

Manchurian Wildrice (*Zizania latifolia*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, August 2014
Revised, April 2018, June 2018
Web Version, 9/28/2021

Organism Type: Plant
Overall Risk Assessment Category: High



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Available: <https://commons.wikimedia.org/wiki/File:Zizania-latifolia-2.jpg>

1 Native Range and Status in the United States

Native Range

GISD (2018) lists *Zizania latifolia*'s native range to China, India, Japan, Republic of Korea, Myanmar, Russian Federation, Taiwan, and Viet Nam.

From Terrell and Batra (1982):

“Distribution of *Z. latifolia* is rather widespread in eastern Asia, [...]. In the USSR it is indigenous in the Dahuria region of eastern Siberia and in the Udsk, Ussuri, and Zeya-Bureya regions in the Soviet Far East (Komarov, 1936; Tzvelev, 1976); these regions are north of Manchuria and Mongolia. [...] Also, it occurs in Japan, Okinawa, Korea, Taiwan, northeast India, Burma, Malaya, Viet Nam or Indo-China (sensulato).”

Status in the United States

GBIF Secretariat (2018) reports that *Zizania latifolia* has been introduced in Hawaii and there have been reports of it growing in the wild. *Zizania latifolia* has also been reported in Maryland.

From Terrell and Batra (1982):

“*Zizania latifolia* has been introduced into the United States approximately 11 times (USDA Plant Inventory records). The only surviving introductions are the plants growing in shallow water in Snowden Pond at the Patuxent Wildlife Research Center of the U.S. Department of the Interior near Laurel, Maryland [...]. This accession was established in the 1920s after being introduced under the aegis of C. E. Chambliss, U.S.D.A. scientist, from an unknown source and locality in Asia (Dore, 1969, p. 21). The plants have been shifted from one locality to another within the Center, [...]. The present population of fewer than 20 plants has been observed for several years by Terrell. There have never been any culm enlargements and there is every indication that the Patuxent plants are free of *Ustilago esculenta*. [...] A few plants transplanted to a greenhouse at Beltsville, Maryland, flowered rarely, but produced a few "seeds" by self-pollination. Plants from the Patuxent population were sent to W. H. P. Emery, Department of Biology, Southwest Texas State University, San Marcos, Texas, and later Emery sent plants to James Percich and R. L. Bowden, Department of Plant Pathology, University of Minnesota, St. Paul. Accordingly, there are 3 known plantings now in the United States.”

Z. latifolia is in trade in the United States (e.g., PlayItKoi 2021).

Means of Introductions in the United States

From Terrell and Batra (1982):

“This accession was established in the 1920s after being introduced under the aegis of C. E. Chambliss, U.S.D.A. scientist, from an unknown source and locality in Asia (Dore, 1969, p. 21).”

Remarks

No additional remarks.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to World Flora Online (2021), *Zizania latifolia* (Griseb.) Turcz. Ex Stapf is the accepted name for this species.

From ITIS (2018):

Kingdom Plantae
Subkingdom Viridiplantae
Infrakingdom Streptophyta
Superdivision Embryophyta
Division Tracheophyta
Subdivision Spermatophytina
Class Magnoliopsida
Superorder Lilianae
Order Poales
Family Poaceae
Genus *Zizania*
Species *Zizania latifolia* (Griseb.)

Size, Weight, and Age Range

From GISD (2018):

“*Zizania latifolia* is a perennial aquatic grass, which grows up to 4m tall, [...]”

Environment

From GISD (2018):

“*Z. Latifolia* is a relatively hardy plant that can grow in both fresh and salt water (Environment Waikato, 2002). Yamaguchi (1990) states that, “*Zizania latifolia* can be grown in stagnant ponds and in poorly drained soils.” It does well in sandy, loamy or clayey soils; in acid, neutral or alkaline soils and can grow in full sun or semi-shade (Plants for the future, 2000).”

Climate

GISD (2018) suggests that *Zizania latifolia* occurs in tropical and temperate climates.

Distribution Outside the United States

Native

GISD (2018) lists *Zizania latifolia*'s native range to China, India, Japan, Republic of Korea, Myanmar, Russian Federation, Taiwan, and Viet Nam.

From Terrell and Batra (1982):

“Distribution of *Z. latifolia* is rather widespread in eastern Asia, [...]. In the USSR it is indigenous in the Dahuria region of eastern Siberia and in the Udsu, Ussuri, and Zeya-Bureya regions in the Soviet Far East (Komarov, 1936; Tzvelev, 1976); these regions are north of Manchuria and Mongolia. [...] Also, it occurs in Japan, Okinawa, Korea, Taiwan, northeast India, Burma, Malaya, Viet Nam or Indo-China (sensulato).”

Introduced

GISD (2018) lists *Zizania latifolia* as alien, invasive, and established in New Zealand and lists *Zizania latifolia* as alien, invasiveness unspecified, and established in the United Kingdom.

NOBANIS (2018) lists *Zizania latifolia* as introduced to Estonia and introduced, invasive, and established in European parts of Russia.

From GISD (2018):

“*Z. latifolia* is included in the First Schedule of the National Pest Plant Accord. All plants on the list are designated as Unwanted Organisms, and are banned from sale, propagation and distribution throughout New Zealand.”

GBIF Secretariat (2018) reports that *Zizania latifolia* has been introduced to British Columbia. The record information suggests this is an established population. GBIF Secretariat (2018) also reports observations of *Z. latifolia* in the wild in Belgium.

From Terrell and Batra (1982):

“Distribution of *Z. latifolia* is rather widespread in eastern Asia, but it may have been introduced in southeastern Asia and parts of China and the USSR. [...] It is introduced in western USSR. [...] In China it is in Manchuria and several provinces, often introduced for cultivation (Thrower and Chan, 1980). [...] and has been introduced in Europe, New Zealand, and rarely in North America (see below).”

From NIWA (2016):

“The current distribution of Manchurian wild rice is predominantly in the Kaipara District of Northland centred around its site of introduction, the Northern Wairoa River (near Dargaville) and associated waterways. Smaller infestations occur within the Whangarei and Far North Districts, as well as in Rodney and Waitakere Districts (Auckland), Hauraki Plains (Waikato), and Kapiti Coast (Wellington). Potentially Manchurian wild rice could infest any lowland wetland, especially the margins of still or flowing water bodies in New Zealand.”

Means of Introduction Outside the United States

From GISD (2018):

“It is often cultivated as a food crop in East Asia and is often grown as cover for wild fowl along the sides of lakes in Britain (Plants for a Future, 2000).”

From NIWA (2016):

“A native of Asia, Manchurian wild rice was originally introduced to New Zealand around the turn of the last century in the ballast carried by timber ships, which was discarded on the banks of the Northern Wairoa River. Although introduced accidentally (one of the few aquatic weeds not introduced deliberately – for example, as an ornamental pond plant), it has also been deliberately planted in the Hauraki Plains area, supposedly to stabilise stop-banks.”

From Morozova (2014):

“*Zizania latifolia* was introduced in the fifties of the last century in many water reservoirs in various regions of European Russia as a fodder plant in hunter farms.”

Short Description

From GISD (2018):

“*Zizania latifolia* is a perennial aquatic grass, which grows up to 4m tall, with spreading rhizomes. The flowers are hermaphrodite (have both male and female organs). *Z. latifolia* is tall and upright with 2-3cm wide leaves up to 2.5m long and a stout midrib. The flower head is 40-60cm long, and is purplish or red brown in colour (Environment Waikato, 2002); National Pest Plant Accord, 2001; Plants for a Future, 2000).”

Biology

From GISD (2018):

“The flowers are hermaphrodite (have both male and female organs).”

From Han et al. (2018):

“Perennial herb [*Zizania latifolia*] that sprouts fast in early spring with increasing water level at the beginning of the flood season. It reaches maximum coverage when the lake reaches its maximum water level. After the flood season, the plant gradually dies. The growth of the ZI [*Zizania latifolia*] community can be significantly restricted under flooding years due to insufficient oxygen influx (Yamasaki, 1984).”

Human Uses

From GISD (2018):

“Plants for a Future (2000) state that "The swollen stem bases, infected with the smut fungus *Ustilago esculenta*, are eaten as a vegetable by the Chinese. They must be harvested before the fungus starts to produce spores since the flesh deteriorates at this time. They are parboiled then sautéed with other vegetables and have a nutty flavour reminiscent of coconut. The wild forms of this species have developed resistance to the smut, so especially disease-susceptible cultivars are grown. The seed can be cooked. It can be used like rice in sweet or savoury dishes. The seed can also be ground into a flour and used in making cakes, biscuits etc. Young inflorescences can be cooked and used as a vegetable. Young shoots can be eaten either raw or cooked and have a pleasant sweet taste. Leaves can be woven into mats." As for medical uses the authors report that, "The shoots, roots and the seed are diuretic and febrifuge and the leaves are tonic.”

From Dong et al. (2012):

“*Z. latifolia*, is one of the most important aquatic and economic vegetable crops cultivated in the Southeast China since ancient time (Guo [et al.], 2007). Nowadays, around 100 thousands hectares of *Z. latifolia* were planted in more than ten provinces in China (Chen, 1991; Zhai et al., 2001).”

Terrell and Batra (1982):

“Grains of *Z. latifolia* have been used for food, sometimes in the form of flour, and the grains and rhizomes have been used as diuretics and as medicines for anemia, heart disease, and liver disease (Stapf, 1909; Camus, 1950). In Europe the plants have been used for forage and to make paper (Camus, 1950). In New Zealand the species is a troublesome weed which is not eaten by livestock (Cumberland, 1966).”

“Ancient Chinese herbals and encyclopedias refer to the cultivation of *Z. latifolia* as a vegetable back at least to the 10th century (Stapf, 1909; Camus, 1950). *Zizania latifolia* was also used as a grain in ancient times, but later came to be used primarily as a vegetable. Grain of *Z. latifolia* was used in rituals of the Chou dynasty according to Chou Ui (written about 1100 B.C.) or Ritual of the Chou Dynasty (also mentioned by Huang, 1978). A recent book (Chang, 1977) concerning foods in Chinese culture includes [...] a poem dating back to the Chou dynasty (12th century B.C.-221 B.C.) which refers to "corn of zizania." In this case, corn means the *Zizania* grains. In Europe Osbeck (1757), a Swede and a pupil of Linnaeus, gave one of the earliest accounts of the use by the Chinese of the plant as a vegetable.”

Z. latifolia is in trade in the United States (e.g., PlayItKoi 2021).

Diseases

Poelen et al. (2014) lists *Anagrus nilaparvatae* as a parasite of *Zizania latifolia*.

Threat to Humans

No records of threats to humans from *Zizania latifolia* were found.

3 Impacts of Introductions

From Champion and Hofstra (2010):

“Plants form dense, mono specific vegetation in wetlands and on the margins of water bodies, also invading flood-prone pasture and cropping land. Obstruction of drains by this plant promotes flooding and expands the habitat available to it.”

From NIWA (2016):

“*Zizania latifolia*, commonly known as Manchurian wild rice or Manchurian ricegrass, is a giant semi-aquatic grass that has smothered riverbanks, invaded pastures, and run rampant through drainage channels as it continues its invasion of our waterways.”

“A native of Asia, Manchurian wild rice was originally introduced to New Zealand around the turn of the last century in the ballast carried by timber ships, which was discarded on the banks of the Northern Wairoa River. Although introduced accidentally (one of the few aquatic weeds not introduced deliberately – for example, as an ornamental pond plant), it has also been deliberately planted in the Hauraki Plains area, supposedly to stabilise stop-banks. However, rather than stabilise banks, Manchurian wild rice can in the longer term cause them to slump and encourage erosion of bank material. Commonly found growing in soft mud, its growth intensifies the wet soft soil conditions that may cause the deterioration of stop-banks. In addition to stop-bank slumping, Manchurian wild rice causes a host of other problems wherever it is present in New Zealand. For example, it invades drainage channels, preventing access to them and impeding water flow and in turn increasing the likelihood of flooding. Unless intensive grazing is maintained in pastures adjacent to Manchurian wild rice-filled drains, it will also invade these areas, encouraged by the flooding it causes by blocking the drains. This plant is extremely invasive in native vegetation and appears to reduce the diversity of vegetation it invades, displacing small-stature species and enveloping taller vegetation. In general, species enveloped by dense growths of this grass are unable to reproduce and sustain themselves under those conditions, resulting in long-term monocultures of Manchurian wild rice.”

From GISD (2018):

“The Auckland Regional Council (2002) reports that, *Zizania latifolia* is a very invasive plant. It can invade pastures causing good land to become waterlogged and form swampy areas. The rhizomes of the plant can also penetrate into and through stopbanks, opening them up and eventually destroying them. It can damage lakes and streamside plant communities by overtopping and suppressing other marginal species. *Z. latifolia* is difficult to eradicate because any root or rhizome fragments will regrow. Herbicides are the most effective control measure, but use of these is restricted because many chemicals can affect waterways. There are concerns that the spread of *Z. latifolia* could seriously affect the use of farmland, and freshwater and

estuarine ecosystems. (The Auckland Regional Council 2002; Environment Waikato, 2002; The Northland Regional Council, 2002).”

4 History of Invasiveness

Zizania latifolia has been introduced in several localities throughout the world both intentionally as an ornamental, for ecological restoration purposes, and accidentally via ballast water. Introductions have resulted in confirmed established populations in New Zealand, United Kingdom, Russia, United States, and Belgium. In New Zealand *Z. latifolia* is reported to have a negative impact on local ecology by encouraging bank erosion, impeding water flow in drainage channels, and suppressing native species. Due to its invasiveness, this species is banned from sale, propagation, and distribution throughout New Zealand. While no peer-reviewed study directly looking at impacts of *Z. latifolia* introductions was found, reports of the various negative impacts were available from a conference proceeding paper and grey literature. Due to multiple sources listing specific negative impacts, the history of invasiveness is classified as High under a preponderance of evidence.

5 Global Distribution



Figure 1. Known global distribution of *Zizania latifolia*. Observations are reported from Hawaii, North America, Europe, East Asia, and New Zealand. Map from GBIF Secretariat (2018).

6 Distribution Within the United States



Figure 2. Known distribution of *Zizania latifolia* in the contiguous United States. Location is in Maryland. Map from BISON (2018).

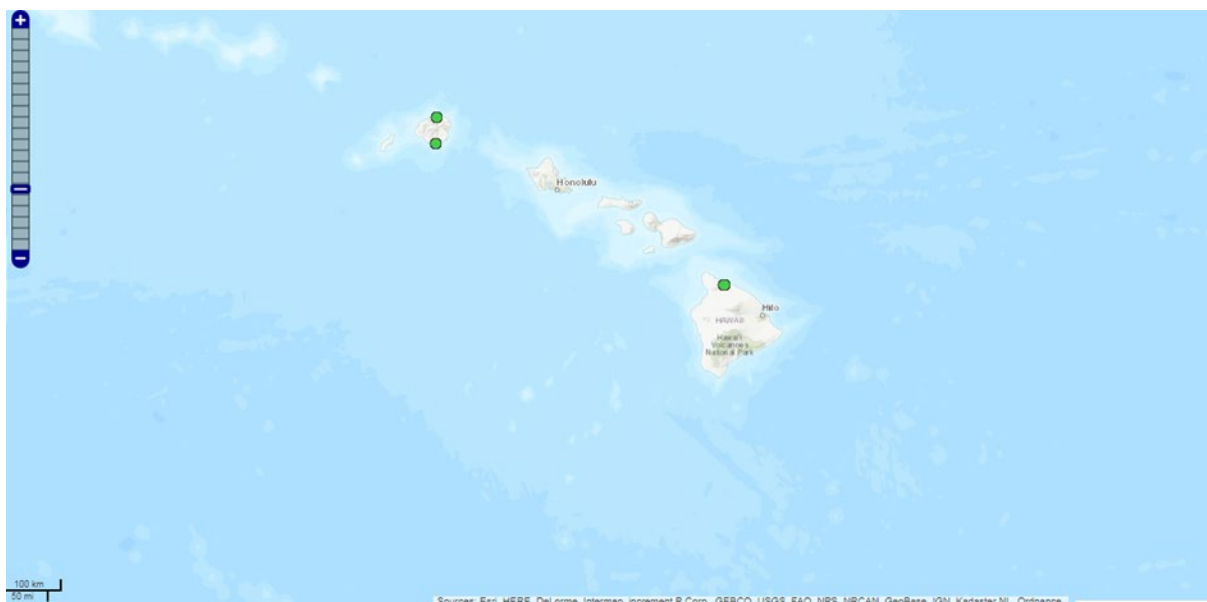


Figure 3. Known distribution of *Zizania latifolia* in Hawaii. Map from BISON (2018).

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Zizania latifolia* was high the mid-Atlantic, parts of the Great Lakes, and southern Great Plains. A small area of high match was also found in northern Washington. Much of the Pacific Coast and Rocky Mountains had a low match. Areas of low match were also found in coastal New England and the interior southeast. The overall Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean distance) for the contiguous United States was 0.442, high. (Scores of 0.103 and greater are classified as high.) Most States had high individual Climate 6 scores. Arizona, California, Idaho, Oregon, South Dakota, and Utah had medium individual scores. Alabama, Louisiana, Mississippi, Nevada, and Rhode Island had low individual scores.

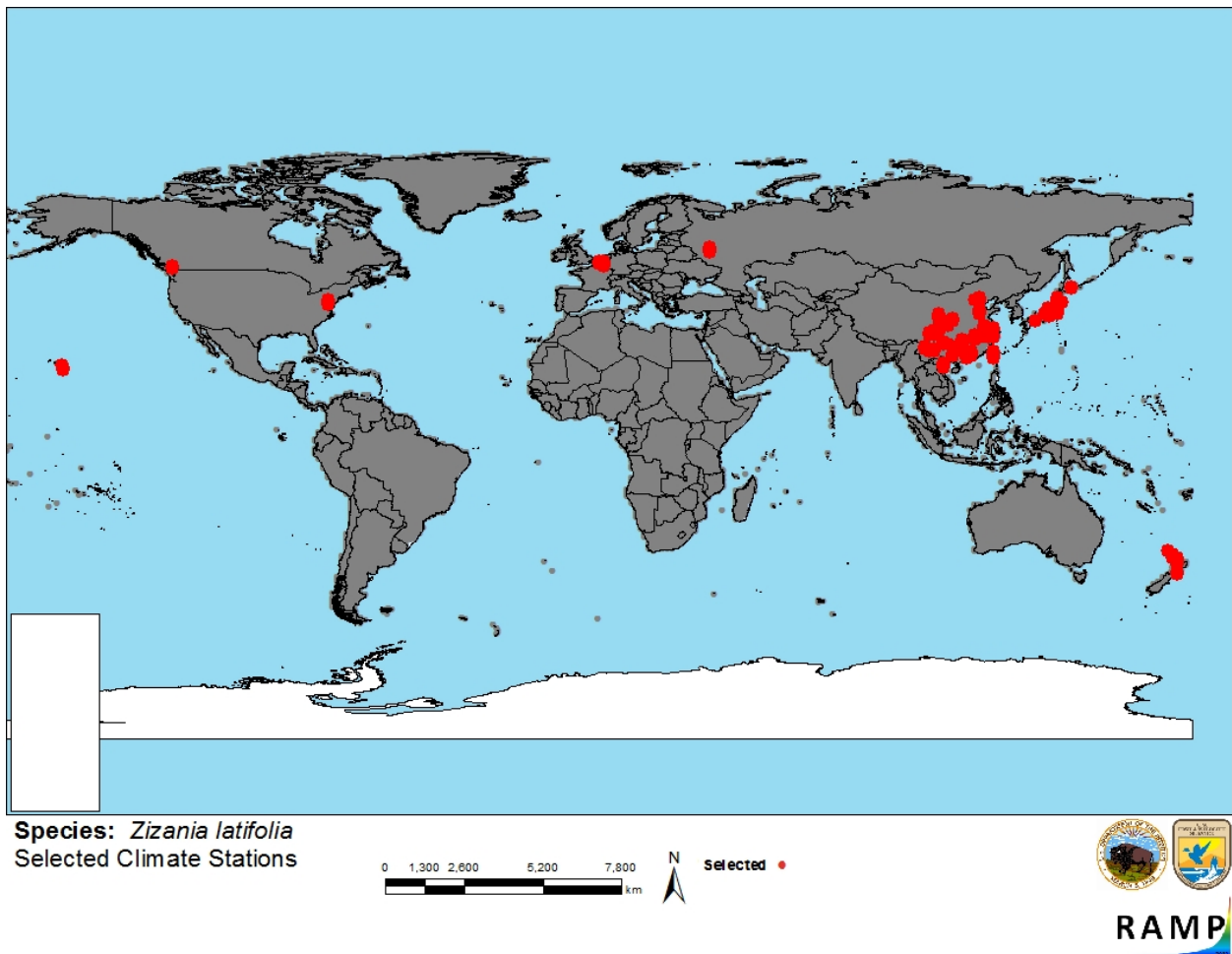


Figure 4. RAMP (Sanders et al. 2014) source map showing weather stations in east Asia, New Zealand, Europe, and North America selected as source locations (red; Canada, United States, Belgium, Russia, China, Japan, New Zealand, Vietnam) and non-source locations (gray) for *Zizania latifolia* climate matching. Source locations from BISON (2018) and GBIF Secretariat (2018). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

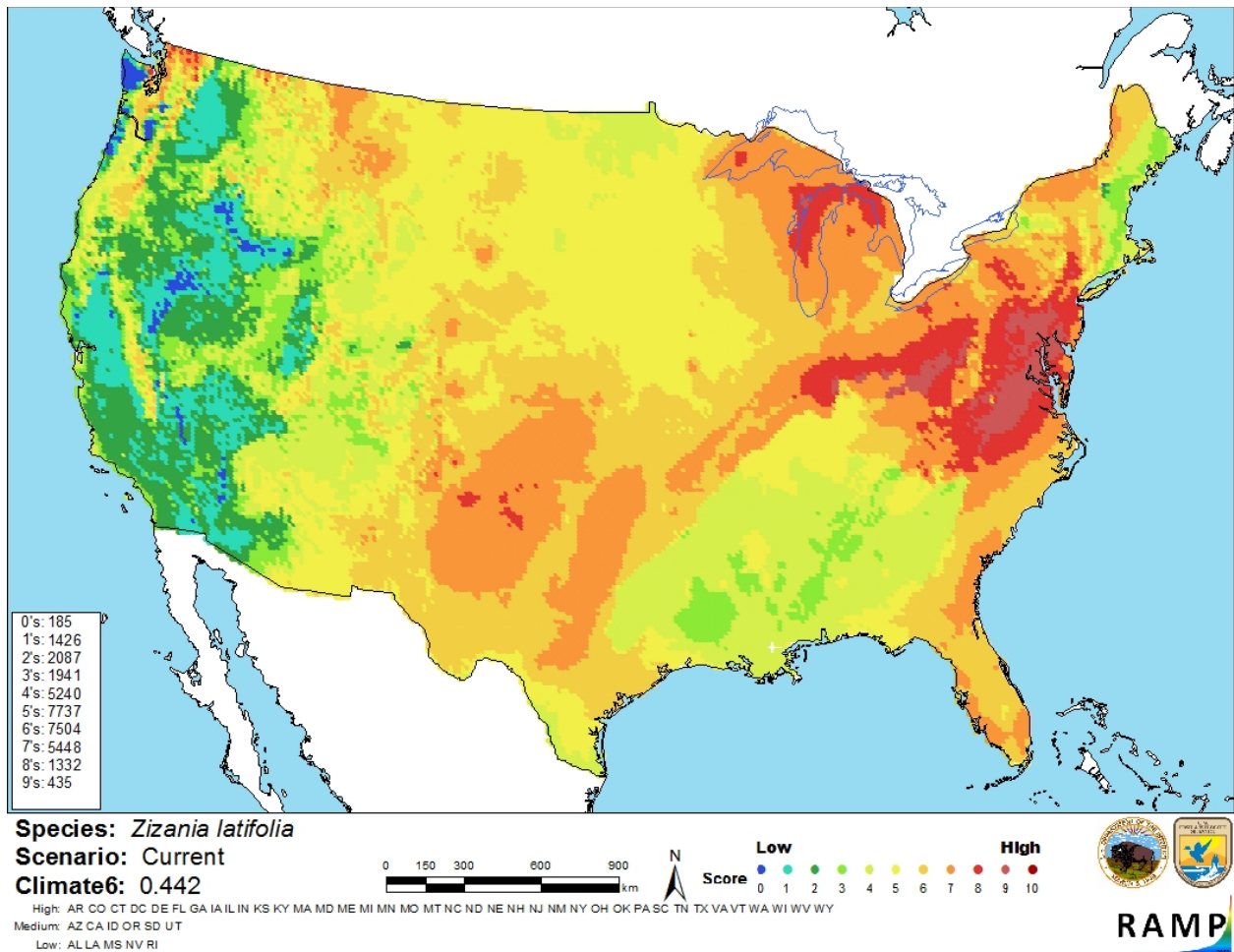


Figure 5. Map of RAMP (Sanders et al. 2014) climate matches for *Zizania latifolia* in the contiguous United States based on source locations reported by BISON (2018) and GBIF Secretariat (2018). Counts of climate match scores are tabulated on the left. 0/Blue = Lowest match, 10/Red = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

8 Certainty of Assessment

The certainty of this assessment is medium. There was adequate biological and ecological information available for *Zizania latifolia*. Records of introductions were found that resulted in established populations. The information pertaining to history of invasiveness was from grey

literature and conference proceedings paper presenting summary impact information. No peer-reviewed papers were available that studied introduction impacts directly.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Zizania latifolia is a wild rice native to East Asia. *Z. latifolia* is used in various ways as a food source and has a long history of use in traditional medicine. *Z. latifolia* is in the horticultural trade in the United States. The plant has been introduced to and become established in the United Kingdom, New Zealand, and Hawaii. *Z. latifolia* monocultures are reported to encourage land erosion, promote flooding, and suppress native species. The history of invasiveness is classified as High. The overall climate match with the United States is high. The majority of the contiguous United States had medium to high local matches. The largest area of high match was focused on the Mid-Atlantic States. The certainty of this assessment is medium due to the lack of peer-reviewed literature contributing to the impact information. The overall risk assessment category is High.

Assessment Elements

- **History of Invasiveness (Sec. 4): High**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Medium**
- **Remarks, Important additional information: None**
- **Overall Risk Assessment Category: High**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 11.

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Dong S, Zheng G, Yu X, Fu C. 2012. Biological control of golden apple snail, *Pomacea canaliculata* by Chinese soft-shelled turtle, *Pelodiscus sinensis* in the wild rice, *Zizania latifolia* field. *Scientia Agricola* 69(2):142–146.

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11 Literature Cited in Quoted Material

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

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