In 1873, Russian thistle entered the United States via contaminated flax seed in South Dakota. By 1898, it occurred at over 40 locations in eastern Washington, in 18 square miles near Pendleton, Oregon, and in much of southern Idaho's irrigated land. By the late 1930s, Russian thistle infested nearly 1 million acres of land in southern Idaho. The weed's drought tolerance and long-distance seed dispersal has made Russian thistle one of the most common weeds in the wheatlands and semidesert range of the western states. Russian thistle is a serious problem, especially when drought, poor crop stands, or late plantings favor its growth. For example, Russian thistle caused a major yield loss under low rainfall in a spring wheat crop in 1985 (Table 1).

<table>
<thead>
<tr>
<th>Year</th>
<th>Russian thistle density (plants/sq ft)</th>
<th>Wheat yield loss (%)</th>
<th>March-June rainfall (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>5</td>
<td>31</td>
<td>3.9</td>
</tr>
<tr>
<td>1984</td>
<td>10</td>
<td>11</td>
<td>5.5</td>
</tr>
<tr>
<td>1985</td>
<td>4</td>
<td>55</td>
<td>1.8</td>
</tr>
</tbody>
</table>


With Russian thistle’s wide distribution and drought tolerance, people have tried to find an economical use for it. In the 1930s, farmers cut tons of Russian thistle for livestock hay because it was often the only forage available during the Dust Bowl. Cattle poisoning was not reported, but sheep poisoning was reported once. Preliminary studies analyzing different Russian thistle selections for forage quality found its protein content ranged from 9 to 23%.

Russian thistle’s drought tolerance and high water use efficiency leads to high productivity, 1.5 to 4 tons/acre of dry matter without irrigation. As a result, pelleted Russian thistle has been tested as an alternative energy source, but commercial development has not occurred.
IDENTIFICATION

Russian thistle is a broadleaf plant in the goosefoot family (Chenopodiaceae). Russian thistle seedlings look like pine tree seedlings. Leaves are cylindrical, fleshy, up to 2.5 inches long, and alternate. Later leaves are progressively shorter and broader at the base and the sharp spine at the leaf tip becomes more noticeable. The last leaves look like scales with a sharp spine. Russian thistles can grow 3 feet tall with many branches and a rounded, tumbleweed shape. Plants growing alone are often slightly wider than they are tall. Stems and branches often have red or purple stripes. Single flowers are borne in the leaf axil above a pair of small leaf-like spine-tipped bracts. The greenish to purplish flowers lack petals and are about 1/4 inch across. Fruits have 5 wings (1 from the back of each sepal) and contain a single seed. The grayish seed is 1/16 inch wide and contains a coiled embryo.

These two species intercross and form hybrids with many variations of each weed’s characteristics.

BIOLOGY AND ECOLOGY

Russian thistle is a summer annual, reproducing by seed. The seed is dormant for a short period after it matures. Dormancy is broken over time, allowing seed to germinate over a wide range of temperatures the following spring. Optimum temperatures for Russian thistle germination range from 45°F to 95°F, but it can germinate when night temperatures are below freezing if daytime temperatures are above freezing. However, frost easily kills emerged seedlings. Seeds also germinate with little moisture. Good emergence was noted with as little as 0.3 inch of rainfall (Figure 1).

Barbwire Russian thistle (Salsola paulsenii) is similar to Russian thistle and also grows in the western United States. Barbwire Russian thistle is more prickly, even as a seedling, has stiffer stems with pale stripes, flowers 2 to 3 weeks earlier, and the wings on the fruit can be twice as large. The wings are usually deep red on Russian thistle and colorless to pale pink on barbwire Russian thistle.

Russian thistle seedlings establish poorly in or on compacted soils. On a compacted soil surface, the root cannot penetrate the soil as the coiled embryo unwinds during germination. Under favorable conditions, seedlings can emerge from 2-inch depths, but emergence is best at depths less than 1 inch (Figure 2).

Russian thistle growth is greatly suppressed when other plants establish first, overtop the weed, and have adequate moisture. Russian thistle dominates during drought conditions, in poor stands of cereal crops, or when competing vegetation is removed by practices like overgrazing.
Russian thistle growth in cereal crops. Although Russian thistle is found in most small grains, it is more severe in spring crops. For example, Russian thistle is more severe in spring wheat than winter wheat: 1) almost twice as many seedlings emerge in spring wheat than winter wheat; 2) about half of the seedlings in winter wheat naturally die while most survive in spring wheat; 3) winter wheat suppresses Russian thistle growth more than spring wheat. Although spring wheat is less competitive than winter wheat, a good stand of either crop greatly suppresses Russian thistle (Figure 3).

Russian thistle recovers and begins rapid growth about 2 weeks after wheat harvest. About 90% of its growth in wheat occurs after harvest. This demonstrates the efficiency of Russian thistle's roots in extracting the limited soil moisture remaining after a wheat crop. Roots may extend over 6 feet laterally and 6 feet deep. Because Russian thistle has a spreading root system and is a drought-tolerant C4 plant, it has a high water use efficiency. That is, it produces a lot of shoot growth with little water. Even with this high water use efficiency, each plant used an estimated 8 gallons of water after spring wheat harvest until the first killing frost (late July through late September, Figure 3).

Single plants grown in undisturbed fallow produce over 150,000 seeds, 17,400 seeds after spring wheat harvest, and 4,600 seeds after winter wheat harvest. Russian thistle plants, which break from their roots after maturity, tumble with the wind, spreading seed. Seed viability is rapidly lost in the soil. About 99% of the seed either germinates or decays in the soil during the first year. The large number of seeds produced and rapid dissemination ensure future infestations.

**CONTROL**

Pull, hoe, or cultivate to kill Russian thistle. Grazing or mowing will not kill the weed or stop seed production because new branches resprout from the stem. In noncropped areas, established, competitive perennial grasses suppress Russian thistle. Similarly, a healthy stand of winter wheat is also more competitive against Russian thistle than spring cereals. If Russian thistle is a problem after small grain harvest, control the weed within 2 weeks after harvest with tillage or herbicides, before soil moisture is depleted and the weed produces large quantities of seed. Control Russian thistle in fencerows and waste areas to prevent a seed source that can infest cultivated fields. Even though seed longevity is short, seed dissemination can quickly reinfest otherwise clean fields.

Two moths were introduced into California as potential biological control agents for Russian thistle. Larvae of Coleophora parthenica are stem borers and larvae of Coleophora klimeschiella are casebearing leaf feeders. Although these moths established, they are ineffective because of heavy parasitization by native wasps. As a result, this biocontrol project was discontinued.

---

Figure 3. Russian thistle growth in fallow and when competing with winter and spring wheat at Lind, Washington. Russian thistle emerged about April 7. Winter and spring wheat were harvested at points marked ww and sw, respectively.

Many Russian thistle plants in the Pacific Northwest are now resistant to herbicides. A survey in eastern Washington found over half of the sampled sites had plants resistant to sulfonylurea herbicides (such as Glean, Finesse, Ally, Amber, Express, and Harmony Extra). Some Russian thistle biotypes are also resistant to herbicides in the triazine herbicide family. Rotate herbicides with different modes of action to help prevent resistance if it is not yet a problem. If a herbicide with a resistance problem is essential to control other weeds, tank-mix it with a herbicide with a different mode of action to control resistant Russian thistle.

For chemical control recommendations, refer to the Pacific Northwest Weed Control Handbook, an annually revised extension publication available from the extension offices of Oregon State University, Washington State University, and the University of Idaho.

By Chris Boerboom, Ph.D., Extension Weed Specialist, Department of Crop and Soil Sciences, Washington State University.

Pacific Northwest Cooperative Extension bulletins are jointly produced by the three Pacific Northwest states—Washington, Oregon, and Idaho. Similar crops, climate, and topography create a natural geographic unit that crosses state lines. Since 1949 the PNW program has published more than 450 titles. Joint writing, editing, and production have prevented duplication of effort, broadened the availability of faculty specialists, and substantially reduced costs for the participating states.

Issued by Washington State University Cooperative Extension, Harry B. Burcalow, interim director; Oregon State University Extension Service, O. E. Smith, director; the University of Idaho Cooperative Extension Service, LeRoy D. Luft, director; and the U.S. Department of Agriculture, in furtherance of the Acts of May 8 and June 30, 1914. Cooperative Extension programs are consistent with federal and state laws and regulations on nondiscrimination regarding race, color, national origin, religion, gender, age, disability, or gender preference. Trade names have been used to simplify information; no endorsement is intended. Published October 1993.