



Pest Rating Proposals and Final Ratings

WEEDS

MANCHURIAN WILD RICE | ZIZANIA LATIFOLIA

□ MARCH 2, 2018 □ LISA SERRANO □ 1 COMMENT

California Pest Rating Proposal for



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Manchurian Wild Rice | *Zizania latifolia*

Current Rating: Q | [visit PEST RATING PROFILE](#)

Proposed Pest Rating: C

Submitted by: Chia-Hung Liu, owner of G&M Nursery

Comment Period: 3/8/18 – 4/22/18

Initiating Event:

G&M Nursery has been granted a Certified Producer's Certificate issued by the County of Riverside through California's Department of Food and Agriculture's Certified Farmers' Market Inspection Program for *Zizania latifolia* at G&M Nursery's production site in Riverside, California (see attached certificates from [2016](#) and [2017](#)). In late 2017, G&M Nursery received a Notice to Hold Commodities or Premises from the Riverside County Agricultural Commission. Riverside County proceeded to collect specimens of G&M Nursery's Manchurian Wild Rice and sent the specimens to the California Department of Food and Agriculture (CDFA) for testing. The CDFA had given the specimen a Q-rating.

History & Status:

Background: The wild rice genus *Zizania*, relation to the members of tribe Oryzaceae (Kong et.al., 2006; Guo et.al., 2007; Yingying et.al., 2013), is an aquatic or wetland versatile food harvested from lakes as grain and vegetable. There are four species (Xu et.al., 2010): *Zizania aquatica* L., *Zizania palustris* L., *Zizania texana* Hitchc., and *Zizania latifolia* Turcz.

Zizania latifolia, which grows 78.7~157.5 in (=2~ 4m) height, is an aquatic perennial grass. *Zizania latifolia* is tall and upright with 1 in (=2~3 cm) wide leaves up to 100 in (=2.5 m) long; the flower head is 15.8 ~ 23.6 in (=40~60 cm) long and purplish or red brown in color. Lower portion of culm, used as vegetable, is immersed; panicle with middle branch bears both male and female spikelet. It is not grown for its grain, as are other wild rice species, but for the stems.

Zizania latifolia is rare in the wild and its use as a grain has completely disappeared in China. It is a popular nutritious aquatic vegetable because the stem of the plant becomes swollen into juicy gall being infected by the fungus *Ustilago esculentia* P. Henn. This vegetable has been grown for centuries in China (Oritani et al. 2007).

When the fungus invades the host plant, its cells increase in size and number. Infection with *Ustilago esculentia* prevents the plant from flowering and setting seed so the crop is propagated asexually by rhizome (Terrel & Battra 1982). New sprouts are infected by spores, which is a paddy (Chung et al. 2004). The galled portion of stem, which is edible as vegetable, is 1.2~1.6 in (=3~4 cm) wide and up to 10 in (=25.4 cm) long.

Worldwide Distribution: *Zizania aquatic*, *Zizania palustris*, and *Zizania tesana*, which are important as field crops, are distributed in North America and Eastern Europe (Yingying et.al., 2013).

Zizania latifolia, which has been cultivated and prevalent at lakes and/or wetlands, is native to the regions of Southeast Asia, Japan, Korea, China (Guo et al. 2007; Xu et al. 2008; Zhang et al. 2014), Taiwan, North-eastern India (Jain et al. 2011 & 2012; Bor 1940 & 1960; Shukla 1996), Russia's Far East (Agro Atlas 2008; Tzvelev 1989; Bor 1940 & 1960; Shukla 1996), Ukraine (Prokudin et al. 1977; Dubyna et al. 1996), Britain (Fern 1997), and Lithuania (Liatukas et al. 2009) where are grown as a vegetable. It has been introduced into Hawaii (Lichvar et al. 2016).

Zizania latifolia was introduced into New Zealand and was naturalized in 1906 (New Zealand plant conservation network, *Zizania latifolia* (2013)).

Official Control: An illegal planting of *Zizania latifolia* infected with smut fungus, *Ustilago esculenta* Henn., was discovered near Modesto, California in 1991 (APSnet: plant disease back issue abstracts). It was destroyed to prevent the spread of the smut that poses a threat to native wild rice.

California Distribution: *Zizania latifolia* has been cultivated in

Riverside County since 2015 (up until G&M Nursery received the Notice to Hold Commodities or Premises from the Riverside County Agricultural Commission in late 2017).

California Interceptions: Riverside County submitted specimens of G&M Nursery's Manchurian Wild Rice to the California Department of Food and Agriculture (CDFA) for testing in 2017.

Consequences of Introduction:

1) Climate/Host Interaction: Evaluate if the pest would have suitable hosts and climate to establish in California. **Score: Medium (2).**

The plant could occur in wetlands, river banks, tidal flats, roadside ditches, and damp paddocks in warm areas (climate of California). The favorable climate temperature for the plant to grow is 68°F~86°F (=20°C~30°C); it grows very slow when temperature is lower than 59°F (=15°C). *Ustilago esculenta* is active when climate temperature is approximate 77°F (=25°C). *Zizania latifolia* stops growing when temperature is lower than 50°F (=10°C) or greater than 86°F (=30°C). A land with pH 5.5~pH 6.5 is suitable for this plant to grow (□□□ 2001- published in Chinese).

-Low (1) Not likely to establish in California; or likely to establish in very limited areas.

-Medium (2) may be able to establish in a larger but limited part of California.

-High (3) likely to establish a widespread distribution in California.

2) Known Pest Host Range: Evaluate the host range of the pest. **Score: Low (1).**

Ustilago esculenta is a species of fungus in the Ustilaginaceae, a family of smut fungi. A suitable temperature for *Ustilago esculenta* to actively grow is approximate 77°F (=25°C) (□□□ 2001- published in Chinese). This species attacks *Zizania latifolia*, which

is the only known host (Chung et al. 2004) and it can be transmitted in the rhizome (Chung et al. 2004). It expresses that this fungus is not dangerous due to infection of other Oryzeae (Liatukas et al. 2009).

-Low (1) has a very limited host range.

-Medium (2) has a moderate host range.

-High (3) has a wide host range.

3) Pest Dispersal Potential: Evaluate the natural and artificial dispersal potential of the pest. **Score: Low (1).**

Infection with *Ustilago esculentia* destroys the flowering structures of the plant and does not make seed so that the crop is propagated asexually by rhizome (Terrell et al. 1982; Chan et al. 1980). Without providing (or recirculating) sufficient supply of water and without having moderate ambient temperature, the plant does not have high reproduction or dispersion.

-Low (1) does not have high reproductive or dispersal potential.

-Medium (2) has either high reproductive or dispersal potential.

-High (3) has both high reproduction and dispersal potential.

4) Economic Impact: Evaluate the likely economic impacts of the pest to California using the criteria below. **Score: Low (1)** causes 0 or 1 (e.g., **G**) of these impacts.

The studies of cytological and morphological suggested that the Asian *Zizania latifolia* is clearly differentiated from the North American species (Duvall, 1987; Terrell et al., 1997), which was well proved by phylogenetic study (Xu et al., 2010). It is a nutritious aquatic vegetable for growing *Zizania latifolia* rather than planting the native *Zizania* in North America for crops (Terrell et al. 1982; Kawagishi et al. 2006). When the supply of water is recirculated in

a closed system, the impact of agricultural use for irrigation will be insignificant.

- A. The pest could lower crop yield.
- B. The pest could lower crop value (includes increasing crop production costs).
- C. The pest could trigger the loss of markets (includes quarantines).
- D. The pest could negatively change normal cultural practices.
- E. The pest can vector, or is vectored, by another pestiferous organism.
- F. The organism is injurious or poisonous to agriculturally important animals.
- G. The organism can interfere with the delivery or supply of water for agricultural uses.**

-Low (1) causes 0 or 1 of these impacts.

-Medium (2) causes 2 of these impacts.

-High (3) causes 3 or more of these impacts.

5) Environmental Impact: Evaluate the environmental impact of the pest on California using the criteria below. **Score: Medium (2)** cause one of the above to occur (e.g., **A**).

Zizania latifolia grows quickly when nitrogen and phosphorus are abundant in the environment (Lee et al. 2004). It is likely that polluted water saturated with nutrients from sewage waste was favorable for vegetative development of this plant. Research in New Zealand showed that *Zizania latifolia* was superior in cleaning of dairy farm wastewater than *Phragmites australis* (Tanner 1996). This plant can be grown in wetlands or shallow shores of water bodies as forage for cattle and horses (Pan et al. 1993; Zhai et al.

2001).

It can cause land to become waterlogged and form swampy areas due to destroyed drainage systems. It can damage lakes and streamside plant communities by overtopping and suppressing the other plants (Liatukas et al. 2009).

A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.

B. The pest could directly affect threatened or endangered species.

C. The pest could impact threatened or endangered species by disrupting critical habitats.

D. The pest could trigger additional official or private treatment programs.

E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

-Low (1) causes none of the above to occur.

-Medium (2) causes one of the above to occur.

-High (3) causes two or more of the above to occur.

Consequences of Introduction to California for Zizania latifolia:

Add up the total score and include it here. **Low (7)**

-Low = 5-8 points

-Medium = 9-12 points

-High = 13-15 points

6) Post Entry Distribution and Survey Information: Evaluate the known distribution in California. Only official records identified by a taxonomic expert and supported by voucher specimens deposited in natural history collections should be considered. Pest incursions that have been eradicated, are under eradication, or have been delimited with no further detections should not be included. **(Score) Not established (0).**

Zizania latifolia has been planted in Riverside, California since 2015. Pest has never detected in California.

-Not established (0) Pest never detected in California, or known only from incursions.

-Low (-1) Pest has a localized distribution in California, or is established in one suitable climate/host area (region).

-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.

-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

Final Score:

The final score is the consequences of introduction score minus the post entry distribution and survey information score: **Low (7)**

Uncertainty:

There is low uncertainty. Some tests in greenhouse can be done for introduction of *Zizania latifolia*, infected with *Ustilago esculenta*, and other wild rice in California so that the effect of this fungus on other native wild rice can be verified.

Conclusion and Rating Justification:

The ambient temperature for *Zizania latifolia* to grow is 68°F~86°F;

Ustilago esculenta is active when the ambient temperature is about 77°F. A land with pH 5.5~6.5 is suitable for this plant to grow. Under these restrictions, *Zizania latifolia* can be cultivated in limited areas in California.

When *Ustilago esculentia* invades *Zizania latifolia*, it prevents the plant from flowering and making seed so that the plant is spread asexually by rhizome. *Zizania latifolia* has been cultivated by G&M Nursery in Riverside, California since 2015 (up until G&M Nursery received the Notice to Hold Commodities or Premises from the Riverside County Agricultural Commission in late 2017). Based on G&M Nursery's experience, knowledge, and skills in growing *Zizania latifolia*, there have not been any problems with the reproduction or dispersion of *Ustilago esculentia* during those years.

Proposed Rating: C

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www.wetland.org.tw/hope/PDF/2713.pdf

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Responsible Party:

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Comment Period:*

3/8/18 – 4/22/18

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Comment Format:

◆ Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

Example Comment:

Consequences of Introduction: 1. Climate/Host Interaction: [*Your comment that relates to "Climate/Host Interaction" here.*]

◆ Posted comments will not be able to be viewed immediately.

◆ Comments may not be posted if they:

Contain inappropriate language which is not germane to the pest rating proposal;

Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

Violates agency regulations prohibiting workplace violence, including threats.

◆ Comments may be edited prior to posting to ensure they are entirely germane.

◆ Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Posted by ls

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ONE THOUGHT ON “MANCHURIAN WILD RICE | ZIZANIA LATIFOLIA”



Dean Kelch

MARCH 8, 2018 AT 3:04 PM

1.) The temperature limits of optimal growth for *Zizania latifolia* is of little import for the purposes of assessing its risk of invasion. Many perennial plants stop or slow growth in cooler or hotter temperatures and resume growth when temperatures return to a more moderate range. *Z. latifolia* has invaded wetlands in habitats as distant as New Zealand and Lithuania; neither country is noted for being as warm as the core native habitat for *Z. latifolia*.

2.) This comment refers to *Ustilago esculenta*, not *Z. latifolia*. Nevertheless, while *Zizania latifolia* is the main host of *Ustilago esculenta*, the fungal pathogen has also been reported to attack *Z. aquatica*, *Zizania* spp. and *Z. caduciflora* (a possible taxonomic synonym of *Z. latifolia*). The possibility that *U. esculenta* may attack native *Zizania* spp. if given a chance is why both *Z. latifolia* and *Ustilago esculenta* have been treated as pests by the USDA.

3.) The commenter states that *Z. latifolia* stems infected with *U. esculenta* do not flower and grow slowly. That may be true, but not all stems are infected; in many cases parts of clumps may grow well and flower. Studies of biological control effectiveness have determined that, depending on the species, 65% to 95% reduction of seeds in invasive plants is needed to prevent spread. Prevention of flowering, if *U. esculenta* were to attack the annual native *Z. palustris*, might have a more devastating effect on the native annual than on the alien perennial.

4.) There is no doubt that *Z. latifolia* and *Z. palustris* are distinct geographically, morphologically, and genetically. Nevertheless, the two species are close relatives and the possibility for sharing susceptibility to *U. esculenta* is real.

5.) The effects described here in the PRP and by the commenter justify a (3), not a (2).

The posted score of 14 (High Risk) is justified.

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DOCUMENTS

[Pest Ratings and Mitigating Actions, Section 3162 \(PDF\)](#)

[Pest Rating Process | Instructions \(PDF\)](#)

[Pest Rating Proposal Form \(Word Document\)](#)

RESOURCES

[Common Names of Insects and Related Organisms](#)

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