowledgeable individual assigned to coordinate its weed-management program. On the negative side, each agency office is responsible

Susan Donaldson, University of Nevada Cooperative Extension

A recent trend, and one that is likely to become more common in the future, has been the purchase of agricultural water rights for nonagricultural uses. Since precipitation rates across the arable lands of Nevada are too low for the production of dryland crops, abandoned agricultural lands can become havens for noxious weed invasion.

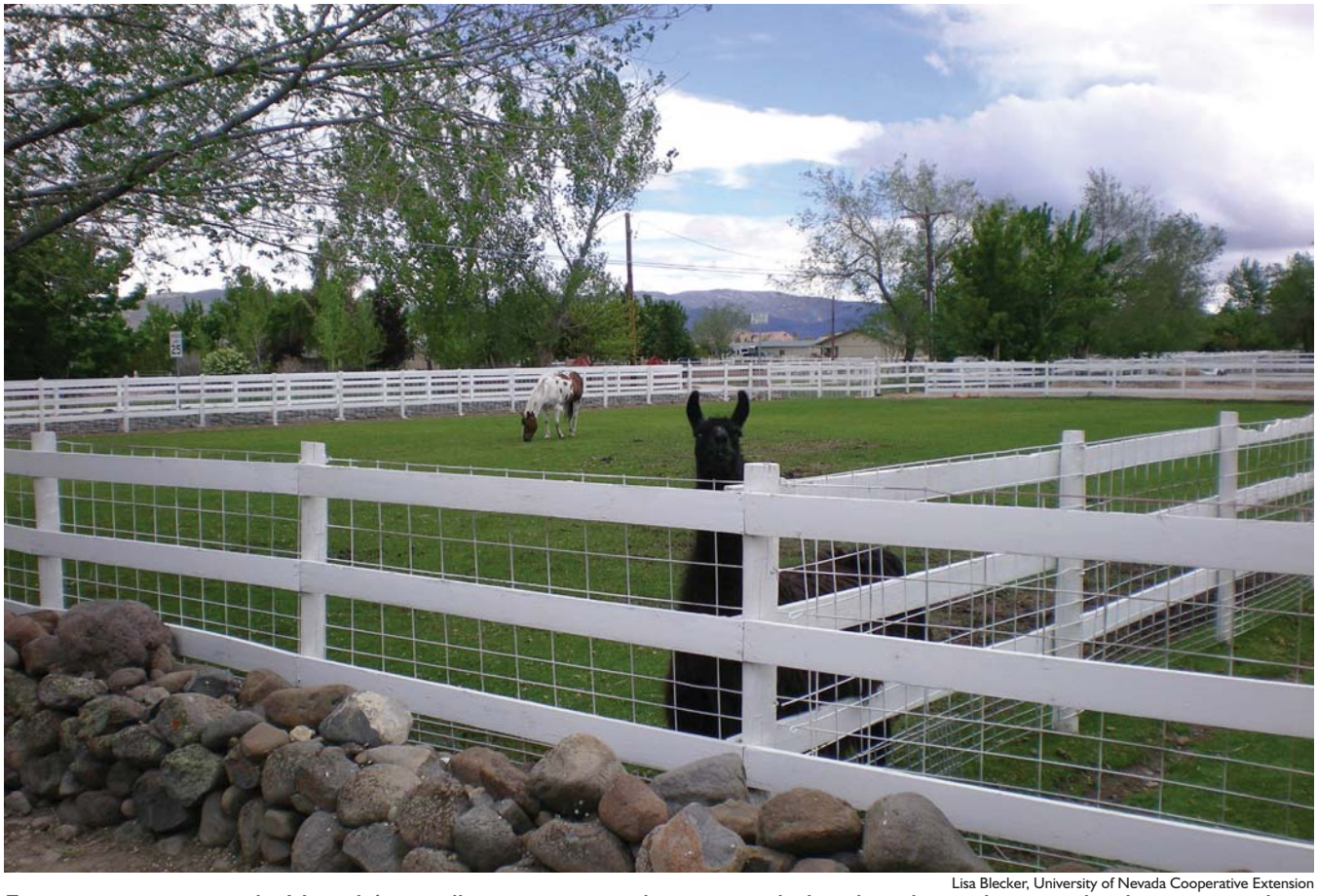
for managing very large areas (usually on the order of millions of acres) and their operating budgets and staffing can be insufficient to ensure an effective weed-management program.

About half of Nevada's private land is dedicated to agricultural production. In 2006, Nevada had nearly 3,000 farms and ranches, and the average size of these

operations was 2,100 acres, more than four times larger than the average United States farm (446 acres: Owens, 2007). Farm size varies greatly among Nevada's counties. For example, the average size of the 397 farms and ranches in Elko County is 6,227 acres, while in Churchill County, 498 operations average 300 acres (Owens, 2007). Nevada's rapidly growing population, coupled with its limited private land resources, has resulted in many farms and ranches being broken into smaller parcels and sold as building lots or smaller farms. When these parcels are purchased by retirees, absentee investors, or individuals looking to move out of cities, the new, small acreage landowners often lack the knowledge, experience and resources to manage weeds.

Purpose of the Research and Education Needs Assessment

The mission of University of Nevada Cooperative Extension (UNCE) is "to discover, develop, disseminate, preserve and use knowledge to strengthen the social, economic and environmental well-being of people." In order to accomplish this mission, UNCE originates outreach programs that are based on the critical needs of Nevada's citizens. The purpose of this statewide assessment is to objectively measure the perceived weed-management issues facing Nevada's agricultural producers and public land managers. Systematically determining Extension program needs enables UNCE faculty to better design outreach efforts that incorporate applied research and education.



Lisa Blecker, University of Nevada Cooperative Extension

Farm size varies greatly. Nevada's rapidly growing population, coupled with its limited private land resources, has resulted in many farms and ranches being broken into smaller parcels and sold as building lots or smaller farms.

CHAPTER TWO

Survey Methods

A needs assessment survey was developed to target the specific weed-management issues faced by Nevada's agricultural producers and public land managers. UNCE faculty members, the Nevada Agriculture State Statistician, agricultural industry representatives in Nevada and weed science experts throughout the western United States provided suggestions to improve the final questionnaire, which they reviewed and approved. The purpose of these reviews was to identify missing attributes and to check for clarity and comprehension of the questions. To encourage a higher response rate, the overall length of the questionnaire was limited to four pages.

The resulting needs assessment questionnaire featured 88 Likert-type questions that asked respondents to rate the importance of a suite of weed-management issues using a scale of 1 (lowest importance) to 5 (highest importance). The assessment's questions were grouped among nine weed-management issues. These were:

1) Sources of weed spread onto farms and ranches
2) Problems caused by weeds
3) Obstacles to weed control efforts
4) Approaches to overall weed-management program
5) Importance of specific weed-management practices including:
   - Preventing weed spread
   - Scouting for new weed infestation
   - Methods of weed control
   - Methods for using plants to exclude weeds
6) Herbicide selection
7) Herbicide application
8) Problematic weeds, and
9) Educational topics

Foxtail barley (*Hordeum jubatum*) is a perennial grass that was listed as one of the top five most problematic weed for producers in Nevada, and producers in the Southern Area considered it their most problematic weed.

Agricultural Producer Survey

To ensure an unbiased sampling of all producers statewide, the assessment was implemented via postal mail. Recipients of the needs assessment questionnaire included all Nevada agricultural producers who, using the standard United States Census definition, reported at least $1,000 in annual income from agriculture. Nevada's State Agriculture Statistician meticulously maintains this database as part of the ongoing census

survey conducted by the Nevada Agriculture Statistics Service (Marty Owens, Personal Communication).

To protect the confidentiality of producers included in the state database, NASS agreed to post the assessment packets on behalf of the UNCE State Weed Specialist. UNCE assembled, stamped, sealed and delivered the survey packets to the NASS office to append mailing labels and deliver to the post office for mailing. This survey implementation approach received approval from the university's Office for Human Research Protections (OHRP) and did not require signed consent forms.

A copy of the questionnaire and cover letter that accompanied the postal mail questionnaire are included in Appendix A. The cover letter was written and signed by the UNCE State Weed Specialist. To further guarantee the anonymity of survey respondents, no attempts were made to track individual recipients using a classic multiple mailing methodology (Dillman, 2000; Dillman, 1978). However, a postcard reminder was mailed by NASS to all survey recipients approximately three weeks following the initial mailing. The postcard reminder, written and signed by the UNCE State Weed Specialist, thanked producers for their voluntary participation and provided contact information for acquiring a replacement copy of the questionnaire.

Public Agency Survey

An electronic version of the survey was developed for weed managers on public lands using Survey Monkey software (http://www.surveymonkey.com/). Nevada lands under state or federal management were identified. Management agencies included: the Bureau of Land Management (BLM), United States Forest Service (USFS), United States Military, National Parks Service (NPS), Bureau of Indian Affairs (BIA), United States Fish and Wildlife Service (USFWS), Nevada Division of State Parks, Nevada Department of Wildlife (NDOW) and Nevada Department of Transportation (NDOT). An email containing a link to the electronic survey and an invitation to participate was sent to a point of contact in each organization. That person then forwarded it to those individuals within their organization with responsibilities for weed management. No efforts were made to track respondents' identities and no mechanisms were in place to link data to individual participants. An email reminder was sent approximately three weeks after the initial mailing to thank weed managers for their voluntary participation and to serve as a reminder for non-respondents.

Data Analysis

The data were analyzed with SPSS (Version 13.0) for Windows (SPSS, 2005). Instrument reliability of the 88 Likert scale questions about producer programming needs, using Cronbach's coefficient alpha (CCA) estimate of internal consistency, resulted in a high score ($r = .952$) (Carmines & Zeller, 1979). The high scores for instrument reliability indicate the questions asked in the assessment are reliable indicators for the items measured.Descriptive statistics were used to analyze the data. These included percentages, means and frequencies based on total responses.

To provide a snapshot view of the importance of weed-management issues, the five Likert scale responses for each survey item were collapsed into three ratings: high, low and neutral. Issues rated as either 4 or 5 on the Likert scale were grouped into a category called "high importance", while items assigned a 1 or 2 were grouped as "low importance". Those producers who assigned a rating of 3 to an issue were considered neutral in their rating of an issue and no changes were made to this category. This procedure is a common data reduction method that facilitates analyzing and viewing Likert scale data (Likert, Roslow & Murphy, 1934).

CHAPTER THREE

Survey Results

Of the total producers surveyed statewide (2,457), 746 returned completed questionnaires, resulting in a 30 percent response rate[2]. This is considered a robust response rate for a postal mail survey, especially since the protocol prevented the direct contact of survey recipients to entice their completion of the survey.

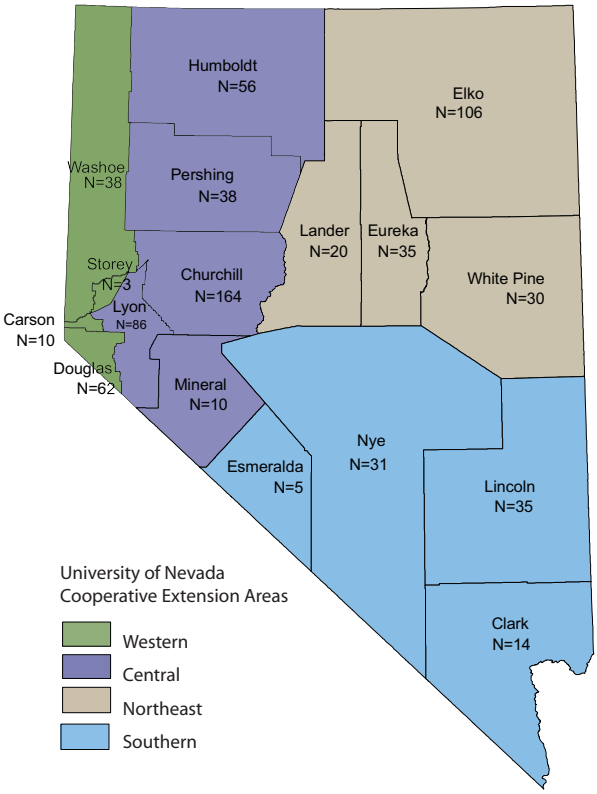


Figure 3. Map showing the number of responses to the agricultural producer survey by county. Counties were placed into one of four groups by geography, primarily following the area boundaries of the University of Nevada Cooperative Extension (UNCE).

Electronic surveys were sent to 63 public land weed managers and 52 responses were received, suggesting a response rate of 83 percent. The exact response rate for this survey is unknown. Email-based surveys are easily forwarded and, since individual respondents were not tracked to ensure confidentiality, the survey could have been completed by individuals who were not initially targeted. Based on communication with supervisors at different agencies, the authors are confident that the overall response rate was at or near the percentage reported above.

Respondents to the agricultural producer survey had the opportunity to indicate the county where their agricultural operation is located. The assessment results indicate that all Nevada counties participated. However, the number of respondents by county varied considerably, being small in some counties and comparatively large in others. Although counties with low numbers of respondents (e.g., two or three) provide information, readers should understand that the results reflect the opinions of a minority of the producers in that county.

Figure 3 illustrates the number of assessment respondents by county. Of the 17 counties, Churchill County produced the largest number of respondents (164), followed by Elko (106), Lyon (86), Washoe (78),

[2] A total of 2,508 surveys were mailed but 51 surveys were returned due to inaccurate postal addresses, leaving 2,457 surveys available to complete and return.

Douglas (62), Humboldt (56), Pershing (38), Eureka and Lincoln (35 each), Nye (31), White Pine (30), Lander (20), Clark (14), Carson City and Mineral (10 each), Esmeralda (5) and Storey County (3). Counties were placed into one of four groups by geography, primarily following the area boundaries of UNCE. The only exceptions were Nye and Esmeralda counties. UNCE has two offices in Nye County, each of which is in a different Extension area. The Pahrump office is in the Southern Area, while the Tonopah office (which also serves Esmeralda County) is in the Central/Northeast Area. Since our survey methods did not allow for distinction between respondents from northern or southern Nye County, Nye and Esmeralda counties were placed in the Southern Area.

Figure 4 illustrates the size of the respondents' agricultural operations, in acres, by percentage of total respondents statewide. Just over half of the total respondents reported their operations were less than 100 acres. The majority of the respondents (28 percent, n = 203) reported operations between 20 and 99 acres while the next largest group (24 percent, n = 176) operated on 19 acres or less. Approximately 14 percent had operations of 100 to 249 acres; 10 percent were from 250 to 499 acres; 11 percent from 1,000 to 4,999 acres; 8 percent from 500 to 999 acres; and 5 percent 5,000 or more acres.

Weed Management Issues

Sources of Weed Spread

Agricultural producers and weed managers on public lands differed in their view of how weeds spread onto their lands (Table 1). By far, farmers and ranchers perceived the most important sources of weed spread to be waterways (64 percent) and neighbors (60 percent). Methods of weed spread they viewed as unimportant were visitors (11 percent), wildlife (17 percent) and vehicles/equipment (23 percent). In contrast, government agencies listed transportation/utility corridors (89 percent), vehicles/equipment (83 percent) and waterways (73 percent) as the most important modes of weed entry, while wildlife (25 percent) and contaminated products (50 percent) were viewed as less important.

Figure 4
Percentage of responses by Nevada farm/ranch size.

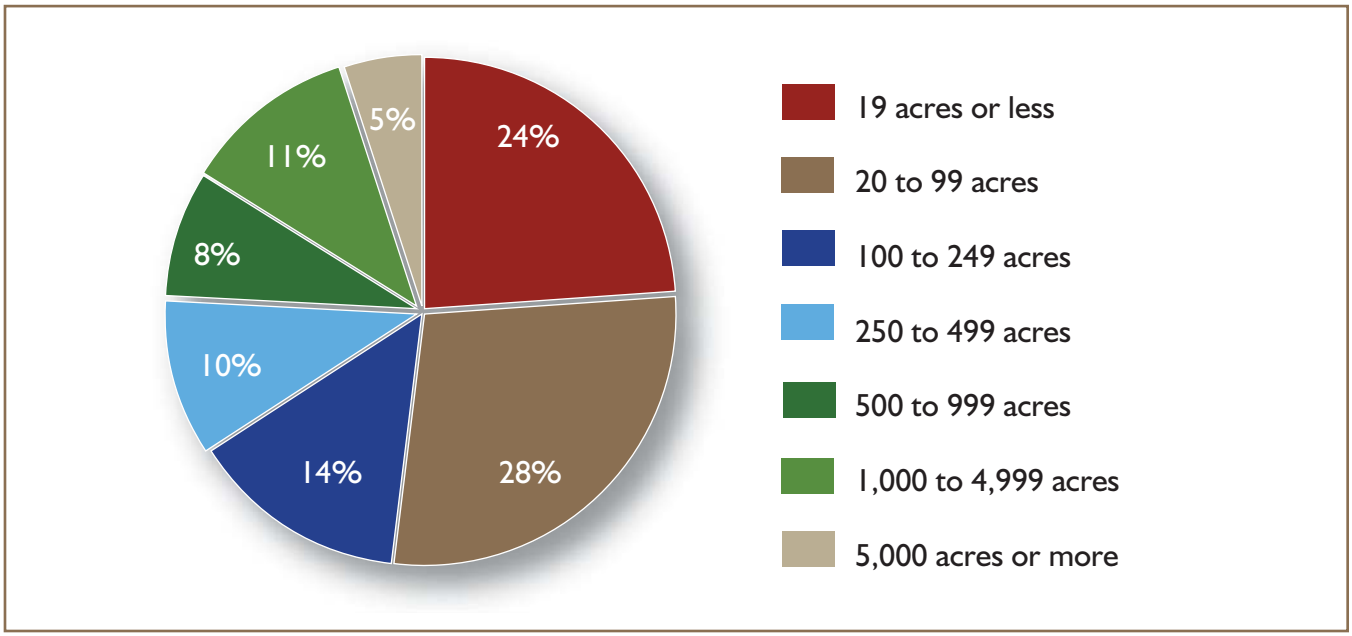


Table 1

Sources of weed spread onto lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Items are sorted in order of decreasing importance to agricultural producers.

	Agricultural Producers		Weed Managers on Public Lands	
Sources of Weed Spread	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Waterways (streams, irrigation ditches, canals, etc.)	1	63.9	3	73.1
Neighbor's property (public or private lands)	2	60.2	4	71.2
Roads, railways or utility corridors	3	38.1	1	88.5
Contaminated products (hay, straw, seed, fill material, etc.)	4	32.8	7	50.0
Livestock (cattle, horses, etc.)	5	24.7	5	59.6
Vehicles or equipment	6	22.5	2	82.7
Wildlife	7	16.9	8	25.0
Visitors or recreational land-users	8	11.1	5	59.6

Susan Donaldson, University of Nevada Cooperative Extension

Earl Creech, Utah State University

Farmers and ranchers and public agency personnel alike identified waterways as important sources of weed spread. Many weed seeds can easily be transported by surface water and deposited downstream or through irrigation canals.

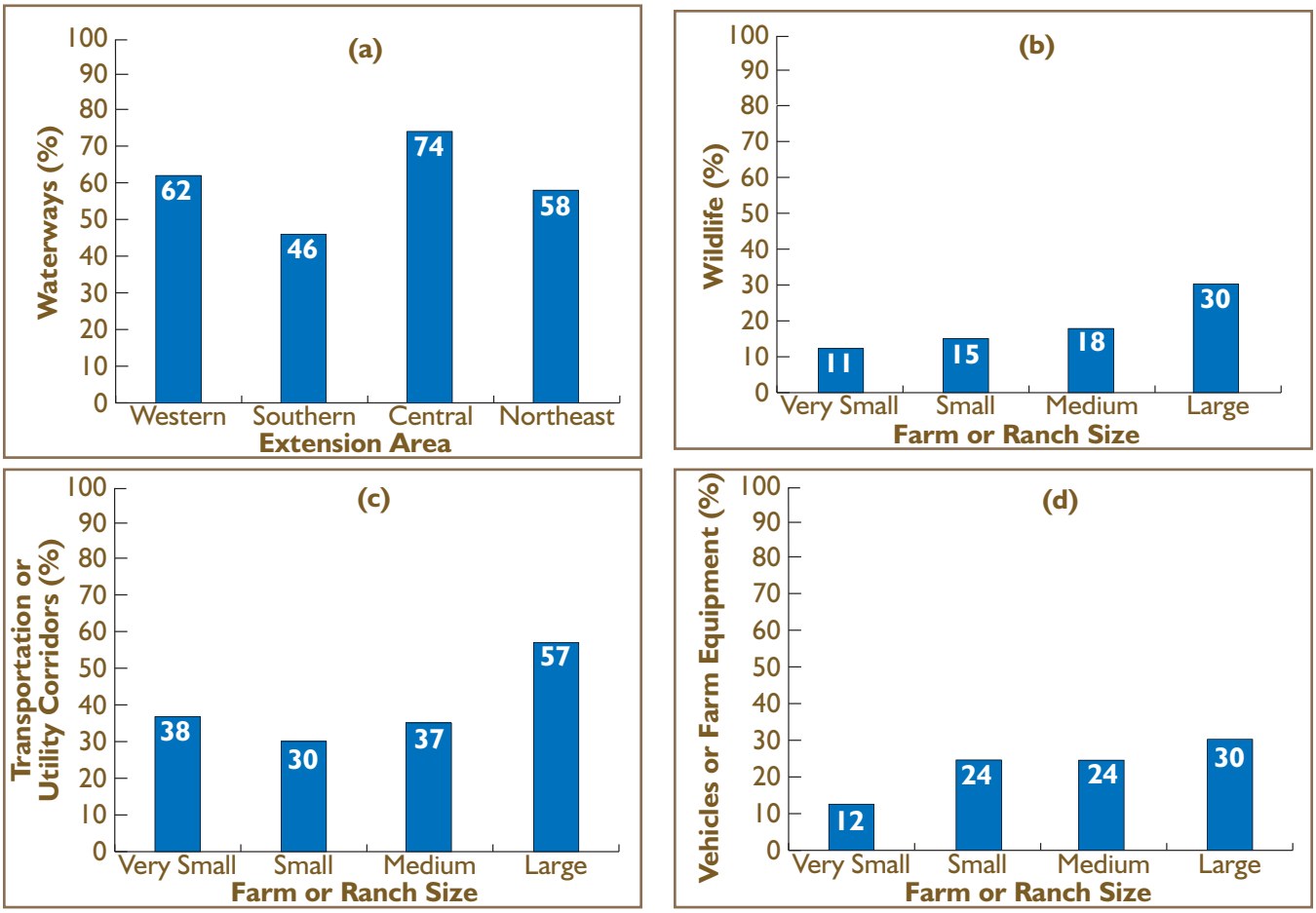
Farmers and ranchers in the Central Area were most likely to list waterways as an important source of weed spread (Figure 5). This is not surprising: farmers in major crop-producing areas in the Central Area, such as Fallon, Lovelock and Yerington, rely extensively on flood irrigation from surface water and water can convey weed seed. Additionally, ranchers irrigate most of their hay crop with water from local streams and rivers. Farmers in other areas tend to draw much of their irrigation water from wells. The movement of seed in irrigation tailwater may be an overlooked problem on farms that use only well water. Producers who operate on more than 1,000 acres are more likely to view transportation/utility corridors, vehicles/equipment and wildlife as important paths of entry for weed seeds than their smaller counterparts. The larger size of these operations might increase the probability that their property would be traversed by a transportation corridor used by humans and/or animals.

Problems Caused by Weeds

On farms and ranches, the top three perceived problems caused by weeds were the cost of weed control (69 percent), reduced crop yield (57 percent) and increased risk of fire (47 percent) (Table 2). Producers were least concerned by impacts of weeds on recreational use (11 percent), wildlife habitat (18 percent) and soil erosion (20 percent). In contrast, weed manag-

Figure 5

Sources of weeds that spread onto lands managed by agricultural producers (n=746) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Data in figure 1a is presented by Extension area [Western (n=123), Southern (n=76), Central (n=319) and Northeast (n=179)]. Data in figures 1b, 1c and 1d are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].



Nathan Belliston, Uinta County Weed Department

Earl Creech, Utah State University

Puncturevine (*Tribulus terrestris*) spreads along roadsides and is commonly transported via vehicle tires. Both producers who operate on more than 1,000 acres and public agency personnel view transportation and utility corridors and vehicles and equipment as important modes of weed entry.

Table 2

Problems caused by weeds on lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Sources of spread are sorted in order of decreasing importance to agricultural producers.

	Agricultural Producers		Weed Managers on Public Lands	
Problems caused by weeds	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Cost of weed control	1	68.6	5	78.4
Reduced growth of crops or desirable plants	2	57.2	1	86.3
Increased risk of fire	3	46.7	3	82.4
Loss of productive grazing	4	44.9	9	43.1
Loss of income or revenue	5	43.7	13	9.8
Reduced water availability	6	32.5	7	52.9
Loss of scenic value	7	29.2	7	52.9
Injury to humans (thorns, allergies, rashes, etc.)	8	28.2	11	19.6
Decreased property values	9	28.0	12	15.7
Loss of biodiversity	10	23.6	2	84.3
Increased soil erosion	11	19.9	6	58.8
Loss of wildlife habitat	12	17.9	3	82.4
Reduced recreational use	13	10.6	10	31.4
Decreased resource values	—	—	—	—

Earl Creech, Utah State University

Dyers woad (*Isatis tinctoria*) out-competes alfalfa for water, light and nutrients, causing a reduction in yields. Producers indicated that reduced crop yields and the cost of weed control measures were important problems caused by weeds.

ers for government agencies listed reduced growth of desirable plants (86 percent), loss of biodiversity (84 percent), loss of wildlife habitat and increased risk of fire (82 percent each) as their most important problems caused by weeds. Not surprisingly, very few agency weed managers view loss of revenue (10 percent) or decreased property values (16 percent) as important problems.

The location of an agricultural operation within Nevada had no effect on producers' perceptions of the problems caused by weeds (data not shown); perceptions did differ by farm size. Farmers/ranchers with operations larger than 1,000 acres expressed more concern about the cost of weed control, reduced crop/forage yield, loss of productive grazing and loss of income than were producers with smaller operations (Figure 6). It stands to reason that producers with larger acreages are more likely to rely on their farm or ranch for their livelihood and so are more concerned about the profitability of the operation than smaller

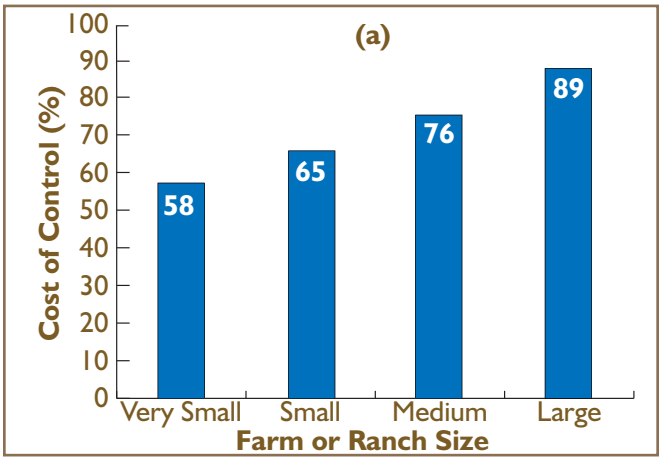
Jeff Amberger

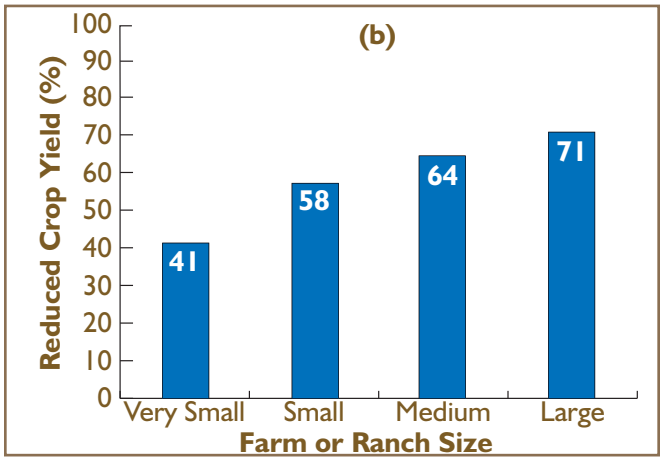
Producers and public agency personnel consider the risk of wildfire to be one of the greatest problems caused by weeds.

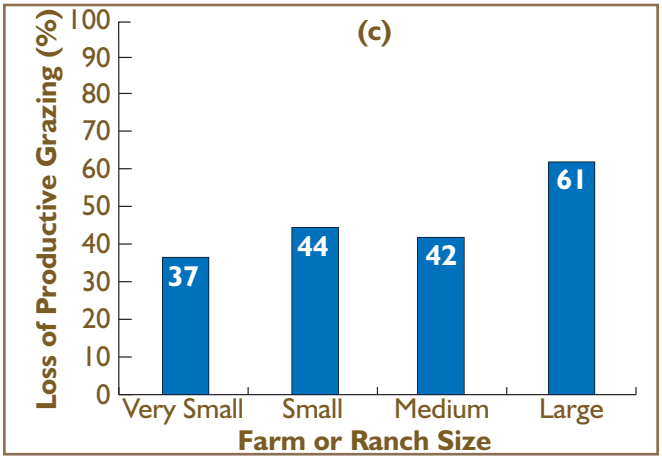
operators who often farm or ranch part-time. Small farmers (19 or less acres) were most likely to rank injury to people as a high importance, although only 38 percent did so. Their level of concern about injury to people is similar to their concern about losses in crop yield, productive grazing and income.

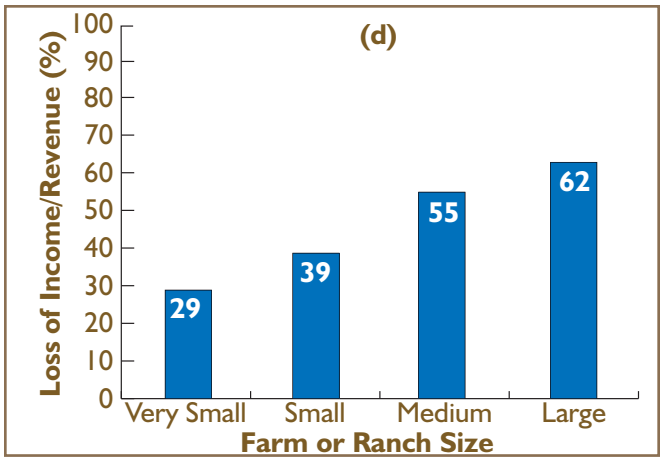
Figure 6

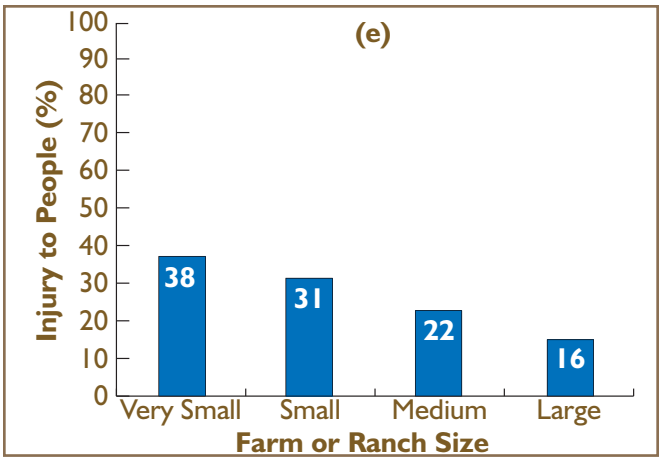
Problems caused by weeds on lands managed by agricultural producers (n=746) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Data are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].











Hoary cress (*Cardaria draba*) was listed as one of the five most problematic weeds for agricultural producers in all Nevada regions except the Southern Area.

Nathan Belliston, Uinta County Weed Department

Obstacles to Weed Management

Nevada's farmers and ranchers perceive their neighbors (62 percent), time/labor constraints (60 percent) and lack of effective control methods (56 percent) to be their greatest obstacles to weed management (Table 3). Public land managers, on the other hand, were most troubled by lack of time/labor (76 percent), lack of money (72 percent) and lack of public awareness (68 percent). Conversely, relatively few agricultural producers or public land weed managers thought that their weed control efforts were hindered by government restrictions, absence of a weed-management plan, poor coordination, or lack of knowledge.

In this survey, large agricultural producers (1,000 or more acres) were more likely to feel that poor coordination between public and private lands hindered their weed control efforts (Figure 7). This is especially

Brad Schultz, University of Nevada Cooperative Extension

Tumbleweeds (Russian thistle: *Salsola iberica*) commonly collect along fence lines. Sixty-two percent of Nevada's farmers and ranchers perceive their neighbors to be their greatest obstacles to weed-management. Weed seeds from neighboring farms, homesteads, public lands and roadways can easily cross boundary lines.

Table 3

Obstacles to weed management on lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Items are sorted in order of decreasing importance to agricultural producers.

	Agricultural Producers		Weed Managers on Public Lands	
Obstacles to weed management	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Neighbors with uncontrolled weeds	1	61.6	4	56.0
Lack of time or labor	2	59.6	1	76.0
Lack of effective control methods	3	55.9	6	46.0
Lack of money	4	49.6	2	72.0
Lack of public awareness or weeds	5	46.6	3	68.0
Negative public perception of herbicides	6	44.6	5	52.0
Lack of knowledge or training	7	40.3	8	26.0
Poor coordination between public and private lands	8	40.0	7	30.0
Absence of a weed-management plan	9	37.7	10	12.0
Restrictions, policies or regulations imposed by government agencies	10	31.0	9	22.0

pronounced in the Northeast Area, which has the highest average farm size in the state (data not shown). Large operations, particularly ranches, are often geographically isolated, sometimes bordered on all sides by public lands and often have large grazing allotments on public lands. Consequently, these producers are more likely than smaller producers to interact with public land managers and have their operations impacted by adjoining public lands. Another impediment identified by larger producers was lack of time and labor.

The Four Cornerstones of Weed Management

Successful weed-management programs have comprehensive efforts across four areas: prevention, detection, control and restoration (Dewey, 2003). Agricultural producers responded that prevention and control are similarly important (89 percent) but indicated that detection (73 percent) and restoration (62 percent) are less important (Table 4). More than 89 percent of agency personnel reported that prevention, detection

Figure 7

Obstacles to weed management on lands managed by agricultural producers (n=746) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Data are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].

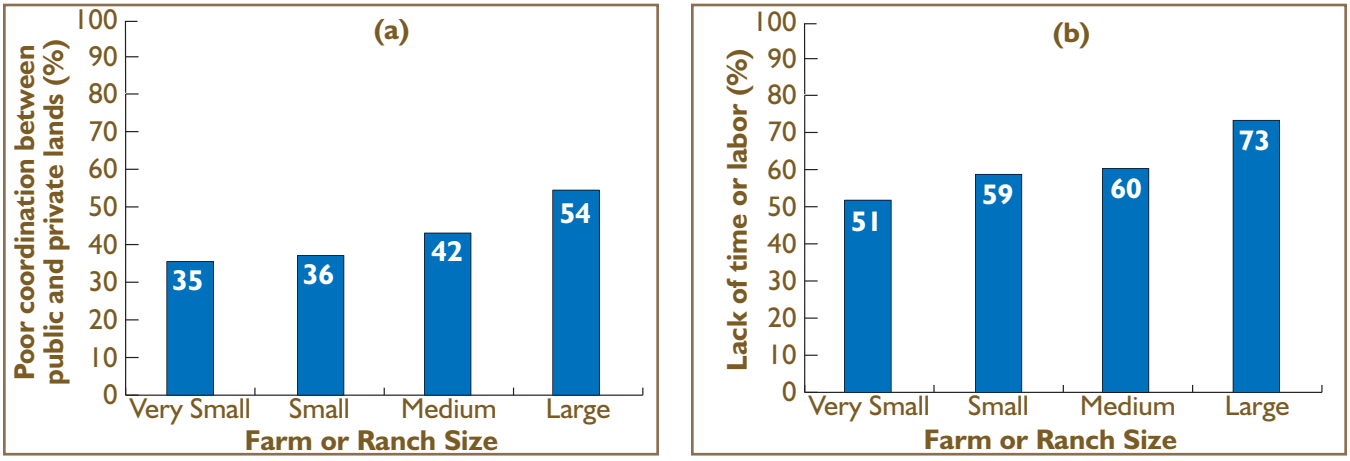


Table 4

Approaches to weed management on lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Items are sorted in order of decreasing importance to agricultural producers.

	Agricultural Producers		Weed Managers on Public Lands	
Approaches to weed management	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Prevent weed invasion/spread	1	89.2	1	91.5
Control weeds	2	89.1	2	89.4
Detect or scout for weeds	3	72.9	2	89.4
Establish competitive crops or other plants to exclude weeds; restore disturbed sites	4	662.2	4	68.1

and control were important but, similar to the agricultural producers, restoration was rated less important (68 percent). The reason for the comparatively low importance placed on restoration in weed-management efforts by respondents to both surveys is unknown. However, successful restoration is essential to preventing weed re-invasion and promotes the long-term success of any weed-management effort.

In the agricultural producer survey, very small producers (19 or less acres) were less likely to see restoration as important compared to those with larger operations (Figure 8). This trend was particularly pronounced in the Western Area, where a high proportion of small operations are based (data not shown). The relative lack of emphasis on restoration by small operators could be due to a lack of knowledge and experience. The discrepancy in responses between very small producers and producers running larger operations could also be due to the scale of the operation. Control and restoration on 19 acres or less is much less costly and is less of a commitment than doing the same on larger operations. It is equally likely that their operations are planted in such a way that revegetation is not a viable option; many smaller operations focus on harvesting edible crops.

Susan Donaldson, University of Nevada Cooperative Extension

Successful restoration is essential to preventing weed re-invasion and promotes the long-term success of any weed-management effort.

Prevention

Respondents to both the agricultural producer and agency surveys indicated that their most important weed prevention practices were scouting for new weed invasions and controlling new weeds immediately – a collection of practices commonly known as early detection and rapid response (Table 5). For agricultural producers, the third most important preventive methods is to work to control weeds on their neighbors land (45 percent). Public agency personnel, however, responded that employees and co-workers need to be aware of or knowledgeable about weeds (79 percent), a component of early detection that facilitates rapid response. Of least importance to both survey groups was quarantining grazing animals. Among agricultural producers, other low-ranking practices were visitor, land-user, employee and co-worker awareness about how weeds spread. Conversely, public agencies placed low emphasis on working with neighbors to control weeds.

Figure 8

Revegetation as a means of weed management by agricultural producers (n=746) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Data are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].

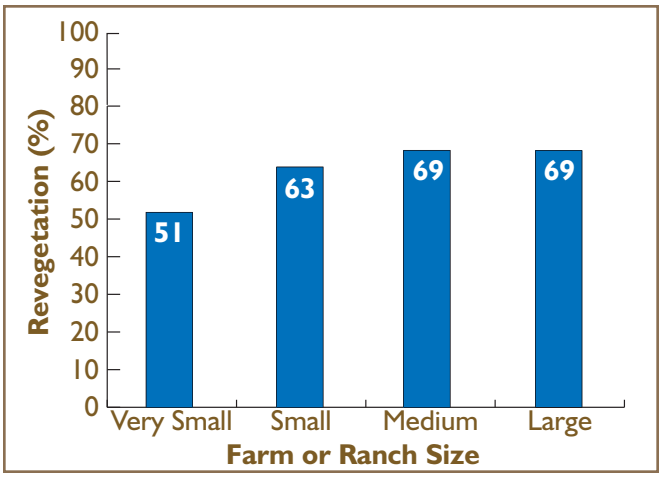


Table 5

Methods of weed prevention on lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Items are sorted in order of decreasing importance to agricultural producers.

	Agricultural Producers		Weed Managers on Public Lands	
Methods of weed prevention	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Control new weeds immediately	1	79.8	2	83.0
Scout for new weed infestations	2	64.9	1	91.5
Work to control weeds on neighbor's property	3	44.5	7	38.3
Use weed-free hay, straw, seed or fill material	4	43.6	5	61.7
Clean equipment or vehicles contaminated with weed seed	5	42.1	4	76.6
Employee or co-worker awareness of weed spread	6	31.8	3	78.7
Visitor or land-user awareness of weed spread	7	25.6	6	57.4
Quarantine grazing animals	8	11.7	8	21.3

Daniel Putnam, © 2008 Regents of the University of California

Vince Davis

Cleaning contaminated vehicles and equipment is an important part of weed prevention.

Among agricultural producers, those with medium to large enterprises (250 or more acres) were more likely to clean contaminated vehicles or equipment as a means of weed prevention (Figure 9). For both groups, only 50 to 55 percent of respondents placed a high priority on these actions. Large producers (1,000 or more acres) indicated that educating visitors and employees about weed prevention was a higher priority than those with smaller acreages, but only 40 percent responded so.

Detection

Casual scouting (i.e., scouting for weeds while doing other tasks) was the highest rated weed detection method by agricultural producers (73 percent), followed by monitoring high-risk areas (roads, waterways and feedlots:64 percent), and using farm/ranch staff (58 percent) (Table 6). Fewer than 15 percent of producers indicated a high importance for using volunteers to scout for weeds, using GIS/GPS technology, formal scouting procedures (using transects or zig-zag pattern) or using a professional consultant or technician. Agency survey respondents rated monitoring high-risk areas and using agency employees as highest priority (91 percent each) followed by using GPS or GIS technology. Less important practices for agencies were using volunteers, professional consultants or technicians and formal scouting procedures. Overall, the percentage of agency personnel ranking these methods of weed detection as important was higher than the percentage of agricultural producers who ranked them as important. The larger the agricultural operation, the more likely producers were to use the farm/ranch staff and to monitor high risk areas as weed detection tactics (Figure 10).

Figure 9

Methods of weed prevention on lands managed by agricultural producers (n=746) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Data are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].

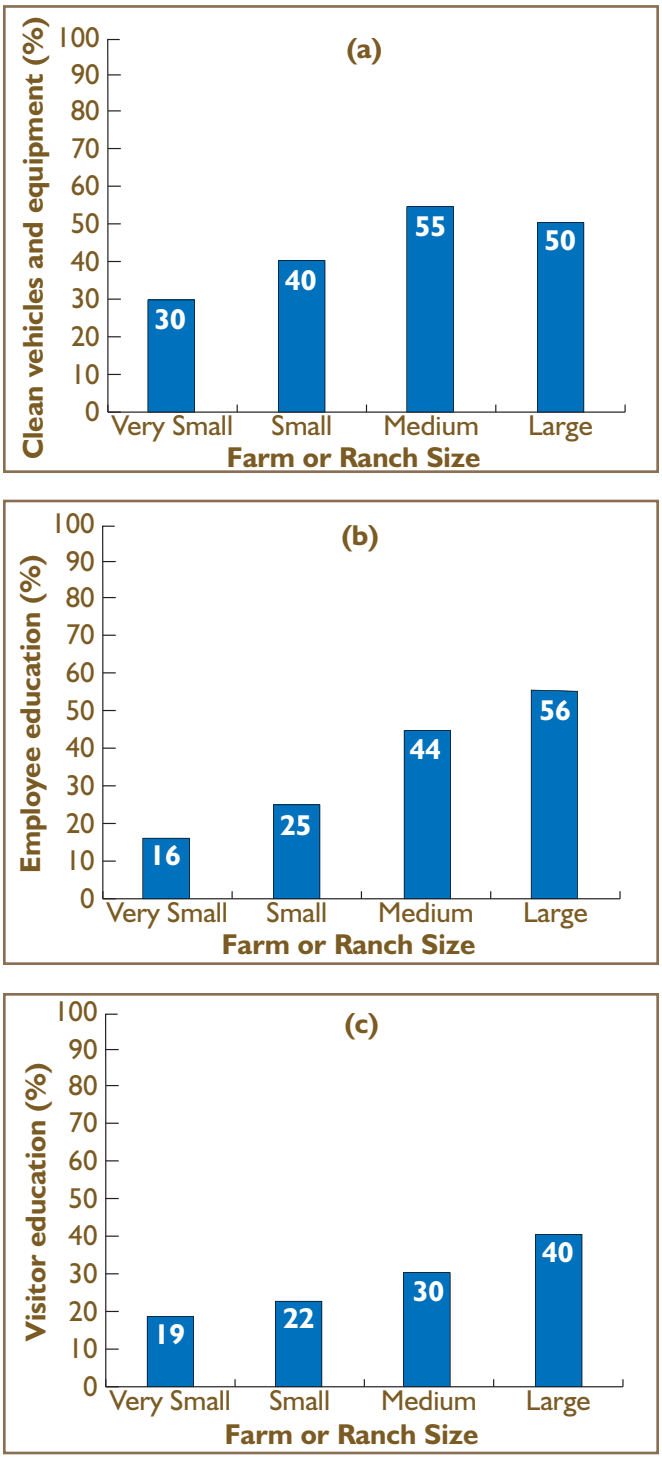


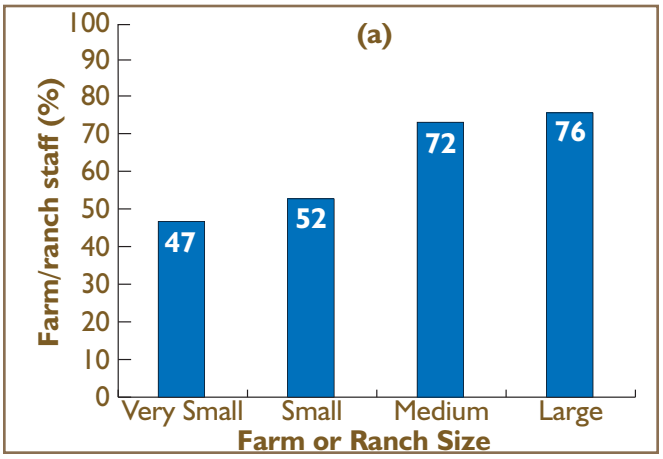
Table 6

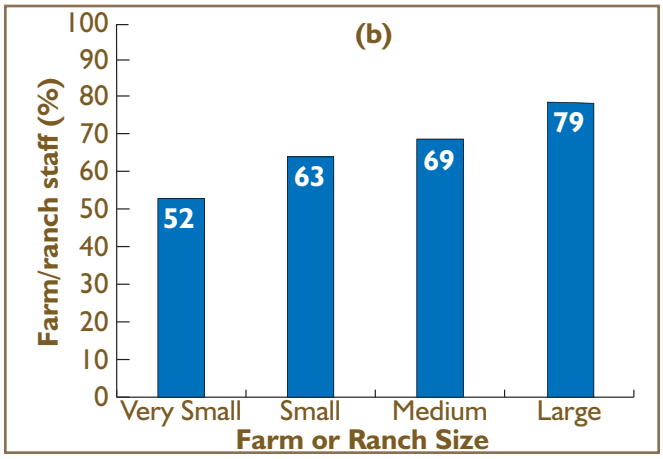
Methods of weed detection on lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate or high importance. Items are sorted in order of decreasing importance to agricultural producers.

	Agricultural Producers		Weed Managers on Public Lands	
Methods of weed detection	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Casual scouting (scout while doing other tasks)	1	72.9	4	82.6
Monitor high-risk areas (roads, waterways, feedlots, etc.)	2	64.0	1	91.3
Scout using farm/ranch staff/agencies employees	3	58.4	1	91.3
Scout using a professional consultant or technician	4	13.5	6	30.4
Formal scouting (use transects or zig-zag pattern)	5	9.9	5	43.5
Use GPS or GIS technology	6	6.4	3	84.8
Scout using volunteers (recreationists or visitors)	7	4.4	7	28.3

Figure 10

Methods of weed detection on lands managed by agricultural producers (n=746) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Data are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].





Nathan Belliston, Uinta County Weed Department

Gerald E. Higginbotham, © 2008 Regents of the University of California

Daniel Putnam, © 2008 Regents of the University of California

Monitoring high risk areas, such as waterways, feedlots and stackyards is a key component to detection of new weed invasions.

Control

Both agricultural producers (77 percent) and agency personnel (96 percent) rated herbicides as their most important method of weed control (Table 7). Controlled burning was of high importance to 61 percent of agricultural producers but only 26 percent of agency personnel. Agency weed specialists rated the use of competitive or desired plants as their second highest weed control method (76.1 percent). Hand-weeding was also considered to be of high importance to respondents of both surveys. Crop rotation and tillage were of highest importance for weed management in the Central Area, where crop production is the primary agricultural activity (data not shown).

Earl Creech, Utah State University

Both agricultural producers and agency personnel rated herbicides as their most important method of weed control above hand weeding, burning, crop rotation and tillage.

Table 7

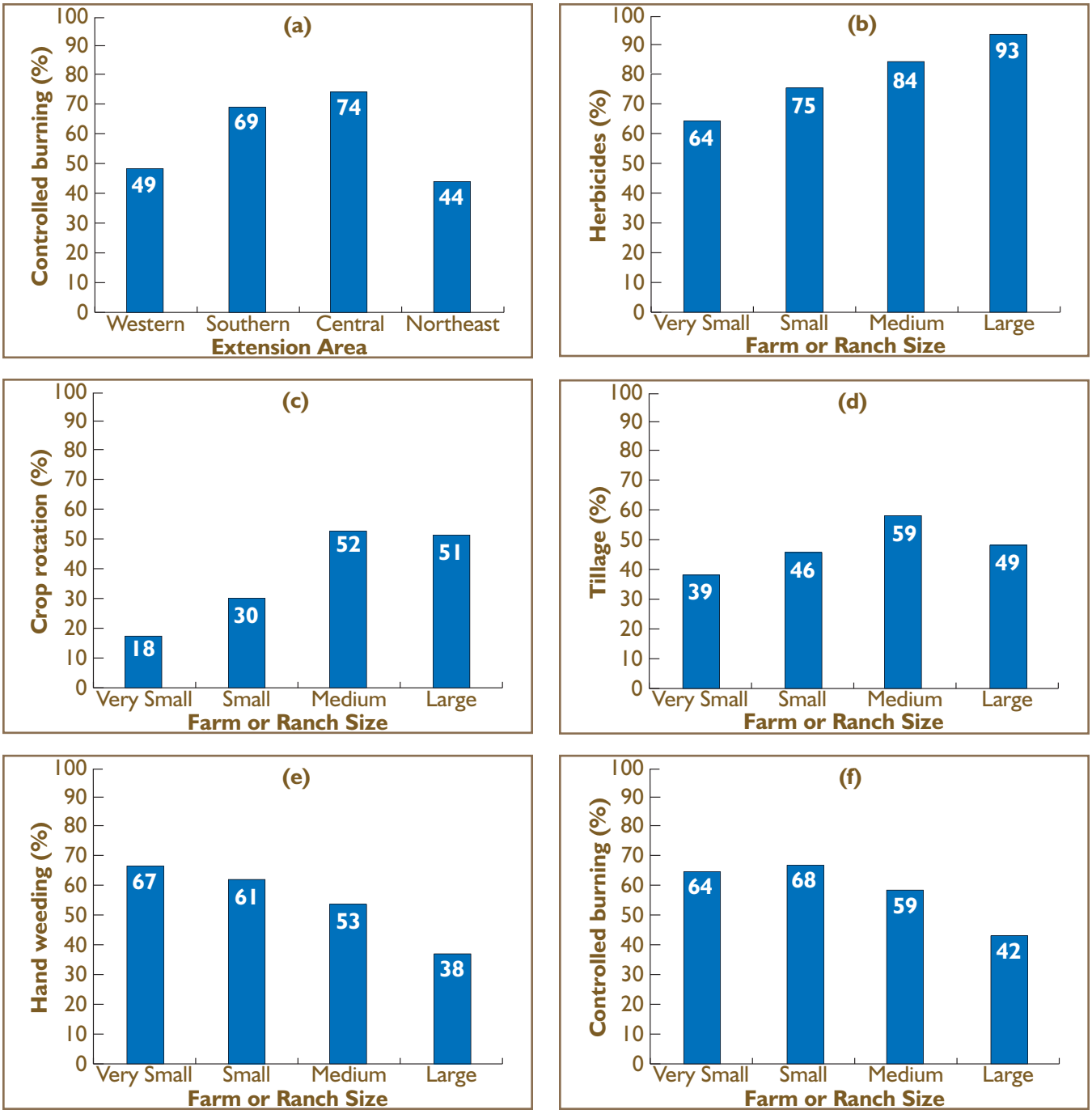
Methods of weed control on lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Items are sorted in order of decreasing importance to agricultural producers.

	Agricultural Producers		Weed Managers on Public Lands	
Methods of weed control	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Herbicides	1	77.1	1	95.7
Controlled burning	2	61.0	9	26.1
Hand-weeding	3	57.4	3	56.5
Mowing	4	55.7	5	37.0
Grazing	5	50.8	8	28.3
Tillage	6	47.5	10	17.4
Crop/desirable plant density or row spacing for weed suppression	7	41.1	6	34.8
Use competitive varieties of crops/desirable plants	8	38.1	2	76.1
Irrigation	9	37.0	12	8.7
Crop rotation	10	35.6	—	—
Select planting date that favors crops/desirable	11	32.1	4	54.3
Mulching	12	20.5	11	10.9
Insects	13	8.1	7	32.6
Microbes (pathogens, bacteria or nematodes)	14	5.6	13	4.3

The use of controlled burning was particularly high among producers in the Central and Southern Extension Areas, but less so in the Western and Northeast Areas (Figure 11). Extensive ditch systems in the Central Area may have contributed to an increased use of fire, whereas proximity to urban areas in the Western Area may have contributed to a decreased use of fire in that area of the state. Large producers were more likely to use herbicides, irrigation timing and crop rotation as weed control strategies. Medium-

Figure 11

Methods of weed control on lands managed by agricultural producers (n=746) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Data in figure 7c are presented by Extension area [Western (n=123), Southern (n=76), Central (n=319) and Northeast (n=179)]. Data in figures 11b, 11c, 11d, 11e and 11f are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].



sized growers (250-999 acres) regarded tillage with greater importance than other size classes, probably because the majority of these operations are located in the Central Area where crop production is the primary driver of the agricultural economy. In contrast, weed control through hand weeding and controlled burning were most important to smaller producers.

Deciding Which Herbicide to Use

Herbicide selection by agricultural producers was based primarily on specific weeds controlled by the herbicide (81 percent), familiarity with the herbicide (79 percent) and weed size/growth stage (76 percent) (Table 8). Agency personnel had similar concern for herbicide efficacy (94 percent) and timing (85 percent), but also rated potential to injury non-target plants (85 percent) and potential to contaminate water (83 percent) as highly important. Surprisingly, producers placed more emphasis on herbicide performance than cost. The criterion that was given the least importance by respondents to both surveys was the potential to cause herbicide-resistant weeds. Nevada is one of the few states in which an herbicide-resistant weed has not been confirmed (Heap, 2009). States such as

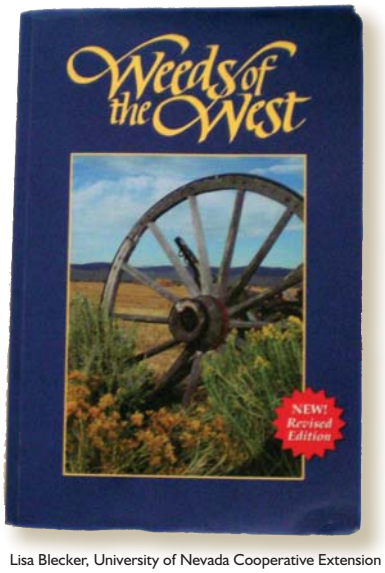
Table 8

Criteria for herbicide selection on lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance. Items are sorted in order of decreasing importance to agricultural producers.

	Agricultural Producers		Weed Managers on Public Lands	
Herbicide selection criteria	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Specific weeds controlled by the herbicide	1	81.4	1	93.5
Familiarity with the herbicide (used it before)	2	78.6	7	73.9
Weed size and growth stage (timing of application)	3	75.8	2	84.8
Potential injury to crops or non-target plants	4	69.8	2	84.8
Air conditions (temperature, humidity, wind)	5	68.0	6	76.1
Longevity of the herbicide in the soil (plant-back restrictions)	6	65.7	9	69.6
Potential to contaminate ground or surface water	7	64.6	4	82.6
Herbicide mode of action	8	60.8	8	71.7
Herbicide availability (in-stock at your local retailer)	9	58.6	12	41.3
Applicator safety	10	58.4	5	80.4
Cost of herbicide	11	55.5	14	32.6
Recommended by consultant or salesperson	12	54.3	11	41.3
Soil conditions (soil type, organic matter, moisture)	13	46.4	10	65.2
Potential to result in herbicide-resistant weeds	14	44.0	13	37.0

California, Illinois and Michigan, with a large number of confirmed resistant weeds tend to have large acreages of intensive crop production with extensive herbicide use. In contrast, less than 1 percent of the land area of Nevada is harvested cropland, over 90 percent of which is in forages where herbicides are rarely used.

Although herbicide-resistant weeds probably occur in Nevada, relatively low levels of herbicide use across the state limits selection pressure for resistant weeds. Consequently, Nevada weed managers place little emphasis on resistance when making herbicide decisions.



Lisa Blecker, University of Nevada Cooperative Extension

Lisa Blecker, University of Nevada Cooperative Extension

Weed identification resources are important to producers and public agency personnel in Nevada because the spectrum of weeds present is the first consideration when deciding which herbicide to use. Familiarity with the herbicide, timing and efficacy were also important in the decision-making process.

Lisa Blecker, University of Nevada Cooperative Extension

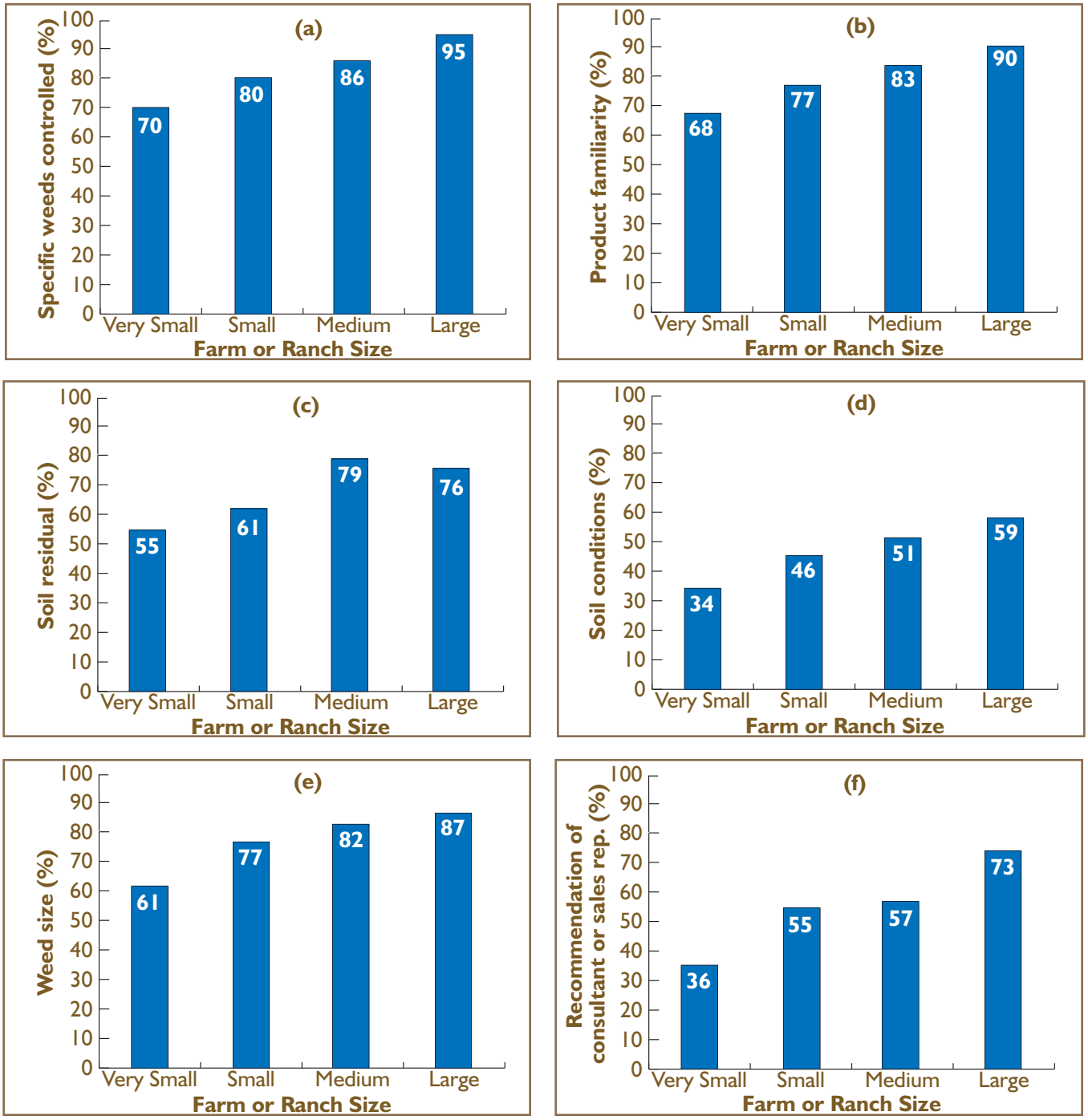
David Allan

Grasses like downy brome (cheatgrass: *Bromus tectorum*) are dry when temperatures are at their highest, increasing fire risk. As such, it is considered one of the most problematic weeds by both agency personnel and producers.

Although producers of all sizes considered many factors in their herbicide selection criteria, in general, larger producers seemed to place greater importance on each of these criteria for herbicide selection than those with smaller operations (Figure 12). Specific weeds to control, product familiarity, soil residual, soil conditions, weed size and the recommendation of a consultant/sales person increased in importance with farm/ranch size. It is important to keep in mind that a lower rating for one of these criteria does not neces-

Figure 12

Herbicide selection criteria for Nevada agricultural producers (n=746). The values represent the percentage of respondents who indicated moderate to high importance. Data in figures are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].



sarily mean the user does not think it is important. It may reflect that the criteria is not an issue in their situation.

Deciding When to Apply Herbicides

Agricultural producers and agency personnel both rated weed size/growth stage and environmental conditions (i.e., moisture, temperature and wind) as their most important criteria for determining the appropriate timing of a chemical application (Table 9). The third highest criterion for agricultural producers was weed density (71 percent) while agency personnel identified potential of weeds to injure non-target plants through competition (73 percent). Neither group used specific calendar dates, the Farmer's Almanac, or pressure from neighbors, the land-owner or visitors to any large extent.

Table 9

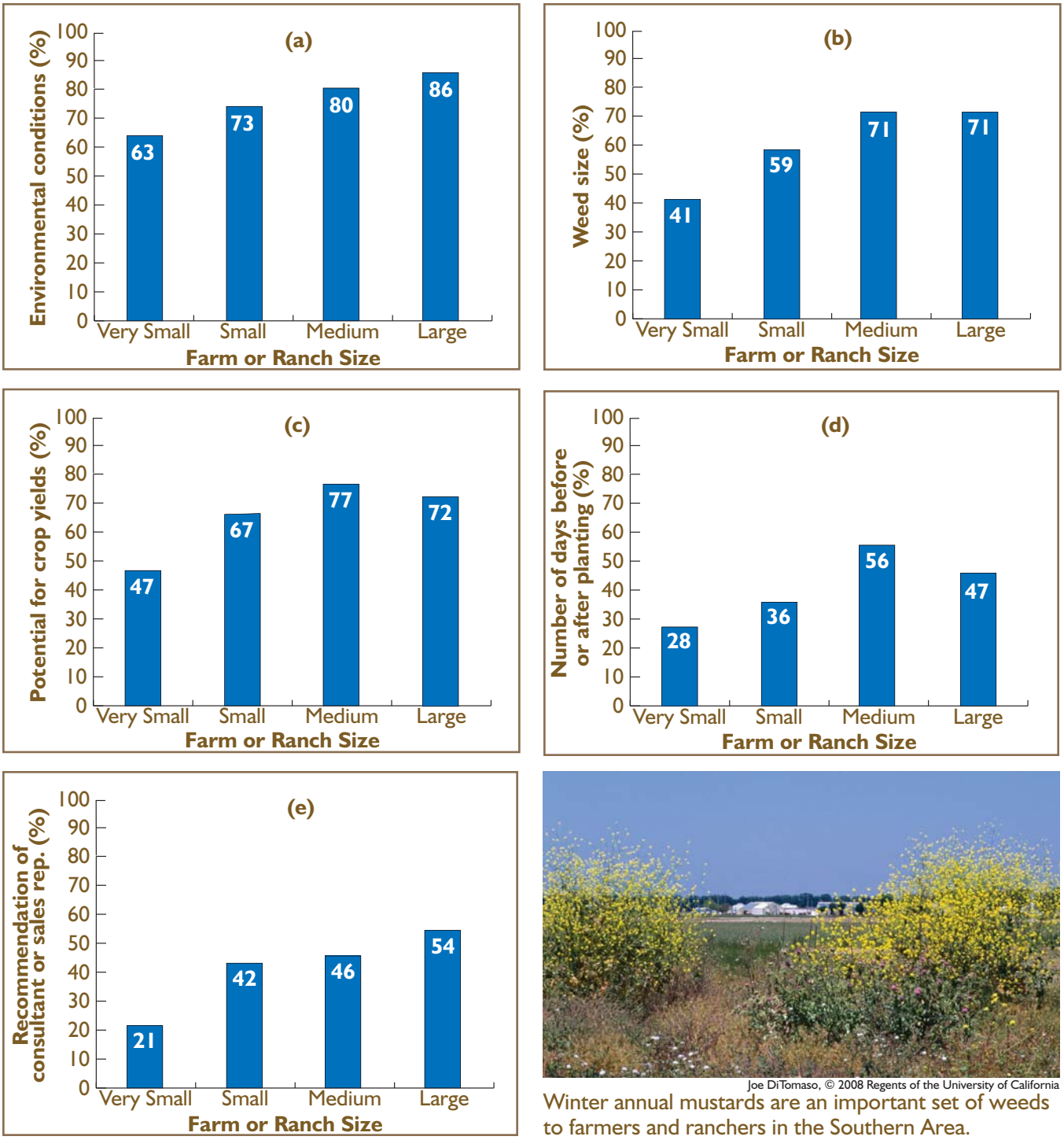
Criteria for timing of herbicide applications on lands managed by agricultural producers (n=746) and public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who indicated moderate to high importance.

	Agricultural Producers		Weed Managers on Public Lands	
Criteria for timing of herbicide applications	**Rank**	**Moderate to High Importance**	**Rank**	**Moderate to High Importance**
		%		%
Weed size or growth stage	1	80.4	1	88.9
Environmental conditions (moisture, temperature, wind, etc.)	2	74.4	2	84.4
Weed density (# of plants per unit area)	3	70.6	4	57.8
Potential for weeds to reduce growth of crops/ desirable plants	4	65.3	3	73.3
Crop/desirable plant size and growth stage	5	59.9	5	46.7
Recommendation of consultant or salesperson	6	40.5	7	24.4
Number of days before or after planting	7	40.0	6	31.8
Specific calendar date	8	13.3	8	22.2
Pressure from landowner, neighbors or visitors	9	5.8	9	20.0
Farmer's almanac	10	5.0	10	2.2

Similar to herbicide use decisions, larger producers were more likely to rate specific criteria for herbicide application timing as important as their smaller counterparts (Figure 13). Applications based on weed size, planting date restrictions, recommendation of a consultant/sales person, environmental conditions and potential for crop yield loss increased in importance with farm/ranch size.

Figure 13

Criteria for timing of herbicide applications for Nevada agricultural producers (n=746). The values represent the percentage of respondents who indicated moderate to high importance. Data are presented by farm or ranch size [Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114)].



Joe DiTomaso, © 2008 Regents of the University of California

Winter annual mustards are an important set of weeds to farmers and ranchers in the Southern Area.

Problematic Weeds

A list of common weeds was assembled through input from weed experts from across Nevada. This list included several blank lines for individuals to write any species that were not included on the list. Survey participants were asked to identify their five most problematic weeds.

Agency survey respondents rated hoary cress (53 percent), Russian knapweed (53 percent), perennial pepperweed (51 percent), saltcedar (49 percent) and downy brome (40 percent) as their five most problematic weeds (Table 10). Of the 18 weed species listed on two or more surveys, only downy brome and bull thistle are not included on the Nevada Noxious Weed List. The high likelihood that a problematic weed on public lands will also be a Nevada noxious weed is probably a function of the vastness of their lands coupled with limited budgets and labor, all of which force public land managers to focus their efforts on a few high priority species. Weeds on the Nevada Noxious

Table 10

Most problematic weeds on lands managed by public land weed managers (n=52) in Nevada. The values represent the percentage of respondents who listed the species as one of their five most problematic weeds. Only weeds listed on two or more surveys are included.

Weed Species		Rank	Problematic (%)
Common name	**Scientific name**		
Hoary cress	*Cardaria draba*	1	53.3
Russian knapweed	*Acroptilon repens*	1	53.3
Perennial pepperweed	*Lepidium latifolium*	3	51.1
Saltcedar	*Tamarix ramosissima*	4	48.9
Downy brome	*Bromus tectorum*	5	40.0
Scotch thistle	*Onopordum acanthium*	6	33.3
Canada thistle	*Cirsium arvense*	7	31.1
Leafy spurge	*Euphorbia esula*	8	24.4
African mustard	*Brassica tournefortii*	9	17.8
Spotted knapweed	*Centaurea biebersteinii*	9	17.8
Musk thistle	*Carduus nutans*	11	15.6
Bull thistle	*Cirsium vulgare*	12	13.3
Medusahead	*Taeniatherum caput-medusae*	12	13.3
Camelthorn	*Alhagi maurorum*	14	6.7
Diffuse knapweed	*Centaurea diffusa*	14	6.7
Yellow starthistle	*Centaurea solstitialis*	14	6.7
Crimson fountaingrass	*Pennisetum setaceum*	17	4.4
Dalmatian toadflax	*Linaria dalmatica*	17	4.4

Weed list are much more limited in distribution and are more likely to affect springs, meadows and riparian areas: all high-value habitat for wildlife and sensitive species. The more limited distribution and potential for impact make them a higher priority.

Agricultural producers and weed managers on public lands differed in their perception of problem weeds; the problematic weed list of agricultural producers was much more diverse (Table 11). Only 13 of the 36 problematic weed species of agricultural producers are listed as Noxious in the state of Nevada. The five species most commonly listed as problematic were hoary cress (42 percent), Russian thistle (41 percent), downy brome (40 percent), perennial pepperweed (40 percent) and foxtail barley (39 percent).

Table 11

Most problematic weeds on lands managed by agricultural producers (n=746) in Nevada. The values represent the percentage of respondents who listed the species as one of five most problematic weeds. Only weeds listed on four or more surveys are included.

Weed Species		Rank	Problematic (%)
Common name	**Scientific name**		
Hoary cress	*Cardaria draba*	1	41.9
Russian thistle	*Salsola iberica*	2	40.6
Downy brome	*Bromus tectorum*	3	40.4
Perennial pepperweed	*Lepidium latifolium*	4	39.5
Foxtail barley	*Hordeum jubatum*	5	38.7
Puncturevine	*Tribulus terrestris*	6	36.2
Cocklebur	*Xanthium strumarium*	7	29.1
Winter annual mustards	*Brassica* spp.	8	27.9
Russian knapweed	*Acroptilon repens*	9	23.5
Canada thistle	*Cirsium arvense*	10	21.6
Sandbur	*Cenchrus* spp.	11	19.9
Kochia	*Kochia scoparia*	12	18.3
Bull thistle	*Cirsium vulgare*	13	17.3
Scotch thistle	*Onopordum acanthium*	14	13.9
Field bindweed	*Convolvulus arvensis*	15	12.0
Leafy spurge	*Euphorbia esula*	16	9.7
Curlycup gumweed	*Grindelia squarrosa*	17	8.1
Yellow starthistle	*Centaurea solstitialis*	18	7.9
Dodder	*Cuscuta* spp.	19	7.4
Redstem filaree	*Erodium cicutarium*	20	6.8
Halogeton	*Halogeton glomeratus*	21	5.9
Musk thistle	*Carduus nutans*	22	5.5
Poison hemlock	*Conium maculatum*	23	5.3
Saltcedar	*Tamarix ramosissima*	24	4.8
Medusahead	*Taeniatherum caput-medusae*	25	1.9
Dyers woad	*Isatis tinctoria*	26	1.8
Common lambsquarters	*Chenopodium album*	27	1.1

Table 11 (continued)

Weed Species		Rank	Problematic (%)
Common name	**Scientific name**		
Curly dock	*Rumex crispus*	27	1.1
Wild iris	*Iris missoriensis*	27	1.1
Bur buttercup	*Ceratocephala testiculata*	30	1.0
Dandelion	*Taraxacum officinale*	30	1.0
Willow	*Salix* spp.	30	1.0
Rabbitbrush	*Chrysothamnus* spp.	33	0.8
Yellow nutsedge	*Cyperus esculentus*	33	0.8
Chicory	*Cichorium intybus*	35	0.7
Redroot pigweed	*Amaranthus retroflexus*	35	0.7
Bittersweet nightshade	*Solanum dulcamara*	37	0.5
Common burdock	*Arctium minus*	37	0.5
Common ragweed	*Ambrosia artemisiifolia*	37	0.5
Crazyweed	*Oxytropis* spp.	37	0.5
Lupine	*Lupinus* spp.	37	0.5
Russian-olive	*Elaeagnus angustifolia*	37	0.5

Producers' perceptions of problem weeds varied by Extension area. In the Western Area, downy brome (51 percent), Russian thistle (48 percent) and hoary cress (46 percent) were most problematic (Table 12). Foxtail barley (57 percent) ranked highest in the Southern Area, followed by Russian thistle (53 percent) and winter annual mustards (42 percent). In the Central Area, puncturevine (48 percent), perennial pepperweed (43 percent), foxtail barley and hoary cress (41 percent each) were reported as the primary weed problems. Hoary cress (52 percent), downy brome (50 percent) and perennial pepperweed (44 percent) were the highest ranking weed problems in the Northeast Area.

Table 12

Top 10 most problematic weeds of Nevada agricultural producers in the Western (n=123), Southern (n=76), Central (n=319) and Northeast (n=179) Extension areas. Respondents were asked to indicate their five most problematic weeds. Weeds are sorted in order of most to least problematic to agricultural producers in each area.

Western Area		Southern Area	
Weed species	**Problematic (%)**	**Weed Species**	**Problematic (%)**
Downy brome	51.2	Foxtail barley	56.6
Russian thistle	48.0	Russian thistle	52.6
Hoary cress	46.3	Winter annual mustards	42.1
Perennial pepperweed	41.5	Puncturevine	39.5
Foxtail barley	39.8	Downy brome	34.2
Puncturevine	39.0	Cocklebur	28.9
Canada thistle	35.8	Sandbur	22.4
Bull thistle	30.1	Russian knapweed	19.7
Russian knapweed	16.3	Field bindweed	17.1
Winter annual mustards	16.3	Hoary cress	17.1
Central Area		**Northeast Area**	
Weed species	**Problematic (%)**	**Weed Species**	**Problematic (%)**
Puncturevine	48.3	Hoary cress	52.0
Perennial pepperweed	43.3	Downy brome	50.3
Foxtail barley	40.8	Perennial pepperweed	44.1
Hoary cress	40.8	Russian thistle	43.0
Cocklebur	34.5	Canada thistle	36.3
Russian thistle	33.2	Scotch thistle	30.2
Downy brome	32.3	Cocklebur	29.1
Sandbur	30.1	Foxtail barley	29.1
Winter annual mustards	28.5	Winter annual mustards	26.8
Russian knapweed	27.9	Bull thistle	25.7

Grower perceptions of problematic weeds also differed by farm or ranch size. The largest producers (1,000 or more acres) ranked perennial pepperweed (53 percent), hoary cress (52 percent) and Russian knapweed (42 percent) as most troublesome (Table 13). These weed species are common in grass hay meadows in Nevada. Many Nevada ranchers produce grass hay and are among the states' larger producers. It is not surprising this group ranked these weeds as problematic. The relative importance of these species tended to decline as the size of the agricultural operation dropped. The smallest producers, those with 19 or fewer acres, listed Russian thistle (53 percent), puncturevine (48 percent) and foxtail barley (40 percent) as most problematic. Of these, only Russian thistle appeared in the top ten among the producers with greater than 1,000 acres.

Table 13

Top 10 most problematic weeds for Nevada agricultural producers by farm/ranch size. Size groupings were Very Small (1-19 acres; n=175), Small (20-249 acres; n=305), Medium (250-999 acres; n=138) and Large (1,000 or more acres; n=114). Respondents were asked to indicate their five most problematic weeds. Weeds are sorted in order of most to least problematic to agricultural producers at each farm or ranch size.

Very Small (1 - 19 acres)		Small (20 - 249 acres)	
Weed species	**Problematic (%)**	**Weed Species**	**Problematic (%)**
Russian thistle	52.6	Downy brome	43.3
Puncturevine	48.0	Hoary cress	41.6
Foxtail barley	40.0	Foxtail barley	39.7
Downy brome	34.9	Puncturevine	39.3
Sandbur	33.1	Perennial pepperweed	39.0
Hoary cress	31.4	Russian thistle	39.0
Cocklebur	26.9	Cocklebur	30.8
Perennial pepperweed	26.9	Winter annual mustards	29.5
Winter annual mustards	25.7	Canada thistle	20.7
Russian knapweed	12.6	Sandbur	20.3
Medium (250-999 acres)		**Large (1,000 plus acres)**	
Weed species	**Problematic (%)**	**Weed Species**	**Problematic (%)**
Foxtail barley	48.6	Perennial pepperweed	52.6
Downy brome	46.4	Hoary cress	51.8
Hoary cress	44.9	Russian knapweed	42.1
Perennial pepperweed	43.5	Scotch thistle	36.0
Russian thistle	37.7	Downy brome	33.3
Russian knapweed	33.3	Canada thistle	30.7
Winter annual mustards	31.2	Russian thistle	28.1
Puncturevine	29.0	Bull thistle	25.4
Canada thistle	28.3	Cocklebur	25.4
Cocklebur	28.3	Leafy spurge	23.7

Future program priorities

Survey participants were asked to identify their three highest priority education and research topics among a list of weed-related topics. The list was assembled through input from weed experts from across the western United States. Respondents were also prompted to add any topic of interest that was not included on the list. The purpose for asking this question was to establish priorities for future outreach/research programs.

Table 14 illustrates the results, listed in order from highest to lowest priority. The topic that producers selected most was weed control using herbicides (56 percent). The second most frequently selected topic was weed control using alternative methods (45 percent), followed by weed identification (39 percent) and preventing weed invasion and establishment (36 percent). Agency personnel most frequently selected revegetate disturbed sites to exclude weeds

Table 14

Priorities for research/outreach programs for Nevada agricultural producers (n=746) and public land weed managers (n=52) statewide. Respondents were asked to select their top three topics. Topics are sorted in order of highest to lowest priority.

Agricultural producers		Weed Managers on public lands	
Educational topic	**Priority (%)**	**Educational topic**	**Priority (%)**
Weed control using herbicides	56.3	Revegetate bare/disturbed sites to exclude weeds	45.2
Weed control using alternative methods	44.7	Weed control using alternative methods	42.9
Weed identification	38.9	Prevent weed invasion and establishment	35.7
Prevent weed invasion and establishment	35.8	Herbicide effects on the environment	31.0
Establish competitive crops/plants to exclude weeds	23.5	Integrate herbicides with alternative weed control	28.6
Integrate herbicides with alternative weed control methods	21.5	Weed control using herbicides	26.2
Manage herbicide resistant/tolerant weeds	16.8	Effect of weeds on resource values	19.0
Economics of weed control	11.8	Economics of weed control	16.7
Herbicide effects on the environment	11.8	Manage herbicide resistant/tolerant weeds	14.3
Effect of weeds on crop yield or livestock production	10.4	Weed identification	14.3
Sprayer calibration	10.3	Methods of scouting or mapping weeds	11.9
Methods for scouting or mapping weeds	6.0	Sprayer calibration	4.8

(45 percent), followed by weed control using alternative methods (43 percent), preventing weed invasion and establishment (36 percent) and herbicide effects on the environment (31 percent). The least frequent responses from both groups were sprayer calibration (10 percent and 5 percent in the producer and agency surveys, respectively) and methods for scouting/mapping weeds (6 percent and 12 percent in the producer and agency surveys, respectively).

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Public agency personnel consider salt cedar (*Tamarix ramosissima*) one of the top five most problematic weeds in Nevada. It is known to occur in all Nevada counties.

Earl Creech, Utah State University

Agency personnel and larger producers (1,000 acres or more) listed Russian knapweed (*Acroptilon repens*) as a top problematic weed.

Susan Donaldson, University of Nevada Cooperative Extension

Forty-five percent of producers surveyed indicated that weed control using alternative methods, such as biological control, should be a high priority education and research topic addressed by the UNCE. *Larinus* spp. (above) and *Cyphocleonus* spp. (below) are insect biological controls currently being used in Nevada to manage spotted knapweed (*Centaurea biebersteinii*).

Susan Donaldson, University of Nevada Cooperative Extension

Producers in all extension areas ranked weed identification, weed control using herbicides, weed control using alternative methods and preventing weed invasion and establishment in the top four, though they were ordered differently in each area (Table 15). Producers with 20 or more acres were most interested in weed control using herbicides while those with 19 or less acres placed highest priority on weed control using alternative (non-chemical) methods and weed identification (Table 16).

Table 15

Priorities for research/outreach programs for agricultural producers in the Western (n=117), Southern (n=75), Central (n=304) and Northeast (n=173) Extension areas. Respondents were asked to select their top three topics. Topics are sorted in order of highest to lowest priority in the Western Area.

Educational topic	Western Area		Southern Area		Central Area		Northeast Area	
	Rank	Priority (%)	Rank	Priority (%)	Rank	Priority (%)	Rank	Priority (%)
Weed identification	1	54.7	3	41.3	3	35.9	3	35.3
Weed control using herbicides	2	47.0	1	64.0	1	56.3	1	59.5
Weed control using alternative methods	3	46.2	2	42.7	2	43.1	2	48.0
Prevent weed invasion and establishment	4	41.9	4	33.3	4	34.9	3	35.3
Integrate herbicides with alternative weed control	5	24.8	5	14.7	6	21.7	6	22.5
Establish competitive crops/ plants to exclude weeds	6	19.7	5	14.7	5	27.3	5	24.9
Manage herbicide resistant/ tolerant weeds	7	12.8	5	14.7	7	18.8	7	19.1
Herbicide effects on the environment	8	12.0	9	13.3	11	9.9	8	13.9
Economics of weed control	9	6.8	9	13.3	9	11.5	9	12.1
Sprayer calibration	9	6.8	5	14.7	10	11.2	10	10.4
Effect of weeds on crop yield or livestock production	11	4.3	9	13.3	8	12.8	11	9.2
Methods for scouting or mapping weeds	11	4.3	12	8.0	12	4.9	12	6.4

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Russian thistle (*Salsola iberica*), a common tumbleweed, was listed as a top five most problematic weed by producers.

Table 16

Priorities for research/outreach programs for Nevada agricultural producers stratified by farm or ranch size. Size groupings were Very Small (1-19 acres; n=158), Small (20-249 acres; n=298), Medium (250-999 acres; n=135) and Large (1,000 or more acres; n=110). Respondents were asked to indicate their top three topics. Topics are sorted in order of highest to lowest priority.

Educational topic	Farm or ranch size							
	Very small		Small		Medium		Large	
	Rank	Priority (%)	Rank	Priority (%)	Rank	Priority (%)	Rank	Priority (%)
Weed control using alternative methods	1	50.0	2	41.9	2	39.3	2	46.4
Weed identification	2	48.7	2	41.9	4	29.6	4	30.9
Weed control using herbicides	3	44.3	1	56.7	1	63.7	1	60.9
Prevent weed invasion and establishment	4	36.7	4	37.9	4	29.6	3	34.5
Establish competitive crops/plants to exclude weeds	5	20.9	5	22.5	6	25.9	5	26.4
Integrate herbicides with alternative weed control methods	6	17.1	6	18.5	3	31.9	7	22.7
Herbicide effects on the environment	7	13.9	10	10.4	8	14.1	11	9.1
Manage herbicide resistant/tolerant weeds	8	11.4	7	14.4	7	20.7	6	25.5
Effect of weeds on crop yield or livestock production	9	10.8	11	9.4	10	11.1	9	11.8
Economics of weed control	10	8.9	9	10.7	8	14.1	9	11.8
Methods for scouting or mapping weeds	11	7.0	12	4.7	11	7.4	12	5.5
Sprayer calibration	12	6.3	8	12.4	12	5.9	8	15.5

Perennial pepperweed (*Lepidium latifolium*) was listed by the majority of agricultural producers and agency personnel as one of the top five most problematic weeds. It is found in all Nevada counties and grows along waterways, out-competing native vegetation.

Nathan Belliston, Uinta County Weed Department

CHAPTER FOUR

Conclusions and Recommendations

This report presents the results of the Nevada's 2008 Weed Management Extension Program Needs Assessment. While results of the needs assessment provide important information, they are not intended to be the only tool used to facilitate decision-making regarding future research and education outreach efforts. While this is the most comprehensive weed research and education program needs assessment completed on a statewide basis in Nevada, additional information from a variety of sources must also be considered. Such sources include, but are not limited to, industry trends, emerging issues from surrounding states and priorities identified in federal, regional and state government programs.

The results in this report can be classified into two general categories. First, they serve as a snapshot of the current challenges and management practices associated with weeds in Nevada. This information can assist UNCE personnel in

1) understanding the weed problems in Nevada,
2) identifying potential research and outreach needs (particularly those that may not have been recognized/stated as a need in the question on program priorities), and
3) providing baseline data for tracking changes in perceptions/behavior over time.

The second component of this report is stakeholder input on future research/outreach program priorities. This information will allow UNCE faculty to allocate resources in the most efficient and effective way in order to improve and expand current programs as well as create new programs.

In addition to UNCE internal use, this publication provides other colleges, agencies, organizations and individuals with critical and timely information about specific research and education needs of agricultural producers and weed managers on public lands in Nevada. Information in this publication provides insight into the weed-management challenges throughout Nevada and serves as a guide for program development.

Jean Dixon, University of Nevada Reno

The information gained from the needs assessment survey will allow UNCE faculty to allocate resources to improve and expand current programs as well as create new programs to address the needs identified in this report.

Additionally, there are some general observations that can be made, based on the results of the data analysis presented in the previous chapter.

First, the high response rate (30 percent) speaks to the importance of weeds to Nevada agricultural producers. In a 2006 survey, Nevada agricultural producers rated water issues as their top-ranked concern (Singletary & Smith, 2006), not surprising considering the arid nature of the state. However, weed control in that survey was ranked as a close second. Furthermore, a survey of community needs assessments published by University of Nevada Cooperative Extension personnel found that weeds were listed as a concern in Churchill, Lincoln and Carson City counties, as well as in the Tahoe Basin and Western Nevada (Carlos, et al., 1999; Holloway, 1999; Kocher & Coburn, 2007; Powell, 2004; and Skelly, Carignan & Christiansen, 2008). The high level of concern expressed by farmers and ranchers about weeds suggests that knowledge and education are in high demand and would be well received. For many years, UNCE faculty have been sensitive to educational needs about weeds and have often stepped outside of their area of expertise to conduct research, write publications and teach workshops on weed-related matters. In 2007, the first State Weed Specialist in many years was hired by UNCE to provide statewide leadership in weed outreach/research efforts.

Second, there is a vast difference in weed-management needs of agricultural producers and public agency personnel. In very few instances did perceptions and practices of farmers and ranchers agree with data collected from weed managers on public land. Much of this difference can be tied to roles and goals of individuals in each group. Agricultural producers rarely, if ever, specialize in weed management; they manage weeds in addition to handling all aspects of growing crops, raising livestock and directing the day-to-day challenges of running an agricultural enterprise. The primary goal of most agricultural operations is to be financially viable. In contrast, public agencies usually employ one or more individuals whose sole responsibility is to manage a weed control program. In addition, public land managers typically apply tax dollars to land management in ways that satisfy the general public, agency administrators and elected public officials. Due to the vast differences between the identified needs of agricultural producers and public land managers, research and outreach programs tailored to the individual groups may be more effective than joint programming.

Third, the perceptions, practices and needs among Nevada's agricultural producers often differ. The primary factor that can be used to separate these differences is size (acreage) of the operation; which may in fact segregate many farmers (smaller acreage) from ranchers (larger acreage). In general, large operators appear to be more knowledgeable about weeds and weed management and have greater concern over time and financial constraints than their smaller counterparts. As a result, each audience will probably require different outreach and research programs.

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APPENDIX A

Nevada Weed Management Extension Program Needs Assessment Questionnaire and Cover Letter

University of Nevada
Cooperative Extension

February 20, 2008

Dear Nevada Agricultural Producer,

This past year, I was hired as the State Weed Specialist for Cooperative Extension. My hiring stems from concerns expressed by Nevada farmers and ranchers regarding the rapid spread of noxious weeds and the need for more information and training on weed control.

My goal is to provide accurate and timely information that will improve your ability to control weeds on your operation. Your input is extremely important for me to focus my efforts in the areas that are of greatest need to Nevada's agricultural producers.

Enclosed is a 4-page questionnaire that asks questions about problematic weeds and several weed control issues. Completing the survey should take about 10 minutes of your time. After you complete the questionnaire, enclose it in the self-addressed and stamped envelope provided. Please return the completed survey by March 10.

Your participation is strictly voluntary. I assure you that your individual responses will be anonymous. The questionnaire contains no identifying marks and I request that you do not write your name on the questionnaire. Once I have summarized the responses from producers across the state, I will share it with you in a Cooperative Extension publication. No individual answers will be shared with anyone.

Please accept my thanks for your time in completing and returning the enclosed questionnaire. I work very hard to provide quality research and education programs to Nevadans and this survey will help strengthen my efforts. If you have any questions or concerns, please feel free to call me at 775-423-5121, or the University of Nevada, Reno Social Behavioral Institutional Review Board at 775-327-2368.

Sincerely,

Earl Creech

Earl Creech
State Weed Specialist
University of Nevada Cooperative Extension

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WEED CONTROL SURVEY FOR NEVADA AG PRODUCERS
University of Nevada Cooperative Extension
February 2008

Sections I - VII:

On a scale of 1 (low importance) to 5 (high importance), please circle the number that rates the importance of the following weed management issues.

	IMPORTANCE				
I. How do weeds spread onto your farm or ranch?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
1. Waterways (streams, irrigation ditches, canals, etc)	1	2	3	4	5
2. Roads, railways, or utility corridors	1	2	3	4	5
3. Neighbors property (public or private lands)	1	2	3	4	5
4. Wildlife	1	2	3	4	5
5. Livestock (cattle, horses, etc.)	1	2	3	4	5
6. Agricultural products (hay, straw, grain, seed, fill material, etc.)	1	2	3	4	5
7. Vehicles or farm equipment	1	2	3	4	5
8. Visitors or recreational land-users	1	2	3	4	5
II. What are the problems caused by weeds on your farm or ranch?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
9. Cost of weed control	1	2	3	4	5
10. Reduced crop yield	1	2	3	4	5
11. Loss of productive grazing (injury to livestock, reduced forage, etc.)	1	2	3	4	5
12. Decreased property values	1	2	3	4	5
13. Reduced water availability	1	2	3	4	5
14. Increased soil erosion	1	2	3	4	5
15. Loss of income	1	2	3	4	5
16. Loss of wildlife habitat	1	2	3	4	5
17. Loss of scenic value	1	2	3	4	5
18. Loss of biodiversity	1	2	3	4	5
19. Increased risk of fire	1	2	3	4	5
20. Reduced recreational use	1	2	3	4	5
21. Injury to humans (thorns, allergies, rashes, etc.)	1	2	3	4	5
III. What are the obstacles to your weed control efforts?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
22. Lack of money	1	2	3	4	5
23. Lack of effective control methods	1	2	3	4	5
24. Lack of training and skills in weed control	1	2	3	4	5
25. Lack of time or labor	1	2	3	4	5
26. Lack of public awareness of weeds	1	2	3	4	5
27. Negative public perception of herbicides	1	2	3	4	5
28. Neighbors with uncontrolled weeds	1	2	3	4	5
29. Absence of a weed management plan	1	2	3	4	5
30. Restrictions imposed by government agencies	1	2	3	4	5
31. Poor coordination between public and private lands	1	2	3	4	5

	IMPORTANCE				
IV. How important are the following approaches to your overall weed management program?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
32. Prevent weed invasion/spread	1	2	3	4	5
33. Detect or scout for weeds (including weed identification)	1	2	3	4	5
34. Control weeds (herbicides, grazing, burning, hand removal, etc.)	1	2	3	4	5
35. Establish competitive crops or other plants to exclude weeds	1	2	3	4	5
V. How important are the following practices on your farm or ranch?					
How do you prevent weed spread?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
36. Control weeds on neighbor's property (public or private land)	1	2	3	4	5
37. Clean equipment or vehicles contaminated with weed seed	1	2	3	4	5
38. Use weed free hay, straw, seed, or fill material	1	2	3	4	5
39. Quarantine grazing animals	1	2	3	4	5
40. Employee or co-worker awareness of weed spread	1	2	3	4	5
41. Visitor or land-user awareness of weed spread	1	2	3	4	5
42. Scout for new weed infestations	1	2	3	4	5
43. Control of new weeds immediately	1	2	3	4	5
How do you scout for new weed infestations?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
44. Scout using farm/ranch staff	1	2	3	4	5
45. Scout using a professional consultant or technician	1	2	3	4	5
46. Scout using volunteers (recreators or visitors)	1	2	3	4	5
47. Use GPS or GIS technology	1	2	3	4	5
48. Formal scouting procedure (use transects or zig-zag pattern)	1	2	3	4	5
49. Casual scouting procedures (scout while doing other tasks)	1	2	3	4	5
50. Monitoring high-risk areas (roads, waterways, feedlots, etc.)	1	2	3	4	5
How do you control weeds?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
51. Insects	1	2	3	4	5
52. Microbes (pathogens, bacteria, or nematodes)	1	2	3	4	5
53. Grazing	1	2	3	4	5
54. Herbicides	1	2	3	4	5
55. Irrigation	1	2	3	4	5
56. Crop rotation	1	2	3	4	5
57. Tillage	1	2	3	4	5
58. Hand-weeding	1	2	3	4	5
59. Mowing	1	2	3	4	5
60. Mulching	1	2	3	4	5
61. Controlled burning	1	2	3	4	5

	IMPORTANCE				
How do you use crops or other plants to exclude weeds?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
62. Plant competitive varieties	1	2	3	4	5
63. Adjust planting date to favor crop or desirable species	1	2	3	4	5
64. Density (# of plants per unit area) or row spacing to suppress weeds	1	2	3	4	5
VI. How do you decide which herbicide to use?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
65. Specific weeds controlled by the herbicide	1	2	3	4	5
66. Cost of herbicide	1	2	3	4	5
67. Potential to result in herbicide resistant weeds	1	2	3	4	5
68. Applicator safety	1	2	3	4	5
69. Potential injury to crops or non-target plants	1	2	3	4	5
70. Potential to contaminate ground or surface water	1	2	3	4	5
71. Familiarity with the herbicide (used it before)	1	2	3	4	5
72. Longevity of the herbicide in the soil (plant-back restrictions)	1	2	3	4	5
73. Air conditions (temperature, humidity, wind)	1	2	3	4	5
74. Herbicide mode of action	1	2	3	4	5
75. Soil conditions (soil type, organic matter, moisture)	1	2	3	4	5
76. Weed size and growth stage (timing of application)	1	2	3	4	5
77. Recommended by constultant or chemical sales rep.	1	2	3	4	5
78. Herbicide availability (in-stock at your local retailer)	1	2	3	4	5
VII. How do you decide when to apply herbicides?	**Low**	**Moderately Low**	**Neutral**	**Moderately High**	**High**
79. Weed size (height) and growth stage	1	2	3	4	5
80. Weed density (# of plants per unit area)	1	2	3	4	5
81. Crop (or non-target plant) size and growth stage	1	2	3	4	5
82. Number of days before or after planting	1	2	3	4	5
83. Specific calendar date	1	2	3	4	5
84. Farmer's almanac	1	2	3	4	5
85. Pressure from neighbors, land owner, or visitors	1	2	3	4	5
86. Recommendation of consultant or chemical sales rep.	1	2	3	4	5
87. Environmental conditions (moisture, temperature, wind)	1	2	3	4	5
88. Potential for weeds to cause crop yield loss	1	2	3	4	5

89. What are your **five most problematic weeds**? (check only 5)			
❑ Cheatgrass	❑ Halogeton Russian thistle	❑ Russian knapweed	❑ Thistle, Scotch
❑ Cocklebur	❑ Kochia (or alkali weed)	❑ Russian thistle (or tumbleweed)	❑ Yellow starthistle
❑ Dodder	❑ Leafy spurge	❑ Saltcedar (or tamarisk)	❑ Whitetop (or hoary cress)
❑ Dyer's woad	❑ Medusahead	❑ Sandbur	❑ Other:
❑ Field bindweed (or morningglory)	❑ Mustards, winter annual	❑ Tall whitetop (or perennial pepperweed)	❑ Other:
❑ Filaree	❑ Nutsedge	❑ Thistle, bull	❑ Other:
❑ Foxtail barley	❑ Poison hemlock	❑ Thistle, Canada	
❑ Gumweed (or tarweed)	❑ Puncturevine (or goathead)	❑ Thistle, musk	

90. How many total **acres** do you operate (not including public land allotments)?			
❑ 19 or less	❑ 100 to 249	❑ 500 to 999	❑ 5,000 or more
❑ 20 to 99	❑ 250 to 499	❑ 1,000 to 4,999	

91. Please select **three topics** that you would like to learn more about: (check only 3)			
❑ Weed control using herbicides	❑ Weed control using alternative methods (mowing, grazing, biocontrol, burning, etc.)	❑ Weed identification	❑ Other (please specify):
❑ Effect of weeds on crop yield or livestock production	❑ Integrate herbicides with alternative weed control methods	❑ Sprayer calibration	
❑ Herbicide effects on the environment	❑ Establish competitive crops/plants to exclude weeds	❑ Prevent weed invasion and establishment	
❑ Manage herbicide resistant/tolerant weeds	❑ Methods for scouting or mapping weeds	❑ Economics of weed control	

92. Please list the Nevada county(s) in which you deal with weeds:			
❑ Carson City	❑ Esmeralda	❑ Lyon	❑ Washoe
❑ Clark	❑ Eureka	❑ Mineral	❑ White Pine
❑ Churchill	❑ Humboldt	❑ Nye	
❑ Douglas	❑ Lander	❑ Pershing	
❑ Elko	❑ Linkcoln	❑ Story	

93. Please provide any additional comments in the space provided:

Thank you for completing this questionnaire. Please return the completed questionnaire in the self-addressed envelope provided, or mail to Earl Creech, UNCE State Extension Weed Specialist, 111 Sheckler Road, Fallon NV 89406.

APPENDIX B

Nevada Weed Management Extension Program Needs Assessment Questionnaire Responses by County

Tables B–1 through B–11

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
CHURCHILL COUNTY
N=164

Table B-1

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Waterways (streams, irrigation ditches, canals, etc)	1	86.6
Neighbors property (public or private lands)	2	57.5
Roads, railways, or utility corridors	3	36.4
Vehicles or farm equipment	4	25.8
Contaminated products (hay, straw, grain, seed, fill material, etc.)	5	25.3
Livestock (cattle, horses, etc.)	6	18.4
Wildlife	7	12.8
Visitors or recreational land-users	8	7.5
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	71.7
Reduced growth of crops or desirable plants (yield)	2	60.9
Increased risk of fire	3	44.3
Loss of productive grazing (injury to livestock, reduced forage, etc.)	4	43.4
Loss of income	5	42.6
Injury to humans (thorns, allergies, rashes, etc.)	6	33.8
Reduced water availability	7	33.3
Decreased property values	8	27.5
Loss of scenic value	9	26.5
Loss of biodiversity	10	18.4
Loss of wildlife habitat	11	16.8
Increased soil erosion	12	16.2
Reduced recreational use	13	8.1
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Neighbors with uncontrolled weeds	1	66.9
Lack of time or labor	2	56.2
Lack of effective control methods	3	52.9
Negative public perception of herbicides	4	48.3
Lack of money	5	44.7
Poor coordination between public and private lands	6	43.3
Lack of public awareness of weeds	7	43.2
Absence of a weed-management plan	7	43.2
Lack of knowledge or training	9	40.5
Restrictions, policies, or regulations imposed by government agencies	10	32.2

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
CHURCHILL COUNTY

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Control weeds (herbicides, grazing, burning, hand removal, etc.)	1	92.0
Prevent weed invasion/spread	2	91.1
Detect or scout for weeds	3	70.4
Establish competitive crops or other plants to exclude weeds	4	66.9
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	80.4
Scout for new weed infestations	2	63.2
Work to control weeds on neighbor's property	3	48.0
Clean equipment or vehicles contaminated with weed seed	4	45.5
Use weed free hay, straw, seed, or fill material	5	40.6
Employee or co-worker awareness of weed spread	6	27.5
Visitor or land-user awareness of weed spread	7	26.7
Quarantine grazing animals	8	13.5
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	1	69.1
Casual scouting procedures (scout while doing other tasks)	2	69.0
Scout using farm/ranch staff	3	49.7
Scout using a professional consultant or technician	4	13.8
Formal scouting procedure (use transects or zig-zag pattern)	5	10.9
Scout using volunteers (recreators or visitors)	6	6.2
Use GPS or GIS technology	7	5.4
How do you control weeds?	**Rank**	**Moderate to High Importance**
Controlled burning	1	79.9
Herbicides	2	77.1
Tillage	3	58.4
Mowing	3	58.4
Grazing	5	56.8
Hand-weeding	6	55.2
Crop rotation	7	50.7
Irrigation	8	37.3
Mulching	9	19.7
Insects	10	9.3
Microbes (pathogens, bacteria, or nematodes)	11	2.9

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
CHURCHILL COUNTY

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Density (# of plants per unit area) or row spacing to suppress weeds	1	47.7
Adjust planting date to favor crop or desirable species	2	41.5
Plant competitive varieties	3	39.2
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	78.9
Familiarity with the herbicide (used it before)	2	76.6
Weed size and growth stage (timing of application)	3	75.7
Potential injury to crops or non-target plants	4	75.5
Air conditions (temperature, humidity, wind)	4	75.5
Potential to contaminate ground or surface water	6	68.1
Longevity of the herbicide in the soil (plant-back restrictions)	7	67.6
Applicator safety	8	61.9
Herbicide availability (in-stock at your local retailer)	9	59.3
Herbicide mode of action	10	58.6
Cost of herbicide	11	57.4
Recommended by constultant or chemical sales rep.	12	55.9
Potential to result in herbicide resistant weeds	13	44.0
Soil conditions (soil type, organic matter, moisture)	14	41.7
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	84.5
Environmental conditions (moisture, temperature, wind)	2	78.2
Weed density (# of plants per unit area)	3	75.5
Potential for weeds to cause crop yield loss	4	75.2
Crop (or non-target plant) size and growth stage	5	69.1
Number of days before or after planting	6	50.7
Recommendation of consultant or chemical sales rep.	7	23.4
Specific calendar date	8	12.1
Farmer's almanac	9	5.0
Pressure from neighbors, land owner, or visitors	10	4.3

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
CHURCHILL COUNTY

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using herbicides	1	57.3
Weed control using alternative methods	2	40.9
Prevent weed invasion and establishment	3	34.1
Weed identification	4	30.5
Establish competitive crops/plants to exclude weeds	5	25.6
Integrate herbicides with alternative weed control methods	6	25.0
Manage herbicide resistant/tolerant weeds	7	18.3
Effect of weeds on crop yield or livestock production	8	14.0
Sprayer calibration	9	12.2
Economics of weed control	9	12.2
Herbicide effects on the environment	11	8.5
Methods for scouting or mapping weeds	12	4.3
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Puncturevine	1	53.7
Sandbur	2	50.0
Hoary cress (whitetop)	3	45.7
Perennial pepperweed (tall whitetop)	4	41.5
Cocklebur	5	40.9
Foxtail barley	6	39.6
Kochia	7	37.8
Winter annual mustards	8	31.1
Russian thistle	9	28.7
Downy brome (cheatgrass)	10	26.2
Russian knapweed	11	21.3
Curlycup gumweed	12	14.6
Filaree	13	12.8
Bull thistle	14	9.1
Dodder	14	9.1
Field bindweed	14	9.1
Canada thistle	17	6.7
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	25.6	
20 to 249 acres	50.6	
250 to 999 acres	18.3	
1,000 or more acres	5.5	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
CLARK AND LINCOLN COUNTIES
N=47

Table B-2

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Waterways (streams, irrigation ditches, canals, etc)	1	60.9
Neighbors property (public or private lands)	2	59.1
Contaminated products (hay, straw, grain, seed, fill material, etc.)	3	26.7
Roads, railways, or utility corridors	4	24.4
Vehicles or farm equipment	5	22.2
Livestock (cattle, horses, etc.)	6	20.9
Wildlife	7	20.5
Visitors or recreational land-users	8	15.9
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	64.4
Reduced growth of crops or desirable plants (yield)	2	60.9
Loss of productive grazing (injury to livestock, reduced forage, etc.)	3	40.0
Loss of income	3	40.0
Increased risk of fire	5	38.6
Reduced water availability	6	36.4
Decreased property values	7	31.1
Loss of scenic value	8	27.3
Injury to humans (thorns, allergies, rashes, etc.)	9	24.4
Loss of biodiversity	10	15.9
Increased soil erosion	11	14.0
Reduced recreational use	12	11.4
Loss of wildlife habitat	13	6.8
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Lack of effective control methods	1	58.7
Lack of money	2	53.3
Lack of knowledge or training	3	52.2
Lack of time or labor	3	52.2
Neighbors with uncontrolled weeds	5	46.7
Lack of public awareness of weeds	6	41.3
Absence of a weed management plan	7	37.8
Poor coordination between public and private lands	7	37.8
Negative public perception of herbicides	9	37.0
Restrictions, policies, or regulations imposed by government agencies	10	25.6

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
CLARK AND LINCOLN COUNTIES

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Prevent weed invasion/spread	1	93.3
Control weeds (herbicides, grazing, burning, hand removal, etc.)	2	91.3
Establish competitive crops or other plants to exclude weeds	3	68.2
Detect or scout for weeds	4	63.6
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	72.7
Scout for new weed infestations	2	54.5
Clean equipment or vehicles contaminated with weed seed	3	48.8
Work to control weeds on neighbor's property	4	41.9
Use weed free hay, straw, seed, or fill material	4	41.9
Employee or co-worker awareness of weed spread	6	16.3
Visitor or land-user awareness of weed spread	7	12.2
Quarantine grazing animals	8	7.0
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	68.9
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	2	59.5
Scout using farm/ranch staff	3	56.1
Formal scouting procedure (use transects or zig-zag pattern)	4	12.2
Scout using a professional consultant or technician	5	7.3
Scout using volunteers (recreators or visitors)	6	4.9
Use GPS or GIS technology	7	2.4
How do you control weeds?	**Rank**	**Moderate to High Importance**
Mowing	1	75.0
Controlled burning	2	73.9
Herbicides	3	69.8
Hand-weeding	4	58.1
Grazing	5	57.8
Tillage	6	51.1
Irrigation	7	48.8
Crop rotation	8	39.1
Mulching	9	29.3
Microbes (pathogens, bacteria, or nematodes)	10	10.3
Insects	11	5.0

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
CLARK AND LINCOLN COUNTIES

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Plant competitive varieties	1	53.5
Density (# of plants per unit area) or row spacing to suppress weeds	2	52.3
Adjust planting date to favor crop or desirable species	3	44.2
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	82.2
Familiarity with the herbicide (used it before)	2	77.8
Weed size and growth stage (timing of application)	3	77.3
Air conditions (temperature, humidity, wind)	4	72.7
Potential injury to crops or non-target plants	5	71.1
Longevity of the herbicide in the soil (plant-back restrictions)	6	66.7
Cost of herbicide	7	65.9
Herbicide mode of action	8	61.4
Herbicide availability (in-stock at your local retailer)	9	60.5
Potential to contaminate ground or surface water	10	60.0
Applicator safety	11	55.6
Soil conditions (soil type, organic matter, moisture)	12	53.3
Potential to result in herbicide resistant weeds	13	48.8
Recommended by constultant or chemical sales rep.	14	42.9
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	91.1
Weed density (# of plants per unit area)	2	77.3
Environmental conditions (moisture, temperature, wind)	3	66.7
Potential for weeds to cause crop yield loss	4	65.9
Crop (or non-target plant) size and growth stage	5	61.4
Number of days before or after planting	6	47.6
Recommendation of consultant or chemical sales rep.	7	31.8
Specific calendar date	8	25.6
Farmer's almanac	9	12.2
Pressure from neighbors, land owner, or visitors	10	7.0

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
CLARK AND LINCOLN COUNTIES

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using herbicides	1	66.0
Weed identification	2	42.6
Weed control using alternative methods	3	31.9
Prevent weed invasion and establishment	4	29.8
Effect of weeds on crop yield or livestock production	5	19.1
Establish competitive crops/plants to exclude weeds	5	19.1
Sprayer calibration	5	19.1
Integrate herbicides with alternative weed control methods	8	14.9
Manage herbicide resistant/tolerant weeds	9	12.8
Economics of weed control	10	10.6
Herbicide effects on the environment	11	8.5
Methods for scouting or mapping weeds	11	8.5
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Foxtail barley	1	63.8
Winter annual mustards	2	51.1
Russian thistle	2	51.1
Puncturevine	4	46.8
Cocklebur	5	40.4
Downy brome (cheatgrass)	6	38.3
Sandbur	7	31.9
Field bindweed	8	25.5
Kochia	8	25.5
Russian knapweed	10	19.1
Bull thistle	11	14.9
Saltcedar	12	10.6
Perennial pepperweed (tall whitetop)	12	10.6
Canada thistle	12	10.6
Yellow starthistle	12	10.6
Hoary cress (whitetop)	12	10.6
Scotch thistle	17	8.5
Leafy spurge	18	6.4
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	29.8	
20 to 249 acres	46.8	
250 to 999 acres	17.0	
1,000 or more acres	6.4	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
DOUGLAS AND CARSON CITY COUNTIES
N=68

Table B-3

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Neighbors property (public or private lands)	1	77.3
Waterways (streams, irrigation ditches, canals, etc)	2	71.4
Roads, railways, or utility corridors	3	32.8
Contaminated products (hay, straw, grain, seed, fill material, etc.)	4	25.8
Livestock (cattle, horses, etc.)	5	16.4
Vehicles or farm equipment	6	13.8
Wildlife	7	11.9
Visitors or recreational land-users	8	5.0
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	66.7
Reduced growth of crops or desirable plants (yield)	2	53.1
Loss of productive grazing (injury to livestock, reduced forage, etc.)	3	50.0
Loss of income	4	41.9
Increased risk of fire	4	41.9
Reduced water availability	6	32.3
Loss of scenic value	7	25.4
Increased soil erosion	8	24.6
Loss of wildlife habitat	9	24.2
Injury to humans (thorns, allergies, rashes, etc.)	10	23.8
Loss of biodiversity	11	18.0
Decreased property values	12	15.9
Reduced recreational use	13	10.2
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Neighbors with uncontrolled weeds	1	74.2
Lack of time or labor	2	55.4
Lack of effective control methods	3	53.8
Lack of public awareness of weeds	4	51.7
Negative public perception of herbicides	5	45.9
Lack of money	6	44.4
Absence of a weed management plan	7	41.9
Lack of knowledge or training	8	40.6
Poor coordination between public and private lands	9	38.1
Restrictions, policies, or regulations imposed by government agencies	10	29.5

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
DOUGLAS AND CARSON CITY COUNTIES

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Control weeds (herbicides, grazing, burning, hand removal, etc.)	1	90.6
Prevent weed invasion/spread	2	89.1
Detect or scout for weeds	3	78.7
Establish competitive crops or other plants to exclude weeds	4	58.3
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	84.6
Scout for new weed infestations	2	76.6
Work to control weeds on neighbor's property	3	52.5
Use weed free hay, straw, seed, or fill material	4	42.2
Clean equipment or vehicles contaminated with weed seed	5	36.5
Employee or co-worker awareness of weed spread	6	31.7
Visitor or land-user awareness of weed spread	7	24.6
Quarantine grazing animals	8	9.8
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	76.2
Scout using farm/ranch staff	2	61.7
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	3	58.5
Scout using a professional consultant or technician	4	21.1
Formal scouting procedure (use transects or zig-zag pattern)	5	15.5
Use GPS or GIS technology	6	5.2
Scout using volunteers (recreators or visitors)	7	3.4
How do you control weeds?	**Rank**	**Moderate to High Importance**
Herbicides	1	82.8
Hand-weeding	2	59.7
Mowing	3	58.7
Controlled burning	4	58.1
Grazing	5	53.1
Irrigation	6	40.0
Tillage	7	32.8
Crop rotation	8	21.4
Mulching	9	14.0
Insects	10	9.1
Microbes (pathogens, bacteria, or nematodes)	11	7.4

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
DOUGLAS AND CARSON CITY COUNTIES

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Plant competitive varieties	1	29.8
Density (# of plants per unit area) or row spacing to suppress weeds	1	29.8
Adjust planting date to favor crop or desirable species	3	17.5
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	86.9
Familiarity with the herbicide (used it before)	2	81.4
Weed size and growth stage (timing of application)	3	75.9
Potential injury to crops or non-target plants	4	72.9
Air conditions (temperature, humidity, wind)	5	66.7
Potential to contaminate ground or surface water	6	65.5
Herbicide mode of action	7	60.0
Applicator safety	8	59.6
Longevity of the herbicide in the soil (plant-back restrictions)	8	59.6
Herbicide availability (in-stock at your local retailer)	8	59.6
Recommended by constultant or chemical sales rep.	11	50.8
Potential to result in herbicide resistant weeds	12	47.3
Cost of herbicide	13	37.9
Soil conditions (soil type, organic matter, moisture)	14	32.7
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Environmental conditions (moisture, temperature, wind)	1	80.0
Weed size (height) and growth stage	2	78.7
Weed density (# of plants per unit area)	3	75.4
Potential for weeds to cause crop yield loss	4	69.0
Crop (or non-target plant) size and growth stage	5	51.8
Recommendation of consultant or chemical sales rep.	6	38.6
Number of days before or after planting	7	32.1
Specific calendar date	8	14.3
Pressure from neighbors, land owner, or visitors	9	7.1
Farmer's almanac	10	3.6

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
DOUGLAS AND CARSON CITY COUNTIES

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed identification	1	50.0
Weed control using herbicides	2	42.6
Weed control using alternative methods	2	42.6
Prevent weed invasion and establishment	4	35.3
Integrate herbicides with alternative weed control methods	5	23.5
Establish competitive crops/plants to exclude weeds	6	20.6
Manage herbicide resistant/tolerant weeds	7	11.8
Economics of weed control	8	7.4
Effect of weeds on crop yield or livestock production	9	5.9
Sprayer calibration	9	5.9
Herbicide effects on the environment	11	4.4
Methods for scouting or mapping weeds	11	4.4
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Canada thistle	1	57.4
Downy brome (cheatgrass)	2	45.6
Foxtail barley	3	44.1
Hoary cress (whitetop)	4	42.6
Perennial pepperweed (tall whitetop)	5	41.2
Puncturevine	6	39.7
Bull thistle	6	39.7
Russian thistle	8	38.2
Russian knapweed	9	25.0
Yellow starthistle	10	13.2
Winter annual mustards	11	11.8
Cocklebur	12	10.3
Filaree	12	10.3
Scotch thistle	12	10.3
Dodder	15	8.8
Field bindweed	15	8.8
Kochia	15	8.8
Musk thistle	15	8.8
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	29.4	
20 to 249 acres	44.1	
250 to 999 acres	20.6	
1,000 or more acres	5.9	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
ELKO COUNTY
N=106

Table B-4

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Waterways (streams, irrigation ditches, canals, etc)	1	70.9
Neighbors property (public or private lands)	2	61.4
Roads, railways, or utility corridors	3	55.6
Contaminated products (hay, straw, grain, seed, fill material, etc.)	4	39.2
Livestock (cattle, horses, etc.)	5	32.7
Vehicles or farm equipment	6	23.0
Wildlife	7	22.2
Visitors or recreational land-users	8	19.0
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	70.9
Reduced growth of crops or desirable plants (yield)	2	58.4
Loss of productive grazing (injury to livestock, reduced forage, etc.)	3	55.4
Increased risk of fire	4	46.0
Loss of scenic value	5	43.4
Loss of income	6	39.4
Loss of biodiversity	7	37.4
Reduced water availability	8	34.7
Decreased property values	9	33.7
Increased soil erosion	10	28.0
Injury to humans (thorns, allergies, rashes, etc.)	10	28.0
Loss of wildlife habitat	12	25.3
Reduced recreational use	13	14.3
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Lack of time or labor	1	67.0
Neighbors with uncontrolled weeds	2	62.7
Lack of effective control methods	3	56.9
Poor coordination between public and private lands	4	56.3
Lack of money	5	56.2
Lack of public awareness of weeds	6	56.0
Lack of knowledge or training	7	46.1
Negative public perception of herbicides	8	45.0
Absence of a weed management plan	9	35.0
Restrictions, policies, or regulations imposed by government agencies	10	34.7

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ELKO COUNTY

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Prevent weed invasion/spread	1	89.5
Control weeds (herbicides, grazing, burning, hand removal, etc.)	2	89.4
Detect or scout for weeds	3	75.7
Establish competitive crops or other plants to exclude weeds	4	62.7
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	80.4
Scout for new weed infestations	2	68.3
Work to control weeds on neighbor's property	3	50.5
Use weed free hay, straw, seed, or fill material	4	45.1
Employee or co-worker awareness of weed spread	5	44.0
Clean equipment or vehicles contaminated with weed seed	6	43.4
Visitor or land-user awareness of weed spread	7	37.4
Quarantine grazing animals	8	10.1
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	1	67.3
Casual scouting procedures (scout while doing other tasks)	2	65.7
Scout using farm/ranch staff	3	63.6
Scout using a professional consultant or technician	4	15.3
Use GPS or GIS technology	5	10.3
Formal scouting procedure (use transects or zig-zag pattern)	6	6.2
Scout using volunteers (recreators or visitors)	7	3.1
How do you control weeds?	**Rank**	**Moderate to High Importance**
Herbicides	1	81.2
Mowing	2	52.6
Hand-weeding	3	51.6
Grazing	4	48.4
Controlled burning	5	36.5
Irrigation	6	34.4
Tillage	7	23.4
Crop rotation	8	22.8
Mulching	9	15.2
Insects	10	6.6
Microbes (pathogens, bacteria, or nematodes)	11	4.4

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ELKO COUNTY

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Plant competitive varieties	1	27.6
Density (# of plants per unit area) or row spacing to suppress weeds	2	25.3
Adjust planting date to favor crop or desirable species	3	21.1
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	86.3
Familiarity with the herbicide (used it before)	2	78.8
Weed size and growth stage (timing of application)	3	77.0
Potential to contaminate ground or surface water	4	67.3
Air conditions (temperature, humidity, wind)	5	64.3
Herbicide mode of action	6	62.9
Applicator safety	7	62.2
Potential injury to crops or non-target plants	8	60.6
Herbicide availability (in-stock at your local retailer)	9	60.0
Longevity of the herbicide in the soil (plant-back restrictions)	10	59.8
Cost of herbicide	11	59.6
Recommended by constultant or chemical sales rep.	12	55.1
Soil conditions (soil type, organic matter, moisture)	13	47.4
Potential to result in herbicide resistant weeds	14	44.9
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	76.8
Environmental conditions (moisture, temperature, wind)	2	67.4
Weed density (# of plants per unit area)	3	65.7
Potential for weeds to cause crop yield loss	4	54.3
Crop (or non-target plant) size and growth stage	5	48.9
Recommendation of consultant or chemical sales rep.	6	33.0
Number of days before or after planting	7	21.3
Specific calendar date	8	8.5
Pressure from neighbors, land owner, or visitors	9	5.3
Farmer's almanac	10	2.1

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
ELKO COUNTY

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using herbicides	1	51.9
Weed control using alternative methods	2	50.9
Prevent weed invasion and establishment	2	32.1
Weed identification	4	30.2
Establish competitive crops/plants to exclude weeds	5	23.6
Integrate herbicides with alternative weed control methods	6	19.8
Herbicide effects on the environment	7	13.2
Manage herbicide resistant/tolerant weeds	7	13.2
Sprayer calibration	7	13.2
Effect of weeds on crop yield or livestock production	10	10.4
Economics of weed control	10	10.4
Methods for scouting or mapping weeds	12	7.5
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Hoary cress (whitetop)	1	54.7
Perennial pepperweed (tall whitetop)	2	53.8
Canada thistle	3	44.3
Scotch thistle	3	44.3
Downy brome (cheatgrass)	5	39.6
Russian thistle	5	39.6
Cocklebur	7	36.8
Leafy spurge	8	29.2
Bull thistle	9	24.5
Poison hemlock	10	17.9
Foxtail barley	11	17.0
Russian knapweed	11	17.0
Winter annual mustards	13	10.4
Musk thistle	13	10.4
Yellow starthistle	15	9.4
Halogeton	16	8.5
Kochia	16	8.5
Sandbur	16	8.5
Dyer's woad	19	5.7
Field bindweed	19	5.7
Curlycup gumweed	19	5.7
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	7.6	
20 to 249 acres	37.1	
250 to 999 acres	12.4	
1,000 or more acres	42.9	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
EUREKA AND LANDER COUNTIES
N=55

Table B-5

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Neighbors property (public or private lands)	1	63.5
Roads, railways, or utility corridors	2	51.0
Waterways (streams, irrigation ditches, canals, etc)	3	42.3
Contaminated products (hay, straw, grain, seed, fill material, etc.)	4	40.4
Vehicles or farm equipment	5	28.8
Livestock (cattle, horses, etc.)	6	22.0
Wildlife	7	14.0
Visitors or recreational land-users	8	9.8
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	79.6
Reduced growth of crops or desirable plants (yield)	2	60.4
Loss of income	3	53.8
Loss of productive grazing (injury to livestock, reduced forage, etc.)	4	41.2
Increased risk of fire	5	37.3
Decreased property values	6	31.4
Reduced water availability	7	28.8
Loss of scenic value	8	28.0
Loss of biodiversity	9	27.5
Injury to humans (thorns, allergies, rashes, etc.)	9	27.5
Increased soil erosion	11	19.6
Loss of wildlife habitat	11	19.6
Reduced recreational use	13	10.0
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Lack of time or labor	1	73.1
Negative public perception of herbicides	2	56.6
Neighbors with uncontrolled weeds	3	56.6
Lack of effective control methods	4	54.9
Poor coordination between public and private lands	5	52.9
Lack of money	6	52.8
Lack of public awareness of weeds	7	51.9
Restrictions, policies, or regulations imposed by government agencies	8	44.2
Lack of knowledge or training	9	42.0
Absence of a weed management plan	10	35.3

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
EUREKA AND LANDER COUNTIES

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Control weeds (herbicides, grazing, burning, hand removal, etc.)	1	92.6
Prevent weed invasion/spread	2	90.6
Detect or scout for weeds	3	81.1
Establish competitive crops or other plants to exclude weeds	4	79.2
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	94.5
Scout for new weed infestations	2	70.6
Clean equipment or vehicles contaminated with weed seed	3	56.6
Use weed free hay, straw, seed, or fill material	3	56.6
Employee or co-worker awareness of weed spread	5	48.0
Work to control weeds on neighbor's property	6	47.1
Visitor or land-user awareness of weed spread	7	43.1
Quarantine grazing animals	8	21.6
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	88.5
Scout using farm/ranch staff	2	71.2
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	3	65.4
Scout using a professional consultant or technician	4	23.1
Formal scouting procedure (use transects or zig-zag pattern)	5	11.5
Use GPS or GIS technology	6	7.8
Scout using volunteers (recreators or visitors)	7	0.0
How do you control weeds?	**Rank**	**Moderate to High Importance**
Herbicides	1	85.2
Tillage	2	64.2
Crop rotation	3	55.8
Hand-weeding	4	54.9
Irrigation	5	53.8
Mowing	6	53.7
Grazing	7	51.0
Controlled burning	8	47.2
Mulching	9	15.7
Insects	10	10.0
Microbes (pathogens, bacteria, or nematodes)	11	8.0

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EUREKA AND LANDER COUNTIES

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Density (# of plants per unit area) or row spacing to suppress weeds	1	61.5
Plant competitive varieties	2	54.7
Adjust planting date to favor crop or desirable species	3	51.9
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	86.0
Familiarity with the herbicide (used it before)	2	84.2
Potential injury to crops or non-target plants	3	80.4
Longevity of the herbicide in the soil (plant-back restrictions)	3	80.4
Weed size and growth stage (timing of application)	3	80.4
Potential to contaminate ground or surface water	6	72.5
Herbicide mode of action	6	72.5
Air conditions (temperature, humidity, wind)	8	70.6
Herbicide availability (in-stock at your local retailer)	9	68.6
Soil conditions (soil type, organic matter, moisture)	9	68.6
Cost of herbicide	11	66.7
Recommended by constultant or chemical sales rep.	12	63.5
Applicator safety	13	58.8
Potential to result in herbicide resistant weeds	14	51.0
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	78.4
Crop (or non-target plant) size and growth stage	2	78.0
Environmental conditions (moisture, temperature, wind)	3	76.0
Potential for weeds to cause crop yield loss	3	76.0
Weed density (# of plants per unit area)	5	74.0
Number of days before or after planting	6	60.0
Recommendation of consultant or chemical sales rep.	7	50.0
Specific calendar date	8	14.3
Pressure from neighbors, land owner, or visitors	9	10.2
Farmer's almanac	10	8.3

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
EUREKA AND LANDER COUNTIES

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using herbicides	1	67.3
Weed identification	2	36.4
Prevent weed invasion and establishment	2	36.4
Weed control using alternative methods	4	34.5
Integrate herbicides with alternative weed control methods	5	27.3
Manage herbicide resistant/tolerant weeds	6	25.5
Establish competitive crops/plants to exclude weeds	7	23.6
Economics of weed control	8	14.5
Herbicide effects on the environment	9	12.7
Sprayer calibration	10	9.1
Effect of weeds on crop yield or livestock production	11	5.5
Methods for scouting or mapping weeds	12	3.6
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Downy brome (cheatgrass)	1	60.0
Russian thistle	2	49.1
Hoary cress (whitetop)	2	49.1
Winter annual mustards	4	41.8
Russian knapweed	5	40.0
Perennial pepperweed (tall whitetop)	5	40.0
Foxtail barley	7	36.4
Canada thistle	8	34.5
Bull thistle	9	32.7
Kochia	10	30.9
Scotch thistle	11	20.0
Cocklebur	12	18.2
Musk thistle	13	14.5
Halogeton	14	12.7
Puncturevine	14	12.7
Leafy spurge	16	10.9
Field bindweed	17	9.1
Curlycup gumweed	17	9.1
Sandbur	17	9.1
Yellow starthistle	17	9.1
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	1.8	
20 to 249 acres	23.6	
250 to 999 acres	43.6	
1,000 or more acres	30.9	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
HUMBOLDT COUNTY
N=56

Table B-6

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Neighbors property (public or private lands)	1	75.5
Waterways (streams, irrigation ditches, canals, etc)	2	53.8
Roads, railways, or utility corridors	3	44.4
Contaminated products (hay, straw, grain, seed, fill material, etc.)	4	44.2
Livestock (cattle, horses, etc.)	5	41.5
Wildlife	6	34.0
Vehicles or farm equipment	7	30.2
Visitors or recreational land-users	8	15.1
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	72.9
Reduced growth of crops or desirable plants (yield)	2	67.3
Loss of productive grazing (injury to livestock, reduced forage, etc.)	3	59.6
Loss of income	4	58.8
Increased risk of fire	5	46.2
Decreased property values	6	41.5
Loss of scenic value	7	25.5
Loss of biodiversity	8	22.0
Reduced water availability	9	19.2
Loss of wildlife habitat	10	15.7
Injury to humans (thorns, allergies, rashes, etc.)	10	15.7
Increased soil erosion	12	15.4
Reduced recreational use	13	8.0
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Neighbors with uncontrolled weeds	1	69.8
Lack of time or labor	2	64.2
Lack of money	3	51.0
Lack of effective control methods	3	51.0
Lack of public awareness of weeds	5	44.2
Restrictions, policies, or regulations imposed by government agencies	6	38.5
Poor coordination between public and private lands	6	38.5
Negative public perception of herbicides	8	36.5
Absence of a weed management plan	9	35.3
Lack of knowledge or training	10	27.5

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IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Prevent weed invasion/spread	1	94.4
Control weeds (herbicides, grazing, burning, hand removal, etc.)	2	87.0
Detect or scout for weeds	3	81.1
Establish competitive crops or other plants to exclude weeds	4	66.0
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	88.7
Scout for new weed infestations	2	69.8
Clean equipment or vehicles contaminated with weed seed	3	61.5
Use weed free hay, straw, seed, or fill material	4	59.6
Employee or co-worker awareness of weed spread	5	46.0
Work to control weeds on neighbor's property	6	45.3
Visitor or land-user awareness of weed spread	7	26.9
Quarantine grazing animals	8	17.3
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	86.8
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	2	81.1
Scout using farm/ranch staff	3	65.4
Formal scouting procedure (use transects or zig-zag pattern)	4	17.6
Use GPS or GIS technology	5	13.5
Scout using a professional consultant or technician	6	7.8
Scout using volunteers (recreators or visitors)	7	7.7
How do you control weeds?	**Rank**	**Moderate to High Importance**
Herbicides	1	88.9
Controlled burning	2	66.0
Mowing	3	54.9
Tillage	4	53.8
Hand-weeding	5	52.8
Grazing	6	50.0
Crop rotation	7	40.0
Irrigation	8	36.0
Mulching	9	28.0
Insects	10	4.1
Microbes (pathogens, bacteria, or nematodes)	10	4.1

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HUMBOLDT COUNTY

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Density (# of plants per unit area) or row spacing to suppress weeds	1	50.0
Plant competitive varieties	2	45.1
Adjust planting date to favor crop or desirable species	3	29.4
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	86.5
Familiarity with the herbicide (used it before)	2	86.3
Weed size and growth stage (timing of application)	3	86.0
Longevity of the herbicide in the soil (plant-back restrictions)	4	78.4
Air conditions (temperature, humidity, wind)	5	74.5
Potential injury to crops or non-target plants	6	73.1
Potential to contaminate ground or surface water	7	69.2
Herbicide availability (in-stock at your local retailer)	8	68.6
Applicator safety	9	66.7
Recommended by constultant or chemical sales rep.	10	64.2
Herbicide mode of action	11	62.0
Potential to result in herbicide resistant weeds	12	58.0
Cost of herbicide	13	56.6
Soil conditions (soil type, organic matter, moisture)	14	46.0
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	92.3
Environmental conditions (moisture, temperature, wind)	2	82.4
Potential for weeds to cause crop yield loss	3	78.0
Weed density (# of plants per unit area)	4	74.5
Crop (or non-target plant) size and growth stage	5	66.7
Recommendation of consultant or chemical sales rep.	6	62.3
Number of days before or after planting	7	43.1
Specific calendar date	8	9.8
Pressure from neighbors, land owner, or visitors	9	5.9
Farmer's almanac	10	0.0

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
HUMBOLDT COUNTY

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using herbicides	1	48.2
Weed control using alternative methods	2	44.6
Weed identification	3	35.7
Manage herbicide resistant/tolerant weeds	4	30.4
Establish competitive crops/plants to exclude weeds	5	26.8
Integrate herbicides with alternative weed control methods	6	25.0
Prevent weed invasion and establishment	7	19.6
Economics of weed control	8	8.9
Effect of weeds on crop yield or livestock production	9	7.1
Methods for scouting or mapping weeds	9	7.1
Sprayer calibration	9	7.1
Herbicide effects on the environment	12	1.8
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Perennial pepperweed (tall whitetop)	1	51.8
Downy brome (cheatgrass)	2	46.4
Russian knapweed	3	44.6
Russian thistle	4	42.9
Hoary cress (whitetop)	5	41.1
Puncturevine	6	30.4
Cocklebur	7	26.8
Winter annual mustards	7	26.8
Canada thistle	9	23.2
Scotch thistle	10	19.6
Field bindweed	11	17.9
Leafy spurge	11	17.9
Foxtail barley	13	16.1
Kochia	14	10.7
Filaree	15	8.9
Halogeton	15	8.9
Sandbur	15	8.9
Bull thistle	15	8.9
Medusahead	19	7.1
Dodder	20	5.4
Saltcedar	20	5.4
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	16.1	
20 to 249 acres	30.4	
250 to 999 acres	14.3	
1,000 or more acres	39.3	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
LYON COUNTY
N=86

Table B-7

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Waterways (streams, irrigation ditches, canals, etc) lands)	1	65.8
Neighbors property (public or private	2	51.9
Roads, railways, or utility corridors	3	36.8
Contaminated products (hay, straw, grain, seed, fill material, etc.)	4	32.5
Livestock (cattle, horses, etc.)	5	26.0
Vehicles or farm equipment	6	22.2
Wildlife	7	16.7
Visitors or recreational land-users	8	6.8
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	65.9
Reduced growth of crops or desirable plants (yield)	2	55.1
Increased risk of fire	3	54.4
Loss of productive grazing (injury to livestock, reduced forage, etc.)	4	44.9
Loss of income	5	43.4
Loss of scenic value	6	37.3
Reduced water availability	7	35.5
Loss of biodiversity	8	35.1
Injury to humans (thorns, allergies, rashes, etc.)	9	34.2
Increased soil erosion	10	30.3
Decreased property values	11	24.7
Loss of wildlife habitat	12	21.3
Reduced recreational use	13	12.3
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Neighbors with uncontrolled weeds	1	61.0
Lack of time or labor	2	59.7
Lack of public awareness of weeds	3	51.9
Lack of money	4	50.0
Lack of effective control methods	4	50.0
Negative public perception of herbicides	6	44.7
Absence of a weed management plan	7	41.0
Restrictions, policies, or regulations imposed by government agencies	8	35.1
Lack of knowledge or training	9	32.9
Poor coordination between public and private lands	10	32.1

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
LYON COUNTY

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Control weeds (herbicides, grazing, burning, hand removal, etc.)	1	88.1
Prevent weed invasion/spread	2	81.7
Detect or scout for weeds	3	70.0
Establish competitive crops or other plants to exclude weeds	4	59.2

V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	77.4
Scout for new weed infestations	2	71.6
Work to control weeds on neighbor's property	3	39.5
Use weed free hay, straw, seed, or fill material	4	36.4
Employee or co-worker awareness of weed spread	5	28.9
Clean equipment or vehicles contaminated with weed seed	6	26.7
Visitor or land-user awareness of weed spread	7	18.4
Quarantine grazing animals	8	6.8
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	72.5
Scout using farm/ranch staff	2	66.7
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	3	66.2
Scout using a professional consultant or technician	4	12.2
Formal scouting procedure (use transects or zig-zag pattern)	5	11.0
Use GPS or GIS technology	6	6.9
Scout using volunteers (recreators or visitors)	7	4.1
How do you control weeds?	**Rank**	**Moderate to High Importance**
Controlled burning	1	72.0
Herbicides	2	69.7
Hand-weeding	3	59.5
Mowing	4	50.6
Tillage	5	50.0
Grazing	6	44.6
Crop rotation	7	34.7
Irrigation	8	33.8
Mulching	9	27.4
Insects	10	10.8
Microbes (pathogens, bacteria, or nematodes)	11	5.6

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
LYON COUNTY

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Density (# of plants per unit area) or row spacing to suppress weeds	1	44.2
Plant competitive varieties	2	37.7
Adjust planting date to favor crop or desirable species	3	35.1
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	84.4
Familiarity with the herbicide (used it before)	2	76.3
Weed size and growth stage (timing of application)	3	72.4
Potential injury to crops or non-target plants	4	69.4
Air conditions (temperature, humidity, wind)	5	65.8
Potential to contaminate ground or surface water	6	64.9
Longevity of the herbicide in the soil (plant-back restrictions)	7	63.0
Herbicide mode of action	8	57.7
Herbicide availability (in-stock at your local retailer)	9	56.2
Applicator safety	10	53.4
Cost of herbicide	11	51.4
Soil conditions (soil type, organic matter, moisture)	12	50.7
Potential to result in herbicide resistant weeds	13	47.9
Recommended by constultant or chemical sales rep.	14	46.6
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	76.6
Environmental conditions (moisture, temperature, wind)	2	72.6
Weed density (# of plants per unit area)	3	66.2
Potential for weeds to cause crop yield loss	4	56.2
Crop (or non-target plant) size and growth stage	5	54.9
Recommendation of consultant or chemical sales rep.	6	40.0
Number of days before or after planting	7	38.2
Specific calendar date	8	11.6
Pressure from neighbors, land owner, or visitors	9	4.3
Farmer's almanac	10	2.8

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
LYON COUNTY

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using herbicides	1	46.5
Weed control using alternative methods	2	41.9
Prevent weed invasion and establishment	3	33.7
Weed identification	4	30.2
Establish competitive crops/plants to exclude weeds	5	24.4
Manage herbicide resistant/tolerant weeds	6	18.6
Integrate herbicides with alternative weed control methods	7	16.3
Herbicide effects on the environment	8	12.8
Economics of weed control	9	11.6
Effect of weeds on crop yield or livestock production	10	10.5
Sprayer calibration	11	9.3
Methods for scouting or mapping weeds	12	5.8
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Puncturevine	1	52.3
Foxtail barley	2	50.0
Russian thistle	3	43.0
Downy brome (cheatgrass)	4	37.2
Perennial pepperweed (tall whitetop)	5	36.0
Winter annual mustards	6	31.4
Hoary cress (whitetop)	7	30.2
Cocklebur	8	22.1
Dodder	9	17.4
Russian knapweed	10	16.3
Field bindweed	11	15.1
Kochia	12	14.0
Sandbur	13	12.8
Filaree	14	11.6
Bull thistle	14	11.6
Canada thistle	14	11.6
Curlycup gumweed	17	8.1
Scotch thistle	17	8.1
Yellow starthistle	17	8.1
Leafy spurge	20	5.8
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	34.9	
20 to 249 acres	40.7	
250 to 999 acres	12.8	
1,000 or more acres	11.6	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
NYE, ESMERALDA AND MINERAL COUNTIES
N=46

Table B-8

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Neighbors property (public or private lands)	1	59.5
Contaminated products (hay, straw, grain, seed, fill material, etc.)	2	47.7
Waterways (streams, irrigation ditches, canals, etc)	3	36.8
Roads, railways, or utility corridors	4	23.8
Visitors or recreational land-users	5	22.0
Vehicles or farm equipment	6	19.0
Wildlife	7	15.0
Livestock (cattle, horses, etc.)	8	14.3
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	56.8
Reduced growth of crops or desirable plants (yield)	2	52.4
Increased risk of fire	3	48.8
Loss of income	4	34.1
Injury to humans (thorns, allergies, rashes, etc.)	5	31.8
Reduced water availability	6	31.7
Loss of productive grazing (injury to livestock, reduced forage, etc.)	7	31.0
Decreased property values	8	26.8
Loss of scenic value	8	26.8
Loss of biodiversity	10	21.2
Loss of wildlife habitat	11	14.6
Reduced recreational use	12	9.8
Increased soil erosion	13	7.1
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Lack of effective control methods	1	59.1
Neighbors with uncontrolled weeds	2	54.5
Lack of time or labor	3	50.0
Lack of public awareness of weeds	4	46.5
Negative public perception of herbicides	5	45.5
Lack of money	6	40.9
Poor coordination between public and private lands	7	38.1
Absence of a weed management plan	8	33.3
Lack of knowledge or training	9	32.6
Restrictions, policies, or regulations imposed by government agencies	10	25.6

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
NYE, ESMERALDA AND MINERAL COUNTIES

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Prevent weed invasion/spread	1	84.1
Control weeds (herbicides, grazing, burning, hand removal, etc.)	2	78.3
Detect or scout for weeds	3	72.1
Establish competitive crops or other plants to exclude weeds	4	52.4
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	76.7
Scout for new weed infestations	2	62.8
Use weed free hay, straw, seed, or fill material	3	45.2
Clean equipment or vehicles contaminated with weed seed	4	40.9
Employee or co-worker awareness of weed spread	5	37.2
Work to control weeds on neighbor's property	6	34.9
Visitor or land-user awareness of weed spread	7	19.0
Quarantine grazing animals	8	9.5
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	62.8
Scout using farm/ranch staff	2	58.1
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	3	51.2
Scout using volunteers (recreators or visitors)	4	17.5
Formal scouting procedure (use transects or zig-zag pattern)	5	10.0
Use GPS or GIS technology	6	9.8
Scout using a professional consultant or technician	7	2.5
How do you control weeds?	**Rank**	**Moderate to High Importance**
Controlled burning	1	62.2
Herbicides	2	56.8
Hand-weeding	3	52.4
Tillage	4	46.2
Grazing	5	41.0
Mowing	5	41.0
Irrigation	7	35.9
Crop rotation	8	28.2
Mulching	9	20.5
Insects	10	5.1
Microbes (pathogens, bacteria, or nematodes)	10	5.1

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
NYE, ESMERALDA AND MINERAL COUNTIES

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Plant competitive varieties	1	35.0
Density (# of plants per unit area) or row spacing to suppress weeds	2	34.1
Adjust planting date to favor crop or desirable species	3	22.0
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Familiarity with the herbicide (used it before)	1	78.0
Weed size and growth stage (timing of application)	2	68.4
Potential injury to crops or non-target plants	3	65.8
Specific weeds controlled by the herbicide	4	63.4
Applicator safety	5	61.5
Potential to contaminate ground or surface water	6	60.5
Longevity of the herbicide in the soil (plant-back restrictions)	6	60.5
Herbicide mode of action	8	56.4
Air conditions (temperature, humidity, wind)	9	55.3
Soil conditions (soil type, organic matter, moisture)	10	47.4
Recommended by constultant or chemical sales rep.	11	45.9
Cost of herbicide	12	43.9
Herbicide availability (in-stock at your local retailer)	13	42.1
Potential to result in herbicide resistant weeds	14	41.0
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	75.6
Environmental conditions (moisture, temperature, wind)	2	73.0
Weed density (# of plants per unit area)	3	63.4
Crop (or non-target plant) size and growth stage	4	61.5
Potential for weeds to cause crop yield loss	5	59.5
Number of days before or after planting	6	39.5
Recommendation of consultant or chemical sales rep.	7	32.4
Specific calendar date	8	13.5
Pressure from neighbors, land owner, or visitors	8	13.5
Farmer's almanac	10	5.6

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
NYE, ESMERALDA AND MINERAL COUNTIES

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using herbicides	1	52.2
Weed control using alternative methods	2	47.8
Weed identification	3	45.7
Prevent weed invasion and establishment	4	39.1
Integrate herbicides with alternative weed control methods	5	19.6
Establish competitive crops/plants to exclude weeds	6	17.4
Effect of weeds on crop yield or livestock production	7	15.2
Herbicide effects on the environment	7	15.2
Manage herbicide resistant/tolerant weeds	9	13.0
Economics of weed control	9	13.0
Sprayer calibration	11	6.5
Methods for scouting or mapping weeds	12	4.3
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Foxtail barley	1	54.3
Russian thistle	2	47.8
Puncturevine	3	37.0
Downy brome (cheatgrass)	4	32.6
Hoary cress (whitetop)	5	30.4
Winter annual mustards	6	28.3
Perennial pepperweed (tall whitetop)	6	28.3
Russian knapweed	8	23.9
Cocklebur	9	19.6
Saltcedar	10	15.2
Sandbur	10	15.2
Filaree	12	10.9
Kochia	12	10.9
Leafy spurge	12	10.9
Poison hemlock	12	10.9
Bull thistle	12	10.9
Field bindweed	17	8.7
Curlycup gumweed	17	8.7
Canada thistle	17	8.7
Dodder	20	6.5
Halogeton	20	6.5
Scotch thistle	20	6.5
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	32.6	
20 to 249 acres	41.3	
250 to 999 acres	21.7	
1,000 or more acres	4.3	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
PERSHING COUNTY
N=38

Table B-9

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Waterways (streams, irrigation ditches, canals, etc)	1	66.7
Neighbors property (public or private lands)	2	48.6
Roads, railways, or utility corridors	3	40.0
Contaminated products (hay, straw, grain, seed, fill material, etc.)	4	25.7
Livestock (cattle, horses, etc.)	5	17.1
Visitors or recreational land-users	5	17.1
Wildlife	7	13.6
Vehicles or farm equipment	8	11.1
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	78.4
Reduced growth of crops or desirable plants (yield)	2	63.9
Increased risk of fire	3	55.3
Loss of income	4	54.3
Loss of productive grazing (injury to livestock, reduced forage, etc.)	5	38.9
Decreased property values	6	36.1
Reduced water availability	7	33.3
Loss of scenic value	8	25.0
Injury to humans (thorns, allergies, rashes, etc.)	9	23.7
Loss of biodiversity	10	14.7
Loss of wildlife habitat	11	14.3
Reduced recreational use	12	11.8
Increased soil erosion	13	11.1
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Lack of money	1	57.9
Neighbors with uncontrolled weeds	2	56.8
Lack of effective control methods	3	54.3
Lack of time or labor	4	52.8
Absence of a weed management plan	4	52.8
Lack of public awareness of weeds	6	45.9
Negative public perception of herbicides	6	45.9
Lack of knowledge or training	8	36.1
Restrictions, policies, or regulations imposed by government agencies	8	36.1
Poor coordination between public and private lands	10	33.3

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
PERSHING COUNTY

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Prevent weed invasion/spread	1	92.1
Control weeds (herbicides, grazing, burning, hand removal, etc.)	2	91.9
Establish competitive crops or other plants to exclude weeds	3	75.7
Detect or scout for weeds	4	75.0
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	75.0
Scout for new weed infestations	2	63.9
Clean equipment or vehicles contaminated with weed seed	3	38.2
Use weed free hay, straw, seed, or fill material	4	29.4
Work to control weeds on neighbor's property	5	26.5
Employee or co-worker awareness of weed spread	6	25.0
Visitor or land-user awareness of weed spread	7	23.5
Quarantine grazing animals	8	11.8
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	72.2
Scout using farm/ranch staff	2	60.0
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	3	54.3
Scout using a professional consultant or technician	4	14.7
Formal scouting procedure (use transects or zig-zag pattern)	5	12.1
Use GPS or GIS technology	6	6.1
Scout using volunteers (recreators or visitors)	7	3.0
How do you control weeds?	**Rank**	**Moderate to High Importance**
Herbicides	1	91.2
Tillage	2	73.5
Controlled burning	3	69.5
Mowing	4	58.3
Crop rotation	5	57.6
Hand-weeding	5	57.1
Irrigation	7	55.9
Grazing	8	52.8
Mulching	9	23.5
Insects	10	12.1
Microbes (pathogens, bacteria, or nematodes)	11	9.1

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
PERSHING COUNTY

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Density (# of plants per unit area) or row spacing to suppress weeds	1	58.8
Plant competitive varieties	2	45.7
Adjust planting date to favor crop or desirable species	3	38.2
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Weed size and growth stage (timing of application)	1	88.6
Familiarity with the herbicide (used it before)	2	85.7
Specific weeds controlled by the herbicide	3	80.6
Air conditions (temperature, humidity, wind)	4	77.1
Herbicide mode of action	5	73.5
Recommended by constultant or chemical sales rep.	6	72.2
Potential injury to crops or non-target plants	7	71.4
Longevity of the herbicide in the soil (plant-back restrictions)	8	62.9
Applicator safety	9	55.6
Soil conditions (soil type, organic matter, moisture)	10	54.3
Herbicide availability (in-stock at your local retailer)	10	54.3
Potential to contaminate ground or surface water	12	52.8
Cost of herbicide	13	50.0
Potential to result in herbicide resistant weeds	14	41.7
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Environmental conditions (moisture, temperature, wind)	1	88.6
Crop (or non-target plant) size and growth stage	2	87.9
Weed size (height) and growth stage	3	86.1
Potential for weeds to cause crop yield loss	4	80.0
Weed density (# of plants per unit area)	5	75.0
Number of days before or after planting	6	61.8
Recommendation of consultant or chemical sales rep.	6	61.8
Specific calendar date	8	20.6
Farmer's almanac	9	8.8
Pressure from neighbors, land owner, or visitors	9	8.8

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
PERSHING COUNTY

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using herbicides	1	55.3
Weed identification	2	39.5
Weed control using alternative methods	3	36.8
Prevent weed invasion and establishment	4	28.9
Establish competitive crops/plants to exclude weeds	5	18.4
Integrate herbicides with alternative weed control methods	6	15.8
Herbicide effects on the environment	7	13.2
Manage herbicide resistant/tolerant weeds	7	13.2
Economics of weed control	7	13.2
Sprayer calibration	10	10.5
Effect of weeds on crop yield or livestock production	11	5.3
Methods for scouting or mapping weeds	12	2.6
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Russian knapweed	1	60.5
Perennial pepperweed (tall whitetop)	2	42.1
Downy brome (cheatgrass)	3	39.5
Foxtail barley	4	36.8
Hoary cress (whitetop)	4	36.8
Russian thistle	6	31.6
Kochia	7	28.9
Cocklebur	8	26.3
Winter annual mustards	8	26.3
Puncturevine	8	26.3
Canada thistle	11	23.7
Field bindweed	12	21.1
Dodder	13	13.2
Yellow starthistle	14	10.5
Halogeton	15	7.9
Leafy spurge	15	7.9
Sandbur	15	7.9
Scotch thistle	15	7.9
Filaree	19	5.3
Medusahead	19	5.3
Saltcedar	19	5.3
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	2.7	
20 to 249 acres	37.8	
250 to 999 acres	32.4	
1,000 or more acres	27.0	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
WASHOE AND STOREY COUNTIES
N=79

Table B-10

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Neighbors property (public or private lands)	1	60.0
Waterways (streams, irrigation ditches, canals, etc)	2	53.6
Roads, railways, or utility corridors	3	33.3
Contaminated products (hay, straw, grain, seed, fill material, etc.)	4	26.1
Livestock (cattle, horses, etc.)	5	23.9
Vehicles or farm equipment	6	14.5
Wildlife	7	13.2
Visitors or recreational land-users	8	7.2
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	59.2
Increased risk of fire	2	56.2
Reduced growth of crops or desirable plants (yield)	3	43.5
Loss of productive grazing (injury to livestock, reduced forage, etc.)	4	39.7
Loss of income	5	33.3
Loss of scenic value	6	26.8
Reduced water availability	7	26.4
Injury to humans (thorns, allergies, rashes, etc.)	8	25.7
Loss of biodiversity	9	25.4
Decreased property values	10	21.9
Increased soil erosion	11	21.1
Loss of wildlife habitat	11	21.1
Reduced recreational use	13	8.8
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Neighbors with uncontrolled weeds	1	60.6
Lack of effective control methods	2	56.8
Lack of time or labor	3	53.3
Lack of public awareness of weeds	4	48.6
Negative public perception of herbicides	5	47.2
Lack of knowledge or training	6	40.5
Lack of money	7	37.8
Absence of a weed management plan	8	37.5
Poor coordination between public and private lands	9	30.6
Restrictions, policies, or regulations imposed by government agencies	10	28.2

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
WASHOE AND STOREY COUNTIES

IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Prevent weed invasion/spread	1	88.2
Control weeds (herbicides, grazing, burning, hand removal, etc.)	2	87.7
Detect or scout for weeds	3	66.7
Establish competitive crops or other plants to exclude weeds	4	45.9
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	75.0
Scout for new weed infestations	2	55.4
Work to control weeds on neighbor's property	3	39.7
Use weed free hay, straw, seed, or fill material	4	38.9
Clean equipment or vehicles contaminated with weed seed	5	29.2
Employee or co-worker awareness of weed spread	6	23.9
Visitor or land-user awareness of weed spread	7	15.3
Quarantine grazing animals	8	7.0
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	69.7
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	2	59.2
Scout using farm/ranch staff	3	53.4
Scout using a professional consultant or technician	4	11.3
Use GPS or GIS technology	5	10.0
Scout using volunteers (recreators or visitors)	6	6.9
Formal scouting procedure (use transects or zig-zag pattern)	7	5.7
How do you control weeds?	**Rank**	**Moderate to High Importance**
Herbicides	1	68.0
Hand-weeding	2	63.6
Mowing	3	54.3
Grazing	4	52.8
Controlled burning	5	42.3
Tillage	6	38.6
Irrigation	7	31.9
Mulching	8	19.1
Crop rotation	9	17.4
Insects	10	12.9
Microbes (pathogens, bacteria, or nematodes)	11	8.7

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WASHOE AND STOREY COUNTIES

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Plant competitive varieties	1	28.2
Density (# of plants per unit area) or row spacing to suppress weeds	2	25.7
Adjust planting date to favor crop or desirable species	3	21.4
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	74.2
Familiarity with the herbicide (used it before)	2	70.8
Potential to contaminate ground or surface water	3	69.2
Weed size and growth stage (timing of application)	4	67.2
Potential injury to crops or non-target plants	5	61.9
Air conditions (temperature, humidity, wind)	6	60.9
Applicator safety	7	55.4
Longevity of the herbicide in the soil (plant-back restrictions)	7	55.4
Cost of herbicide	9	50.7
Herbicide mode of action	10	49.2
Herbicide availability (in-stock at your local retailer)	10	49.2
Recommended by constultant or chemical sales rep.	12	43.9
Potential to result in herbicide resistant weeds	13	40.3
Soil conditions (soil type, organic matter, moisture)	14	36.5
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	72.3
Weed density (# of plants per unit area)	2	70.5
Environmental conditions (moisture, temperature, wind)	3	69.4
Crop (or non-target plant) size and growth stage	4	49.2
Potential for weeds to cause crop yield loss	5	45.9
Recommendation of consultant or chemical sales rep.	6	33.9
Number of days before or after planting	7	26.2
Specific calendar date	8	11.5
Farmer's almanac	9	4.9
Pressure from neighbors, land owner, or visitors	10	0.0

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
WASHOE AND STOREY COUNTIES

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed identification	1	49.4
Weed control using alternative methods	2	43.0
Weed control using herbicides	3	41.8
Prevent weed invasion and establishment	4	36.7
Establish competitive crops/plants to exclude weeds	5	24.1
Integrate herbicides with alternative weed control methods	6	22.8
Manage herbicide resistant/tolerant weeds	7	19.0
Herbicide effects on the environment	8	13.9
Economics of weed control	9	6.3
Sprayer calibration	9	6.3
Effect of weeds on crop yield or livestock production	11	3.8
Methods for scouting or mapping weeds	12	2.5
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Downy brome (cheatgrass)	1	51.9
Russian thistle	2	46.8
Perennial pepperweed (tall whitetop)	2	46.8
Hoary cress (whitetop)	4	43.0
Puncturevine	5	40.5
Foxtail barley	6	35.4
Winter annual mustards	7	26.6
Bull thistle	8	20.3
Cocklebur	9	16.5
Canada thistle	10	15.2
Russian knapweed	11	13.9
Yellow starthistle	11	13.9
Curlycup gumweed	13	11.4
Sandbur	13	11.4
Scotch thistle	15	10.1
Saltcedar	16	8.9
Poison hemlock	17	7.6
Field bindweed	18	5.1
Leafy spurge	18	5.1
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	31.6	
20 to 249 acres	46.8	
250 to 999 acres	11.4	
1,000 or more acres	10.1	

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
WHITE PINE COUNTY
N=30

Table B-11

Percentage of respondents who indicated moderate to high importance. Items within each group are sorted in order of decreasing importance.

I. How do weeds spread onto your farm or ranch?	Rank	Moderate to High Importance
Neighbors property (public or private lands)	1	65.5
Waterways (streams, irrigation ditches, canals, etc)	2	37.9
Wildlife	3	34.5
Contaminated products (hay, straw, grain, seed, fill material, etc.)	3	34.5
Vehicles or farm equipment	5	31.0
Livestock (cattle, horses, etc.)	6	28.6
Roads, railways, or utility corridors	7	27.6
Visitors or recreational land-users	8	17.2
II. What are the problems caused by weeds on your farm or ranch?	**Rank**	**Moderate to High Importance**
Cost of weed control	1	76.7
Reduced growth of crops or desirable plants (yield)	2	65.5
Loss of income	3	53.3
Increased risk of fire	4	44.8
Loss of biodiversity	5	41.4
Loss of productive grazing (injury to livestock, reduced forage, etc.)	6	37.9
Reduced water availability	6	37.9
Loss of scenic value	8	34.5
Loss of wildlife habitat	9	28.6
Decreased property values	10	24.1
Injury to humans (thorns, allergies, rashes, etc.)	11	17.2
Increased soil erosion	12	13.8
Reduced recreational use	13	10.7
III. What are the obstacles to your weed control efforts?	**Rank**	**Moderate to High Importance**
Lack of time or labor	1	58.6
Negative public perception of herbicides	2	55.2
Lack of public awareness of weeds	3	51.7
Lack of money	4	50.0
Neighbors with uncontrolled weeds	4	50.0
Lack of effective control methods	6	48.3
Poor coordination between public and private lands	7	43.3
Lack of knowledge or training	8	34.5
Absence of a weed management plan	8	34.5
Restrictions, policies, or regulations imposed by government agencies	10	20.7

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IV. How important are the following approaches to your overall weed management program?	Rank	Moderate to High Importance
Prevent weed invasion/spread	1	86.7
Control weeds (herbicides, grazing, burning, hand removal, etc.)	1	86.7
Establish competitive crops or other plants to exclude weeds	3	72.4
Detect or scout for weeds	4	69.0
V. How important are the following practices on your farm or ranch?		
How do you prevent weed spread?	**Rank**	**Moderate to High Importance**
Control of new weeds immediately	1	76.7
Scout for new weed infestations	2	55.2
Clean equipment or vehicles contaminated with weed seed	3	53.6
Use weed free hay, straw, seed, or fill material	4	46.7
Work to control weeds on neighbor's property	5	37.9
Visitor or land-user awareness of weed spread	6	34.5
Employee or co-worker awareness of weed spread	7	28.6
Quarantine grazing animals	8	14.3
How do you scout for new weed infestations?	**Rank**	**Moderate to High Importance**
Casual scouting procedures (scout while doing other tasks)	1	73.3
Monitoring high-risk areas (roads, waterways, feedlots, etc.)	2	65.5
Scout using farm/ranch staff	3	64.3
Scout using a professional consultant or technician	4	25.0
Formal scouting procedure (use transects or zig-zag pattern)	5	14.3
Scout using volunteers (recreators or visitors)	6	7.1
Use GPS or GIS technology	6	7.1
How do you control weeds?	**Rank**	**Moderate to High Importance**
Herbicides	1	67.9
Hand-weeding	1	67.9
Mowing	3	63.0
Grazing	4	59.3
Tillage	4	59.3
Controlled burning	6	57.1
Irrigation	7	42.3
Crop rotation	8	33.3
Mulching	9	26.9
Microbes (pathogens, bacteria, or nematodes)	10	16.0
Insects	11	8.0

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WHITE PINE COUNTY

How do you use crops or other plants to exclude weeds?	Rank	Moderate to High Importance
Plant competitive varieties	1	46.4
Density (# of plants per unit area) or row spacing to suppress weeds	1	46.4
Adjust planting date to favor crop or desirable species	2	22.2
VI. How do you decide which herbicide to use?	**Rank**	**Moderate to High Importance**
Specific weeds controlled by the herbicide	1	84.6
Weed size and growth stage (timing of application)	2	81.5
Cost of herbicide	3	74.1
Familiarity with the herbicide (used it before)	4	69.2
Longevity of the herbicide in the soil (plant-back restrictions)	4	69.2
Air conditions (temperature, humidity, wind)	4	69.2
Potential injury to crops or non-target plants	7	66.7
Potential to contaminate ground or surface water	8	53.8
Herbicide availability (in-stock at your local retailer)	8	53.8
Herbicide mode of action	10	50.0
Soil conditions (soil type, organic matter, moisture)	10	50.0
Recommended by constultant or chemical sales rep.	10	50.0
Applicator safety	13	42.3
Potential to result in herbicide resistant weeds	14	34.6
VII. How do you decide when to apply herbicides?	**Rank**	**Moderate to High Importance**
Weed size (height) and growth stage	1	81.5
Potential for weeds to cause crop yield loss	2	76.9
Weed density (# of plants per unit area)	3	74.1
Environmental conditions (moisture, temperature, wind)	4	73.1
Crop (or non-target plant) size and growth stage	5	50.0
Number of days before or after planting	6	42.3
Recommendation of consultant or chemical sales rep.	7	34.6
Specific calendar date	8	7.7
Farmer's almanac	8	7.7
Pressure from neighbors, land owner, or visitors	10	3.8

2008 Agricultural Producer Weed Management Extension Program Needs Assessment
WHITE PINE COUNTY

VIII. Priorities for research/outreach programs (select 3)	Rank	Moderate to High Importance
Weed control using alternative methods	1	60.0
Weed control using herbicides	2	56.7
Weed identification	3	43.3
Prevent weed invasion and establishment	4	33.3
Integrate herbicides with alternative weed control methods	5	20.0
Establish competitive crops/plants to exclude weeds	5	20.0
Manage herbicide resistant/tolerant weeds	7	16.7
Economics of weed control	8	13.3
Effect of weeds on crop yield or livestock production	9	10.0
Herbicide effects on the environment	9	10.0
Methods for scouting or mapping weeds	9	10.0
Sprayer calibration	12	6.7
IX. What are your most problematic weeds? (select 5) (Only includes weeds listing by 5 percent or more of respondents)	**Rank**	**Moderate to High Importance**
Downy brome (cheatgrass)	1	60.0
Foxtail barley	2	50.0
Winter annual mustards	3	46.7
Hoary cress (whitetop)	3	46.7
Russian thistle	5	43.3
Halogeton	6	33.3
Cocklebur	7	30.0
Field bindweed	8	26.7
Bull thistle	9	23.3
Russian knapweed	10	20.0
Canada thistle	10	20.0
Perennial pepperweed (tall whitetop)	12	16.7
Kochia	13	13.3
Puncturevine	13	13.3
Scotch thistle	13	13.3
Sandbur	16	10.0
Yellow starthistle	16	10.0
Musk thistle	18	6.7
X. How many total acres do you operate (not including public land allotments)?	**Respondents**	
19 or less acres	16.7	
20 to 249 acres	36.7	
250 to 999 acres	16.7	
1,000 or more acres	30.0	

USDA is an equal opportunity provider and employer.