Wild Rice Notes

University of California
Agriculture and Natural Resources

July 2025

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Riceworm moth (*Apamea apamiformis*): Background and Update

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General Description

Riceworm moths (*Apamea apamiformis*) are a native insect species to some northern states in the U.S. (Eastern South Dakota and southward to Virginia, Ohio, and Illinois) and Canada (Nova Scotia and westward to Manitoba). The life cycle of the riceworm has been noted to be well-synced with wild rice production, which has made it the most important insect pest on this crop. It was first reported in the late 1950s to be a pest in Canada, and then in 1960 it was reported to be a serious pest in Minnesota. At this point in time, there have been no observations or reports of their presence in California.

Eggs laid by the adults are very small and have a subspherical and creamy appearance. After a few days, the eggs will be more off-white to yellow in color until they are about to hatch, when they change to a dark grey coloration. The larval stage causes economic damage for wild rice producers. Riceworm larvae can be identified by the longitudinal stripes on the upper surface of their body, with widths that vary in later instars.

In This Issue

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Life cycle (well adapted to wild rice production cycle)

Starting from late June to early July, adult riceworm moths will emerge as soon as wild rice panicles appear. They begin to lay eggs in multiple rows on the wild rice heads (in the floret). There can be up to hundreds of eggs in a single head, and egg deposition can last between 4 to 6 weeks. Length of deposition is based on the adults' flight period that lasts until August. This long oviposition period leads to a variety of instars (life stages) present in the field at the same time.

The egg stage lasts between 8 and 9 days, then they hatch into the larval stage, which has 7 instar phases and a pupal stage prior to becoming an adult. The riceworm young larvae bore out of the floret and can feed on several wild rice heads. It has been observed that the larvae spin silken threads to hang from for the wind to drift them to the next flower head to consume. During late instars (6^{th} to 7^{th}), the larvae overwinter in the soil from September to October. If the soil is flooded, the larvae overwinter in the plant stalks and move to the soil in spring. The larvae emerge from the soil and actively feed throughout May until the molting process begins for the pupal stage of their life cycle. This stage is a 3-week pupation period that occurs during June until late June or early July, when the riceworm moth then emerges as an adult.

Instar Phases (aka Life Cycle Stages) in Wild Rice

Third- to seventh-instar larvae are most likely to be present in wild rice fields during harvest. Larger larvae can be found under leaf sheaths during the fall, although some will be present in the stalks as well.

Damage to wild rice

Riceworm moth larvae eat the wild rice seeds, which can lead to severe injury and kernel loss. Because of this, the larvae can cause significant yield losses when not managed. Older larvae cause more injury with their boring behavior into the wild rice stalks while continuing to feed on the heads and leaf sheaths of the plant.

Injury observations

Severe injury will be apparent since the larvae leave silk residues and white, starchy frass aside from damaged kernels in the area where they fed.

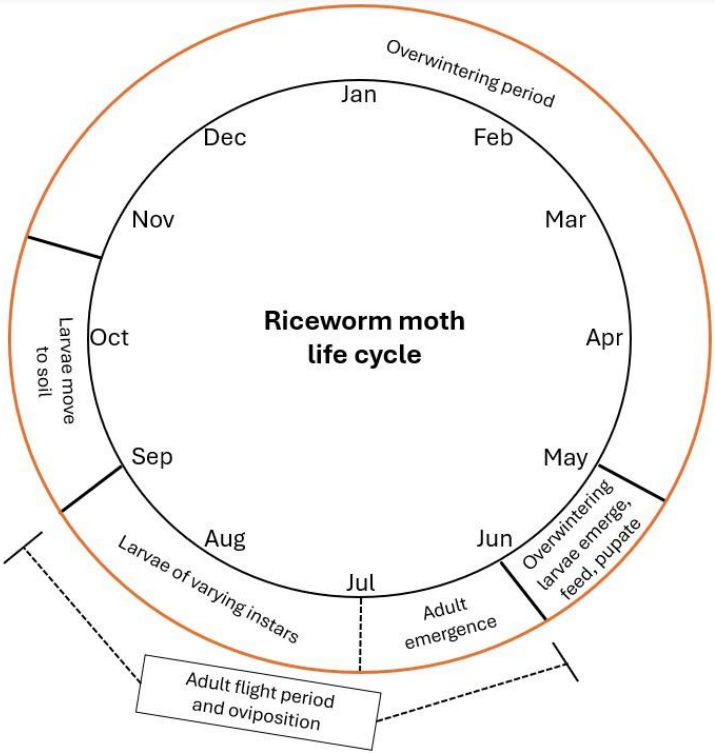

Figure 1. Riceworm moth (Apamea apamiformis) life cycle. Figure credit: Consuelo Baez Vega.

Current issues

In Canada, northern Saskatchewan was severely affected by riceworm moth larvae in 2024, resulting in significant yield losses. Many growers in the area were unable to harvest wild rice due to substantial losses, which also resulted in a loss of seed for reseeding the following season. The last major outbreak prior to the 2024 outbreak in northern Saskatchewan was in 2000.

> For further information on the 2024 outbreak: https://www.cbc.ca/news/canada/saskatchewan/unidentified-pest-wild-rice-harvest-damage-1.7322906

Management

Insecticides are the only known tool to manage riceworm moth larvae. The most commonly used insecticide active ingredient is malathion, although in 1973 it was anecdotally observed by wild rice producers to have lost efficacy in lowering population numbers. The active ingredient carbaryl has also been used for riceworm moth management.

Prevention

Although not observed in California at this time, monitoring and prevention are great practices to maintain for wild rice producers. The following are tips and suggestions for prevention:

- Clean tractors, implements, and other field equipment, especially when moving from infested locations to non-infested locations
    - Particularly important for imported tools and equipment (from outside of California)
- Ensure imported seeds are from verifiable and credited sources
- Use certified seed if and when possible

Miscellaneous

Moths appear to be attracted to common milkweed for its nectar, which has a blooming period similar to moth emergence. Another note of interest is a study conducted by Dahlberg & Pastor in 2014, which observed increased riceworm moth infestations associated with wild rice plants of greater biomass and sediment nitrogen availability, which may enhance plant growth.

References

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An Update on The Wild Rice Pest Management Strategic Plan

Consuelo Baez Vega, Graduate Student, CSU-Chico
Whitney Brim-DeForest, UC Rice and Wild Rice Advisor

California wild rice is a specialty crop that was first produced in the Sacramento Valley in 1972 and has since expanded further north into counties such as Shasta, Lassen, and Modoc. Much of the knowledge for wild rice production has been obtained from a few sources and the experience of wild rice producers. There are not many articles and books on the production of wild rice in California. As such, a Pest Management Strategic Plan (PMSP), with the aid of California wild rice producers, has been in development since 2023. The project was funded by the Western IPM Center (through USDA/NIFA). This is the first PMSP created for California wild rice.

What is a Pest Management Strategic Plan?

It is a robust document containing useful information about wild rice produced in California, including general crop information, pests, and management strategies. Additionally, it contains appendices of developmental stages, price statistics, and efficacy ratings of management tools. This document was created in association with the Western Integrated Pest Management Center, which hosts PMSPs for all crops across several Western states (link: https://ipmdata.ipmcenters.org/source_list.cfm?sourcetypeid=4). The wild rice PMSP will be available and accessible at this link as well.

The Importance of a PMSP

Overall, there is a demand for additional information to better understand wild rice production in California, and the needs and priorities of the wild rice industry. This document can be utilized by the industry and/or scientists and researchers when seeking grant funding. It can also be used to assist in and justify the development of products for pest management (pesticides, other pest management tools). It can also be used as a resource and primary source data for developing policy or interacting with policy makers.

Loyant™ CA Registered for Use in Wild Rice

Whitney Brim-DeForest, CE Rice and Wild Rice Advisor

Loyant™ CA Rinskor™ active (florpyrauxifen-benzyl) was recently registered for use in California wild rice, with a Section 24(c), a special local needs registration. The registration only allows for the use in California wild rice. It cannot be applied to river or lake grown wild rice and should only be applied to cultivated wild rice in California.

Loyant™, which is an auxin mimic, is applied as a foliar product, with a ground rig only (it CANNOT be applied by air). It provides early-season control of sedges and broadleaf weeds, and although not strong on watergrasses, it can provide some suppression. It also controls cattails (tules). Refer to the label for specific weed species and their corresponding growth stages. In wild rice, Loyant™ should be applied at or after the 2-leaf stage, and cannot be applied later than 60 days before harvest.

As always, the label is the law, so make sure to read and follow the current labels for each of these herbicides (found on the manufacturer's website or at the Department of Pesticide Regulation's website). Also, check in locally with your Agricultural Commissioner's office for training information and any other county-specific requirements.

With this new option, wild rice growers in California should have a great suite of tools available for 2026, both for resistance management as well as to prevent the selection of future resistance. For help planning a weed management program, please reach out to your local Advisor (Whitney Brim-DeForest: 530-822-7515, or Ryan Hill: 530-527-3101).

FIFRA Section 24 (c) Special Local Need (SLN) Label

Corteva Agriscience LLC 9330 Zionsville Road Indianapolis, IN 46268-1054 USA

FIFRA 24(c) SPECIAL LOCAL NEED LABEL (SLN)

FOR DISTRIBUTION AND USE ONLY IN THE STATE OF CALIFORNIA

For Postemergence Aquatic Weed Control in Cultivated Rice or Wild Rice

Loyant™ CA

EPA Reg. No. 62719-743 **EPA SLN No: CA-250002**

This label expires and must not be distributed or used in accordance with this SLN registration after **June 30, 2030.**

ATTENTION

- It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
- This labeling must be in the possession of the user at the time of application.
- Read the label affixed to the container for Loyant CA before applying. Carefully follow all precautionary statements and applicable use directions.
- Except as directed in this supplemental labeling, use of Loyant CA according to this supplemental labeling is subject to all use precautions and limitations imposed by the label affixed to the container for Loyant CA.

Directions for Use

Refer to the main Loyant CA product label for Precautions and Restrictions, Mixing Instructions, and Application Directions.

Apply Loyant CA herbicide to rice or wild rice at or after 2 leaf stage with no exposed roots at 1.33 pt/acre by ground in a minimum of 10 gallons/per acre to control or suppress listed aquatic weeds that are emerged from the water. Listed weeds which are not emerged from the water may not be controlled. Only one application of Loyant CA may be made per year. Use of an agriculturally approved methylated seed oil adjuvant at a rate of 0.5 pints per acre is recommended to be added to Loyant CA. Do not use pure organosilicone surfactants in spray mixtures of this product. Read and follow all use directions and precautions on adjuvant labels. See main Loyant CA label for information on drift reduction.

DO NOT TANK MIX ANY PESTICIDE PRODUCT WITH THIS PRODUCT without first referring to the following website for the specific product: www.LoyantCAtankmix.com. This website contains a list of active ingredients that are currently PROHIBITED from use in tank mixture with this product.

- Do not apply this product through any type of irrigation system.
- Do not use treated water for any form of irrigation.
- Do not use treated water for hydroponic farming.
- Do not rotate treated land to crops other than rice or wild rice for 3 months following application.
- Do not apply to rice or wild rice used for seed production.
- Do not tank mix Loyant CA with malathion or methyl parathion. Do not make an application of malathion or methyl parathion within 7 days of an application of Loyant CA.
- Do not apply by air.

Target Weeds and Use Restrictions:
Apply Loyant CA at a rate of 1.33 pints per acre to control or suppress the weeds listed below.

Target Weeds	Maximum Growth Stage	Use Restrictions
barnyard grass (*Echinochloa crus-galli*)	*4 leaf*	• *Apply only to cultivated rice or wild rice fields. DO NOT apply to river or lake grown rice or wild rice.* • *Do not exceed a total of 1.33 pint per acre per year.* • *Do not permit spray mists containing Loyant CA to drift onto desirable broadleaf plants.* • *Do not use treated water for irrigation of other crops.* • *Do not apply after panicle initiation.* • *Preharvest interval: Do not apply within 60 days of harvest.*
California arrowhead (*Sagittaria montevidensis*)	6”	
common water plantain (*Alisma plantago-aquatica*)	6”	
ducksalad (*Heteranthera limosa*)	6”	
early watergrass (*Echinochloa oryzoides*) - suppression	4 leaf	
junglerice (*Echinochloa colona*)	4 leaf	
late watergrass (*Echinochloa phyllopogon*) - suppression	4 leaf	
monochoria (*Monochoria* spp.)	6”	
redstem (*Ammannia* spp.)	6”	
ricefield bulrush (*Schoenoplectus mucronatus*)	6”	
smallflower umbrella sedge (*Cyperus difformis*)	6”	
waterhyssop species (*Bacopa* spp.)	6”	
cattail (*Typha latifolia*)	3 feet	

Special Conditions and Risks of Use
USE OF Loyant CA HERBICIDE (THE “PRODUCT”) ON CULTIVATED RICE OR WILD RICE (THE “CROP”) MAY RESULT IN CROP INJURY, CROP YIELD REDUCTION AND/OR CROP LOSS. READ AND UNDERSTAND THESE SPECIAL CONDITIONS AND RISKS OF USE BEFORE USING THE PRODUCT ON THE CROP.

Corteva Agriscience makes the product available for use in the manner described in this Special Local Need Labeling on the basis that, in the sole opinion of the user, the benefits and utility derived from the use of the Product on the Crop outweigh the potential risk of Crop injury or loss. The decision to use this Product in the manner described in this Special Local Need Labeling must be made by each individual user on the basis of anticipated benefits versus (i) the risk of Crop injury, Crop yield reduction and Crop loss, (ii) the severity of the target pest infestation, (iii) the cost and availability of alternative pest controls, and (iv) any other relevant factors.

By purchasing the Product for use, or using the Product, in the manner described in this Special Local Need Labeling, you acknowledge and accept that:
(1) You assume all risk of Crop injury, Crop yield reduction and Crop loss;
(2) Corteva Agriscience does not make, and does not authorize any agent or representative to make, any representations or recommendations regarding the use of this Product on the Crop other than the statements on this Supplemental labeling;
(3) Corteva Agriscience does not make, and does not authorize any agent or representative to make, any warranties, express or implied, with respect to the use of the Product on the Crop and disclaim all warranties, expressed or implied, including any implied warranty of merchantability;
(4) Corteva Agriscience disclaims all liability for any damages, losses, expenses, claims or causes of actions arising out of or relating to Crop injury, Crop yield reduction and/or Crop loss;
(5) These Conditions and Risks of Use for Special Local Need supersede any contrary representations or recommendations by Corteva Agriscience, or its respective agents or representatives, and any provisions in or on any Product literature or labeling including any provisions on the label affixed to the Product container.

If these Special Conditions and Risks of Use are not acceptable, the unopened Product may be returned to the seller for a refund or used for a different labeled use in accordance with the label affixed to the Product container. These Special Conditions and Risks of Use for Special Local Need are required by Corteva Agriscience and not specified by the US EPA or the State of California.

24(c) Registrant:
Corteva Agriscience LLC
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Indianapolis, IN 46268
Phone: 1-800-258-3033

R466-002
Accepted: 06/03/2025
Initial Printing