Plant Propagation Protocol for *Zizania palustris*

ESRM 412 - Native Plant Production

Spring 2020

Figure 1 Photo by Louis-M. Landry from CalPhotos. Web. 27 May 2020.

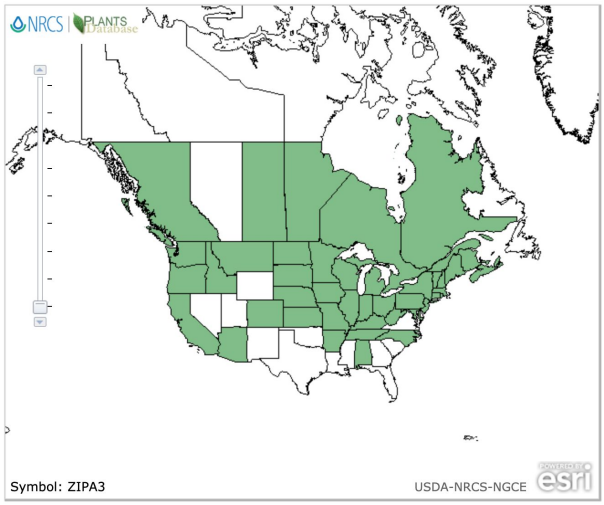

Figure 2 Plants Database. Zizania palustris. USDA, n.d. Web. 27 May 2020.

North American Distribution

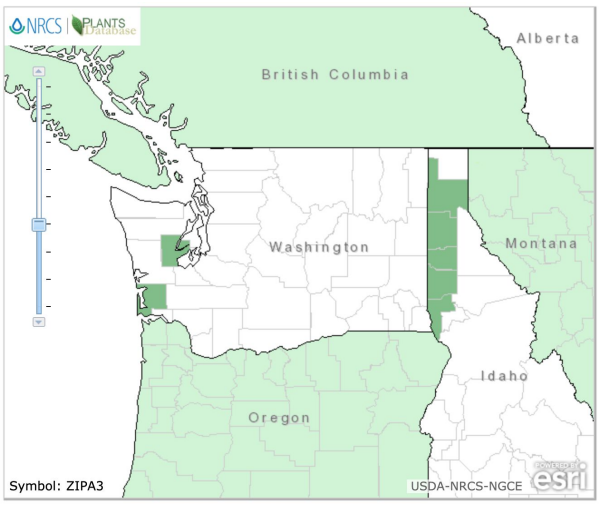

Figure 3 Plants Database. Zizania palustris. USDA, n.d. Web. 27 May 2020.

Washington Distribution

TAXONOMY	
Plant Family	
Scientific Name	Poaceae / Gramineae[1]
Common Name	Grass family[1]
Species Scientific Name	
Scientific Name	*Zizania palustris*[1]
Varieties	*Zizania palustris* var. *palustris* L. (author is L.) *Zizania palustris* var. *interior* (Fassett) Dore (Does not grow in WA)[1,2]
Sub-species	*Zizania palustris* subsp. *palustris* = *Zizania palustris L.* var. *palustris*[3]
Cultivar	No information found.
Common Synonym(s)	No information found.
Common Names	*Zizania palustris* in Ojibwe: manoomin[11] northern wildrice[1,2] Northern wild rice[7]

Species Code (as per USDA Plants database)	ZIPA3[1]; ZIZPAL in the RNGR Database[7]
GENERAL INFORMATION	
Geographical range	It is common in most of southern Canada east of the Rocky Mountains and the Great Lakes region of the US (Hitchcock 1971).[6] In WA it appears in 2 counties west of the Cascades (Mason & Pacific).[1]
Ecological distribution	Wild rice is found in wet meadows, marshes, and lake margins in water 0.9 to 2.4 m (3 to 8 ft) deep.[6]
Climate and elevation range	The wetland status of *Zizania palustris* is OBL or obligate wetland which means it is a hydrophyte and often occurs in wetlands.[1] No elevation information found on this particular species; however, the elevation for *Zizania palustris L. var. interior* (Fassett) Dore is < 1200 m.[10]
Local habitat and abundance; may include commonly associated species	*Zizania* palustris grows mostly to the north of *Z. aquatica*, but the two species overlap in the Great Lakes region, eastern Canada, and New England. It is cultivated as a crop in some provinces and states, with California being the largest producer. All records from both species located in the western part of the Flora region reflect deliberate plantings; none are known to have persisted. In cultivated strains, the pistillate spikelets remain on the plant at maturity.[5]
Plant strategy type / successional stage	Perennial herb, monoecious, aquatic.[8]
Plant characteristics	Plants annual. Culms to 3 m, erect, usually at least partly immersed. Sheaths glabrous or with scattered hairs; ligules 3–16 mm, upper ligules trun-cate, lanceolate or triangular, erose; blades 20–60 cm long, 3–21(40+) mm wide, glabrous, margins glabrate or scabrous. Panicles 24–60 cm long, 1–20(40) cm wide; branches unisexual. Staminate branches ascending or divergent; pedicel apices 0.2–0.4 mm wide. Staminate spikelets 6–17 mm,

	lanceolate, acuminate or awned, awns to 2 mm. Pistillate branches mostly appressed or ascending, a few sometimes divergent; pedicel apices 0.7–1.2 mm wide. Pistillate spikelets 8–33 mm long, 1–2.6 mm wide, lanceolate or oblong, coriaceous or indurate, lustrous, glabrous or with lines of short hairs, apices usually hirsute and abruptly narrowed, awned, awns to 10 cm; lemmas and paleas remaining clasped at maturity; aborted pistillate spikelets0.6–2.6 mm wide. Caryopses 6–30 mm long, 0.6–2 mm wide. 2n = 30.[5]
PROPAGATION DETAILS	
Propagation protocol for production of Container (plug) *Zizania palustris* L. plants by Carol C. Baskin[7]	
Ecotype	No information provided in this protocol.
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	No information provided in this protocol.
Time to Grow	0
Target Specifications	No information provided in this protocol.
Propagule Collection Instructions	No information provided in this protocol.
Propagule Processing / Propagule Characteristics	Seed dormancy is physiological dormancy.
Pre-Planting Propagule Treatments	Seeds were cold stratified for 180 days. Seeds germinate at temperatures of 17 to 23 C.
Growing Area Preparation / Annual Practices for Perennial Crops	No information provided in this protocol.
Establishment Phase Details	No information provided in this protocol.

Length of Establishment Phase	No information provided in this protocol.
Active Growth Phase	No information provided in this protocol.
Length of Active Growth Phase	No information provided in this protocol.
Hardening Phase	No information provided in this protocol.
Length of Hardening Phase	No information provided in this protocol.
Harvesting, Storage and Shipping	No information provided in this protocol.
Length of Storage	No information provided in this protocol.
Guidelines for Outplanting / Performance on Typical Sites	No information provided in this protocol.
Other Comments	No information provided in this protocol.
Propagation protocol for wild rice (*Zizania palustris* L. [Poaceae]) by Tara Luna[6] And Harvesting Instructions for *Zizania aquatica* (a close relative to *Zizania palustris*) by Deane.[9]	
Ecotype	No information provided in this protocol.
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Bareroot and Plug+Propagule Option
Stock Type	No information provided in this protocol.
Time to Grow	Germination in natural stands starts when water temperatures reach 7 °C (45 °F), usually in late April and early May. In the natural germination sequence, dormancy is broken by cold and low oxygen levels in the mud over winter and germination begins when increased aeration occurs from water flow in spring.
Target Specifications	No information provided in this protocol.
Propagule Collection Instructions	No information provided in this protocol.
Propagule Processing / Propagule	No information provided in this protocol.

Characteristics	
Pre-Planting Propagule Treatments	Wild rice seed requires 3 to 4 mo of storage in cold water 1 °C (34 °F) to break seed dormancy that is caused by a tough, impermeable pericarp covered by a wax layer, and an imbalance of growth promoters and Inhibitors. *It is unclear as to whether this means cold-moist stratification or soaking the seeds in water.
Growing Area Preparation / Annual Practices for Perennial Crops	No information provided in this protocol.
Establishment Phase Details	Fresh seeds, however, can be germinated by carefully removing the pericarp from directly above the embryo and although these seeds cannot be planted directly, they can be germinated in water and the seedlings transplanted later.
Length of Establishment Phase	The primary root emerges 7 to 10 d after the emergence of the coleoptile.
Active Growth Phase	Usually, by 3 wk, seedlings have at least 3 true leaves without the waxy covering that is still submerged. These leaves eventually die, and 2 wax covered, floating leaves emerge 29 d after germination. Upright aerial leaves appear 10 d later and tillering begins after another 10 d (Oelke 1982). Wild rice flowers in late July, and grain forms during August. The adventitious root system is shallow with a lateral spread up to 30 cm (12 in). Up to 50 tillers per mature plant can be produced from the main stem and its tillers. Many tillers bear panicles.
Length of Active Growth Phase	Wild rice requires from 106 to 130 d for maturation in north centralMinnesota, depending on the growing season and local variety.
Hardening Phase	No information provided in this protocol.

Length of Hardening Phase	No information provided in this protocol.
Harvesting, Storage and Shipping	Instructions for *Zizania aquatica* (a close relative to *Zizania palustris*): Late summer, mid-August into mid-September. Grains are collected by using two sticks the length of your arm. One is used to bend the plant over the canoe. The other stick is used to gently brush the plant to knock off ripe seeds. Successive visits to the same plant are possible as not all the seeds ripen at the same time. Harvesting can start as early as after 4.5 months of growth. Grain is harvested when the plants are still green. If they are brown, you're too late. Collected grains should be sun dried for at least a couple of days. An alternative is parching the grains which is heating them in an open pan, stirring until they are dry. Hull parched rice immediately or they will remoisten. Keep away from sand. A little grit goes a long ways.[9]
Length of Storage	No information provided in this protocol.
Guidelines for Outplanting / Performance on Typical Sites	No information provided in this protocol.
Other Comments	Formed an important staple in the diet, cooked with deer broth and maple sugar and eaten in Ojibwa communities. Cooked alone or with meat and used as the principle cereal food in Chippewa communities. Rice gathered and dried for a winter supply of food, sweetened with maple sugar and used to make pudding, and valuable for cooking with wild fowl or game and maple sugar used to season the mixture in Potawatomi communities. While use of *Zizania palustris* for sustenance in Indigenous communities of the Great Lakes region is well documented, the Native American Ethnobotany Database has no documentation of its primacy in Coast Salish communities.[4] For centuries, Native Americans harvested wild rice. Before the grain ripened, women in

	canoes would bend a group of stalks together and wrap the heads with bark strips. Once mature, grain was harvested by bending the long stalks over the canoe and shaking off the ripened grain with ricing sticks, and by cutting the bundled stalks for processing at camp. Because some rice was not fully ripened, wild rice was cured before storage by drying it in the sun for a few days, drying it on racks above fire, or drying or parching the grains in a large metal kettle over a slow fire. In the later process, some grains would pop or break resulting in a flavor preferred by many. Threshing, to remove the tough hull covering the grain, was traditionally work for men and boys. Treading on grain in shallow holes lined with a skin or filling barrels with grain and pounding it with a stick were common threshing methods. Hulls were winnowed by pouring the rice over a blanket and using a breeze or a birch bark fan. An intricate system of agitating shallow trays (similar to modern separators) was used by at least 1 tribe to remove chaff. Clean rice was put in bags made of skins or boxes made from cedar bark or fiber or birch bark (Densmore 1974). Wild rice was traditionally prepared in several ways. Often it was boiled and eaten plain or with maple sugar or used in soups and stews made from wild game or berries. Upper Michigan, northern Wisconsin, and Minnesota east and north of the Mississippi River were the primary wild rice regions in the US (Hitchcock 1971). Today, wild rice is of economic importance. One major market is Grey Owl Foods,a marketing organization owned by Native Americans from 72 reservations in Saskatchewan, Canada (NSWRDP 1999)... Many native varieties are recognized by Native Americans, each growing in its own niche of water depth, temperature, mud, and water quality (Oelke 1993).[6]

INFORMATION SOURCES	
References	See Below
Other Sources Consulted	See Below
Protocol Author	Sierra Red Bow
Date Protocol Created or Updated	05/27/20

References

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[2]ITIS Report. 2020. Zizania palustris. Retrieved from https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=505807#null (accessed May 27, 2020).

[3]Terrell, E. E. & M. R. Duvall. 2000. Zizania. In Catalogue of New World Grasses (Poaceae): I. Subfamilies Anomochlooideae, Bambusoideae, Ehrhartoideae, and Pharoideae. Contr. U.S. Natl. Herb. 39: 116–118. Retrieved from http://legacy.tropicos.org/Name/25527394?projectid=10 (accessed May 27, 2020).

[4]Native American Ethnobotany DB. N.d. Zizania palustris, http://naeb.brit.org/uses/search/?string=zizania+palustris# (accessed May 27, 2020).

[5]Terrell, Edward. 2020. Zizania palustris. Open Herbarium, https://openherbarium.org/taxa/index.php?taxon=Zizania%20palustris(accessed May 27, 2020).

[6]Luna, Tara. 2000. Propagation protocol for wild rice (Zizania palustris L. [Poaceae]). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources, https://npn.rngr.net/npn/journal/articles/propagation-protocol-for-wild-rice-zizania-palustris-l-poaceae(accessed May 27, 2020).

[7]Baskin, Carol C.. 2003. Propagation protocol for production of Container (plug) Zizania palustris L. plants University of Kentucky Lexington, Kentucky. In: Native Plant Network. US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources, https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=poaceae-zizania-2537 (accessed May 27, 2020).

[8]James P. Smith, Jr. 2012, Zizania. Jepson eFlora, https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=9782 (accessed May 27, 2020).

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[10]James P. Smith, Jr. 2012, Zizania palustris var. interior. Jepson eFlora, https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=67914 (accessed May 27, 2020).
[11]The Ojibwe People's Dictionary. 2015. Manoomin, https://ojibwe.lib.umn.edu/main-entry/manoomin-ni (accessed May 27, 2020).

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