Needs Assessment for Noxious Weeds in Humboldt County: Part 5 of 5 – Priority Research and Outreach

Brad Schultz, Extension Educator, Humboldt County; Earl Creech, Extension Agronomist, Utah State University; and Loretta Singletary, Area Director and Extension Educator, Lyon County

Introduction
Humboldt County covers 9,658 square miles in north-central Nevada, largely north of Interstate 80. The federal government administers about 81 percent of the land area. Winnemucca is the only incorporated city and most of the county’s 18,000 residents live within 20 miles of town, including small acreage developments in Grass Valley and Paradise Hill. Small, widespread, unincorporated agricultural communities include Golconda, Paradise Valley, Orovada, McDermitt, Kings River and Denio. Isolated ranches and farms occur throughout the county.

The local economy is heavily dependent on mining and agriculture. Recreation is widespread on the public lands and several large transportation and utility corridors cross the county. These land uses may facilitate the establishment and spread of noxious and invasive weeds.

In 2007, the value of agricultural products sold in Humboldt County was $74.35 million (USDA 2009). Commodity sales were valued at $46.54 million for crops and $27.8 million for livestock (mostly beef cattle). There were 254 economically reportable farms and ranches on 756,313 acres of farmland. Median farm size was 160 acres, the sixth largest in Nevada. On a nationwide basis, Humboldt County is among the top 2 percent of producers for acres of hay production and potatoes, the top 5 percent for acres of field and grass seed crops and the top 13 percent for the number of cattle and calves.

Agriculture has a significant multiplier effect in Humboldt County (Harris et al. 1993). For every dollar of increased livestock sales, total economic activity increases by $2.31. Livestock production has the second highest economic multiplier of 21 economic sectors measured. Each additional livestock production employee results in 2.9 more employees in other segments of the economy. Every dollar of increased sales from crop production increases total economic activity in Humboldt County from between $1.78 to $2.08. An increase in one crop production employee increases employment in other segments of the economy by 2.3 to 3.5 employees.

Noxious and invasive weeds have the potential to reduce both crop yield and forage availability for livestock (Duncan and Clark 2005). Substantial reductions in crop and livestock production would reduce the income of agricultural producers and decrease expenditures at local businesses. The agricultural multiplier data strongly suggest that reduced agricultural income would have a substantial negative effect upon Humboldt County’s economy. Furthermore, noxious weeds can significantly reduce land values. A classic study about the Brooks Ranch in North Dakota found that after noxious weeds heavily infested the ranch, it took 13 years to sell and the final price was 60 to 80 percent less per acre than for nearby areas without weeds (Weiser 1997).

The University of Nevada Cooperative Extension’s (UNCE) statewide needs assessment about the general research and education needs of agricultural producers (Singletary and Smith 2006) found that 90 percent of Humboldt County’s respondents ranked weed identification and control as a high priority. This effort, however, did not identify the specific education and research needs to control and manage noxious weeds. Furthermore, it did not address weed issues on public lands, a significant resource for Humboldt County’s (and Nevada’s) livestock industry. UNCE, therefore, was unable to develop a well-defined, issue-specific education...
and research program for weed management. This shortfall was addressed in 2008 when UNCE conducted a statewide needs assessment for noxious weeds.

The statewide results were published in 2010 in a UNCE Special Publication (Creech et al. 2010). The results for Humboldt County are being presented in a series of five fact sheets focused on the following themes: 1) problem weeds and the approaches and methods used for their control; 2) problems and obstacles to weed management; 3) the spread, prevention, and detection of weeds; 4) herbicides and the criteria used for their selection and timing of use; and 5) priority research and outreach programs. This fact sheet discusses part five of the series: priority research and outreach needs in Humboldt County. The results from Humboldt County producers are compared with agricultural producers from Nevada and weed managers on public lands.

Survey Methods
A 93-question survey targeted the specific weed management issues faced by Nevada’s agricultural producers and public land managers. The survey was sent to all agricultural producers who reported at least $1,000 of annual income from agriculture. The recently published statewide needs assessment (Creech et al. 2010) describes the specific methodology and initial data analysis. Additional data analysis in this paper is the Kolmogorov-Smirnov test (Analytical Software 2008) to determine if the distribution of responses was statistically similar among agricultural producers in Humboldt County, agricultural producers across Nevada and weed managers for public lands. For the reported P-values, the smaller the number, the greater the probability the two distributions are different.

Results
In Humboldt County, the top four educational topics reported by agricultural producers were weed control using herbicides, weed control using alternative methods, weed identification and managing herbicide resistant/tolerant weeds (Table 1). Each was considered a priority by 30 to 48 percent of the respondents. Less than 10 percent of Humboldt County’s agricultural producers ranked the economics of weed control; herbicide effect on the environment; the effect of weeds on crop yield, livestock production or resource values; sprayer calibration and methods for scouting or mapping weeds as important education topics. Moderately ranked (10 to 29 percent of respondents) educational topics included establishing competitive crops or plants to exclude weeds, integrating herbicides with alternative weed control methods and preventing weed invasion and establishment.

The distribution of responses for priority educational topics was similar between agricultural producers in Humboldt County and Nevada (P=0.90), and very different between each agricultural producer group and the public land weed managers (P=0.00 for both comparisons). Despite a similar distribution of responses among the two agricultural groups, there were relatively large differences (≥ 10 percent) for three educational topics. Humboldt County’s agricultural producers had a much higher priority rating for managing herbicide resistant/tolerant weeds, and a much lower priority for preventing weed invasion and establishment, and herbicide effects on the environment.

Compared to Humboldt County’s agricultural producers, public land weed managers placed a much higher priority for preventing weed invasion and establishment, establishing competitive plants to exclude weeds, understanding herbicide effects on the environment and understanding the effect of weeds on livestock production or resource values. Public land weed managers placed substantially less emphasis on weed control with herbicides, weed identification and managing herbicide resistant/tolerant weeds.

Discussion and Conclusions
The statistical difference in the distribution of responses between both groups of agricultural producers and public land managers reflects, to at least some degree, the internal regulations and policies that dictate program implementation for government agencies. Profit is not a government agencies objective; thus, an agency’s response to a weed management issue may be entirely different than for an agriculturalist, even when their weed issues and conditions are similar. Public land weed managers were less than 7 percent of the respondents in the statewide needs assessment. Data about their responses are included in this paper so that each group (particularly public land ranchers) has a better
understanding about the concerns of the others. Further interpretation about the responses of public land weed managers will not occur because they are very small part of the target audience.

Humboldt County’s agricultural producers ranked the prevention of weed invasion and establishment as one of the less important educational topics (7th of 12). This is somewhat surprising because 94 percent of Humboldt County’s respondents ranked the prevention of weed invasion and spread as an important approach to weed management (Schultz et al. 2010a), and they ranked it 7 percentage points higher than the control of weeds (Schultz et al. 2010a). In contrast, Humboldt County’s respondents identified weed control with herbicides as the most important education topic, and ranked it 2.5 times higher in priority than preventing weed invasion and establishment (Table 1).

Several interpretations of this apparent disconnect are possible. First, many agricultural producers may believe they know how to prevent the establishment and spread of weeds and now want to focus their effort on controlling existing infestations. Perhaps, more likely, they believe that weeds are widely established and current and future efforts should focus more upon the control of existing infestations than preventing the establishment of new infestations. Finally, the data may indicate that many agricultural producers do not believe that preventing weed invasion and spread is a control method. They may view weed control as an action that occurs only after weeds become established, not as a preventive action. To achieve successful weed control and management, agricultural producers may need a paradigm shift. That is, they need to understand that the prevention of weed spread and establishment is one management action in the process of controlling weeds, and is equally as important as herbicide application.

The highest-ranked educational priority in Humboldt County was weed control with herbicides. Data from Schultz et al. (2010b) suggest specific programming should focus on matching weed species with appropriate herbicides, the best growth stage of the crop and/or weed to apply herbicides, understanding the effects (positive and negative) of herbicide longevity in the soil, how environmental conditions affect herbicide effectiveness, and potential herbicide injury to nontarget species.

The use of alternative methods of weed control was the second highest educational priority. In contrast, educational programming about how to integrate herbicide and alternative methods of weed control was the sixth-ranked priority. The comparatively low ranking for educational programming that integrates the two highest-ranked educational topics—herbicides and alternative methods of weed control—is perplexing. Agricultural producers may believe that if they learn about herbicides and alternative weed control methods independent of one another, they can combine the two approaches and be successful. This may or may not be true. The combination of chemical and nonchemical weed control efforts often is better than either approach applied independently, but the degree of increased effectiveness may depend on the specific sequence of treatments, or the application of specific treatments at specific stages of the weed growth cycle. Successful integration of herbicide and alternative weed control methods must be strategically implemented and based on the biology and physiology of both the weed and the nontarget species.

Weed identification is the third priority education issue for agricultural producers in Humboldt County. The data, however, suggest that any formal education program about weed identification should be expanded to include information about weed physiology, growth, development and biology (e.g., annual vs. perennial plants, seed production, seedling establishment). The successful application of an herbicide, and implementation of cultural and mechanical weed control methods, requires that the applicator know not only the specific weed species but also how the weeds develop, grow and reproduce. Appropriate approaches for one species may not work for another and may actually spread companion weed species.

The stated need for educational programming about herbicide resistant or tolerant weeds may be misleading. None of the noxious weed species in Humboldt County are known to be resistant to herbicides. While resistance is possible, some applicators may be attributing unsuccessful herbicide applications to herbicide resistance, when other factors are the cause. It is possible that the wrong herbicides were
applied or the correct herbicide was applied at the wrong growth stage. Both scenarios can result in ineffective treatments and the incorrect conclusion that the weeds are resistant to one or more herbicides. Agricultural producers who believe they have encountered herbicide resistant weeds should work closely with UNCE and the Nevada State Department of Agriculture to begin the appropriate process to verify their suspicions and develop appropriate alternative control methods. Educational programming for weed management, however, should address why no single herbicide should be the only herbicide used and that it may lead to herbicide resistance.

One successful method of weed control is establishing vegetation to compete with weeds, especially rangeland weeds (Sheley et al. 1999). Planting competing vegetation was the fifth-highest educational priority of agricultural producers in Humboldt County. As a method of weed control, only 45 percent of agricultural producers in Humboldt County ranked this approach as important (Schultz et al. 2010a), and only 20 percent selected it as one of their three priority educational topics. This suggests that many agricultural producers may not understand that eliminating the weed is only the first step toward successful weed management. If desired plants do not replace the weed, either the weed will return or another weed will take its place. The comparatively low priority placed on establishing competitive vegetation suggests some agricultural producers may not understand the importance of revegetating many treated areas, particularly noncropland and permanent grass-hay meadows and pastures.

References


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Table 1. Priorities for research/outreach programs for Nevada agricultural producers (n=746), Humboldt County agricultural producers (n=56) and public land weed managers (n=52) statewide. Respondents were asked to select their top three topics.

<table>
<thead>
<tr>
<th>Educational topic</th>
<th>Nevada agricultural producers</th>
<th>Humboldt County agricultural producers</th>
<th>Public land weed managers</th>
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<tbody>
<tr>
<td></td>
<td>Rank</td>
<td>Priority (%)</td>
<td>Rank</td>
</tr>
<tr>
<td>Weed control using herbicides</td>
<td>1</td>
<td>56.3</td>
<td>1</td>
</tr>
<tr>
<td>Weed control using alternative methods</td>
<td>2</td>
<td>44.7</td>
<td>2</td>
</tr>
<tr>
<td>Weed identification</td>
<td>3</td>
<td>38.9</td>
<td>3</td>
</tr>
<tr>
<td>Prevent weed invasion and establishment</td>
<td>4</td>
<td>35.8</td>
<td>7</td>
</tr>
<tr>
<td>Establish competitive crops/plants to exclude weeds¹</td>
<td>5</td>
<td>23.5</td>
<td>5</td>
</tr>
<tr>
<td>Integrate herbicides with alternative weed control methods</td>
<td>6</td>
<td>21.5</td>
<td>6</td>
</tr>
<tr>
<td>Manage herbicide resistant/tolerant weeds</td>
<td>7</td>
<td>16.8</td>
<td>4</td>
</tr>
<tr>
<td>Economics of weed control</td>
<td>8</td>
<td>11.8</td>
<td>8</td>
</tr>
<tr>
<td>Herbicide effects on the environment</td>
<td>9</td>
<td>11.8</td>
<td>12</td>
</tr>
<tr>
<td>Effect of weeds on crop yield or livestock production or resource values²</td>
<td>10</td>
<td>10.4</td>
<td>9</td>
</tr>
<tr>
<td>Sprayer calibration</td>
<td>11</td>
<td>10.3</td>
<td>9</td>
</tr>
<tr>
<td>Methods for scouting or mapping weeds</td>
<td>12</td>
<td>6.0</td>
<td>9</td>
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</tbody>
</table>

1. For agricultural producers the question was phrased “to establish competitive crops/plants to exclude weeds” and for weed managers on public lands the question was phrased, “revegetate bare/disturbed sites to exclude weeds.”

2. For agricultural producers the question addressed crop yield or livestock production and for public land weed managers the wording stated resource values.