Managing Perennial Pepperweed in Uintah County, Utah

Chad R. Reid, G. Allen Rasmussen, and Steven Dewey

Introduction

Perennial pepperweed (*Lepidium latifolium* L.) is a native of southern Europe and western Asia and has become dominant on some wetlands in the intermountain west. It has been declared a noxious weed in a number of western states. Original importations were thought to be in contaminated sugarbeet (*Bela vulgare* L.) seed. Spread of this weed is usually by water carrying seed from upstream areas. Once established, perennial pepperweed rapidly spreads by rhizomes, especially in moist soils. The plant can grow to heights greater than 1 m and readily suppresses surrounding herbaceous vegetation. Research on management of perennial pepperweed is limited, with most of the work being done on cropland.

The first report of perennial pepperweed in Uintah County known by the authors was at the Ouray National Wildlife Refuge in 1972 (Neil Folks, personnel communication). It was of little more than botanical interest at that time. In 1983 extremely high flows on the Green River (50,000 CFS near Jensen, Utah) caused extensive flooding of low areas along the river. After these high flows, landowners started reporting perennial pepperweed in pastures and hay fields. In 1989 the county weed supervisor initiated a spray program for perennial pepperweed. Several landowners cooperated with the county to spray approximately 600 acres with 2,4-D amine applied by airplane at the rate of 3 quarts per acre. Perennial pepperweed was in full bloom. Results were disappointing with estimates of control in the 10 to 20 percent range. After this, landowners were very skeptical about control of perennial pepperweed.

Perennial pepperweed is linked to other problems in Uintah County. Land areas along the Green River include some of the most productive mosquito habitat in North America. This habitat is capable of producing up to 10 million mosquitos per acre per brood. This also creates considerable human health concerns as surveillance sentinel flocks of chickens in Uintah County frequently seroconvert for mosquito-borne Western Equine Encephalitis and Saint Louis Encephalitis. Perennial pepperweed directly interferes with mosquito control in the area because of changes in the vegetation canopy in the invaded areas. Vegetation in these areas would normally consist of salt grass (*Distichlis stricta*), alkali sacaton (*Sporobolus airoides*), and poverty sumpweed (*Iva axillaris*) all of which are low growing plants. When these areas become dominated by perennial pepperweed the canopy height and density make effective application of insecticides difficult for mosquito control. Repeated applications of organophosphate insecticides for the past 20 years to control mosquitoes have resulted in mosquito populations with a developed resistance to these insecticides. Newly developed insecticides such as Bti (*Bacillus thuringiensis israelensis*) require much shorter application intervals and must be applied directly to the water to control the aquatic larvae. The dense canopy of perennial pepperweed severely impacts these applications by intercepting the chemical before it contacts the water (Steven V. Romney, personal communication).

The problem of perennial pepperweed along the Green River has been further intensified

by the Recovery Program for Endangered Fishes of the Upper Colorado. There are currently four species of fish listed as endangered in the Green River. The Colorado squawfish *(Ptychocheilus lucis)*, the humpback chub (*Gila cypha*), the bonytail chub (*Gila elegans*) and the razorback sucker *(Xyrauchen texanus)*. The last three species mentioned are thought to require backwaters for spawning and young fish grow-out areas. In order to increase the number and size of these areas the U.S. Fish and Wildlife Service is proposing to flood areas adjacent to the river channel on a regular basis. Flooding these areas produces a large number of mosquitos and appears to further the spread of perennial pepperweed.

These factors and poor results of past herbicide treatments lead to the initiation of a study by Chad Reid, USU Extension Agent, Allen Rasmussen, USU Range Management Specialist and Steven Dewey, USU Extension Weed Specialist, to evaluate control methods for perennial pepperweed. On riverine areas, few control methods have been developed, though herbicides have shown the greatest potential. A review of the available literature showed the only treatment reported to be effective was 2,4-D amine (2,4 diclorophenoxy acetic acid) at a rate of 2 quarts per acre applied twice a year for 3 to 6 years and then repeated when necessary (Hackett and Post 1986). However, this strategy has still not provided long-term control on riverine systems in Utah. The purpose of this study was to evaluate the efficacy of new herbicides on perennial pepperweed populations in wetlands in two locations in Uintah County, Utah.

MATERIALS AND METHODS

Ten treatments were evaluated including nine herbicide treatments and a control. Herbicide treatments included: Escort (metsulfuron) at three rates (1/3, 1/2, 3/4 oz. product/acre); 2,4-D amine (2 qts. product/acre); 2,4-D amine (2 qts. product/acre) + plus three rates of Escort (1/3, 1/2, 3/4 oz. product/acre); and two rates of Landmaster (2,4-D + glyphosate) (26 oz. product/acre, 54 oz. product/acre). Treatments were applied to perennial pepperweed during the bud stage of development on May 25, 1994. Fall treatments using the same herbicides were applied but showed minimal effect so the results will not be discussed further. Herbicides were applied using a CO_2 backpack sprayer with a hand-held 6-nozzle boom (20-inch nozzle spacing), delivering 12.4 gallons per acre at 35 psi. A non-ionic surfactant (X-77) was added to treatments containing Escort. Herbicides, application rates, and timing were determined from a pilot study. Mechanical top removal was included in the pilot study. However, since it provided no control, it was not included in this study.

This study was conducted on two sites and arranged in a randomized complete block design, with three replications. Plots were 10 x 30 feet. The first site was an Utaline loam soil on an old terrace of the Green River. This is a desert loam (shadscale range site) but is now an artificial wetland because of adjacent irrigated cropland. The other site was on wet meadow adjacent to the Green River that is flooded periodically in the spring and receives agricultural tail-water. The soil on this site is a Pogoneab clay loam and described as a wet saline stream bank (coyote willow range site). Plots were evaluated by visual inspection on September 7, 1994. Two independent observers recorded estimates of percent control, and these estimates were then averaged. In addition, biomass was estimated by clipping two 0.25 m^2 quadrates on September 14, 1994 in each plot. Biomass was recorded using air dry weights. ANOVA was

used for data analysis. Treatment means were separated using Duncan's MRT.

RESULTS

Perennial pepperweed biomass reduction and visual control ratings were significantly ($P<.05$) different between the Utaline loam and Pogoneab clay loam sites. Biomass values were not significantly different among herbicide treatments on the Utaline loam site (Table 1). However, visual control ratings for herbicide treatments during the first growing season after application were significantly ($P<.05$) different from each other on this site. Biomass and visual control ratings were significantly different among herbicide treatments ($P<.05$) on the Pogoneab clay loam site.

Escort at 3/4 oz. per acre plus 1 qt of 2,4-D showed the greatest reduction in biomass on site one. Escort at 1/3 oz. per acre was most effective in controlling pepperweed on site two. The low rate of Landmaster was least effective on both sites. Biomass production on plots treated with the high rate of Landmaster was not different from the Escort treatments. The Utaline loam site had a lower soil water holding capacity and was subjected to drought stress associated with irrigation on the adjacent farm ground not being started until late summer. This added stress appeared to increase the efficacy of most herbicide treatments. Higher rates of Escort and Escort combined with 2,4-D did not significantly ($P>.05$) increase control based on first-year evaluations. Data from this study and a pilot study (Table 2) indicate that low rates of Escort are the most economical way to treat perennial pepperweed. While higher rates of Landmaster gave equal control, Roundup had a negative effect on desirable grasses in the plots. Also, data from the pilot study indicated that treatments with 2,4-D or Glyphosphate (Rodeo) showed less control during the second growing season.

SUMMARY

Low rates of Escort (1/2 to 3/4 oz. per acre) will give excellent control the first year of application and good control the following year. Further research is needed looking at longer-term control of perennial pepperweed including competition with desirable species. Efforts in Uintah County include herbicide application to restrict perennial pepperweed to the Green River drainage and the evaluation of competitive grass species such as Newhy RS Hybid Wheatgrass (*Agropyron repens* X *Agropyron spicatum*) to prevent re-invasion.

LITERATURE CITED

Folks, N. 1996. Personal communication, Superintendent, Browns Park Waterfowl Management Area. Utah Division of Wildlife Resources.

Hackett, I. and D. Post. 1986. Perennial pepperweed control in Nevada university of Nevada, Reno, Cooperative Extension 86-11 4pp.

Romney, S. 1996. Personal communication, Director of Abatement District Uintah County Mosquito Abatement District.

Table 1 Percent visual control and biomass of perennial pepperweed at two locations near Jensen, UT, 1994.

Treat.	Herbicide	Rate	% Visual Control		Biomass (lbs/acre)	
			Site 1	Site 2	Site 1	Site 2
1	Escort	1/3 oz. per acre	99 [d]	82 [d]	71 [a]	71 [a]
2	Escort	1/2 oz. per acre	90 [bc]	91 [e]	142 [a]	107 [a]
3	Escort	3/4 oz. per acre	93 [c]	87 [e]	178 [a]	427 [ab]
4	Escort+ 2,4-D (amine)	1/3 oz. + 1qt. per acre	93 [c]	85 [e]	14 [a]	320 [ab]
5	Escort+ 2,4-D (amine)	1/2 oz. + 1qt. per acre	92 [c]	91 [e]	249 [a]	427 [ab]
6	Escort+ 2,4-D (amine)	3/4 oz. + 1qt. per acre	98 [d]	89 [e]	28 [a]	356 [ab]
7	2,4-D (amine)	1qt. per acre	95 [cd]	64 [c]	142 [a]	676 [b]
8	Landmaster	26 oz. per acre	85 [b]	48 [b]	641 [a]	1282 [c]
9	Landmaster	54 oz. per acre	92 [c]	73 [cd]	107 [a]	320 [a]
10	Check (untreated)		0 [a]	0 [a]	2777 [b]	2065 [d]

All rates listed as amount of product per acre
Site 1 = Utaline Loam
Site 2 = Pogoneab Clay Loam

Table 2. Results by year of selected pilot-study treatments near Jensen, UT, for 1994 and 1995.

Treatment	Herbicide	Rate	% Visual Control	
			Year 1	Year 2
1	Escort	3/4 oz. per acre	97 [c]	76 [c]
2	Escort + 2,4-D (amine)	1/2 + 1qt. per acre	99 [c]	78 [c]
3	2,4-D (amine)	2 qts. per acre	95 [c]	70 [c]
4	Rodeo	2 qts. per acre	75 [b]	13 [b]
5	Check (untreated)		0 [a]	0 [a]

All rates listed as amount of product per acre