2017 Washington State Visual Snail Survey

Prepared by
Washington State Department of Agriculture
Plant Protection Division
Entomology Branch

March 2018

In Cooperation with the
United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine

Introduction

In response to the discovery of *Cernuella virgata* and *Candidula intersecta*, the Washington State Department of Agriculture (WSDA) in cooperation with the United States Department of Agriculture-Animal and Plant Health Inspection Service (USDA-APHIS) conducted detection surveys in the Port of Tacoma, Port of Seattle and throughout Washington State.

Background

Cernuella virgata

In November 2005, WSDA personnel discovered an invasive snail infestation while conducting the "Exotic Wood Boring Beetle" survey in the Port of Tacoma. The specimens were submitted to Patrick Marquez, USDA Entomologist. David Robinson, USDA National Malacologist at the Academy of Natural Sciences in Philadelphia, identified as *Cernuella virgata*.

Cernuella virgata is a serious economic pest in grain growing areas of Australia. Based on the 2010 crop Figures, Washington State ranked sixth nationally in barley production, and fourth in wheat production. Whitman County, Washington produces more wheat and barley than any other county in the United States. *Cernuella virgata* could economically threaten Washington's grain industry. WSDA listed *Cernuella virgata* on Washington's State Priority Pest List.

Candidula intersecta

In June 2006, WSDA personnel conducted a general detection survey for *Cernuella virgata* in the Port of Seattle. No *Cernuella virgata* were detected, however another snail in the family Hygromiidae was detected infesting over one linear mile of rail lines along West Marginal Way. The specimens were submitted to Patrick Marquez, USDA Entomologist. David Robinson, USDA National Malacologist at the Academy of Natural Sciences in Philadelphia, identified the specimens as *Candidula intersecta*.

Candidula intersecta, native to Europe, is a pest of pears, plums and peaches. It does damage by feeding on tree fruit, to leaves of young saplings, young annuals and seeds. The economic impact of *Candidula intersecta* is unknown for Washington State. WSDA lists *Candidula intersecta* on Washington's State Priority Pest List.

Methods and Materials

Mollusk Trapping

In the fall, WSDA continued testing out the effectiveness of "Baited Delta Trap and "Blanket", but added pitfall traps with brewer yeast at detecting mollusk. The Baited Delta trap were used to provide shelter, moisture and mollusk bait as food attractant with tangle foot to trap the mollusk. The Pitfall traps were baited with brewer yeast as a food attractant and lined with tangle foot to trap the mollusk. Blankets were used to provide shelter with moisture. The traps were installed in October, inspected every 7 days and removed at the end of November (trap images are above trap map 1). Combinations of slugs and/or snails were detected in 53 inspections of traps. 2 inspections with slugs in a "Blanket' and 24 inspections with snails in "Blanket", 17 inspections with snails in "Baited Delta" and 12 inspections with snails in "Pitfall with brewer yeast" traps.

Survey

WSDA reviewed the data gathered during the 2016 Visual Snail Survey and other high risk areas

determined by high risk sites such as ports, rail lines and industrial areas for the 2017 Visual Snail Survey. WSDA divides the visual snail detection survey into three sections: "Port of Tacoma" (maps 2 and 3), Port of Seattle" (map 4) and "State" (map 5).

WSDA conducted the 2017 Visual Snail Survey April to December. The highest snail activity is during cool wet weather, the majority of the snail visual survey was conducted throughout the spring and the fall. The visual survey continued as weather permitted in July and August. At various sites, a snail "Wanted" poster was distributed (Appendix A).

WSDA personal used an iPhone in the field using "iForm" to record trap data, such as record trap number, collection dates, lure changes, waypoints and trap removal dates. All data from "iForm" were stored into one data base using Excel for easy export to NAPIS and uploaded to ArcGIS real time Washington state map.

Samples

All snails and slugs were drowned in a vial filled with water between 12-24 hours. Snails and slugs were sorted into groups (similar shapes and sizes) and placed in vials with 70% alcohol. A PPQ 391 form (Appendix B) was filled out for each suspect snail or slug. All suspect snail samples were submitted for final identification.

Results

Mollusk trapping

WDSA data from deployed "Blankets", baited delta traps and Pitfall with brew yeast traps for the Port of Tacoma in 2017 had 50% had positive for detections for traps. WSDA will continue to trap in 2018.

Mollusk visual survey

WSDA recorded the following data in the 3 visual snail sections: Port of Tacoma there were 88 negative points, 42 *Candidula intersecta* points, 28 *Cernuella virgata* points and 102 non-target mollusk; Port of Seattle there were 19 negative and 11 non-target mollusk; State there were 388 negative points and 199 non-target mollusk.

WSDA detected some following non-target mollusk:

1. Terrestrial snails: *Oxychillus sp*., *Cepaea nemoralis* and *Cornu aspersus*
2. Terrestrial slugs: *Arion sp. and Deroceras laeve*
3. Aquatic snails

Discussion

The collaboration between WSDA and USDA was invaluable in developing and implementing the survey program. WSDA, along with USDA, were able to successfully survey in the Port of Tacoma, Port of Seattle and various sites throughout Washington State.

In the 2018 fall, WSDA plans to trap for mollusk with Pitfall with brewer yeast", "Blankets" and Baited Delta on the properties with detections of *Cernuella virgata* in the Port of Tacoma.

The snails were easier to detect with the cooler weather, shortly after a rain and early morning surveys. Most snails detected were found along the ground, under debris or near vegetation. Snails were hard to detect during hot weather from July to August. Survey activity was suspended until September except during

favorable weather conditions. Most snails during this time were found aestivating in the lower half of the vegetation or under debris.

All stakeholders within the Port of Tacoma eradication area cooperated fully with WSDA during the snail visual survey. WSDA has stopped reporting non targets such as *Cornu aspersum* and *Cepaea nemoralis* to NAPIS

Summary

It proved quite successful for WSDA and USDA to jointly work together throughout the 2017 visual snail survey. Visual snail surveys are essential to detect and prevent exotic invasive snails from infesting Washington State. Continued delimiting visual snail surveys are a necessity for monitoring and preventing new exotic invasive snail introductions in the Port of Tacoma, Port of Seattle and other high risk sites.

WSDA continues to reduce, isolate and implement various strategies to eradicate the *Cernuella virgata* infestation in the Port of Tacoma. In 2005, *Cernuella virgata* was detected on 11 parcel properties, but in 2017 *Cernuella virgata* has only been detected on 1 parcel property. Fortunately, the population is isolated on the peninsula and bordered on three sides by water. Like Michigan and North Carolina, WSDA and the Port of Tacoma are using an integrated approach, such as vegetation and trash removal, along with the use of baits and barriers, to eradicate *Cernuella virgata* in the Port of Tacoma, Washington.

Compiled by:
J. Cena
March 2018
Washington State Department of Agriculture

Mollusk Trap Images

“Pitfall Trap”

“*Cernuella virgata*”

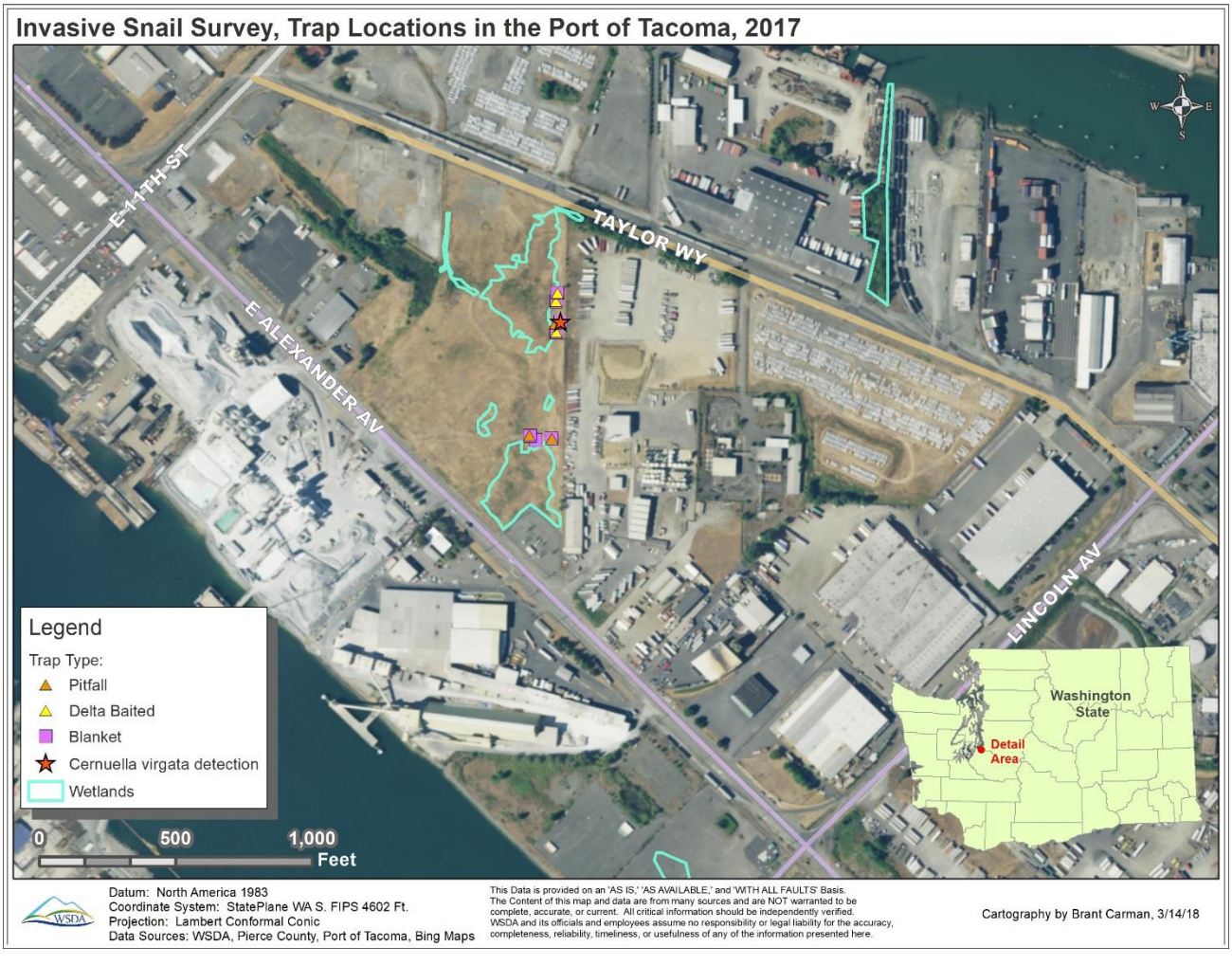
“Baited Delta Trap”

“*Candidula intersecta*”

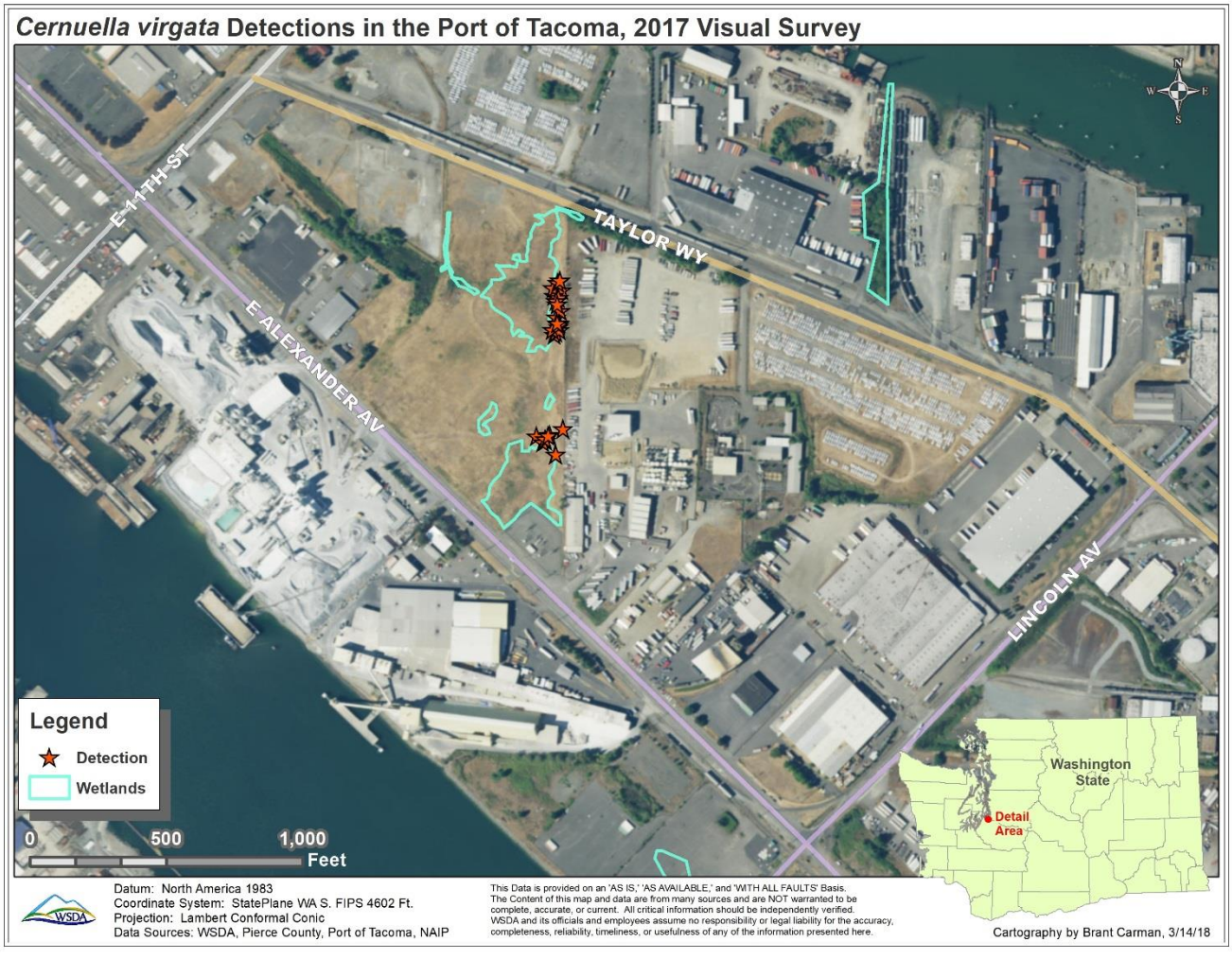
“Blanket”

“*Candidula intersecta*”

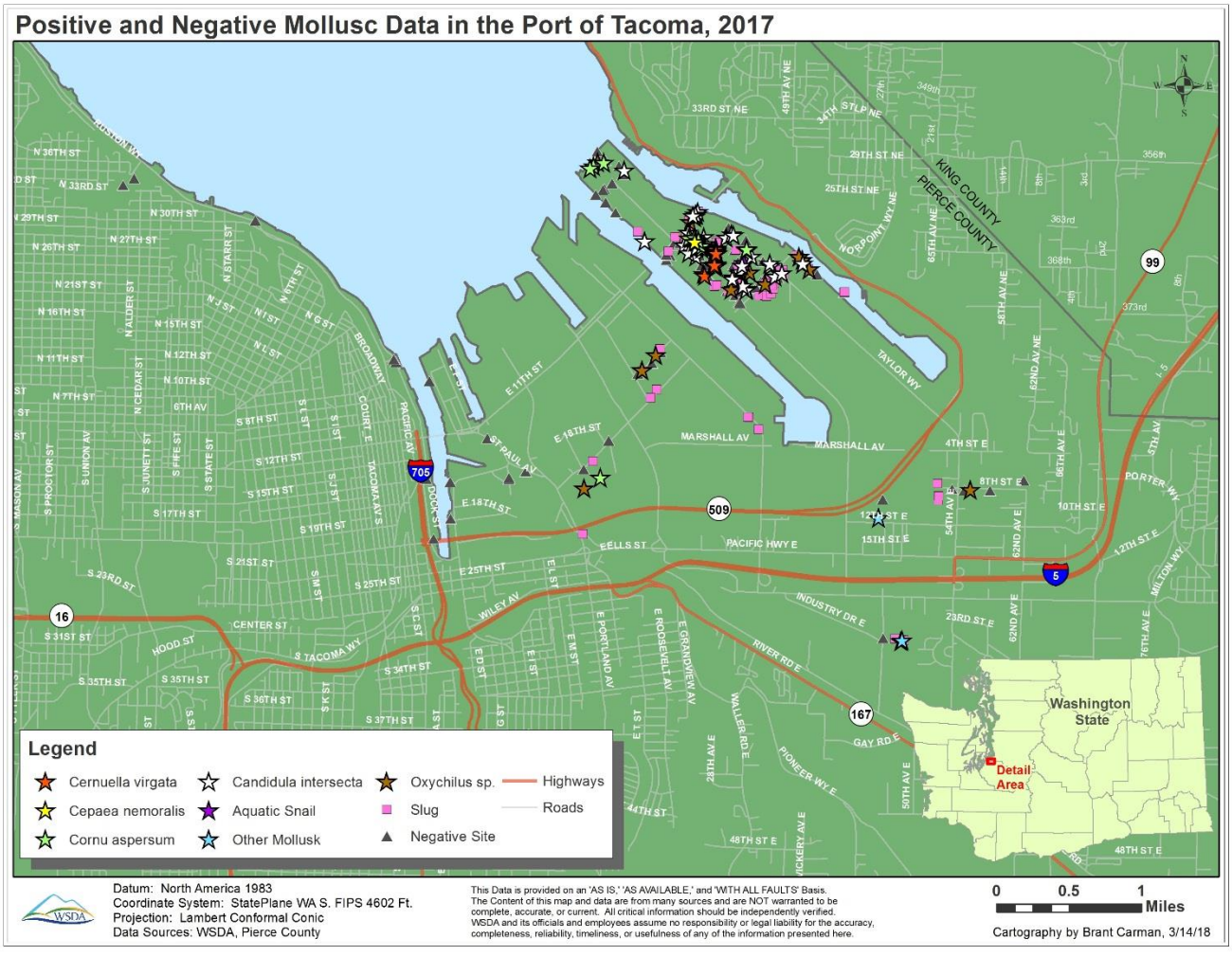
Map 1



Map 2


Cernuella virgata Detections in the Port of Tacoma, 2017 Visual Survey
E 11TH ST
TAYLOR WY
E ALEXANDER AV
LINCOLN AV
N
W
E
S
Legend
Detection
Wetlands
0
500
1,000
Feet
Washington State
Detail Area
Datum: North America 1983
Coordinate System: StatePlane WA S. FIPS 4602 Ft.
Projection: Lambert Conformal Conic
Data Sources: WSDA, Pierce County, Port of Tacoma, NAIP
This Data is provided on an 'AS IS,' 'AS AVAILABLE,' and 'WITH ALL FAULTS' Basis.
The Content of this map and data are from many sources and are NOT warranted to be complete, accurate, or current. All critical information should be independently verified.
WSDA and its officials and employees assume no responsibility or legal liability for the accuracy, completeness, reliability, timeliness, or usefulness of any of the information presented here.
Cartography by Brant Carman, 3/14/18

Map 3


Positive and Negative Mollusc Data in the Port of Tacoma, 2017
Legend
Cernuella virgata
Cepaea nemoralis
Cornu aspersum
Candidula intersecta
Aquatic Snail
Other Mollusk
Oxychilus sp.
Slug
Negative Site
Highways
Roads
Washington State
Detail Area
Datum: North America 1983
Coordinate System: StatePlane WA S. FIPS 4602 Ft.
Projection: Lambert Conformal Conic
Data Sources: WSDA, Pierce County
This Data is provided on an 'AS IS,' 'AS AVAILABLE,' and 'WITH ALL FAULTS' Basis.
The Content of this map and data are from many sources and are NOT warranted to be complete, accurate, or current. All critical information should be independently verified.
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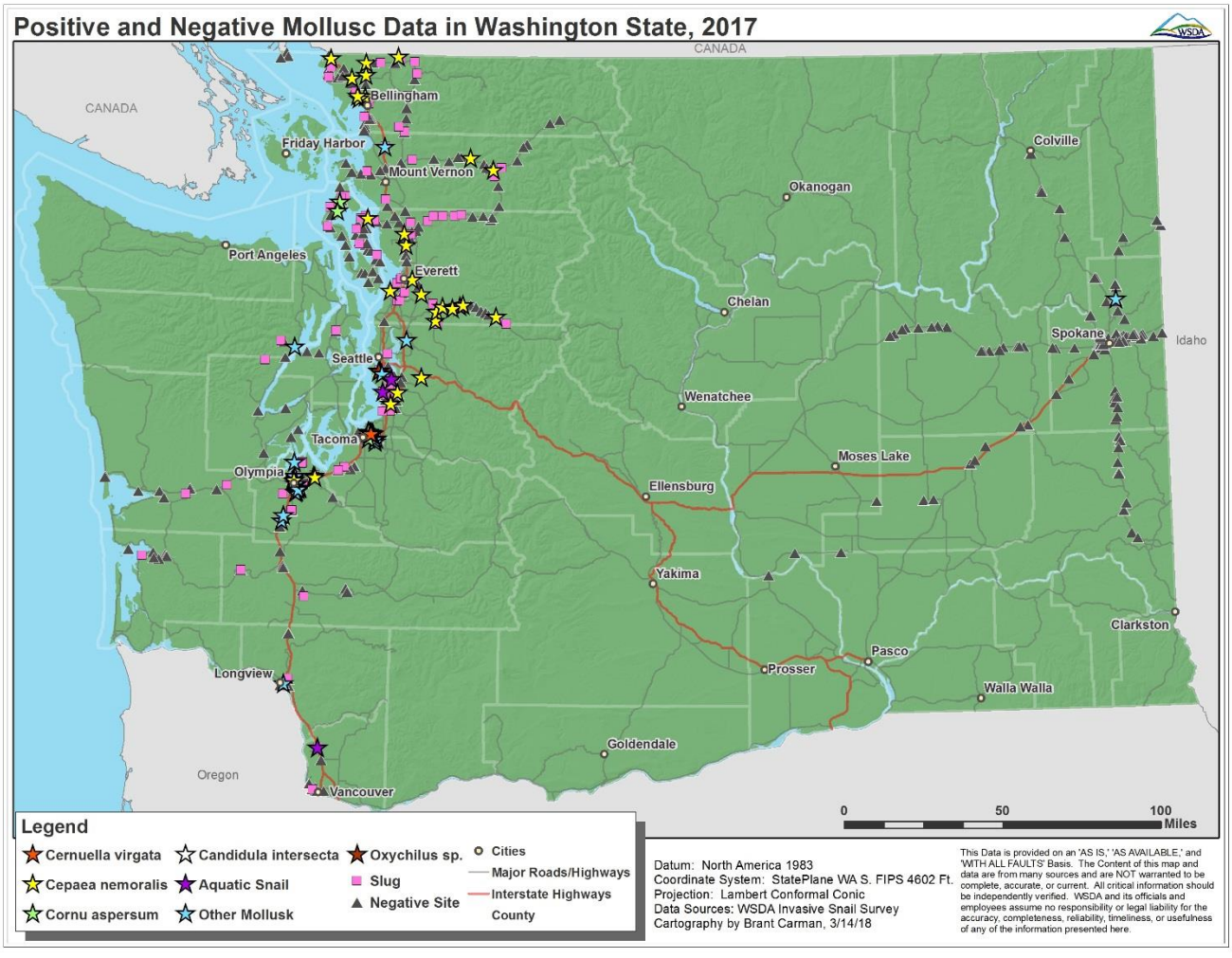
0 0.5 1 Miles
Cartography by Brant Carman, 3/14/18

Map 4

Map 5


Positive and Negative Mollusc Data in Washington State, 2017
CANADA
CANADA
Bellingham
Friday Harbor
Mount Vernon
Port Angeles
Everett
Seattle
Tacoma
Olympia
Longview
Oregon
Vancouver
Goldendale
Yakima
Ellensburg
Wenatchee
Chelan
Okanogan
Colville
Spokane
Idaho
Moses Lake
Pasco
Prosser
Walla Walla
Clarkston
0
50
100
Miles
Legend
Cernuella virgata
Candidula intersecta
Oxychilus sp.
Cities
Cepaea nemoralis
Aquatic Snail
Slug
Major Roads/Highways
Cornu aspersum
Other Mollusk
Negative Site
Interstate Highways
County
Datum: North America 1983
Coordinate System: StatePlane WA S. FIPS 4602 Ft.
Projection: Lambert Conformal Conic
Data Sources: WSDA Invasive Snail Survey
Cartography by Brant Carman, 3/14/18
This Data is provided on an 'AS IS,' 'AS AVAILABLE,' and 'WITH ALL FAULTS' Basis. The Content of this map and data are from many sources and are NOT warranted to be complete, accurate, or current. All critical information should be independently verified. WSDA and its officials and employees assume no responsibility or legal liability for the accuracy, completeness, reliability, timeliness, or usefulness of any of the information presented here.

Appendix A

The vineyard snail

Exotic species of plants and animals lack natural predators and consequently reproduce

The wrinkled dune snail

Two exotic snails, the vineyard snail and the wrinkled dune snail, have recently entered Washington state. State and federal plant health officials are searching statewide for these pests. Please contact WSDA immediately, if you find either of these snails.

Exotic snails enter the United States through one main pathway – container traffic!

With the increase in container movement overseas and domestically, the opportunity for snail infestation increases.

As an importer, you have the unique opportunity to examine every overseas shipment that enters your facility. Your cooperation in reporting exotic pests can result in saving US taxpayers millions of dollars per year and reducing agricultural concerns among US trading partners.

WSDA
WASHINGTON STATE
DEPARTMENT OF AGRICULTURE

AGR PUB 805-191 (N/9/07)

Do you need this publication in another format?
Contact the WSDA Receptionist at (360) 902-1976.

WANTED

Dead or Alive

Exotic Snails

State of Washington
Department of Agriculture

Entomology Program
Pest Detection

Call Toll Free
1-800-443-6684

Infestations of the Vineyard snail clog and damage harvesting machinery.

Exotic snails are of agricultural concern for many reasons. Snails consume some plants of agricultural importance. Snails climb plants, making harvesting difficult and spoiling the product. Snails also carry many plant, animal and human diseases.

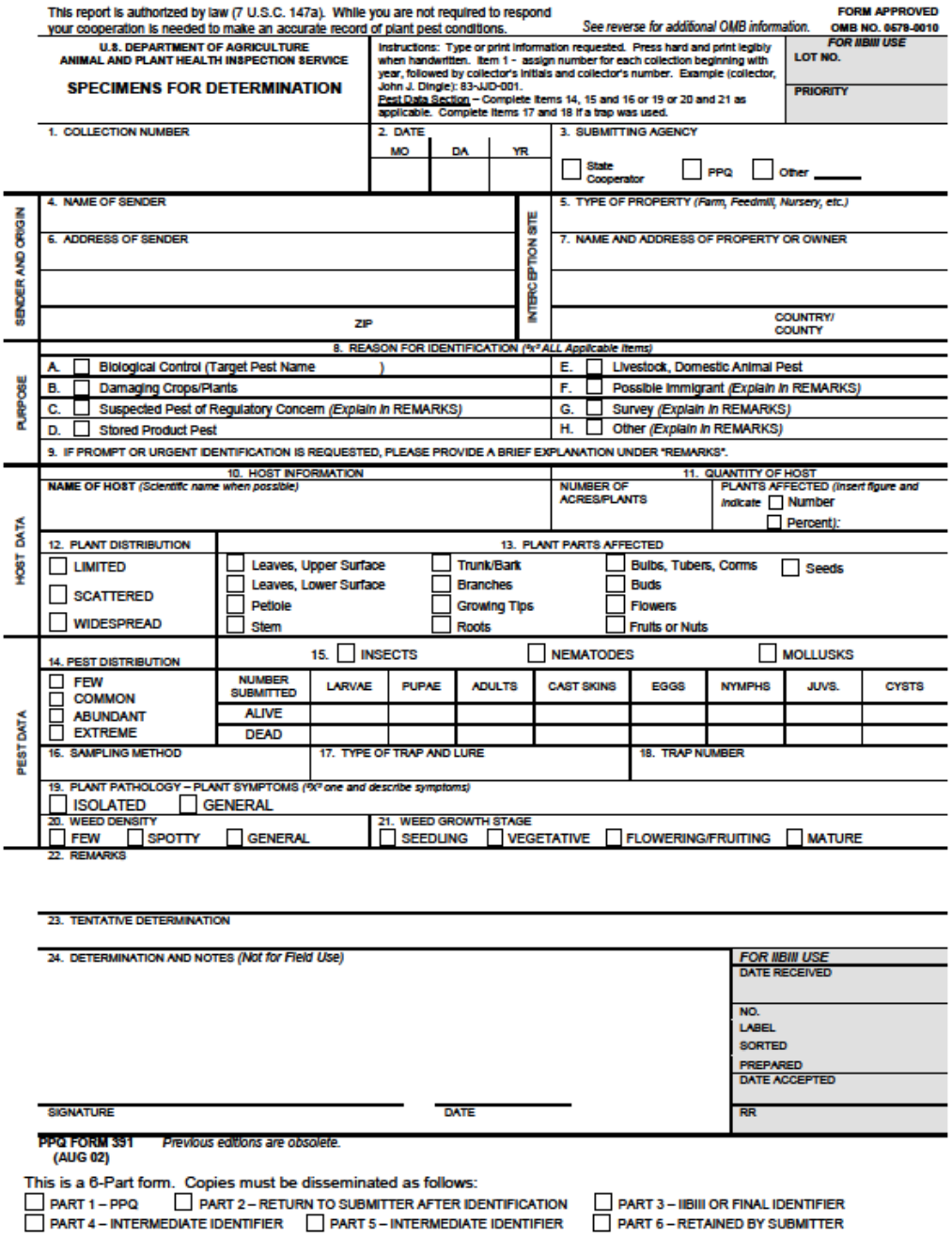
"The vineyard snail"
Cernuella virgata (da Costa)

Shell: Globular, high convex spire with 5-7 convex whorls, small umbilicus, mouth round with an internal rib which may be white or brown
Coloration: White or ginger, usually with dark brown spiral band
Size: 10-20 mm diameter

"The wrinkled dune snail"
Candidula intersecta (Poiret)

Shell: Depressed globular, spire flattened with 4-5 convex whorls with narrow umbilicus
Coloration: Whitish or yellowish white with dark bands and spots
Size: 7-11 mm diameter

Appendix B



This report is authorized by law (7 U.S.C. 147a). While you are not required to respond your cooperation is needed to make an accurate record of plant pest conditions. *See reverse for additional OMB information.*

FORM APPROVED
OMB NO. 0579-0010

U.S. DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE

SPECIMENS FOR DETERMINATION

Instructions: Type or print information requested. Press hard and print legibly when handwritten. Item 1 - assign number for each collection beginning with year, followed by collector's initials and collector's number. Example (collector, John J. Dingle): 83-JJD-001.
Pest Data Section – Complete items 14, 15 and 16 or 19 or 20 and 21 as applicable. Complete items 17 and 18 if a trap was used.

FOR IIBIII USE
LOT NO.
PRIORITY

1. COLLECTION NUMBER
2. DATE (MO / DA / YR)
3. SUBMITTING AGENCY — ☐ State Cooperator ☐ PPQ ☐ Other _____

SENDER AND ORIGIN
4. NAME OF SENDER
6. ADDRESS OF SENDER
ZIP

INTERCEPTION SITE
5. TYPE OF PROPERTY *(Farm, Feedmill, Nursery, etc.)*
7. NAME AND ADDRESS OF PROPERTY OR OWNER
COUNTRY/ COUNTY

PURPOSE
8. REASON FOR IDENTIFICATION *(X all Applicable Items)*

A. ☐ Biological Control (Target Pest Name)	E. ☐ Livestock, Domestic Animal Pest
B. ☐ Damaging Crops/Plants	F. ☐ Possible Immigrant *(Explain in REMARKS)*
C. ☐ Suspected Pest of Regulatory Concern *(Explain in REMARKS)*	G. ☐ Survey *(Explain in REMARKS)*
D. ☐ Stored Product Pest	H. ☐ Other *(Explain in REMARKS)*

9. IF PROMPT OR URGENT IDENTIFICATION IS REQUESTED, PLEASE PROVIDE A BRIEF EXPLANATION UNDER "REMARKS".

HOST DATA
10. HOST INFORMATION — NAME OF HOST *(Scientific name when possible)*
11. QUANTITY OF HOST — NUMBER OF ACRES/PLANTS; PLANTS AFFECTED *(Insert figure and indicate ☐ Number ☐ Percent):*

12. PLANT DISTRIBUTION
☐ LIMITED ☐ SCATTERED ☐ WIDESPREAD

13. PLANT PARTS AFFECTED

☐ Leaves, Upper Surface	☐ Trunk/Bark	☐ Bulbs, Tubers, Corms	☐ Seeds
☐ Leaves, Lower Surface	☐ Branches	☐ Buds	
☐ Petiole	☐ Growing Tips	☐ Flowers	
☐ Stem	☐ Roots	☐ Fruits or Nuts	

PEST DATA
14. PEST DISTRIBUTION
☐ FEW ☐ COMMON ☐ ABUNDANT ☐ EXTREME

15. ☐ INSECTS ☐ NEMATODES ☐ MOLLUSKS

NUMBER SUBMITTED	LARVAE	PUPAE	ADULTS	CAST SKINS	EGGS	NYMPHS	JUVS.	CYSTS
ALIVE								
DEAD								

16. SAMPLING METHOD
17. TYPE OF TRAP AND LURE
18. TRAP NUMBER

19. PLANT PATHOLOGY – PLANT SYMPTOMS *(X one and describe symptoms)*
☐ ISOLATED ☐ GENERAL

20. WEED DENSITY
☐ FEW ☐ SPOTTY ☐ GENERAL

21. WEED GROWTH STAGE
☐ SEEDLING ☐ VEGETATIVE ☐ FLOWERING/FRUITING ☐ MATURE

22. REMARKS

23. TENTATIVE DETERMINATION

24. DETERMINATION AND NOTES *(Not for Field Use)*

SIGNATURE
DATE

FOR IIBIII USE
DATE RECEIVED
NO.
LABEL
SORTED
PREPARED
DATE ACCEPTED
RR

PPQ FORM 391 (AUG 02) *Previous editions are obsolete.*

This is a 6-Part form. Copies must be disseminated as follows:
☐ PART 1 – PPQ ☐ PART 2 – RETURN TO SUBMITTER AFTER IDENTIFICATION ☐ PART 3 – IIBIII OR FINAL IDENTIFIER
☐ PART 4 – INTERMEDIATE IDENTIFIER ☐ PART 5 – INTERMEDIATE IDENTIFIER ☐ PART 6 – RETAINED BY SUBMITTER