4-29-1996

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POCKET GOPHERS DAMAGE SALTCEDAR (TAMARIX RAMOSISSIMA) ROOTS

Sara J. Manning¹, Brian L. Cashore¹, and Joseph M. Szewczak²

Key words: saltcedar, Tamarix ramosissima, pocket gopher, Thomomys bottae, tamarisk, Owens Valley, invasive plant, exotic plant.

Saltcedar (Tamarix ramosissima Ledeb., Tamaricaceae) is an invasive, exotic woody shrub native to Asia (Baum 1978, Hickman 1993) that has colonized extensive areas throughout the western United States (Robin­son 1965, Brotherson and Winkel 1986). Saltcedar possesses many characteristics that render it a nuisance plant (Brotherson and Winkel 1986), and because it has been viewed as a threat to native vegetation communities, researchers have examined its ecology (Car­man and Brotherson 1982, Brotherson and Winkel 1986, Shafroth et al. 1995), water con­sumption (Robinson 1958, van Hylckama 1970, Davenport et al. 1982, Bureau of Reclamation 1992), and cost of control efforts (Brotherson and Field 1987, Neill 1990, Barrows 1993). It is known to inhibit flows in creeks and springs (Robinson 1965, Rowlands 1990); thus, its spread has been detrimental not only to native vegetation but also to native wetland and aquatic fauna (Neill 1983).

Although efforts are under way in the United States to develop biocontrol agents using insects that occur on saltcedar in its native range (DeLoach 1990), to date there have been no reports of native herbivores, insects, or diseases causing saltcedar mortality. Herein we report the first known mortality caused by native mammals on saltcedar.

Our discovery occurred in Owens Valley, California. Water has been exported from Owens Valley—located in the rain shadow created by the Sierra Nevada range directly to its west—since 1913. Alteration of natural water flows created conditions favorable to the spread of saltcedar (Cashore 1985, Babb 1987).

During the winter of 1995, when foliage was absent from saltcedar, we observed that a few plants within a young, even-aged stand were dead. Some of the plants were leaning over, supported by neighboring plants. Upon inspection, we observed that dead plant tap­roots had been gnawed apart approximately 10 cm beneath the soil surface. Teeth marks were clearly visible on the tapered stumps. In addition, prolific gopher tunneling was evident within and around the saltcedar stand, and excavated dirt mounds were located near the dead saltcedar. Examination of growth rings of plants within the stand showed the saltcedar plants to be 7 years old in 1995.

In early April 1995, when saltcedar was just beginning to break bud, we revisited the site to quantify the extent of animal damage and to capture and identify the species tunneling at the site. We examined plants by working from one end of the stand toward the center. Every saltcedar plant in approximately 1/2 of the stand was sampled, for a total of 545 plants. Height was measured, and then plants were tugged to detect the degree of below-ground damage. If tugged plants freely exited the soil and had no attached live roots, the damage was scored as fatal. All of these plants appeared dead, no resprouting was evident, and each had a chewed taproot stump, the diameter of which was measured and recorded. If tugged plants could be pulled from the ground easily, but still had live laterals above the chewed taproot, they were noted as sustaining severe damage. In these instances, diameter of the largest chewed root was measured. Typically, these plants had many dead, but a few living branches. If tugged plants felt loose, but could

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not be easily pulled from the soil, they were scored as sustaining minimum damage. If tugged plants were tightly rooted in the soil, we assumed no root damage. The majority of branches on plants in both these categories appeared alive.

Results of gopher damage are listed in Table 1. Nearly 23% of the plants sampled had experienced some degree of gopher damage; of these, 7.0% were dead as a result of gophers, 5.3% had been severely affected, and 10.6% had been minimally affected. The diameter of gopher-chewed roots ranged from 11 mm to 55 mm and averaged 27.7 mm.

Gopher damage appeared to affect plant height; analysis of variance revealed significant height differences between plants in the 4 categories of damage (F = 4.463, P = 0.004, df = 3). However, saltcedar plants not damaged by gophers tended to be only slightly taller than plants sustaining gopher damage (Table 1), suggesting that gopher damage had been relatively recent.

The study area was searched for evidence of active gopher mounds. Early in the evening, 7 active mounds were excavated, and Sherman live-traps baited with seeds and fresh plant material were placed at the tunnel level. These traps were then covered with soil, using local materials to prevent cave-ins at the trap entrance. Trapping was done under the provision of a scientific collector’s permit issued by the California Department of Fish and Game. Traps were checked the following morning shortly after sunrise.

From the 7 traps set in active gopher tunnels, 1 valley pocket gopher (Thomomys bottae) (Ingles 1965) was captured. Two other traps were found packed with soil, presumably by gophers. The 4 remaining traps showed no obvious sign of gopher activity.

These data are the first reported evidence of a native species, Thomomys bottae, inducing mortality in the exotic Tamarix ramosissima.

The proximity of a saltcedar stand to gopher habitat may increase its susceptibility to gopher damage. At our site, gopher mounds appeared more extensive in the alkali meadow immediately adjacent to the saltcedar stand than in the stand itself. We subsequently made observations at other even-aged stands of saltcedar that occur adjacent to alkali meadows at other locations in Owens Valley and in Deep Springs Valley. Again we found gopher damage, so the phenomenon is not isolated to this single stand.

In general, the influence of fossorial animals on plant communities has received relatively little research attention (Andersen 1987). Although gophers may kill or slow the growth of saltcedar, their long-term effects on stand size and vigor or on saltcedar establishment in the meadow remain unknown. Other researchers have found that pocket gophers cause significant woody plant mortality in a variety of plant communities (Crouch 1971, Marsh and Steele 1992, Fox and Hunt 1994, Ferguson and Adams 1994), and Huntly and Inouye (1988) and Cantor and Whitman (1989) reported that tree encroachment into meadows was significantly slowed when gophers were present in meadows. However, given the vigorous growth of saltcedar in general, gopher damage may merely thin the stand, allowing the remaining individuals to continue unabated.

<table>
<thead>
<tr>
<th>Gopher damage</th>
<th># plants</th>
<th>% of total</th>
<th>Avg. ht. (cm)</th>
<th>±s</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>420</td>
<td>77.0</td>
<td>128.9</td>
<td>33.3</td>
</tr>
<tr>
<td>Minimum</td>
<td>58</td>
<td>10.6</td>
<td>120.3</td>
<td>30.5</td>
</tr>
<tr>
<td>Severe</td>
<td>29</td>
<td>5.3</td>
<td>116.2</td>
<td>32.6</td>
</tr>
<tr>
<td>Fatal</td>
<td>38</td>
<td>7.0</td>
<td>113.4</td>
<td>25.3</td>
</tr>
<tr>
<td>All total</td>
<td>545</td>
<td>100.0</td>
<td>126.2</td>
<td>32.8</td>
</tr>
</tbody>
</table>

**LITERATURE CITED**


Received 11 June 1995
Accepted 19 January 1996