



# WILD OAT

## Identification and Biology

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UNIVERSITY OF IDAHO

### Recognizing Wild Oats

#### The Seed

Pioneers settling North America brought the first wild oat seed from Europe in contaminated seed grain. By transporting wild oat seed in hay, harvest equipment, nursery stock, screenings from processors and contaminated grain for seed or livestock feed, man continues to be the most active means of spreading this weed. Carelessness and indifference have been twin culprits in scattering wild oats across the Idaho landscape.

The flower of the wild oat seed is small, long and slender. It is broad near the middle and tapers at each end. The surface of the lower bract (lemma) has distinct veins, or ribs, and may be covered with a few to very many fine hairs. A long, black twisted bristle (awn) protrudes from the center of the seed (Fig. 2).

In 1968, a drill box survey conducted throughout Idaho showed that 37 percent of grain planted for seed was contaminated with wild oat seed. Some samples contained as many as 99 wild oat seeds per pound of grain seed.

Wild oat seed can be distinguished from cultivated oat varieties by its "sucker mouth" base

In a more recent seed laboratory survey, 10 percent of wheat samples from eastern Idaho contained up to 120 wild oat seeds per pound of grain. The same survey revealed that 28 percent of the barley samples were contaminated with as many as 125 wild oat seeds per pound.

In 1976, laboratory analysis indicated that 8 percent of wheat samples collected contained from 1 to 140 seeds of wild oats per pound of grain and that 15 percent of barley samples contained 1 to 400 such seeds per pound.

Adding to the challenge of containing the spread of wild oats is that, in Idaho, certified small grain seed may contain trace amounts of wild oat seed, up to 1 per pound.

Wild oats are well adapted to the cultivated lands of Idaho and can flourish under most cultural practices currently used in crop production. The densest populations are found in the northern and eastern portions of the state (Fig. 1), although infestations are intensifying throughout south central and western Idaho.

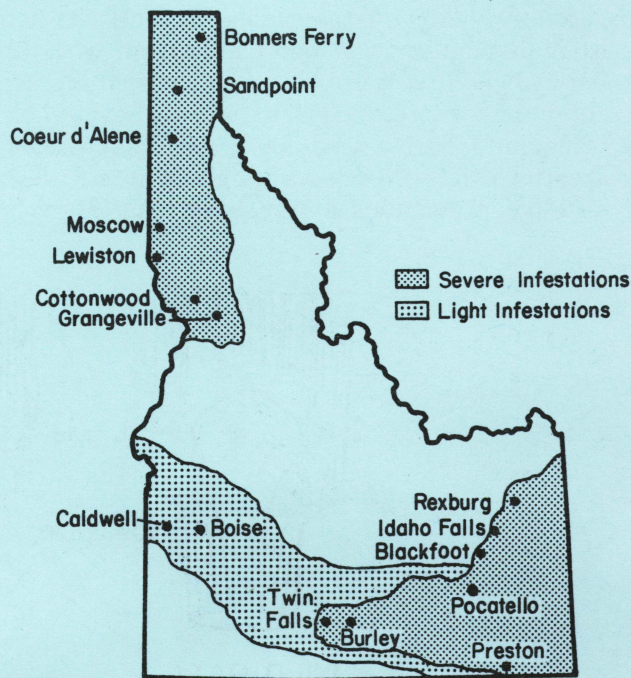
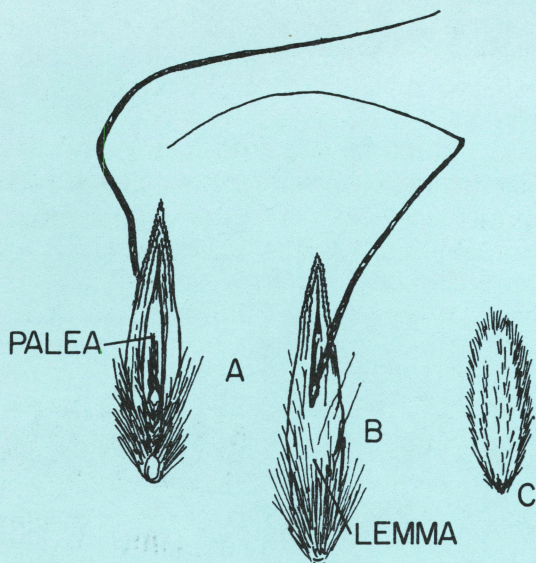


Fig. 1 Areas of Idaho where severe and moderate wild oat infestations occur.

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**Fig. 2.** Wild oat seed with (A) palea (inner bract) attached and (B) lemma (outer bract). Seed with lemma and palea removed (C) has fine, soft hairs.

(callus) ringed with a tuft of hairs. Seed may vary from straw color or light yellow to gray, brown or black. It ranges from 11 to 14 mm long (about 1/2 inch) and from 2.0 to 5.5 mm wide (about 1/16 to 3/16 inch).

The hairs on the lemma, the black awn and the sucker mouth readily distinguish wild oat seeds from those of cultivated oat varieties.

### Seedlings

It may be difficult to identify wild oat seedlings in a small grain crop without looking closely at the vegetative parts of the plants. Several characteristics distinguish wild oat plants from wheat and barley. The first leaf of the wild oat seedling twists counterclockwise when viewed from above, whereas wheat and barley seedlings twist clockwise. The sheath of the wild oat seedling has no auricles, or clawlike projections at the base (Fig. 3). Wheat

seedlings have short, hairy auricles, and barley has long, smooth, clasping auricles that extend above the stem.

In the wild oat seedling, the ligule (collarlike structure at the junction of the leaf blade and sheath) is elongated and bluntly pointed at the center. Wheat seedlings, on the other hand, have long, broad ligules without distinct points. The ligule of barley seedlings is smooth, bluntly pointed and has sloping shoulders. The leaf margin and sheath of the wild oat seedling have fine hairs, whereas the leaf margins of barley and wheat seedlings are hairless.

To make a final confirmation, the soil around the seedling should be carefully loosened and the plant removed so that the attached seed can be identified. Any broad-bladed grass growing outside the seeded rows should be suspect.

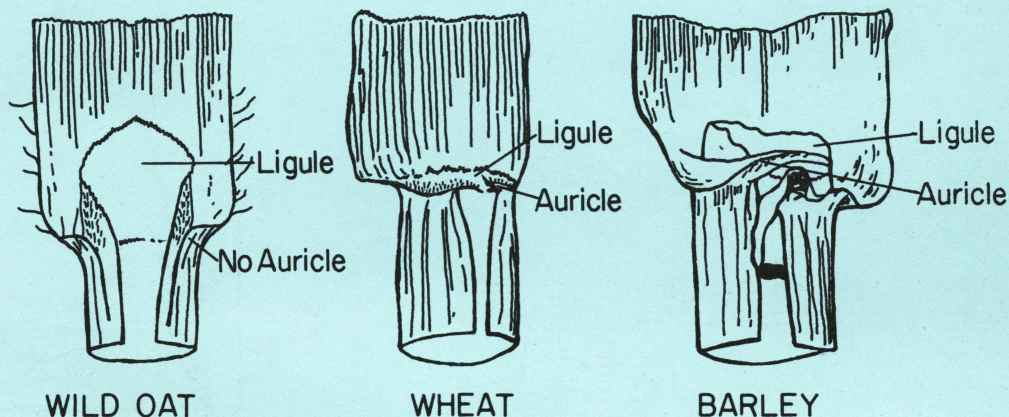
### The Mature Plant

Wild oat is an annual grass, reproducing by seed. Stems are erect, stout, smooth and 1 to 4 feet tall. Its long, rough leaves are broad at the base and gradually narrow to a point. The flower arrangement resembles that of cultivated oats, with two- or three-flowered spikelets about 1 inch long. Wild oat plants develop tillers, or basal branches, that produce seeds at maturity. Under optimum conditions, the plants may send out 30 to 40 tillers, but seven or fewer is the average number.

## Biology

### Variability — Key to Survival

About 60 strains of the two subspecies of wild oats are common to the United States, according to C. I. Seely, professor emeritus at the University of Idaho. This broad genetic base is one reason why wild oat plants adapt so well and populations de-



**Fig. 3.** Comparison of auricles and ligules of wild oat, wheat and barley seedlings.

velop so quickly under a wide variety of climatic and cultural conditions. The genetic variability allows strains to adapt readily to cool or warm climates, changes in cropping systems and possibly to control measures. Where strong seed dormancy is necessary for survival, wild oat populations also exhibit this characteristic. As a result, wild oat seeds from northern Idaho remain dormant for substantially longer periods than seeds from southeast Idaho, Oregon and North Dakota. Studies indicate that some strains of wild oats will tolerate IPC (propham) concentrations six times greater than other strains.

Prolonged growth of monocultures using early maturing crops can result in wild oat populations that shatter early. Rotating crops and periodically changing cultural practices and control programs minimize the adaptability of wild oat plants.

### Seed Production and Viability

Under optimum conditions, wild oat plants have produced up to 40 tillers and more than 500 seeds. However, when growing in small grain fields, they generally produce 200 to 250 seeds, and plants emerging in late June or July may yield as few as 1 to 10 seeds. How many seeds an individual wild oat plant will produce depends on such factors as date of emergence, availability of nutrients and moisture, density of plants and competitiveness of the associated crop.

How long the seeds live depend on the climate, soil and cultural practices to which they are subjected. Generally, wild oat seeds will survive 3 to 5 years in Idaho's cultivated soils. They tend to live longer in clay soils than in sandy and silt soils, and their viability appears to increase in pasture, grass sod and prolonged compacted soil. Seeds collected 21 years ago in the Moscow area and stored under laboratory conditions still had 78 percent viability.

While it is not known exactly how depth of burial affects the length of time seed remains viable, seed buried 15 inches deep for 4 years had a high rate of survival.

### Dormancy

The single factor most responsible for prolonging infestations of wild oats is variability in seed germination. When environmental conditions permit, a portion of the seed produced each year germinates at different time intervals, thus ensuring the perpetuation of the species. Generally, seeds subjected to warm, dry conditions after shattering lose their dormancy more rapidly. The after-ripening process is enhanced and a larger percentage of the seed will germinate when environmental conditions are not limiting. Spring usually finds more seeds remaining dormant if the previous fall has been cool and wet.

Seely has identified six factors that influence dormancy: (1) germination inhibitors in the hull that chemically prohibit germination until they degrade; (2) immature embryos that fail to germinate for 3 to 6 weeks while awaiting favorable weather; (3) an impermeable seed coat that excludes the oxygen necessary for germination; (4) endosperm inhibitors present in the food storage portion of the seed that prohibit food availability for the seedling; (5) environmental stresses such as high moisture levels, low temperatures, sparse crop stands and lack of essential elements; and (6) the location of the seed along the flower stalk.

Seeds produced at the top of the stalk are more dormant than those produced at the bottom (Fig. 4). Within the spikelet, the primary seeds remain dormant only for a short time, but secondary seeds can remain dormant for a year or more and tertiary seeds for 2 years or more (Fig. 5).

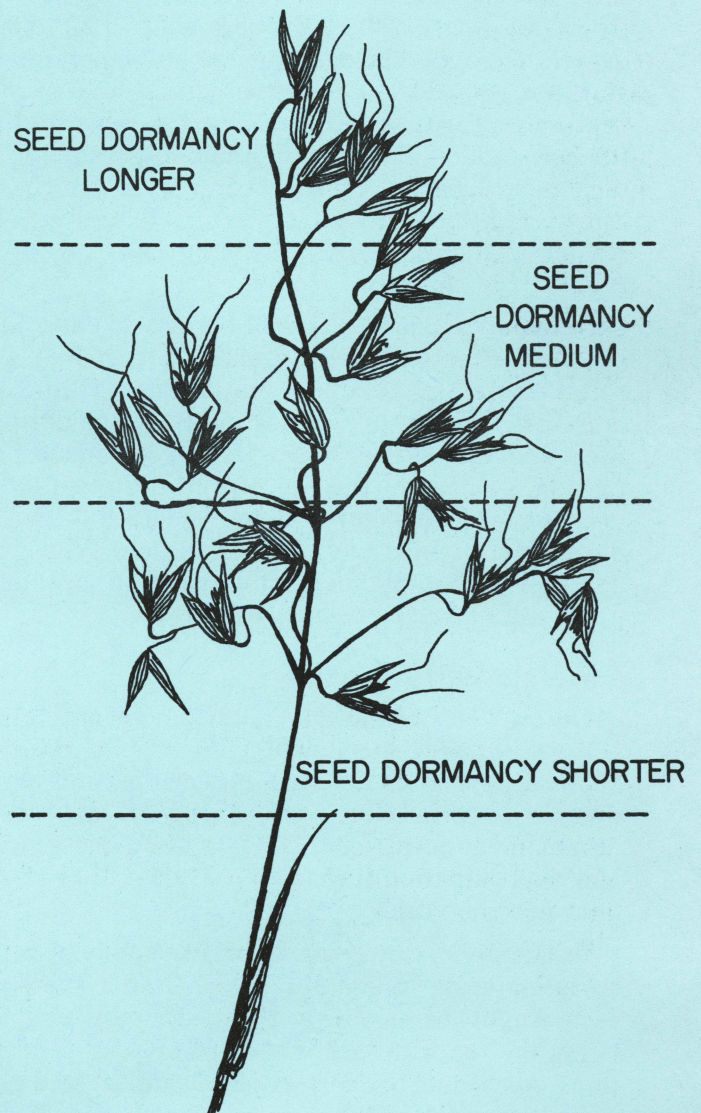


Fig. 4. Influence of seed location along the flower stalk on relative dormancy.

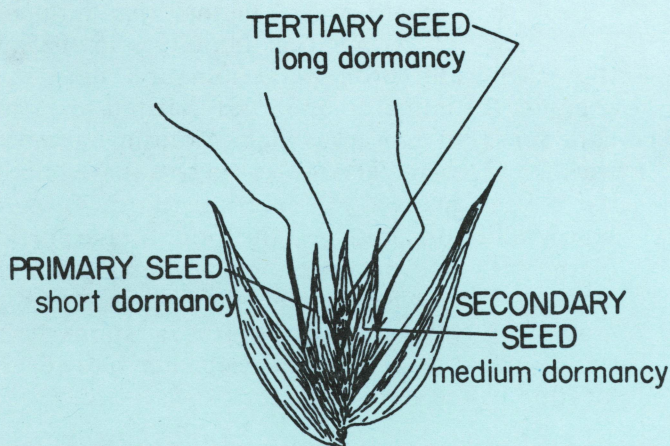


Fig. 5 Influence of seed location in the spikelet on relative dormancy.

## Emergence

Most wild oat seeds germinate in the spring, although a small portion will sprout and emerge in the fall. While seeds will readily germinate at 50 to 60 degrees F., some have germinated at temperatures as low as 40 degrees F. and others as high as 90 degrees F. Light will inhibit germination of fully ripened seed but may slightly stimulate germination of seeds with partially ripened embryos. The highest rate of seed germination has occurred in sandy soils where moisture levels were between 65 and 90 percent of field capacity.

In Idaho's climate, germination of wild oat seeds generally occurs across 2 months. Depending on soil temperatures, seedlings may start appearing in late April, with the major portion emerging during May and early June. Seeds usually germinate in the top 6 inches of the soil profile, although they may emerge from depths of 8 to 10 inches if soil conditions are compatible for germination. Wild oat populations do not emerge uniformly, so seedlings usually are in several stages of growth.

## Development

During the first 30 days after emergence, wild oat seedlings develop slowly. Leaves begin to form about 5 days after the seedling emerges and continue to do so for 60 to 75 days (Fig. 6). Most root development occurs 20 to 75 days after emergence, and tiller initiation starts about 20 days after seedlings become visible.

In late June, flower stalks begin to appear, with seeds maturing in late July. Seed shatter starts in early August before crops mature, thereby repopulating the soil with seed for future wild oat generations. According to Seely, 1 ton of wild oat seed can

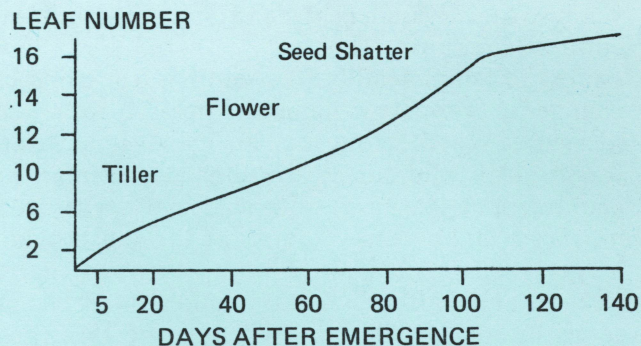


Fig. 6 Development of wild oat plants during the growing season.

be produced on 1 acre. At a test weight of 12 pounds per bushel, that means a total wild oat yield of 167 bushels per acre!

## Population Densities

The intensity of infestations and the time required for wild oat populations to reach economically damaging levels depend on the amount and distribution of seed introduced into a field, environmental conditions, cultural practices and control measures. In Idaho, infestations vary from scattered plants along fence rows and irrigation ditches to totally infested large fields with densities of 150 to 400 seedling wild oat plants per square foot. In some areas, seed populations have exceeded 26 million per acre in the top 6 inches of the soil profile.

## Adaptability

Prolonged fallowing can reduce wild oat populations, but continuous cropping, high rainfall and irrigation enhance their establishment and survival. While maximum germination occurs under cool, moist conditions, established plants are able to survive moderate drought conditions. Plants that emerge in the fall will be victims of winter-kill if they are subjected to temperatures below 15 degrees F. for more than 7 days.

Wild oats are best adapted to crop rotations that include small grains. Short-stawed varieties of wheat allow wild oats to grow above the crop, resulting in vigorous weed growth and greater yield losses. Barley plants can compete with wild oats better than either spring or winter wheat. Peas, lentils, sugarbeets and most other broadleaf crops offer little competition. (See *Wild Oat: Competition and Crop Loss*, University of Idaho Current Information Series 541.)

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