Oregon's New Challenges: The Gypsy Moth and Japanese Beetle

Diana N Kearns, PhD
Oregon Department of Agriculture
Plant Protection & Conservation Program Area

Asian Gypsy Moth and European Gypsy Moth

- Morphologically (appearance) identical
- AGM females can fly, increasing its dispersal ability
- AGM has broader host range and readily feeds on evergreen trees
- EGM studies indicate phenotypic plasticity-the ability to adapt rapidly to new environmental conditions and diets, including leaves containing tannin and secondary plant metabolites

Risks

- Economic
- Ecological
- Human Health

Oregon Potential Economic Costs

- Costs of quarantines to nursery ($803 million;85% exported) and Christmas tree industries ($100 million; 90% exported)
- Forestry production (hardwoods and fir)
- Increased pesticide use by private landowners (urban, nurseries, and private forests)

Northwestern forests: Douglas fir (most common), firs, maples, dogwood, alder, red cedar, pines, oaks, willows

In Oregon, forests comprise 30 million acres of state's 63 million acre land mass (48%) 30 species of conifers and 37 species of hardwoods

Potential ecological risks

Watersheds and streams: Higher temperatures, lower oxygen, increased organic load (affects fish and other aquatic organisms)

Defoliation, in conjunction with climate change, may increase fire risks

Competition/displacement of native species

European Gypsy Moth

Northern tiger swallowtail

Redman and Scriber 2000

Human Health

Each caterpillar sheds its bristly skin four or five times as it grows, and the skins pile up. The bristles may become airborne and irritate human eyes, skin and respiratory systems. In fact, many people develop a rash if they come into contact with the bristles. It becomes extremely unpleasant to work or play outdoors; the caterpillars will also crawl on houses and may get inside.

Oregon's GM catches in 2016

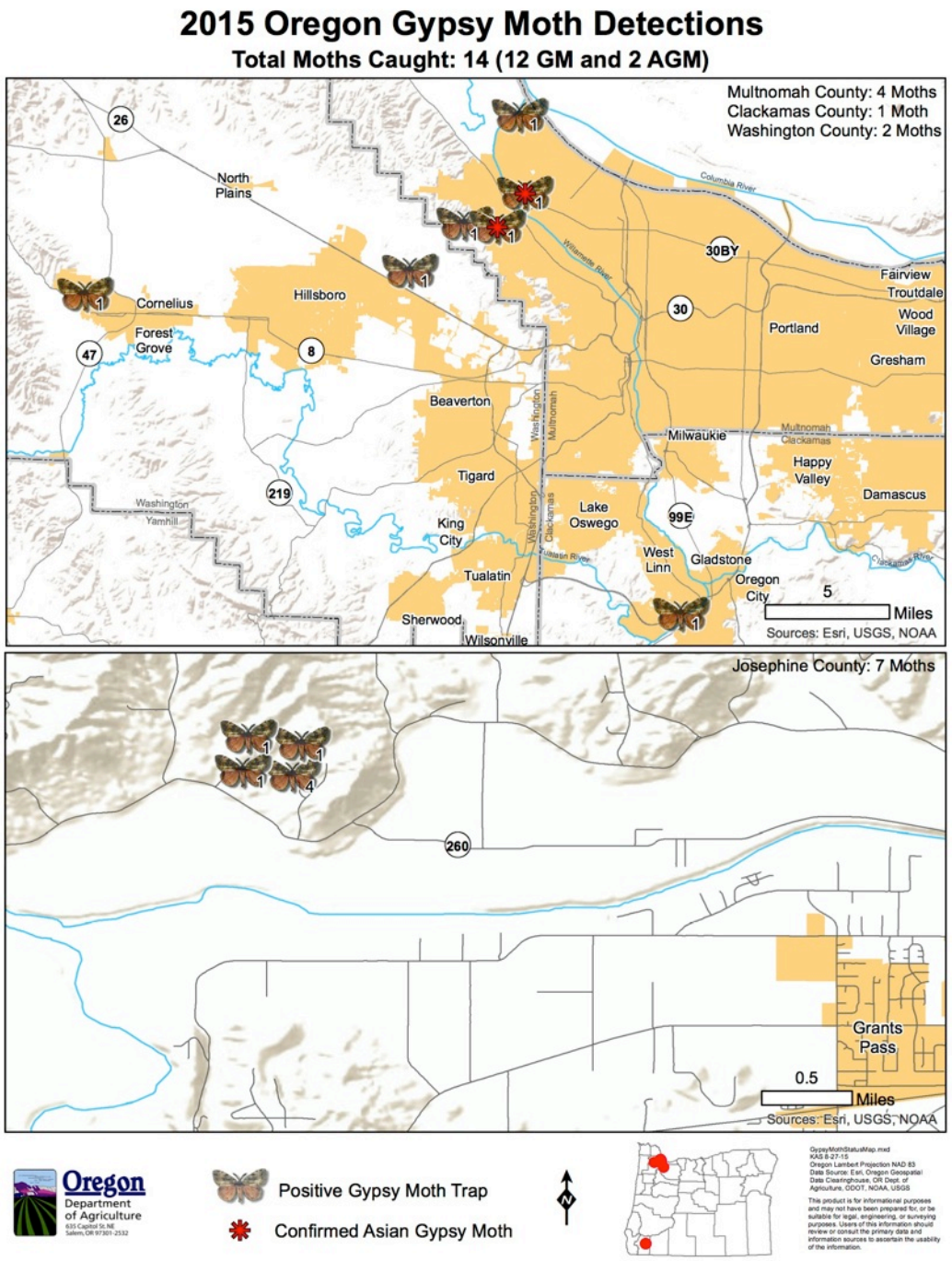
No AGMs caught in Forest Park eradication area

2 EGMs: Along the McKenzie River approximately 22 miles east of Eugene

4 EGMs: NW of Grants Pass

2015

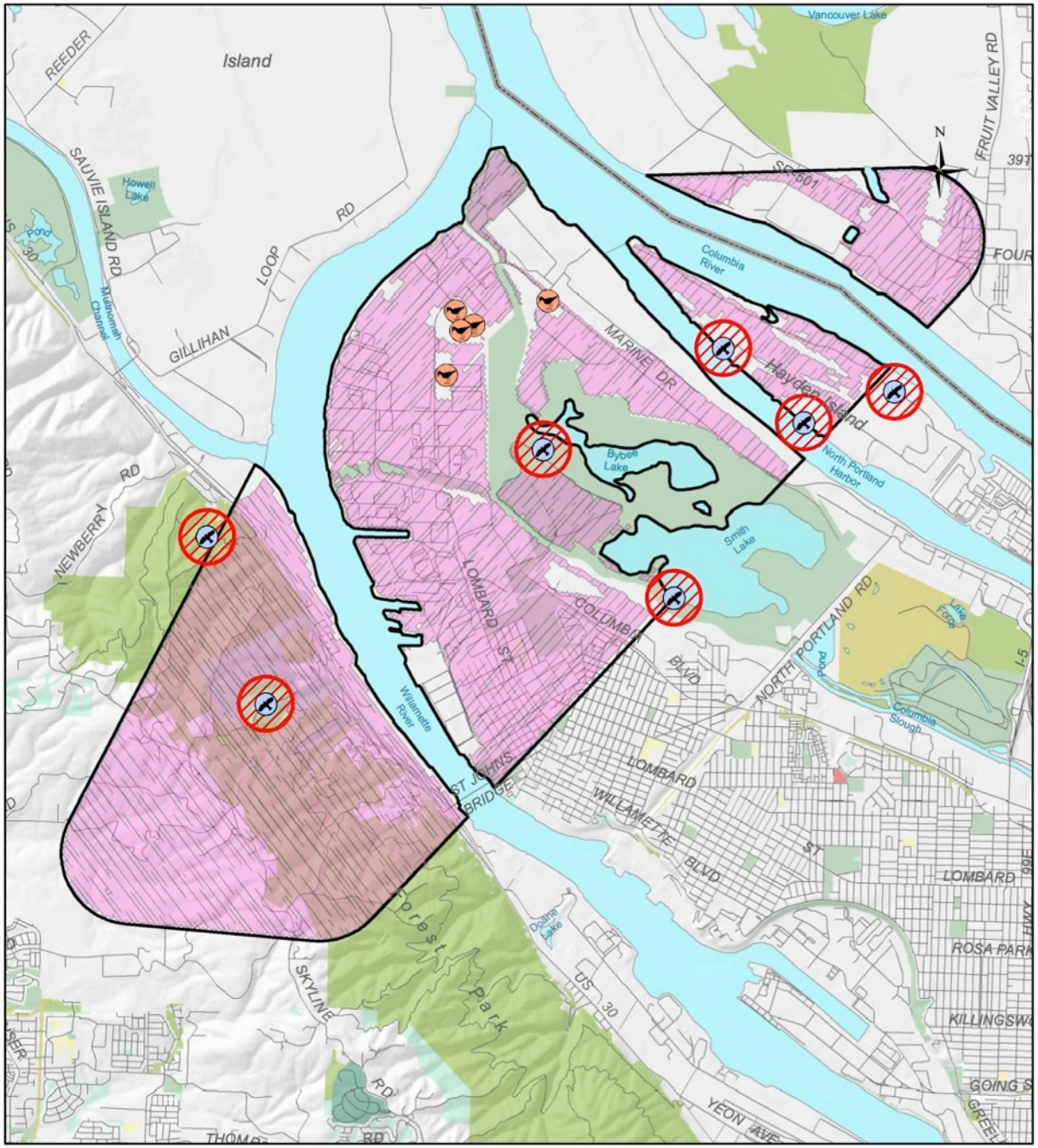
2 AGMs caught near St. Johns and Forest Park (and 5 EGMs, including Washington and Multnomah Counties)



Proposed treatment area was 8600 acres

Actual treatment excluded water and T & E nests
(3 horned lark, 7 active bald eagle nests)

7923 acres



Sentinel GM egg mass monitoring

Treatment dates

- April 16,17,18
- April 25,26
- May 1,2

Ground Operations

Not a perfect beginning:

Two spills on 2nd day of 1st application

- A bolt broke - 250 gallons of Foray 48B were dumped on an empty gravel parking lot adjacent to the Willamette River

- A new bolt was installed, but it broke again, and another 250 gallons were dumped in an open grass field

Response to the spills

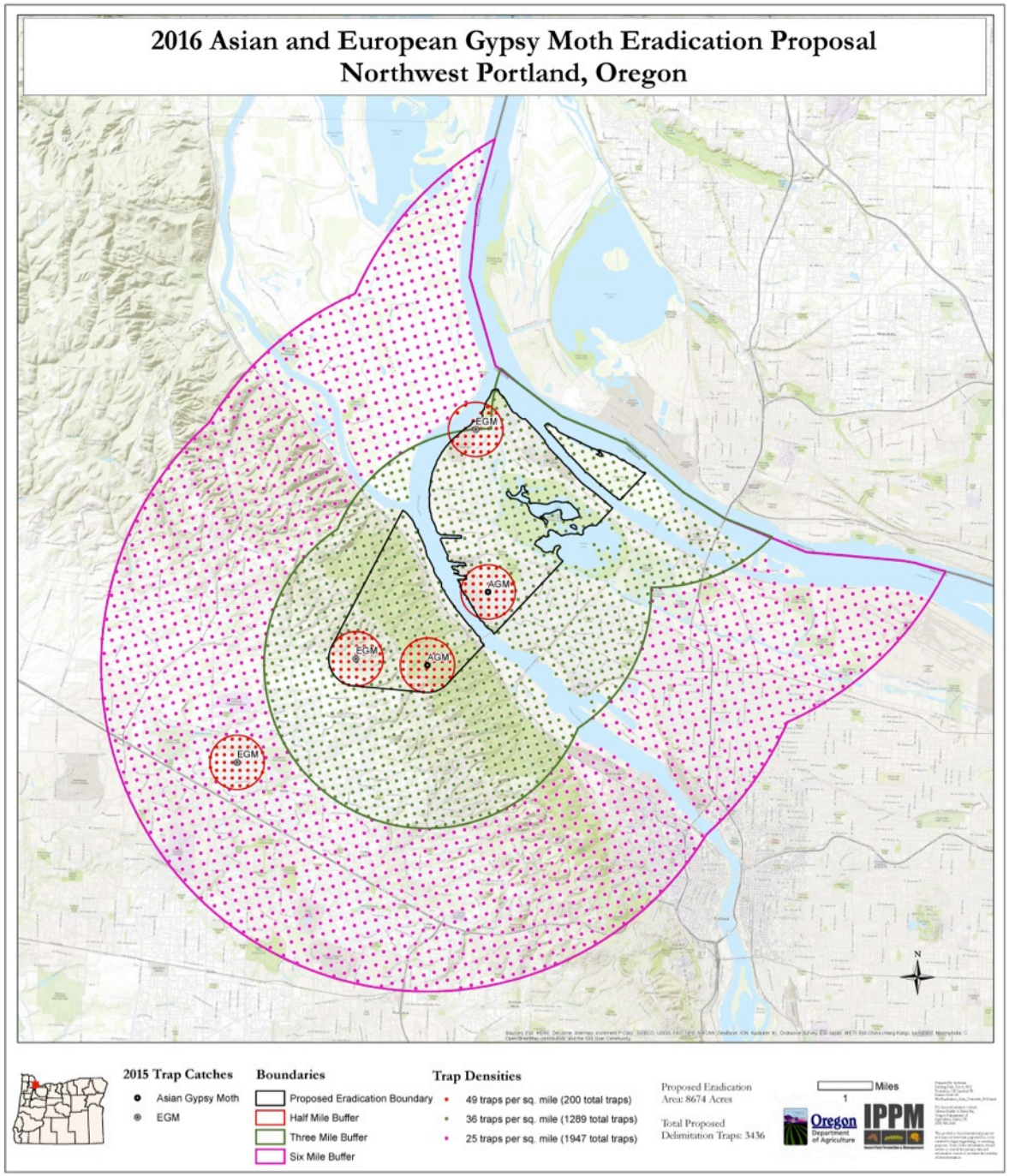
- Project personnel visited the sites and property owners the same day
- Photos and samples taken
- DEQ and FAA notified within 24 hours
- News release the same day

In the end, we had a very successful spray program

2016

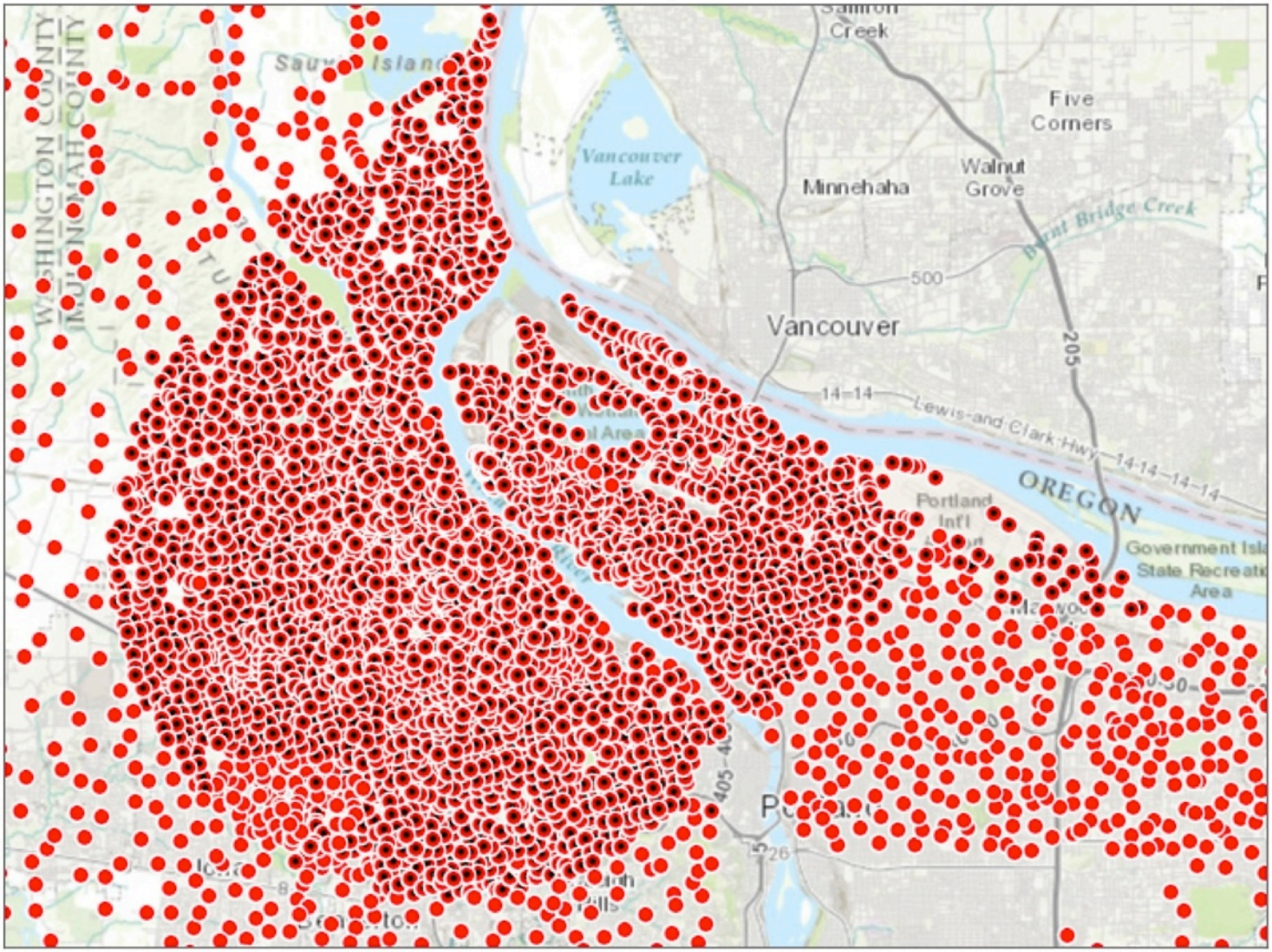
Planned
Delimitation
Trapping
Post treatment

- 49 traps/sq mi
- 36 traps/sq mi
- 25 traps/sq mi



Oregon Department of Agriculture: 2016 GM and AGM Traps

http://geo.maps.arcgis.com/home/webmap/viewer.html?webmap=14c97650fb13453b9974dfa41c52f236



County of Clark, MRLC, Bureau of Land Management, State of Oregon, State of Oregon DOT, State of Oregon GEO, Esri, HERE, DeLorme, Intermap, USGS, NGA, EPA, USDA, NPS, U.S. Forest Service | Oregon Department of Agriculture, Insect Pest Prevention and Management

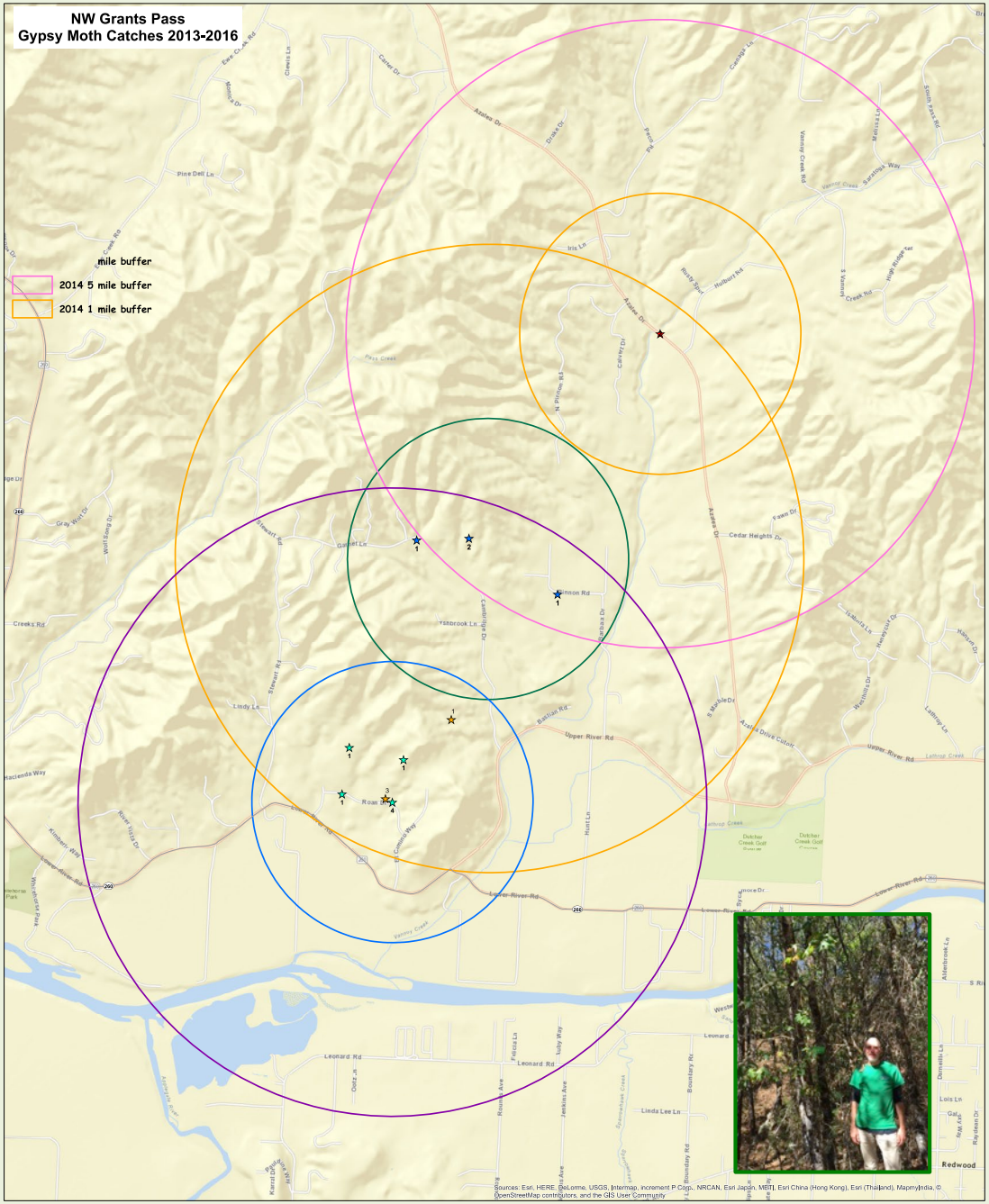
2016
Actual trap
Placement

3,086
Delimitation
traps

NW Grants Pass

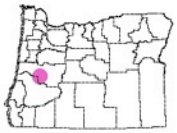
Catches over the past few years from 2013-2016 have followed a southwestern trajectory.

2017-Continue delimitation trapping



Eastern Lane 2016

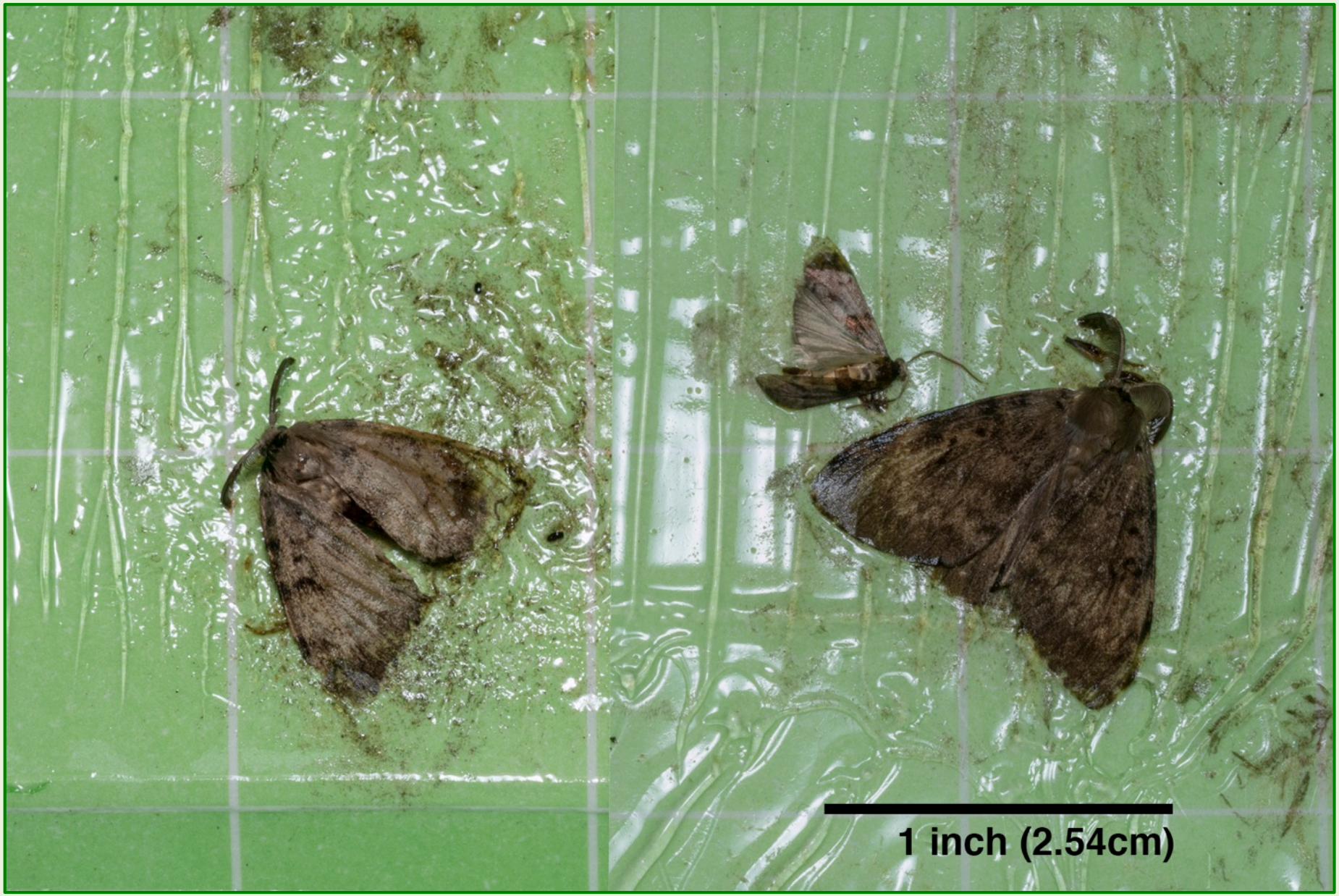
MAP 91



Legend

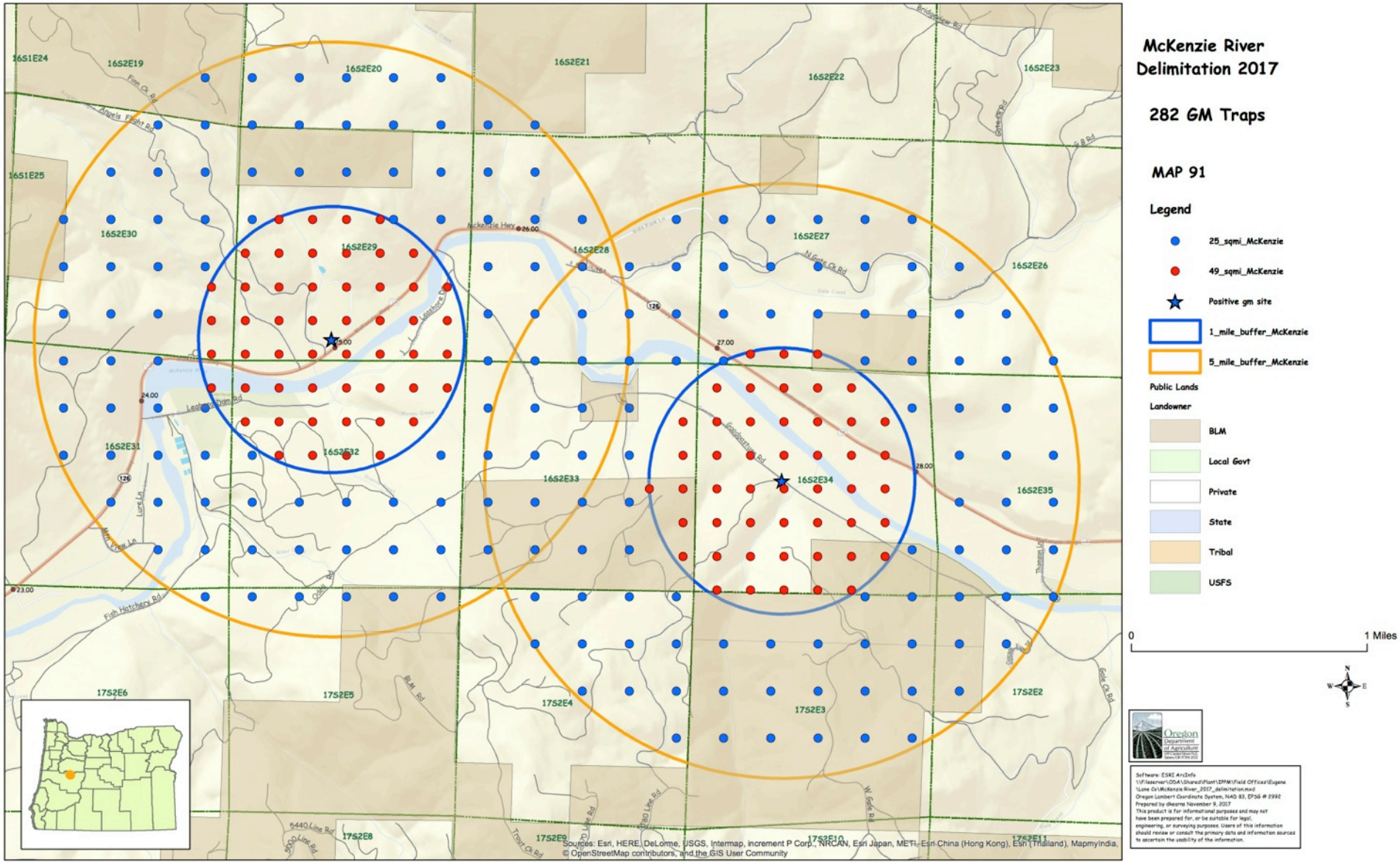
- Positive gm site
- Placed traps

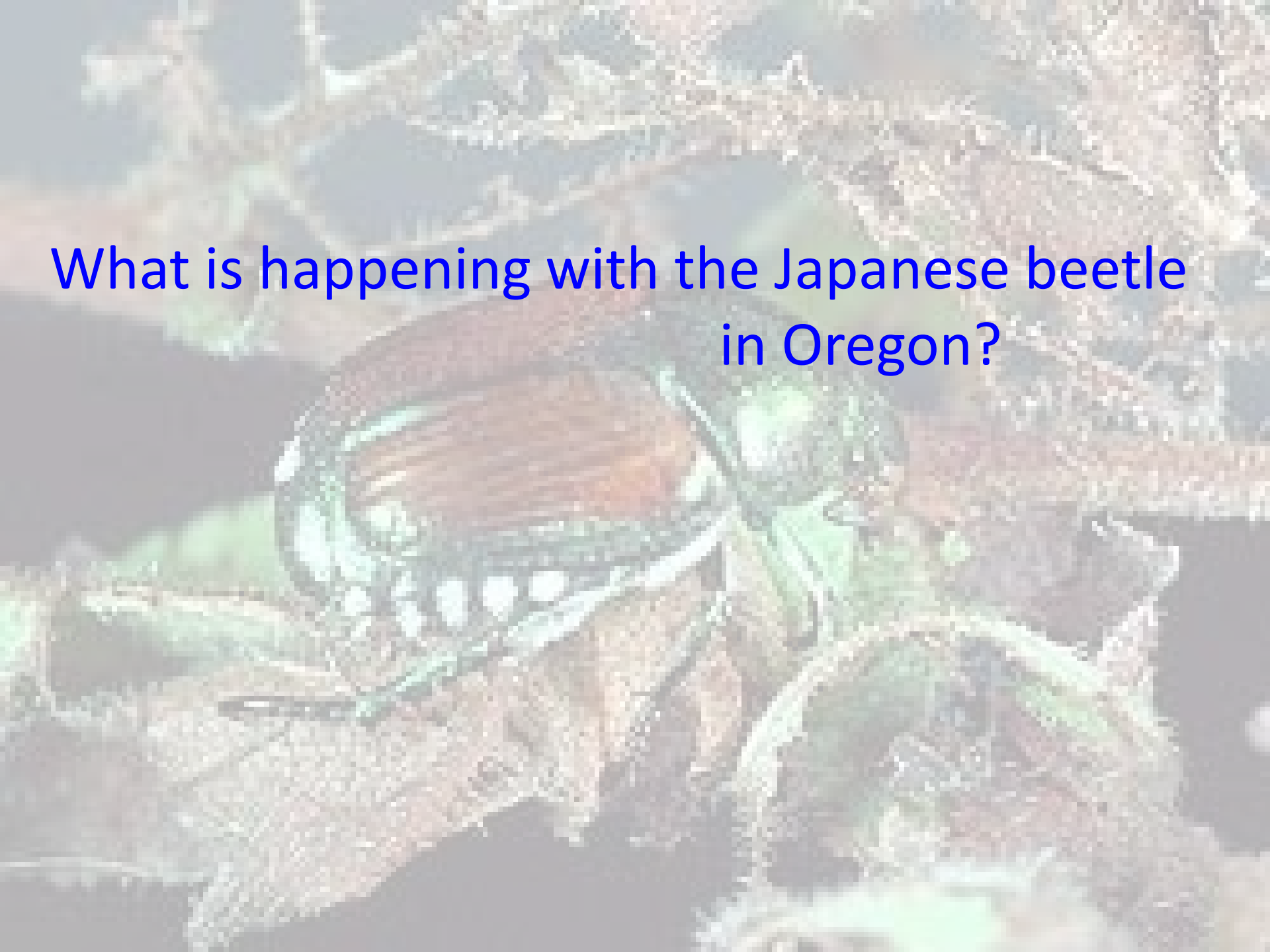
Software: ESRI ArcInfo
\\Fileserver\ODA\Shared\Plant\IPPM\Field Offices\Eugene\Territory Maps_2016\Zoomed_McKenzie River_2016_corcheam.mxd
Oregon Lambert Coordinate System, NAD 83, EPSG # 2992
Prepared by dkearns August 12, 2016
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



Gypsy moth caught near Grants Pass vs. GM caught along McKenzie River

2017 Proposed Delimitation Areas – McKenzie River





What is happening with the Japanese beetle in Oregon?

Japanese Beetle in Oregon

The larva is a whitish “c-shaped” grub

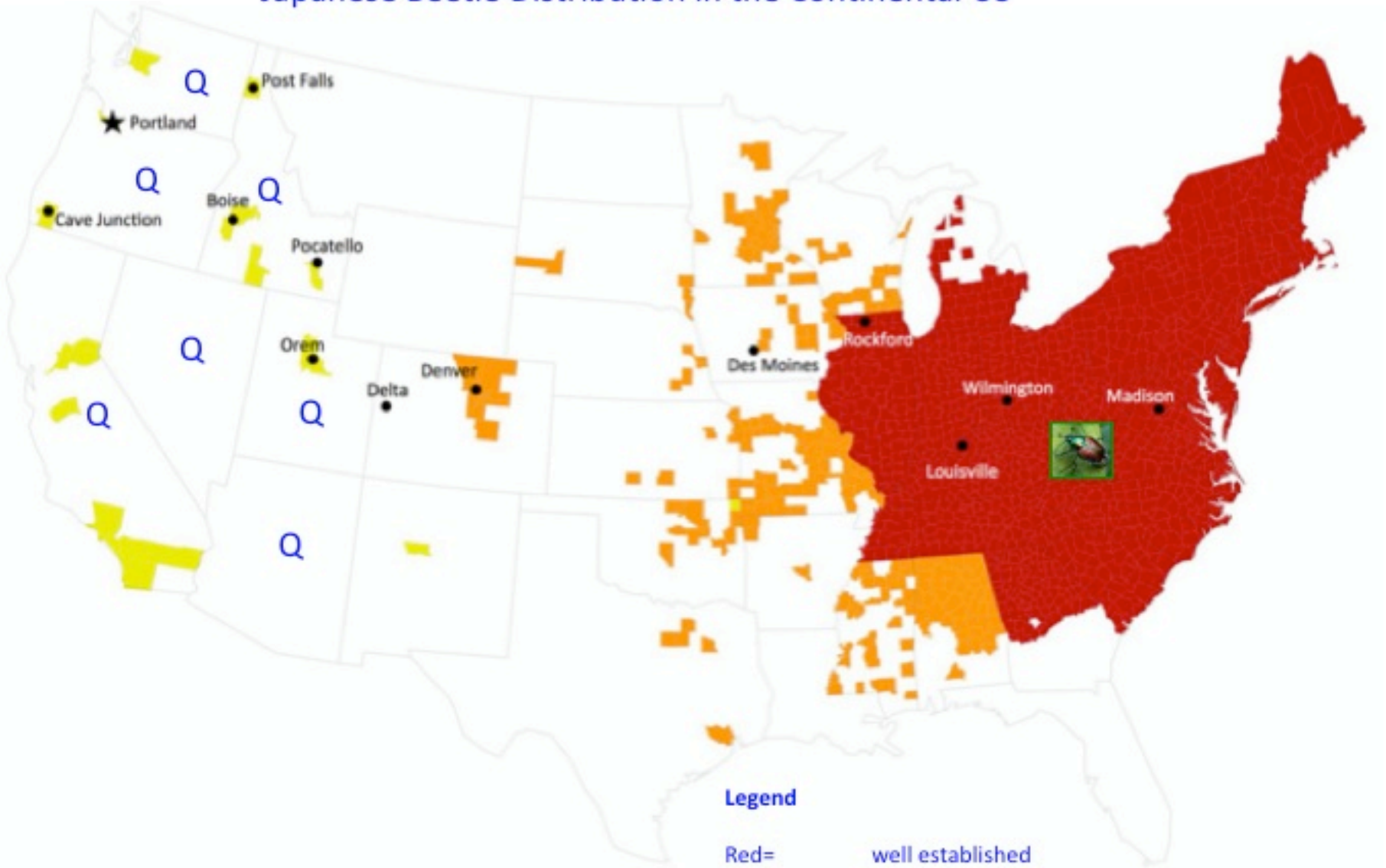
Major cause of turf damage

A major pest of fruit trees, roses, grapes (over 300 species of plants)

Heavy damage to private yards, nursery stock, golf courses, and other landscapes

Impact on native plants

Japanese Beetle Distribution in the Continental US



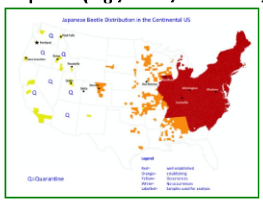
Q=Quarantine

Japanese beetle mini RA 2016

Economic Risk Analysis: Oregon and the Japanese Beetle (*Popillia japonica*) Newman

Name: Japanese Beetle, *Popillia japonica* (Newman)
Origin, biology, hosts: Native to Japan, first found in the U.S. in 1916 (New Jersey); now in most eastern states; one generation per year; larvae feed on grass roots; adults feed on over 300 species of plants (e.g., roses, fruit trees, grapes)

RISK RATING SUMMARY
Relative Risk rating: VERY HIGH
Numerical Score: 9 (on a 1-9 scale)
Uncertainty: LOW



RISK RATING DETAILS

- **Establishment Potential: HIGH**
  Oregon's climate and host plant distribution are ideal for Japanese beetle establishment.
- **Spread Potential: HIGH**
  Since 1916, Japanese beetles have become established in half of the 48 contiguous states. Nursery stock, commercial cargo airplanes, and long-haul trucks are major pathways of introduction.
- **Environmental Impact Potential: LOW**
  Many Japanese beetle hosts occur in Oregon's natural environment. Himalayan blackberry, a known favorite host plant, is abundant. Potential impacts to native species such as bigleaf maple, salmonberry, and native grasses are difficult to predict, but could be significant.
- **Economic Impact Potential: HIGH**
  Oregon has a number of susceptible hosts that are of economic significance (see Table):

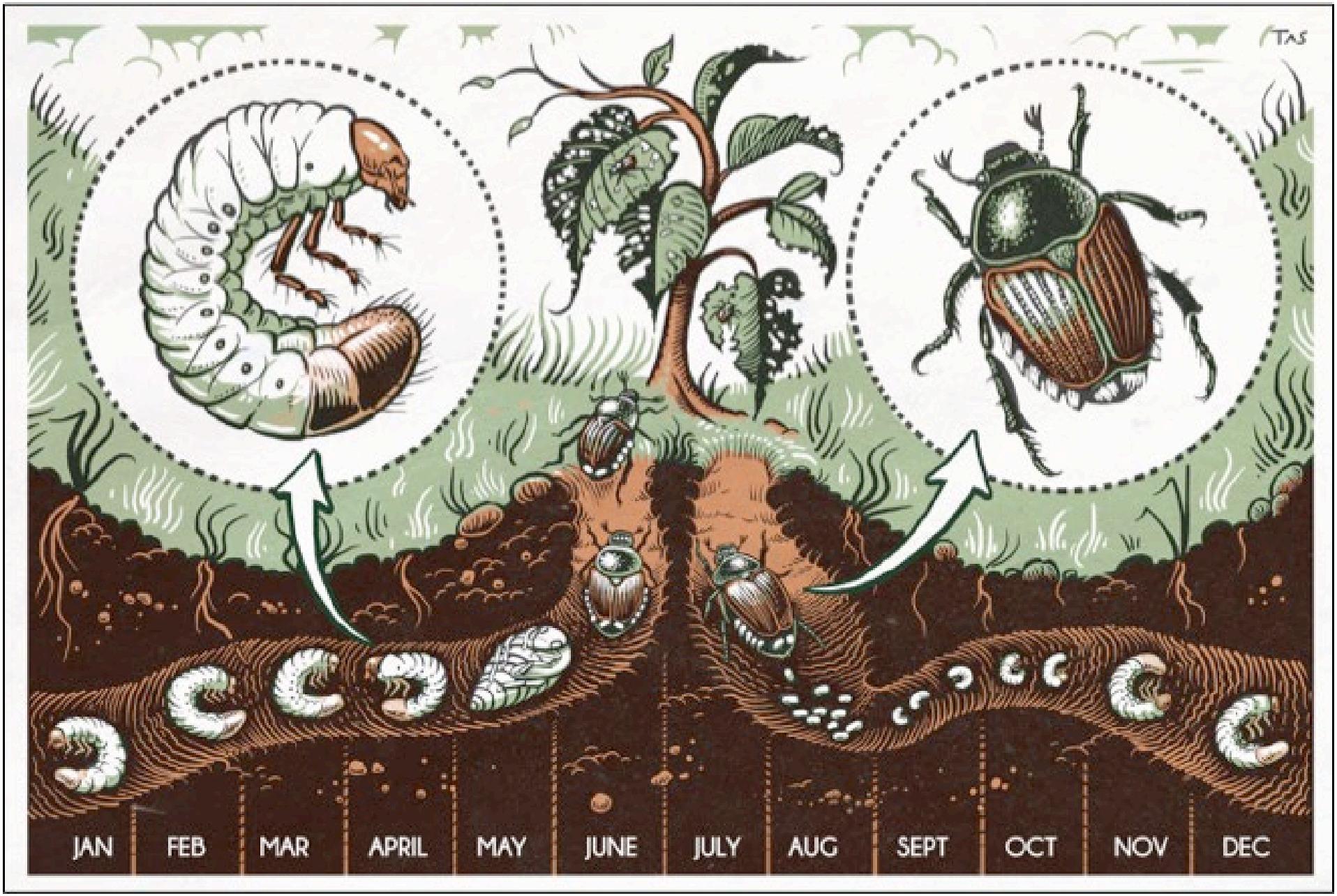
Oregon Crop/Commodity	Bearing or Harvested Acreage	Production Value	Estimated Crop Damage Costs[a]	Estimated Quarantine Costs	Total Economic Impact
Nurseries (B & B, Container, Greenhouse)	61,099[b]	805,000,000[b]	12,880,000	3,477,600[f]	16,357,600
Grapes	19,000	118,320,000	1,893,120	151,450[g]	2,044,570
Hops	5,410	35,679,000	570,864	45,669[g]	616,533
Cannabis	?	361,000,000[d]	5,776,000	Not Applicable	5,776,000
Caneberries	9,000	70,789,000	1,132,624	90,610[g]	1,223,234
Blueberries	9,000	102,325,000	1,637,200	130,976[g]	1,768,176
Pears (all varieties)	14,400	127,392,000	2,038,272	163,062[g]	2,201,334
Sweet cherries	12,500	82,709,000	1,323,344	105,867[g]	1,429,211
Apples	5,100	43,269,000	692,304	55,384[g]	747,688
Snap beans/process	8,500	13,940,000	223,040	17,843[g]	240,883
Grasses (turf)	418,550	449,018,000	7,184,288	574,743[g]	7,759,031
Golf Courses	8,550[c]	336,400,000[e]	5,382,400	Not Applicable	5,382,400
Total	**571,109**	**2,545,841,000**	**34,957,456**	**4,813,204**	**45,546,660**

[a] product of production value multiplied by .016 (damage estimate from Fowler et al. 2007)
[b] OAN 2016
[c] based on 190 golf courses in OR and average of 45 acres of grass planted per 18-hole golf course
[d] 2014 reported 150,628 pounds Oregon internal market, sold at average of $150/ounce
[e] The Oregon Golf Economy Full Report 2013
[f] product of estimated crop damage costs multiplied by .27 (estimated proportion of products that would be quarantined based on destination–western states and Canada)
[g] product of estimated crop damage costs multiplied by .08 (estimated proportion for quarantine costs (Fowler et al. 2007))

TAKE HOME MESSAGE

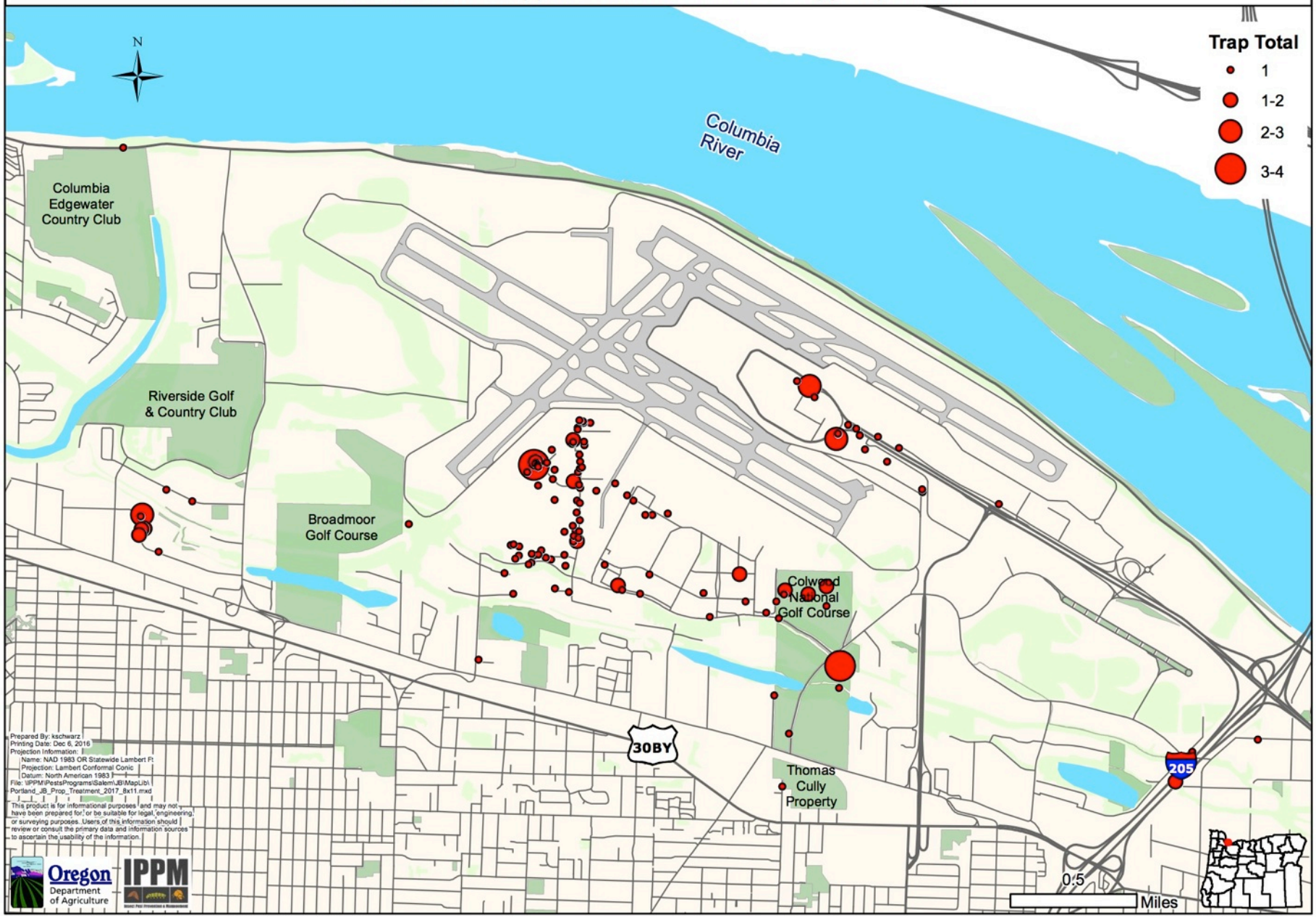
If the Japanese beetle is not eradicated in NW Portland and spreads throughout the state, the economic impact to all crops, commodities, and other related businesses could be approximately $45.5 million.

Typical life cycle of the Japanese beetle

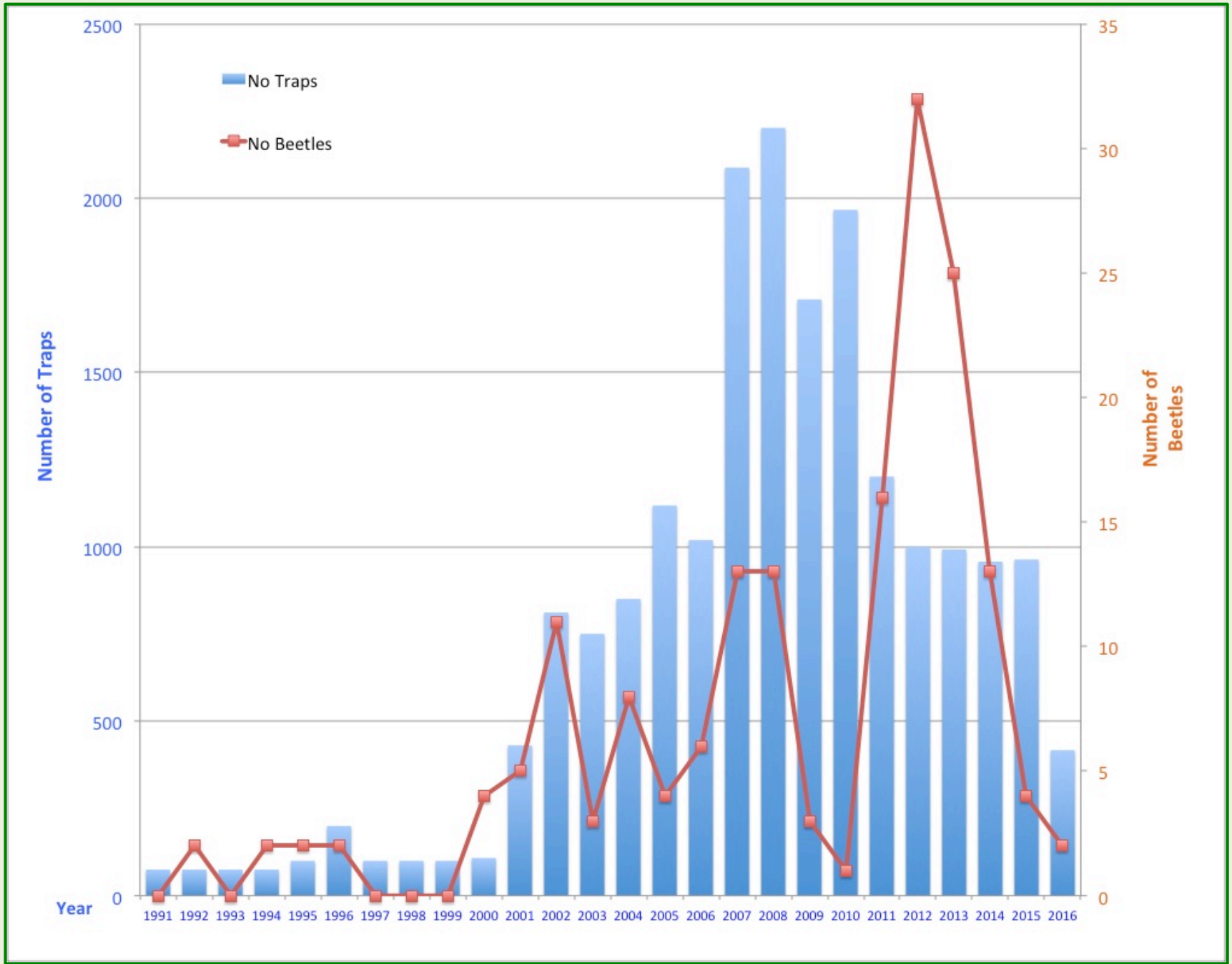


Japanese Beetle Detections at the Portland Airport 2002–2016

Total Beetles Trapped: 148/ 1-32 Beetles Trapped per Year

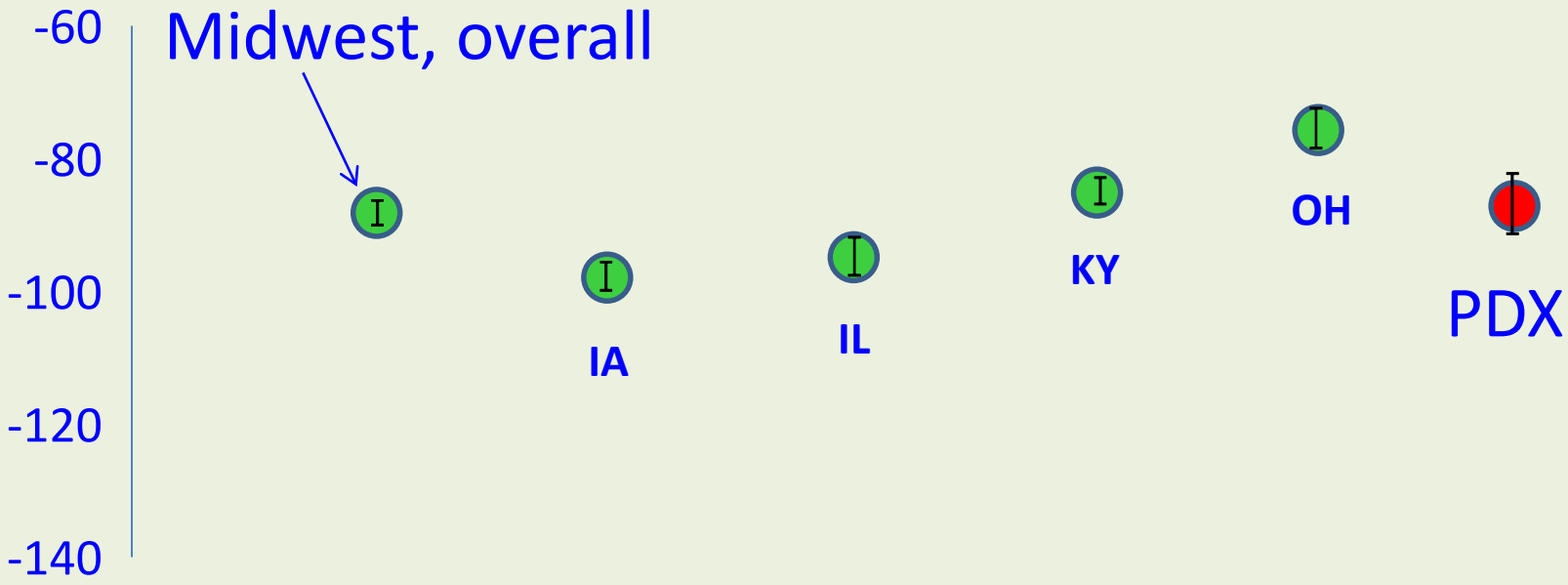


Number of traps placed and Japanese beetles caught around PDX since 1991



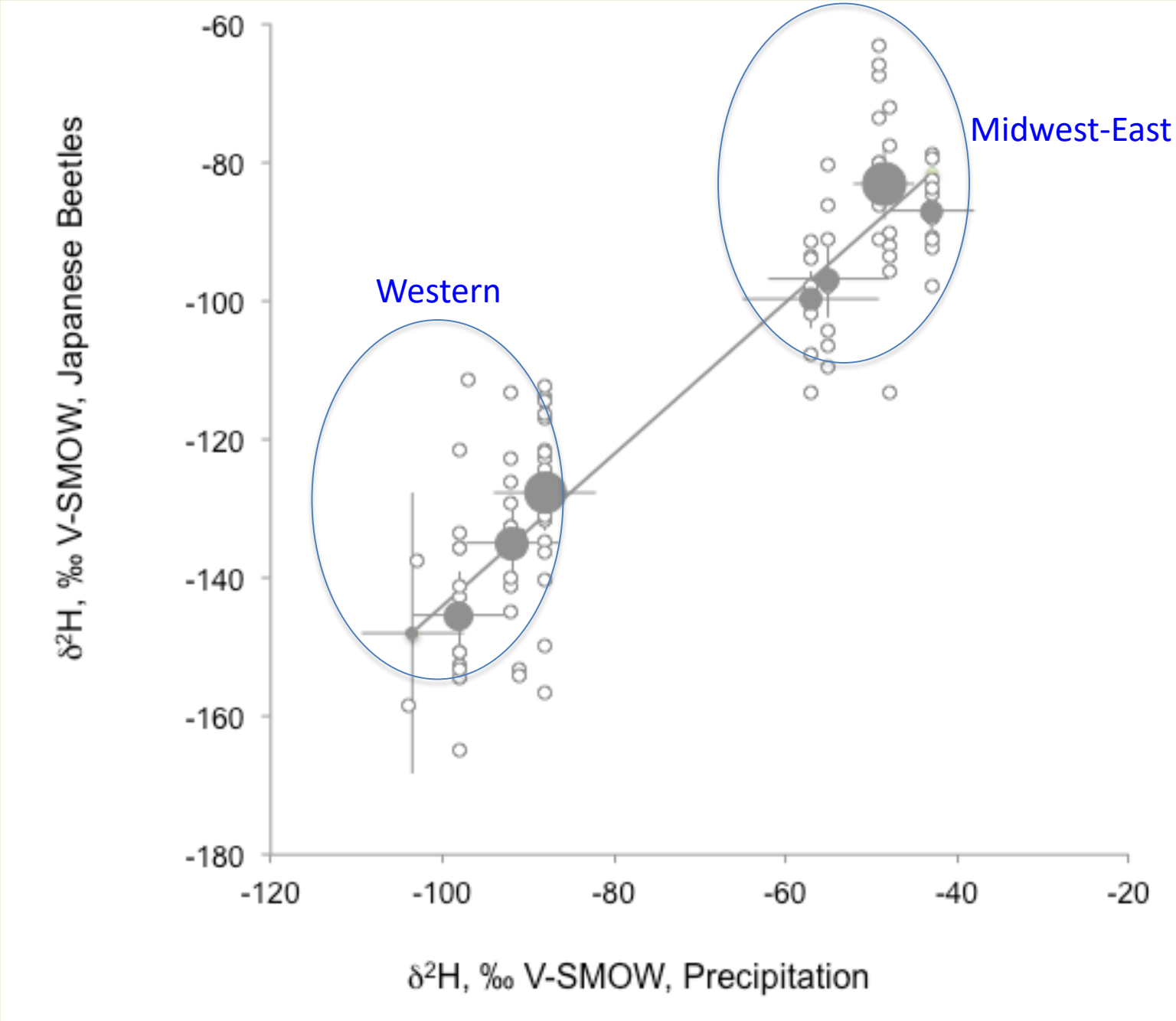
What are stable isotopes?

- Isotopes are atoms of the same element (e.g., C, N, S, O, H) that differ in the number of neutrons
- Plant tissue hydrogen isotope composition is a reflection of local precipitation
- Hydrogen in animal tissue comes from ingested hydrogen (e.g., from plants and prey)



Portland Airport and Japanese beetles in the Midwest have a similar Hydrogen isotope (δ^2H) values

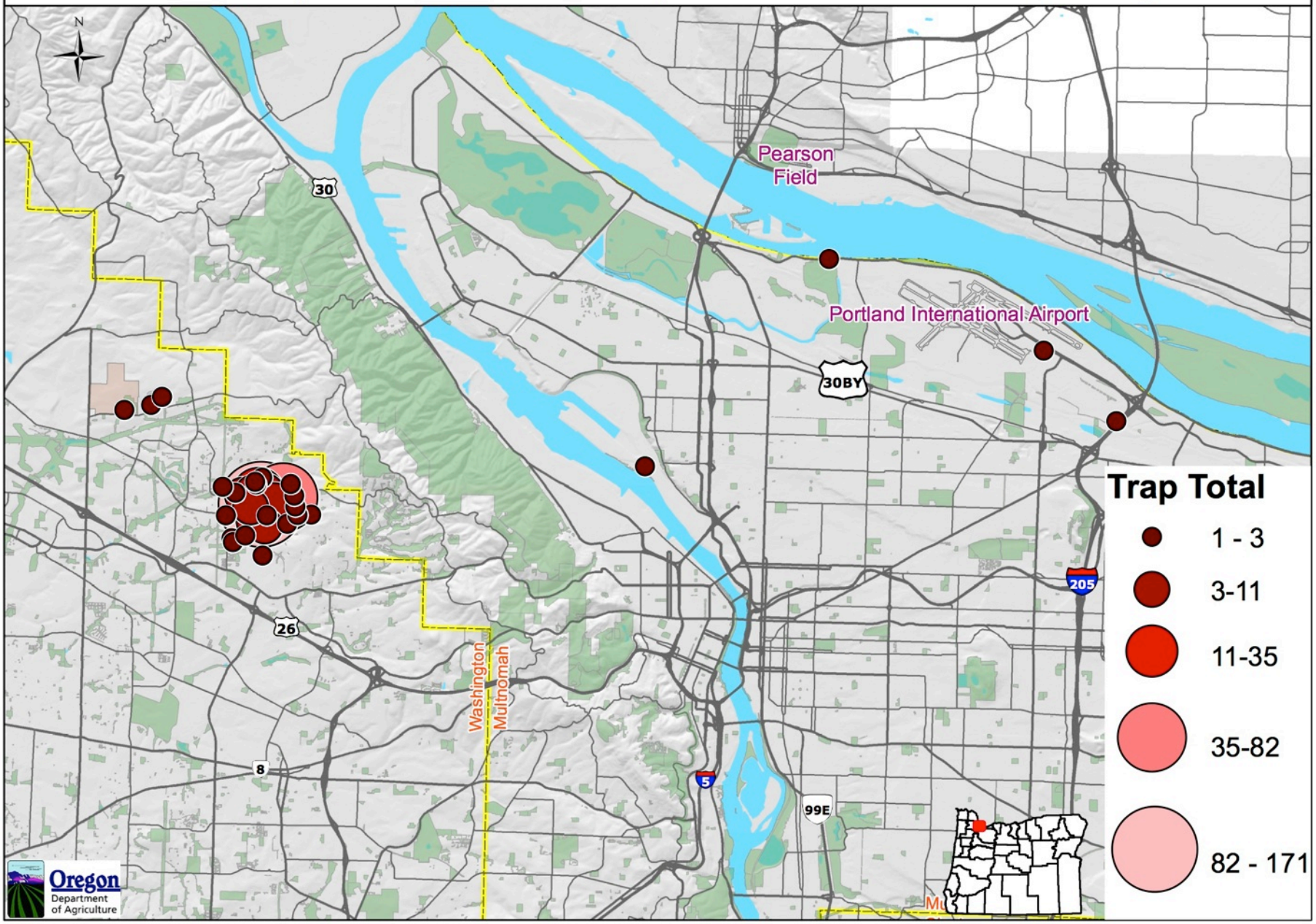
Hydrogen isotope values from all regions

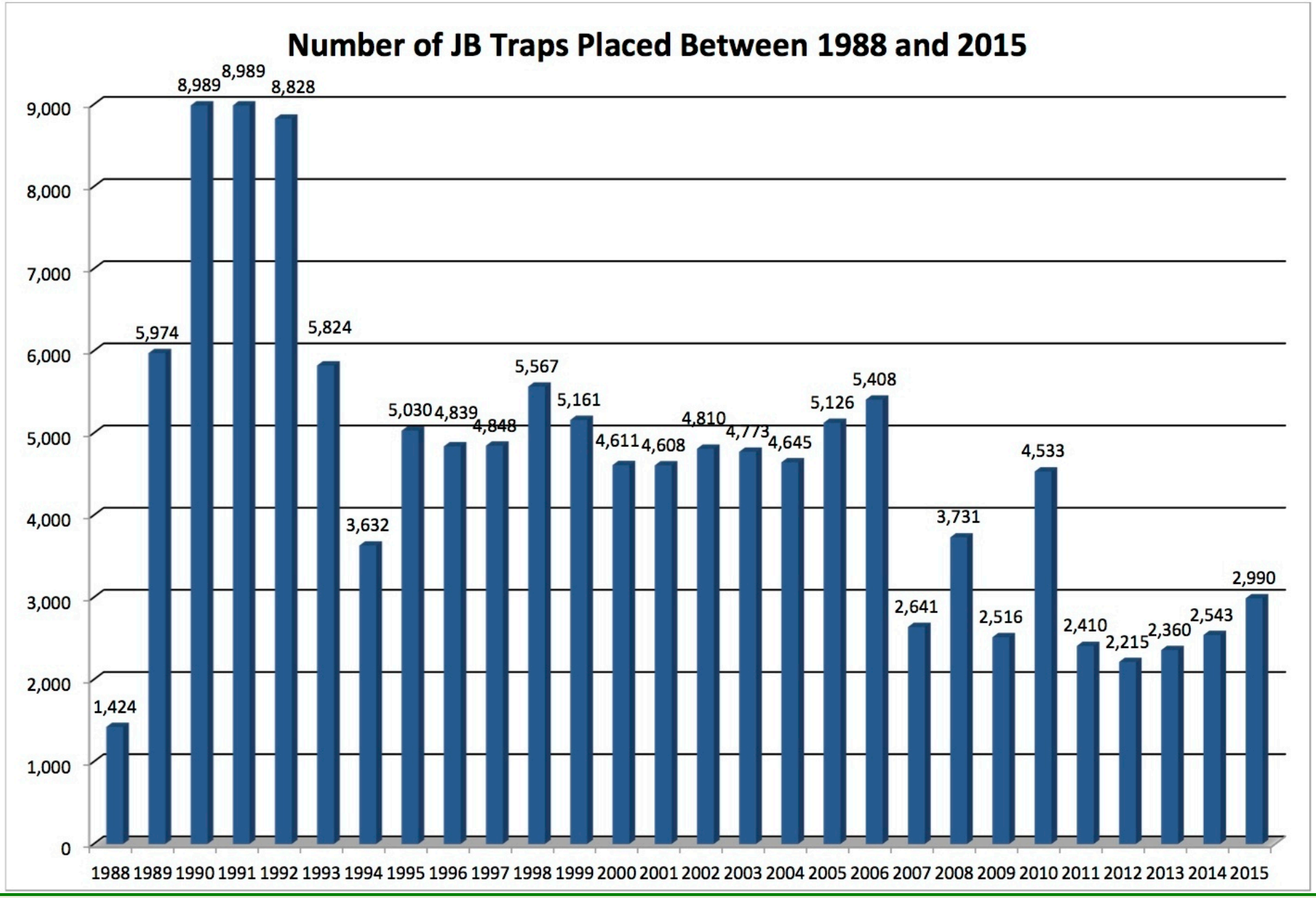


Analysis of the isotopic composition of beetles can be used to identify recent arrivals.

Our research shows that Japanese beetles come into Oregon each year at Portland Airport, and beetles can be brought in multiple times within a single season.

2016 Japanese Beetle Trap Catches Portland, Oregon



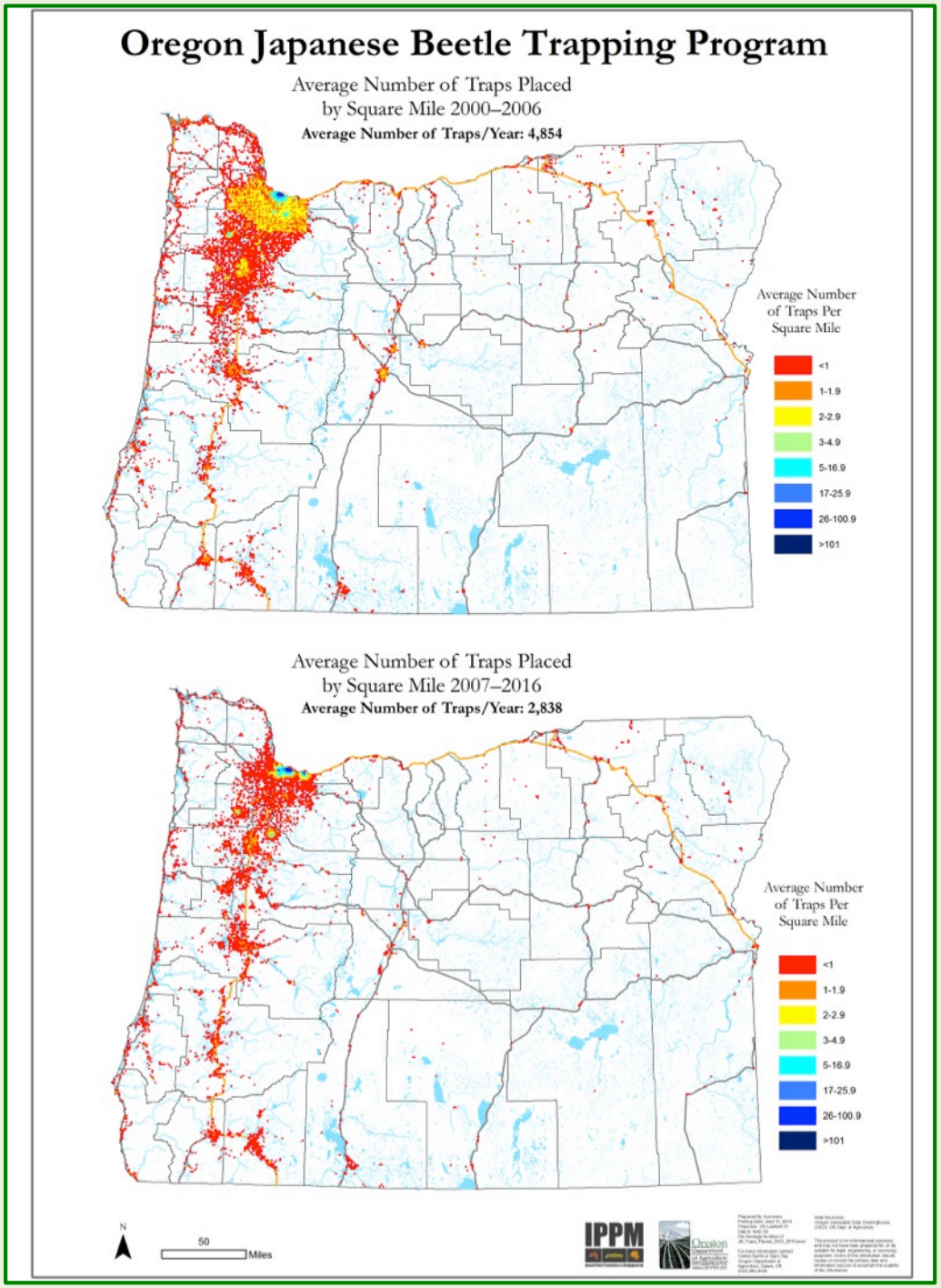

Number of JB Traps Placed Between 1988 and 2015
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1,424
5,974
8,989
8,989
8,828
5,824
3,632
5,030
4,839
4,848
5,567
5,161
4,611
4,608
4,810
4,773
4,645
5,126
5,408
2,641
3,731
2,516
4,533
2,410
2,215
2,360
2,543
2,990
1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

Trapping effort has decreased over the years, but risks of introduction have increased

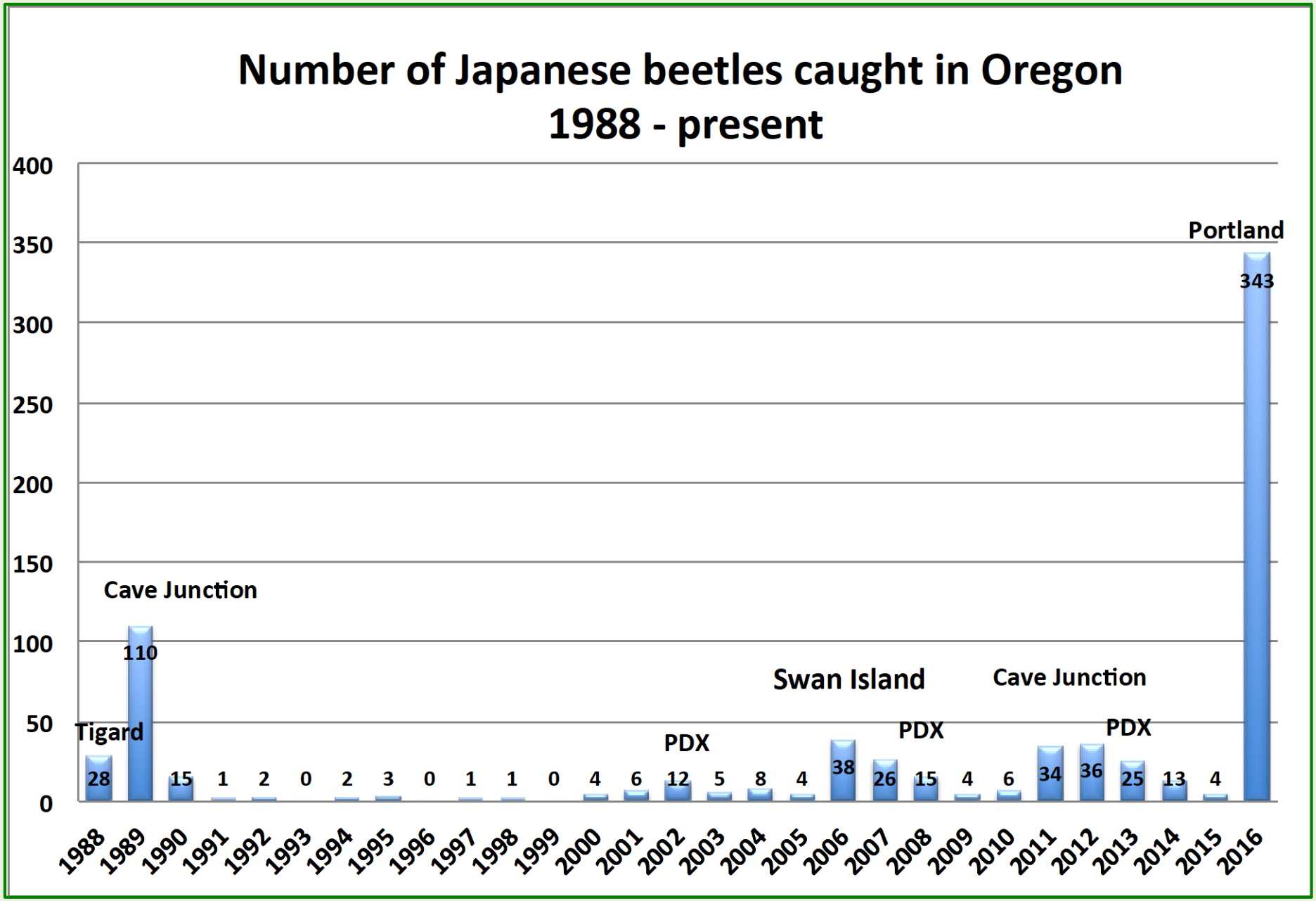
1990-1992 ~ 9000 traps

1993-2006 ~ 5000 traps

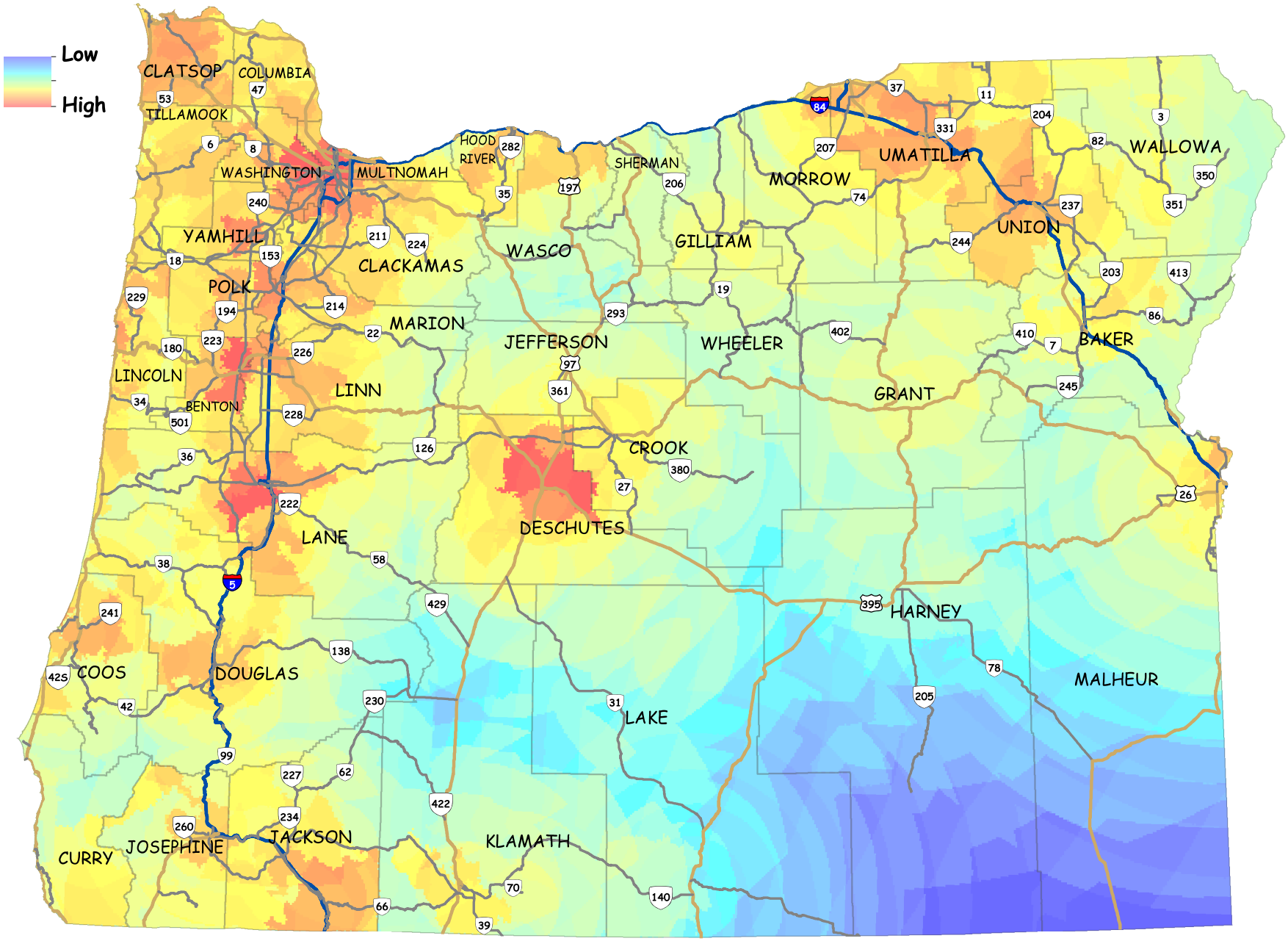
2007-2016 ~ 3000 traps

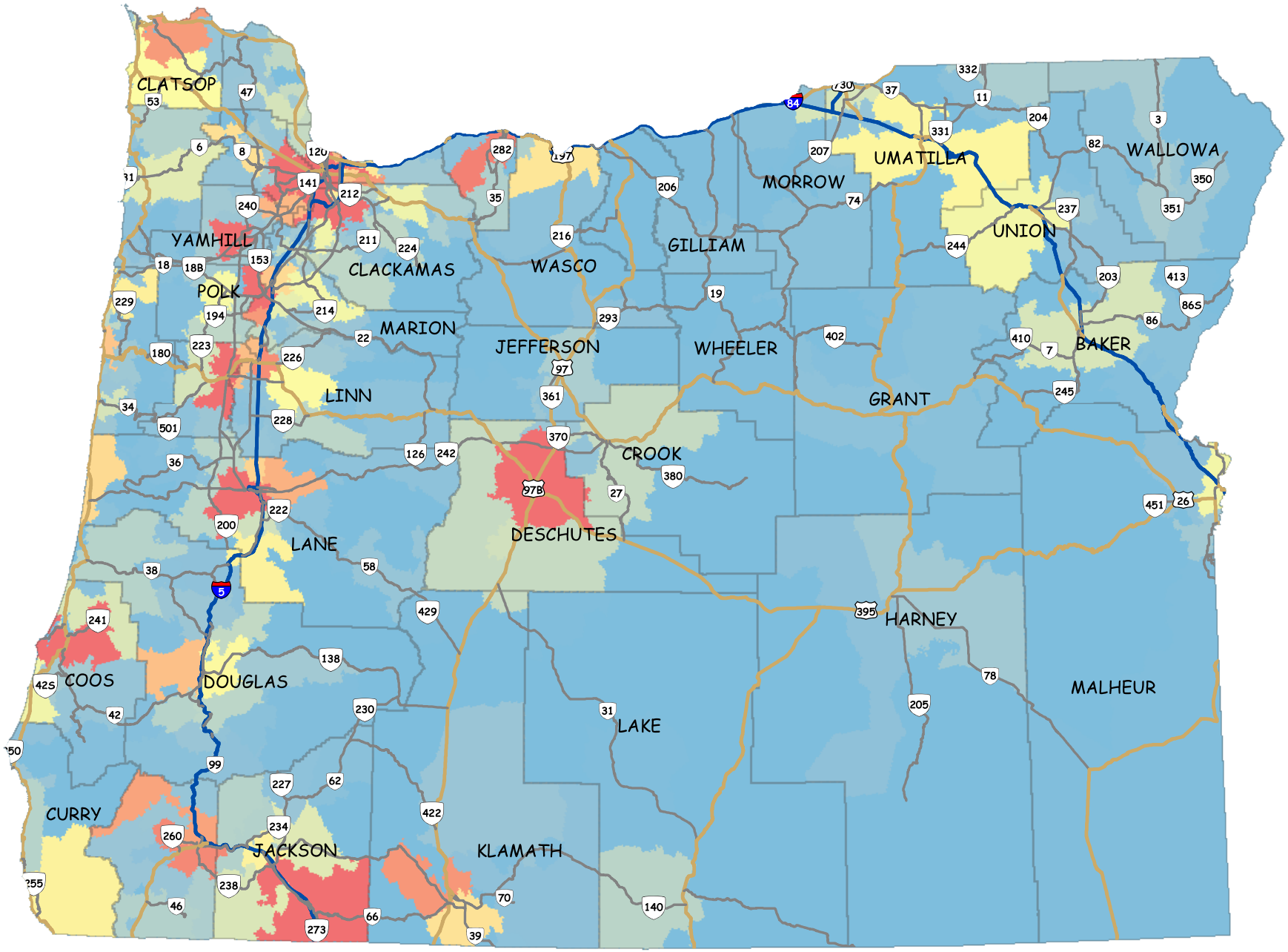


402 Japanese beetles caught between 1988-2015; 2016 catches are 91% of the total for the past 27 years combined!



nvasive Invertebrate Introductions in Oregon





ta source: USDA APHIS PPQ, Fort Collins, CO

Japanese beetles in the neighborhood

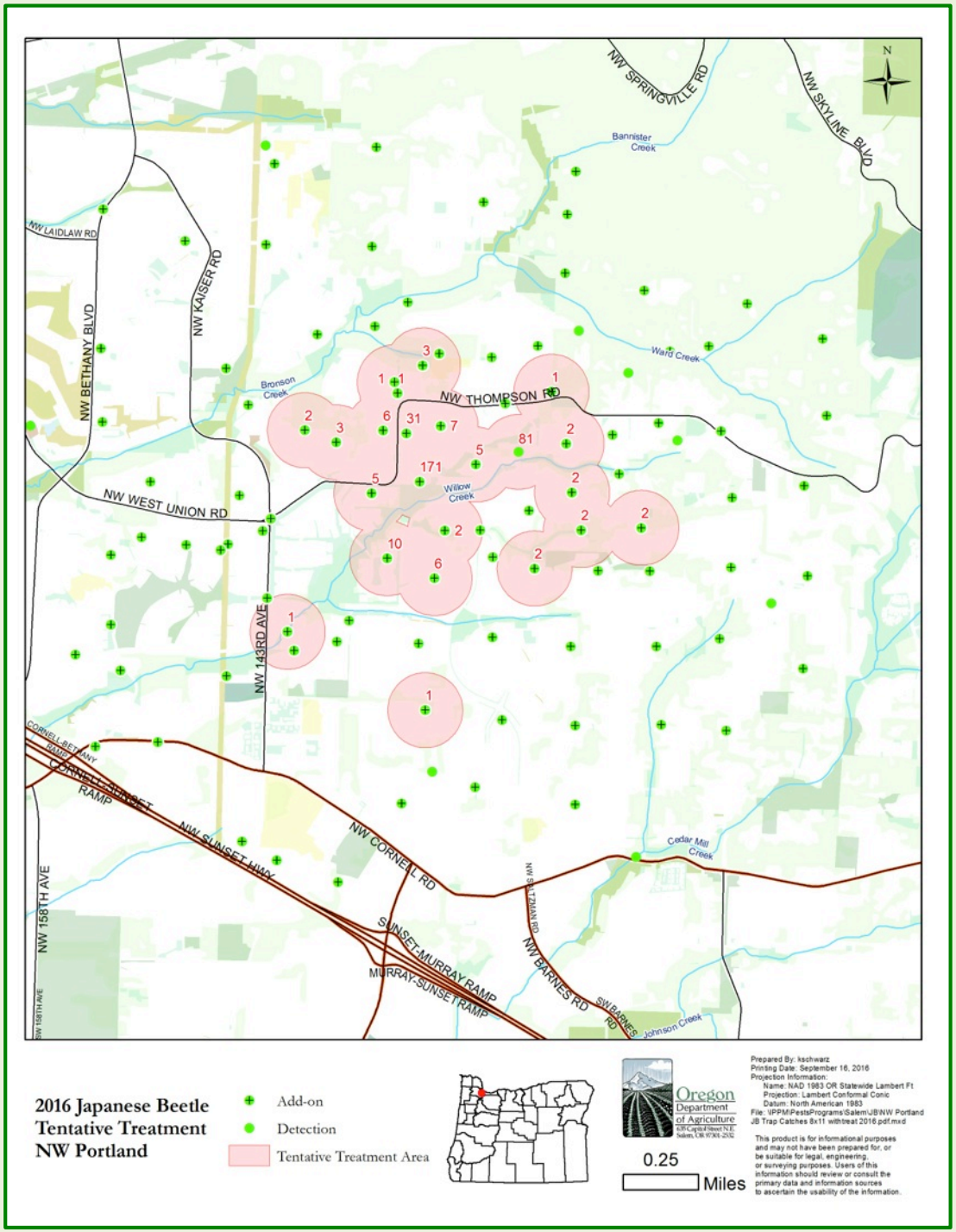
Chomping on roses

Nice new housing area

Chewed leaves

A trap catch

Buffers around Japanese beetle catches

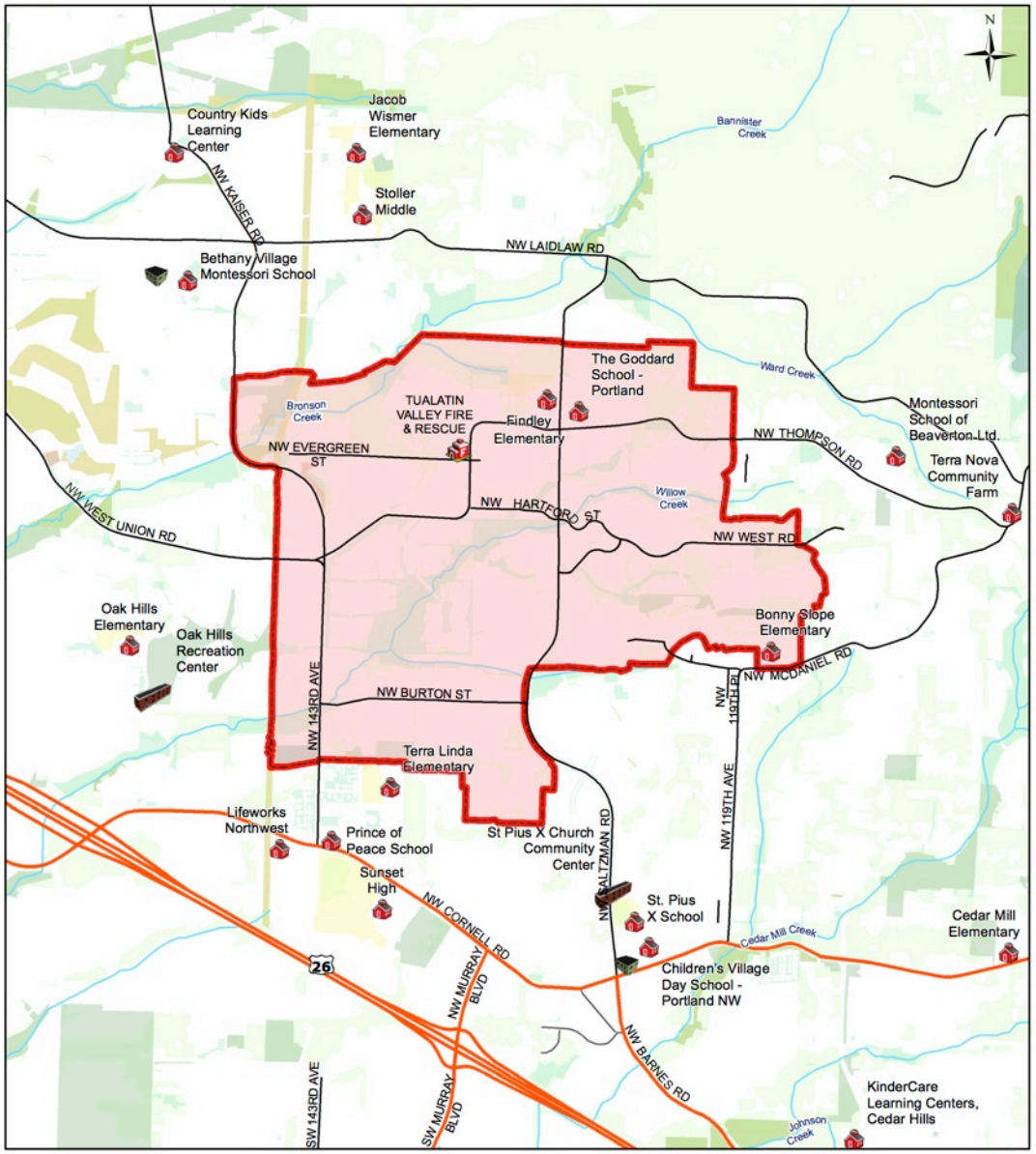


2017

Proposed treatment

1,000 Acres

2,459 Properties



2017 Proposed Japanese Beetle Treatment Area NW Portland, OR

Prop. Treatment Area

Approx. 1,000 Acres
Approx. 2,459 Properties

Oregon Department of Agriculture
635 Capitol Street N.E.
Salem, OR 97301-2532

0.25 Miles

Prepared By: kschwarz
Printing Date: October 21, 2016
Projection Information:
Name: NAD 1983 OR Statewide Lambert Ft
Projection: Lambert Conformal Conic
Datum: North American 1983
File: \\PPM\PestsPrograms\Salem\JB\NW Portland JB Trap Treatment 2017_8x11.mxd

This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Mitigation Proposal

- Use Acelepryn G Insecticide (Group 28 Reduced Risk)
- Treat entire infested area according to label
- Treatment time ~April / May
- Delimit trap densities (200-300 / sq. mi.)

- Duration: 4-5 years
- Cost: ~ $1.2 Million

Reduced Risk Status of Acelepryn™ insecticide

- No Signal Word Required

  A Signal Word is required for all registered pesticide products unless the pesticide product is below toxicological exposure limits.

- Limited Precautionary Statement

  Does not present hazard to humans or domestic animals.

- Limited Protective Equipment Needed

  Shirt, pants, socks, and shoes.

Reduced Risk Pesticide

Term used by the EPA to designate a pesticide with the following properties:

- **Low impact on human health**

  Low mammalian toxicity, reduced exposure to applicators, handlers & workers
- **Low toxicity to non-target organisms**

  Birds, fish, honey bees, parasites & predators
- **Low potential for water contamination**

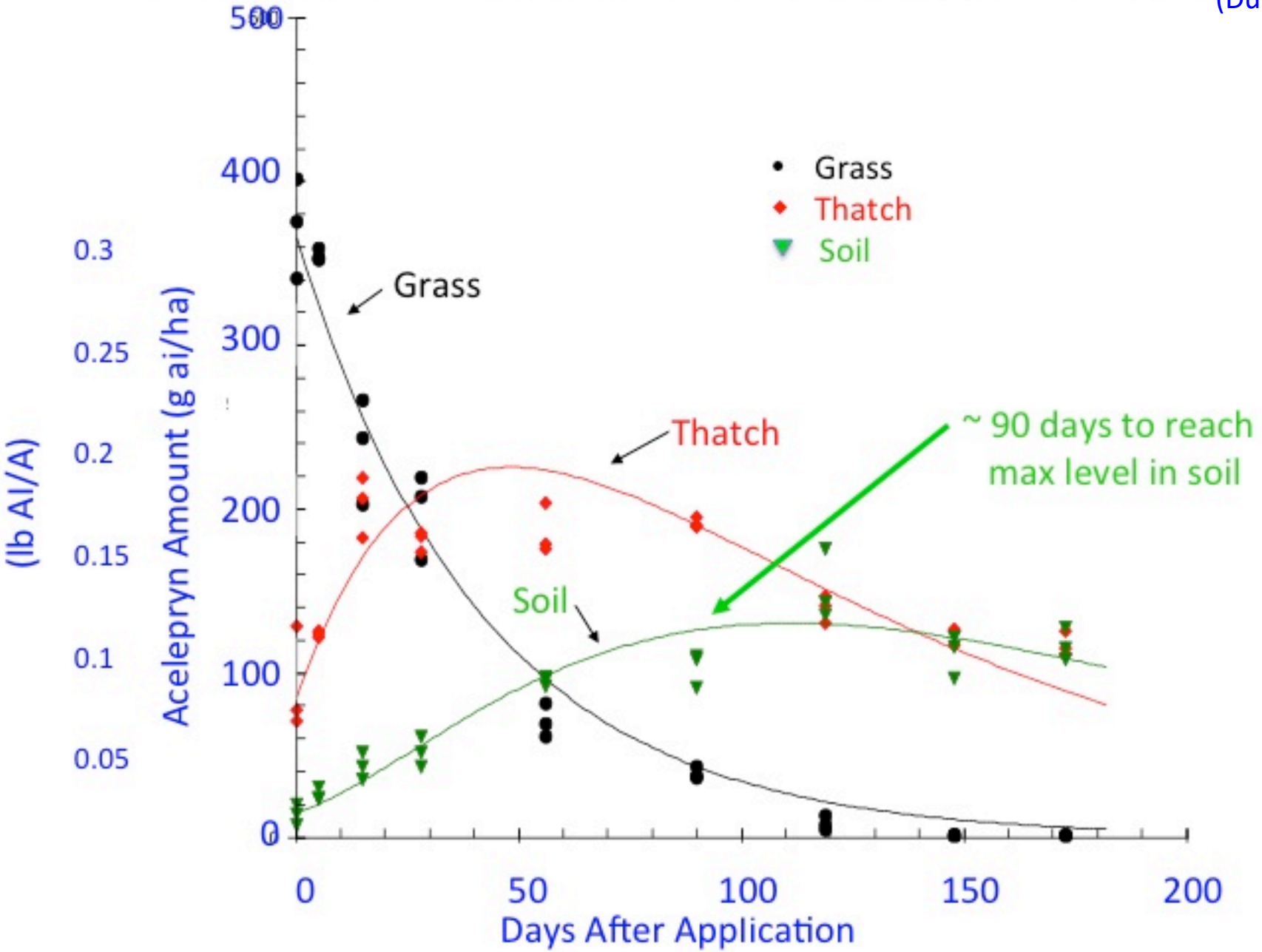
  Ground water, surface water, low water solubility & high affinity for organic matter
- **Low amount of product needed to be efficacious**

  Low amount of active ingredient/area and few applications
- **Low potential for development of pest resistance**

  New mode of action

New Jersey Acelepryn™ Turf Dissipation Study Results

(Dupont)

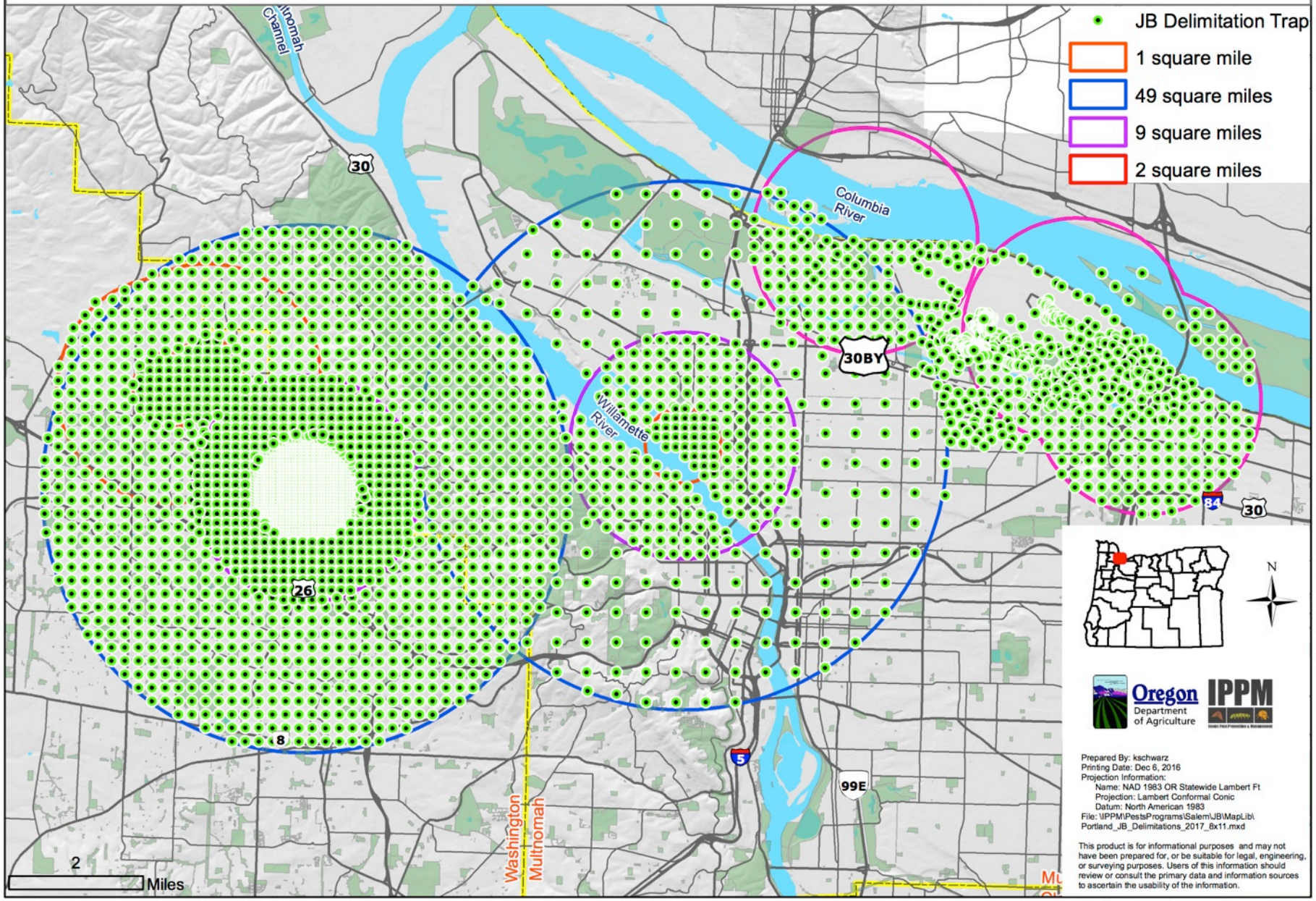


Chlorantraniliprole (Acelepryn), represents a relatively new class of insecticides called anthranilic diamides. It does not adversely affect bee colonies even when the workers forage on flowering clover that had been directly sprayed.

J Larson and D Potter. 2013. Bee-friendly lawn care. Landscape Management (landscapemanagement.net)

2017 Proposed Japanese Beetle Delimitation Portland, Oregon

3,442 Total Proposed Traps, PDX: 752, Swan Island: 382, NW Portland: 2,308



Actions and Consequences

- Permission from home owners
- Multiple years of treatment
- Need grassroots community engagement to be successful
- Temporary quarantine area needs to be established
- Changes in green waste management within eradication boundaries
- Considerations for small farms and nurseries in this area
- Failure will result in decreased quality of life, increased pesticide use, costly quarantines, potential decrease in property values

Legislative Days in Salem: September 21

Japanese Beetle Display on the Capitol Steps

Host plant display, including Cannabis

Conclusion

The Oregon Department of Agriculture is planning to eradicate the Japanese beetle in Northwest Portland beginning in Spring 2017