CEREAL LEAF BEETLE

A Risk Assessment for Washington
Cereal Leaf Beetle (CLB) Risk Assessment
By Mike Klaus, WSDA, Plant Services

I. Summary of Distribution, Hosts And Life Cycle

Distribution: The Cereal Leaf Beetle (CLB), Oulema melanopus (L.), is a chrysomelid beetle naturally distributed throughout Europe to Siberia and North Africa. CLB was found in Ontario and Quebec, Canada and several northeastern and midwestern states during the 1960's and '70's. Utah, Montana and Idaho have recently reported CLB infestations.

Hosts: The preferred hosts in descending order are as follows: the spring planted small grains, including wheat, oats, and barley; such grasses as wild oats, quackgrass, timothy, rye grass, orchard grass, and canary grass; other grasses and grains, including rye, wild rye, smooth brome, foxtail millet, corn, sorghum, and sudan grass and blue grass, millet, fescue, downy brome, redtop, and rice. CLB has been reported in relatively low numbers among stores of oats and barley (CAIPR 1977). CDFA may have intercepted dead CLB adults in shipments of wheat from Montana (undocumented 1992). MSU entomologists have observed no CLB survival in samples of grain from elevators. Even under optimal conditions (being placed on the surface of the grain mass), CLB survival was less than 3 weeks (Morrill et al., 1992).

Life Cycle: CLB overwinters in the adult stage in a variety of sheltered places. Adults are usually found under trees and shrubs surrounding cultivated fields. Best overwintering survival and highest concentrations of overwintering adults are found inside straws or stems of grain stubble adjacent to heavy backdrops located in Fall downwind edges. Periods of extremely cold temperatures (-8 degrees C or below with no snow cover) causes near 100% mortality in ten days to two weeks. Temperatures of 19 degrees centigrade or higher are required to fully activate the beetle. Activity is initiated at 16 degrees C or above. Adults will sun themselves and feed on grass in areas of overwintering, but flight does not occur until temperatures reach 18 degrees C or above.

Adults are strong fliers and move quickly to early spring grasses. As temperatures rise, the adults move to winter grains and then to spring grains. The overwintered adults feed voraciously and may consume 3.5 times their body weight in a day (Ruppel 1964). The females oviposit anywhere on the plant, but prefer the upper surfaces of the leaf, along the mid vein near the base at the point where the leaf sheath arrives. On corn oviposition takes place near the midrib on the underside of the leaf. Corn is attacked primarily by new generation adults which are not sexually mature until the next Fall. Corn is lethal to CLB up to the three leaf stage and adults do not like corn above waist high. Ruppel (1964, 1972) reported an average oviposition of about 200-250 eggs per female, with a maximum potential of 400 eggs per female. An average incubation period of 4-7 days was also reported.
In Michigan, overwintered adults are numerous from mid April through late May (Ruppel, 1964). Adults may live for 40 days or longer. There is one generation per year.

The larvae go through four instars, each lasting 2-3 days (Ruppel, 1964). Feeding begins almost immediately after hatching. The larvae form a fecal covering which apparently protects them from desiccation and natural enemies. If the fecal coat has whitish or pinkish particles or appearance, larva is diseased. This is usually brought on by stress such as high temperatures and/or high humidity.

According to Westdal (1966), larval development is completed in about two weeks, but larvae may be found during most of May and June due to the extended period of oviposition. Pupation takes place in 11-14 days.

In southern Michigan, the first generation of new adult beetles emerges in mid to late June (Ruppel 1972). They feed heavily for about two weeks on any available grasses, grain or corn. These new adults prefer lush tender leaves of primarily late planted spring grain, timothy orchard grass or reed canary grass in the Midwest. They then seek protected sites and become quiescent until the following spring.

CLB have up to a 97% mortality rate over the year according to Ruppel (1972). Only one generation per year occurs.

Battenfield et al.(1982) published an extensive bibliography on CLB.

II. Epidemiology and Control:

Both adults and larvae attack the upper surfaces of the leaves and feed length-wise between the veins (Manson and Boyce 1968). The adults feed right through the leaves causing the leaves to split lengthwise and appear tattered. Larvae eat all chlorophyll containing cells leaving the lower epidermis. They will rarely chew completely through the leaf. When heavily infested, young plants will appear silvery and the entire field will have a frosted appearance.

Adults show a preference for younger plants and even the younger growth on individual plants (Rupple 1978). The larvae cause the greatest damage because of greater abundance. Plants that are attacked may be killed or may be so seriously injured that harvesting is not worthwhile (Manson and Boyce 1968).
Davidson and Lyon (1979) stated that CLB is a vector of maize chlorotic mottle virus (MCMV) and causes the disease corn lethal necrosis. Seed set, fill text weight and protein content are affected. They also report that fumigants have been useful in eliminating CLB infestations in grain, forage and straw. CDFA lists several acceptable treatment regimens for hosts and carriers of CLB (CDFA 1989). Chemical control measures for crop protection were developed in the 1960’s. However, most CLB infested areas of the East no longer require treatments since USDA-introduced biological control agents were established.

III. History of Domestic Introductions:

CLB was first collected in the United States in 1962 in Berrien County, Michigan (Anonymous, 1963, appendix A). The USDA tried unsuccessfully to eradicate CLB with chemicals. Meanwhile other methods were explored. The result was one of the most successful parasite programs in the U.S.

CLB was found near Ogden, Utah in 1984 (Karren, 1989). CLB is now known to occur throughout Utah state (Karren, 1992 unpublished report) and in the states of Idaho and Montana. Isolated populations of CLB were reported in Montana in 1989 (Jensen, 1990).

In Utah, economic populations of CLB were reported in 1991. In 1991, CLB was also reported attacking corn for the first time in Utah. However, the damage was minimal. Dryland wheat was observed to be lightly infested for the first time in Utah in 1991.

No surveys for CLB have been conducted in Washington State. In 1971, USDA made an extensive survey in small grain production regions of the mid-west (Burger, USDA Report, 1971). Montana, Washington, Idaho and Utah were not included in the survey because, as Burger stated in the 1971 report, "It is thought that most of the conditions in states surveyed that may determine the degree of infestation of the CLB, will be recognizable in these states". The following conditions were considered in the survey:

1. Abundance, location and value of host crops (winter wheat, spring wheat, oats and barley).

2. Cropping and cultural practices.

3. Topography and climate.
The most important conditions, in USDA's opinion, that are inicimal to the normal development of CLB are the following:

1. Sparseness of preferred host crops (e.g. spring-planted cereals and succulent native grasses).

2. Cold winters with little or no snow cover and hot dry summers.

3. Open land without protection by hills or vegetative cover.

4. Lack of grain stubble, woodlots and fence rows to provide protection for overwintering adult beetles.

5. Persistent winds during spring feeding and oviposition, and winter winds that significantly effect the chill factor.

Based on those criteria it appears that CLB would not be an important pest for most of the dryland wheat areas of eastern Washington. However, the following areas seem to fit a higher risk category for CLB infestation:

The Palouse - esp. around Walla Walla to Pomeroy area
Northeastern Counties - Spokane, Stevens, and Pend Oreille
Kittitas County - small grains, forage and hay grasses
Western Washington - native grasses (and Christmas trees)

It should be realized that insects are capable of quickly adapting to new environments and therefore CLB may not fit the predictions that were made based on the above criteria. Dr. Karren, Entomologist at Utah State thinks CLB may already be adapting to western conditions. CLB appears to be adapting to whatever overwintering sites exist i.e. ditch banks canals etc. in Utah.
IV. Rating Elements:

Probability of Establishment in Washington State

Estimated probability of pest to spread beyond current western distribution.  
**HIGH**

There is a high probability of spread into Washington. Experts predict that CLB will likely enter Washington by man's movement of livestock with hay and straw. Straw is considered to have the highest risk (Burger, 1992). Some southeastern Washington residents purchase hay from the Camas Prairie in Idaho. That area is not known to be infested with CLB.

Once in Washington, this pest will probably spread relatively fast. Historical evidence of the spread of CLB through the eastern and midwestern U.S. (and now through Utah and into to Idaho) suggests that this insect, once established in a region, can spread rapidly by natural means. The beetles are strong fliers that travel with ease on gusts of wind (USDA, 1979).

Checklist to assess the likelihood of entry:

- Frequency and quantity of CLB movement by natural means - literature suggests rapid movement in the mid-west. Adults are strong fliers.

- Opportunity for contamination of a commodity, cargo or other means of conveyance - Ample opportunity esp. straw and hay bales left in fields after harvest.

- Can CLB survive in transit and what are the viable time frames? Montana State Entomologists report virtually no survival in stored grain.

- Can CLB survive environmental conditions of shipment? Zero survival after three weeks in grain. (Morrill, 1992)

- Number and relatedness of other pests associated with commodities - CLB does not feed on grain, adult beetle size probably too large for survival between individual grain kernels.

- Ease or difficulty of detecting CLB in shipments or surveys - Probably easily detected in grain samples due to size and distinct colors.
Checklist for Potential of Establishment:

- Availability and distribution of susceptible hosts in Washington - high
- Environmental suitability in Washington - high in many areas, low in some
- Reproductive Strategy of the pest - high (see biology)
- Method of pest survival - adult overwinters, high mortality over the year (see biology)
- Intended uses of commodities - hay, grains, straws

Estimate of Economic Impact If Established in Washington. High

If CLB becomes established without its' natural enemies, the economic impact to Washington could be high. CLB attacks both spring and fall grains, but the most severe injury is done to the spring grains (Ruppel 1972). Estimates of losses in Canada ranged from negligible to 75% in spring oats and 25% in winter wheat (CAIPR 1977). In parts of U.S.S.R. losses from infestations ranged from 25 to 50% of the crop (USDA, 1963). In Utah, economic populations of CLB were reported in 1991 (Karren 1992).

A more exact economic impact would be more accurately estimated by a professional economist, such as was done for apple maggot by WSU in 1982 (Schotzko, 1982).

Quarantine Impact:
CLB fits the WSDA definition of an "A" rated insect pest. An "A" pest is an organism of known economic importance subject to state enforced action involving: eradication, quarantine, containment, rejection or other holding action. A strict enforceable quarantine would be needed and would be difficult for Washington to carry out without border stations or at least transshipment point inspections. USDA was unable to stop the spread of CLB in the East after it was detected in the early 1960's.

The California Department of Agriculture has an exterior CLB quarantine, CDFA Quarantine #3277 (see appendix C), to regulate certain cereals, grasses, grass sod, seed fodder and plant litter, used harvesting equipment and cut or balled Christmas trees. CLB's will be found in the trunk area of trees which have shaggy bark or in clumps of dead needles caught where branches meet the main trunk. The grass seed industry would not likely be impacted greatly since CLB free seed could screened if needed. In fact, the CDFA quarantine exempts small grain seed, grass seed and forage seed when cleaned and shipped in bags or small packages.
CDFA is actively following the CLB situation in the West. CDFA quarantined areas of Montana and Utah. CDFA is currently restricting grain from the three CLB infested counties of Montana. Some grain shipments from Montana were rejected by CDFA in 1991 (Brown, CDFA, pers. comm.).

The Washington Hay Market

Perhaps the most immediate concern for CLB in Washington is the potential for quarantine restrictions of our hay exports. Large export shipments of timothy, alfalfa, and oat hay are made from the Ellensburg area. Most of the high quality timothy hay is grown in Kittitas County and has an estimated gate value in excess of $16 million, according to Terry Ely, USDA, APHIS, PPQ and Tom Hoffman, WSU Cooperative Extension Service. The value of all of Washington hay exports to Japan in 1990 was $24 million (Yates, 1992). CDFA reportedly rejected a truckload of Montana grown timothy hay that was reshipped from Ellensburg in 1991. Most Washington oat hay (not straw) is grown in Kittitas and Grant counties. The oat hay market opened up about three years ago. Alfalfa comes into to Ellensburg from many areas (including Alberta, Canada, Idaho, Montana, Nevada and Utah) to be containerized and shipped to Japan. Japan is currently concerned about Hessian fly in these commodities but allows various acceptable treatments depending on the host. The following table summarizes known treatment practices:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timothy</td>
<td>Fumigation - to expedite shipments to Japan</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>visual inspect. growing season, harvest &amp; storage for quackgrass, vol. wheat or barley. Not normally fumigated</td>
</tr>
<tr>
<td>Oat Hay (not a Hessian fly Host)</td>
<td>usually not fumigated. Occasionally field inspected. stored product is visually inspected.</td>
</tr>
</tbody>
</table>

The USDA, ARS is currently testing fumigation treatments for hay including oat hay.

Christmas Trees

Also, Christmas tree shipments could be restricted since CLB adults may overwinter on trees grown with grass cover crops. Current tree inspection and shaking program may address that concern.
The Rodeo Theory

Dr. Karren suggested that the rodeo industry (with all the rapid interstate movement of hay and straw) is a possible mode of transport for CLB. He noted that Ogden and Billings have big rodeos in summer. The Ellensburg Rodeo and County fair is held around Labor Day in our state. The Pendleton Roundup in nearby Oregon is also held in September. This industry would be hard to regulate without border stations. However, the movement of the stock is already regulated and perhaps something could be done in conjunction with those inspections. The highest risk for CLB movement is from infested hay and straw (Burger, 1992 pers. comm.).

The most likely type of movement would be the horseback recreationist and hunters that may bring in CLB infested bedding straw or hay. This group has already been targeted for educational efforts directed towards reducing the risk of weed seed introductions (see appendix B).

Estimate of Environmental Impact if Established. LOW

If CLB becomes established without its' natural enemies, serious damage to grain and hay crops could occur. However, if the biocontrol agents take hold successfully as they have in the eastern U.S., significant CLB damage could be avoided. It is important to note that biocontrol releases in Utah have been unsuccessful so far. It is unknown whether and what factors may be affecting CLB parasites in the West. More parasite establishment research and release attempts should be made in Idaho, Montana and Utah.

If chemical sprays are necessary for CLB, the current methods for control of other grain and hay pests could be disrupted.

Damage to native and Conservation Reserve Program (CRP) grasses may occur and thus impact entire grassland ecosystems. There is no information that any such dramatic impacts have occurred due to CLB infestations.

Estimate of Impact from Social and/or Political Influences.
LOW/MEDIUM

The early stages of CLB invasion and colonization are likely to have localized grain and hay infestations of economic significance. However, parasites would probably become established within a few years which would control CLB. (as was the case in the eastern U.S. in the 70's).
Farmers will have to struggle with developing adequate chemical control programs in those first years of CLB invasion in our state. Nondiscriminate, rash, spray controls directed against CLB may disrupt biological controls already in place for pests like Russian wheat aphid. Sound spray thresholds and practices would need to be developed and adhered to.

However, if CLB parasites do not establish or are slow to establish as seems to be the case in Utah, significant long term problems may cause farmers to demand more research towards combatting this pest.

Conservation Reserve Program (CRP) lands could become infested with CLB. CRP landowners could then be the subject of Pest Board complaints from higher value crop owners such as wheat, oats or corn.

V. Pest Risk Potential Rating  High

VI. Specific Questions:

Should WSDA become involved in a CLB detection survey?

CLB may already occur at low levels in Washington. However, if significant populations of CLB already occurred in Washington, it is likely that county agents, fieldmen or farmers would have reported it by now. If CLB were to be reported, a delimitation survey should be immediately conducted. Early detection would increase the chance of establishing parasites before major crop damage occurs. Also, certain localized CLB situations may be candidates for eradication attempts. However, USDA eradication attempts failed in the 1960's and would likely fail here as well. The chance of local chemical eradication should be considered low. Only special cases of early detection should be considered for eradication. Fortunately, biocontrol of CLB shows great promise. However, this optimism should be tempered by the fact that biocontrol efforts in Utah have not been successful thus far.

Should WSDA become involved in the eradication and/or quarantine of CLB?

Eradication would be unlikely. Very small infestations of CLB may be candidates for eradication attempts. CLB has never been eradicated once established in an area in the U.S. and Canada. Quarantines of a regional or state level may slow the artificial spread of CLB. USDA Quarantines were unsuccessful in stopping CLB spread in the Midwest in the 1960's. Once spread into a region, the natural spread of CLB would be difficult to stop. Any quarantine consideration should include a cooperative effort with adjoining states.
Should WSDA become involved in promoting public awareness of CLB?

Since WSDA will likely have a major regulatory function with regards to CLB, WSDA should be the leader in cooperation with WSU in providing public information for this pest. Descriptions of CLB and damage symptoms should be distributed to county agents, Soil Conservation CRP program administrators and industry publications.

VII. Summary and Recommendations:

Summary:

Cereal leaf beetle is not known to occur in Washington, Oregon or California. In addition to most of the eastern U.S., it is now firmly established in parts of Utah, Montana and Idaho.

Separate infestations of CLB in Utah and Montana indicate that CLB is probably spread by man's activities. Therefore, quarantines would be logical to stop or slow this spread to Washington and to Oregon. A strict enforceable quarantine including border station checks for hay and livestock shipments would be required. While such quarantines may be possible, it is doubtful that WSDA could obtain sufficient support in time to implement a quarantine program in time to stop CLB from entering and establishing in Washington.

Potential significant crop damage by CLB is likely. Such damage has already been reported in Utah and Montana. However, very little total acreage damage was reported.

Once established in an area eradication would be unlikely and quarantines of Washington by other countries or states may be enacted.

Biocontrol is likely for this pest.
Recommendations:

Managing the Risk

1) Strict regulatory action in the form of quarantines of Utah, Montana, Idaho and the majority of eastern U.S. should be considered immediately. This action would require the establishment of transhipment points for inspections. A strict, enforceable quarantine will likely be very expensive and may not be feasible in this year of budgetary constraints.

2) A CLB survey and/or public information program should be conducted. Develop a CLB Extension publication and/or slide set similar to what was done for Russian wheat aphid. Notify Wheat, Hay etc. associations or industry leaders of the potential threat.

3) An emergency "CLB detection action plan" should be developed in cooperation with WSU and other interested parties.

4) WSDA, ODA and CDFA assistance to Utah, Idaho and Montana biocontrol efforts should be considered.

5) WSDA should follow the CLB situation in the west and consider sending an entomologist to an infested area for field training.

6) Determine if/what hay treatments are effective and acceptable for CLB control/elimination.

7) An in-depth CLB economic impact assessment should be undertaken by a professional economist.
Literature Cited


1992. USDA, APHIS, Niles, Michigan. Personal Communication

Brown, S. 1992. CDFA. Personal Communication regarding recent pest border interceptions (checking records to confirm this)


Acknowledgements

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This is a reprint of the 1992 CLB Risk Assessment.
The adult cereal leaf beetle is about 3/16-inch long; the male is slightly smaller and narrower than the female. Wing covers and head are a metallic, bluish black. The legs and the front segment of the thorax are red.

The eggs are cylindrical, rounded, and less than 1/16-inch long. Newly laid eggs are yellowish, but the color darkens to almost black before they hatch.

The larva is slightly longer than the adult, and resembles the Colorado potato beetle larva in shape. The head and legs are brown-black; the body is yellowish. The larva usually is covered by a globule of fecal matter that obscures its coloration except for the head and legs.

The pupa, when removed from its earthen cell, is enveloped in a thin, transparent membrane. Its coloration varies from a bright yellow when it is first formed, to the coloration of the adult just before emergence.

In North America, several species of leaf beetles closely resemble the cereal leaf beetle; the asparagus beetle is one example of a similar species. However, the cereal leaf beetle differs from these other species in that it feeds only on cereals and related grasses. Also, the combination of color patterns of the adult cereal leaf beetle, described here, is not present in the other similar species.

**QUARANTINE**

In an effort to prevent this pest from being spread by shipments of infested materials, the States of Indiana and Michigan have imposed

Prepared by Plant Pest Control Division
AGRICULTURAL RESEARCH SERVICE
Washington, D.C.

Issued March 1963
Watch for the **CEREAL LEAF BEETLE**

The cereal leaf beetle is a serious pest of grain crops. It occurs throughout most of Europe, extending into Siberia in the U.S.S.R. It also damages grain in Morocco and Tunisia in North Africa, and Iran and Turkey in the Near East.

This pest was first identified in the United States in July 1902, when it caused considerable damage to oats, wheat, and winter barley in parts of Berrien County, Mich. Later, it was found to be distributed in Michigan over the southern two-thirds of Berrien County and in the western part of Cass County. Infestations of this insect were found also in northern parts of La Porte and St. Joseph Counties, Ind.

**DAMAGE**

Both adults and larvae of the cereal leaf beetle damage grain crops. Adults take their nourishment from grain shoots, or from adjacent grasses to which they migrate. Larvae chew out long strips between the leaf veins. In heavy infestations, most of the leaves may be consumed, causing the plants to appear yellowish white. Timothy and quackgrass are among the favorite grass hosts.

In other parts of the world, the damage caused by this pest has been of considerable economic importance. In parts of the U.S.S.R., for example, losses from infestations have ranged from 25 to 50 percent of the crop. In certain areas of Romania, attacks have been so severe that the crop had to be plowed under. In a part of Spain, a wheat crop was almost entirely destroyed.

The life cycle of the cereal leaf beetle has four stages—egg, larva, pupa, and adult. Overwintered adults (beetles) appear in the spring; they mate, and the females lay eggs on the upper surfaces of host plant leaves. Larvae hatch from the eggs and begin feeding on the young, tender leaves of the host plants—oats, wheat, barley, rye, corn, and native grasses. In southern Europe, larvae usually are present from late April to the middle of June.

Pupation takes place in earthen cells in the top 2 inches of soil; pupae transform to adults in 20 to 25 days. The adults feed on grasses from July to autumn, then hibernate under field trash or in crevices until the following spring. They rarely hibernate in the soil. In England, the life cycle, from egg to adult, is completed in about 46 days. As far as is known, only one generation occurs in a year.

Cover illustrations: A. Adult beetle. B. Lateral view of larva with fecal coating removed. C. Dorsal view of larva in protective globule of fecal material. D. Eggs (huddled singly or in pairs on top of leaves). E. Pupal case (usually in the upper one inch of soil).
Help! Save wildlife habitat

Please use certified weed-free forage.

- The Greater Yellowstone Area in Wyoming and Montana; National Forest System Lands; Grand Teton & Yellowstone National Parks; Park and Teton Counties in Wyoming, require the use of certified nonnoxious weed-free forage (feed, hay, straw, or mulch.)
- Forage which has been certified weed-free of exotic plants and noxious weeds protects the native or natural habitat of wildlife and preserves the aesthetic value of our natural scenery.

To purchase certified weed-free forage, please call one of the Wyoming Weed & Pest Control Districts, or one of the Montana Weed Control Districts, or Wyoming Department of Agriculture (307) 777-7321, or Montana Department of Agriculture (406) 444-2944.

Feed stores in the area will carry limited quantities of certified hay for hunters and outdoor recreationists.

Remember, it's your land, so let's protect it!

PHOTO HENRY H HODSWIC

Appendix B
3277. CEREAL LEAF BEETLE EXTERIOR QUARANTINE

A quarantine is established against the following pest, its hosts, and possible carriers:

(A) Pest: Cereal leaf beetle (Chrysolina melanocephala). A beetle, family Chrysomelidae, which is a destructive leaf feeder. Wheat, barley, and oats are the principal crops attacked by both larve and adults.

(B) Area Under Quarantine. All states and districts of the United States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.*


(2) Area Not Known To Be Infested. All states in the Area Under Quarantine (see (B) above) and not named in the Infested Area (see (B)(1) above) and not named in the Area Not Known To Be Infested (see (B)(2) above) shall be known as the Area Not Known To Be Infested.

(C) Commodities and Items Covered. Small grains such as barley, oats, and wheat; ear corn; and hay, including marsh hay (pelletized hay is not covered); grass seed; grass and forage seed; fodder and plant litter; used harvesting equipment or machinery; and cut or baled Christmas trees of Scotch pine (Pinus sylvestris), red pine (Pinus resinosa), and Austrian pine (Pinus nigra), including all subspecies thereof.

(D) Restrictions.

(1) Exemption of Commodities Covered. The following commodities are exempt from all restrictions of this quarantine.

(a) Grain sorghum, shelled corn, and soybeans.

(b) Small grain seed, grass seed, and forage seed when cleaned and shipped in bags or small packages.

(c) All straw and hay that has been used as bedding for animals during shipment.

(d) Small grains shipped during the period of February 1 to April 30 inclusive, each year.

(2) Commodities and Items Covered Admitted From Quarantined Area if Treated at Origin.

(a) Commodities and items covered are admissible into California from the area under quarantine provided each lot or shipment is officially certified by an authorized representative of the state department of agriculture or the United States Department of Agriculture affiiming that the lot or shipment was treated prior to shipment under official supervision in a manner approved by the Director of the Department of Food and Agriculture and was not exposed to reinfection.

Commodities and Items Covered Admitted Under Certification as to Origin.

(a) Commodities covered which are grown in and shipped from the Area Not Known To Be Infested are enterable into California provided each lot or shipment is officially certified by an authorized representative of the state department of agriculture and such shipment was made, or the United States Department of Agriculture, giving the date and state or states where the commodities were produced.

A rubber stamp which bears a facsimile signature of the proper state official may be placed on the waybills accompanying shipments shall be acceptable as an authorized certificate.

(b) Used harvesting equipment, machinery, or machinery from the Area Not Known To Be Infested may be admitted under certification from an agricultural official of the state of origin. To be eligible for such certification, the used harvesting equipment or machinery shall not have been used in any infested state for a period of one year prior to shipment.

(c) Used harvesting equipment or machinery from the area under quarantine may be admitted under certification from an agricultural official of the state of origin. To be eligible for such certification, the used harvesting equipment or machinery shall not have been used from April through August of the current year.

Small Grains, Grass Seed, and Forage Seed From Area Not Known To Be Infested With Cereal Leaf Beetle Admitted Under Certification of Inspection.

(a) Small grains such as barley, oats, and wheat; and grass and forage seed, produced in an area not known to be infested as specified in subsection (B)(2) may be admitted under certification from an agricultural official of the state of origin. The certificate shall affime that the lot or shipment has been inspected and found free of cereal leaf beetles (both live and dead). The inspection for such certification shall consist of representative samples from individual truck or rail car lots to be shipped and at least ten (10) representative samples from the top and intermediate areas (inspection holes) of silos.

* Please refer to Appendices B and C for additional infested and quarantined areas.
(3) Commodities and Items Covered Allowed Movement Under Permit From the Director.

(a) The Director may issue permits admitting commodities and items covered, subject to limitations, conditions, and provisions which he may prescribe therein.

DEFINITIONS

APPENDIX A

09-26-60

For the purpose of this quarantine "Small grains such as ..." means barley, oats, wheat, ear corn, rye.

For the purpose of this quarantine the following are not considered "small grains" and are exempt from the quarantine: millet, rice, sesame seed, flax, grain sorghum, shelled corn, soy beans, buckwheat.

Straw and hay means straw and hay from the small grains, it does not include alfalfa hay, or straw from any grain not listed as "small grains." Hay or straw made into wreaths would be considered a processed product and would be exempt from the quarantine.

AREA UNDER QUARANTINE - ADDITIONAL INFESTED STATES

APPENDIX B

06-14-91

The States of Alabama, Arkansas, Georgia, Iowa, Maine, Minnesota, Missouri, North Carolina and South Carolina.

Commodities and items covered under the Cereal Leaf Beetle Exterior Quarantine should be admitted from the above infested areas only if certified as treated by a state agricultural official at origin. Covered commodities and items originating from the above infested areas which are not certified as treated by a state agricultural official at origin should be rejected under authority of Section 6461 of the FAC.

ADDITIONAL AREAS UNDER QUARANTINE

APPENDIX C

06-14-91

<table>
<thead>
<tr>
<th>State</th>
<th>Quarantined Area</th>
<th>Infested Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montana</td>
<td>Entire</td>
<td>Carbon, Stillwater and Yellowstone Counties</td>
</tr>
<tr>
<td>Utah</td>
<td>Entire</td>
<td>Box Elder, Cache, Davis, Morgan, Utah, Salt Lake, Wasatch, and Weber Counties</td>
</tr>
</tbody>
</table>

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Commodities and items covered originating from uninfested areas should be admitted only under a certificate of origin or inspection issued by the origin state agricultural official. Regulated commodities from uninfested areas without an origin certificate should be rejected under authority of Section 6461 of the FAC.