OREGON INVASIVE SPECIES COUNCIL

CITY OF PORTLAND TERRESTRIAL AND AQUATIC INVASIVE ANIMAL ASSESSMENT

Prepared for the Oregon Invasive Species Council by:
Creative Resource Strategies, LLC

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TABLE OF CONTENTS

TABLE OF CONTENTS I

EXECUTIVE SUMMARY III

BACKGROUND 1

1. Characterization 2

2. Evaluation of Existing Programs and Regulatory Authority 2

3. Opportunities for Collaboration 3

4. Share the Results of the Assessment 3

I. CHARACTERIZATION 4

Methods 4

Survey respondents 5

Invasive Animal Lists 5

Recommendations for TEESAG to CoNsider when finalizing the three invasive animal lists 11

Management activities 14

Recommendations for the City of Portland to consider to enhance invasive animal species management activities 15

II. EVALUATION OF EXISTING PROGRAMS AND REGULATORY AUTHORITY 16

Regulations 16

Prevention 19

Control/eradication 21

Recommendations for the City of Portland to Consider Regarding Regulations 22

III. COLLABORATION 24

Recommendations for the City of Portland to consider to enhance collaboration within and outside the City 24

Lessening the spead of invasives 26

Recommendations for the City of Portland to consider to lessen the spread of invasives **27**

CONCLUSIONS AND RECOMMENDATIONS **28**

APPENDICES **34**

EXECUTIVE SUMMARY

The Oregon Invasive Species Council launched an initiative in early 2009 to conduct a statewide management assessment of invasive species. The City of Portland was included in the statewide management assessment, however, the City sought to better understand its role specific to invasive animal management. As a result, the statewide assessment was expanded to provide focus to invasive animal species (excluding fish and zooplankton) in the City of Portland. The City sought to identify invasive animal species currently present in the City of Portland, identify invasive animal species present but not established in the City of Portland, and identify invasive animal species that might be likely to invade habitats in the City of Portland in the next 5–10 years, including a description of the likely pathways of introduction. Draft lists were prepared (Table 1) for survey respondents to confirm or debate the presence of each species on each list.

Table 1. Draft invasive animal lists of species present in the City of Portland, present but not yet established in the City of Portland, and likely to invade habitats in the City of Portland in the next 5–10 years.

Present in the City of Portland	Present, but not yet established in the City of Portland	Likely to invade habitats in the City of Portland in the next 5–10 years
▪ Brown Garden Snail ▪ Bullfrog ▪ Red-eared Slider ▪ Common Snapping Turtle ▪ European Starling ▪ House Sparrow ▪ Rock Pigeon ▪ Domestic Duck and Goose Species ▪ Nutria ▪ Eastern Gray Squirrel ▪ Eastern Fox Squirrel ▪ Virginia Opossum ▪ Eastern Cottontail ▪ Black Rat ▪ Norway Rat ▪ Domestic Cats and Dogs	▪ Banded European Woodsnail ▪ Asian Gypsy Moth ▪ European Gypsy Moth ▪ Japanese Beetle ▪ Mute Swan	▪ Wrinkled Dune Snail ▪ Rosy Gypsy Moth ▪ Nun Moth ▪ Light Brown Apple Moth ▪ Oak Splendour Beetle ▪ Oak Ambrosia Beetle ▪ Woodwasps ▪ Emerald Ash Borer ▪ Apple Snails ▪ Chinese Mystery Snails ▪ Rusty Crayfish ▪ Virile Crayfish ▪ Ringed Crayfish ▪ New Zealand Mudsnails ▪ Mitten Crab ▪ Spiny Waterflea ▪ Fishhook Waterflea ▪ Zebra Mussel ▪ Western Quagga Mussel ▪ Eurasian Collared-dove ▪ Feral Swine

In addition, the city sought to identify the roles and responsibilities of various entities involved with invasive animal species management and education in Portland as well as review existing regulatory authority for invasive animal species management. It sought to define gaps

and overlaps in regulatory authority and invasive animal species management actions, define opportunities for collaboration between entities involved with invasive animal species management, and recommend and prioritize invasive animal management actions that could be implemented by the City of Portland to lessen the threat of introductions and spread.

Abundance and distribution information for each of the species listed in the Non-native Terrestrial and Aquatic Wildlife Species of Management Concern in the City of Portland matrix was developed to provide basic background on each species. A total of 78 individuals representing 41 organizations were invited to participate in an 18-questions online survey via email notification.

A total of 41 individuals representing 28 organizations completed the survey. Survey respondents made recommended changes to the three draft lists presented. Many of these individuals are considered experts in their particular fields (e.g., US Department of Agriculture-Animal Plant Health Inspection Service and Oregon Department of Agriculture—insects; Oregon Department of Fish and Wildlife—turtles).

The majority (82%) of survey respondents believe that Oregon's laws and regulations that pertain to ***prevention*** of invasive animals are inadequate. An even greater percentage of survey respondents (91%) believe Oregon's laws and regulations that pertain to the **control/eradication** of invasive animals are inadequate.

Numerous recommendations were made to improve the City of Portland's response to the threat of invasive animal species. The following chart summarizes those recommendations. Action items are not prioritized among categories—outreach and education, collaboration, leadership, funding, and legislation, because several of these actions can occur simultaneously. However, action items are prioritized within category (note: the three action items for TEESAG are not listed in priority order as they are the recommended changes to the three invasive animal species lists).

Table 2. Suggested list of priority items the City of Portland should consider to improve management of invasive animal species.

Lead	Issue	Action Items	Partners
TEESAG	**Invasive animal species present and established in the City of Portland list**	▪ Retain all species currently on this list. ▪ Add Monk parakeets, brown marmorated stink bugs, Spotted wing drosophila, terrestrial mollusks (*Deroceras reticulatum, Lehmannia valentiana, Limacus flavus, Limax maximus, Milax gigates, Oxychilus draparnaudi, Oxychilus alliarius, Testacella haliotidea, Arion rufus complex,* and *Arion subfuscus*), house mouse, peafowl, ring-necked pheasant, red fox, and chukar.	TEES and TEESAG

Lead	Issue	Action Items	Partners
	Invasive animal species present, but not yet established in the City of Portland list	▪ Retain all species currently on this list, except for Asian Gypsy Moth. ▪ Remove the Asian Gypsy Moth from this list. The Oregon Department of Agriculture and U.S. Department of Agriculture Animal Plant Health Inspection Service just completed the third year of negative trapping data after treatment in St. Helens, and they declared Asian Gypsy moth officially eradicated (Mark Hitchcox, pers. comm.). ▪ Add soft-shelled turtle and box turtle.	TEES and TEESAG
	Invasive animal species not yet known to occur, but that may invade the City of Portland in the next 5-10 years list	▪ Retain all species currently on this list, except for Chinese mitten crab. ▪ Remove Chinese mitten crab from this list. ▪ Add Asian ambrosia beetle (*Xylosandrus crassiusculus*) to the list. ▪ Add Vibernum Leaf Beetle (*Pyrrhalta viburni*) and European chafer (*Rhizotrogus majalis*) to this list.	TEES and TEESAG
		▪ Develop performance measures to track progress in preventing the introduction of invasive animal species and controlling/eradicating existing invasive animal species in the City of Portland.	TEESAG
		▪ Consider whether the percentage of effectiveness monitoring is adequate to monitor the effectiveness of activities relative to animal invasives.	TEESAG and partner organizations, City of Portland

Lead	Issue	Action Items	Partners
City of Portland	**Outreach and Education**	▪ Identify all outreach efforts relative to invasive animal species and determine if a strategic initiative that pools resources would better serve the City long-term.	All partners
		▪ Conduct a year-long awareness and engagement campaign in the City of Portland targeting specific audiences with key messages about animal invasives prevention and control.	Federal, state, and local governments, nonprofit agencies, academic institutions, industry partners
		▪ Provide consistent information to the public regarding resources available to address invasive animal issues, including clear explanations of invasive species laws.	All partners
		▪ Expand the partnerships created by the Audubon Society of Portland and the Feral Cat Coalition to enhance awareness and education about abandonment and feral pet issues and reduce the number of animals in the City over time.	Animal rescue organizations, veterinarians, animal licensing facilities, pet stores
		▪ Broaden the scope of entities that work on invasive animal issues by reaching out to organizations listed in survey responses and articulating a clear niche for them to participate.	U.S. Coast Guard, Power Squadrons, marinas, fishing organizations and businesses, Oregon Department of Transportation, homeowners associations, realtors, Department of Motor Vehicles, Oregon Humane Society, various "rescue" orgs, feed stores, and pet stores
	Collaboration	▪ Consider the development of an invasive animal strategic plan for the City of Portland that includes involvement by	All partners

Lead	Issue	Action Items	Partners
		federal, state, and local governments, academic institutions, nonprofit organizations, and industry.	
		▪ Develop a prioritized list of invasive animal species in the City of Portland and a steering committee comprised of entities with statutory authority for management to develop a long-range strategic plan.	TEESAG and partner organizations, US Department of Agriculture-Animal Plant Health Inspection Service, US Fish and Wildlife Service, US Forest Service, Oregon Department of Fish and Wildlife, Oregon Department of Agriculture, Department of Environmental Quality, Oregon Department of Forestry, other partners
		▪ Focus on the vectors of invasive animal species threatening to invade the City of Portland in the next 5–10 years, and develop priority strategies to lessen the threat of invasion.	US Department of Agriculture-Animal Plant Health Inspection Service, US Fish and Wildlife Service, US Forest Service, Bureau of Land Management, Oregon Department of Fish and Wildlife, Oregon Department of Agriculture, Department of Environmental Quality, Oregon Department of Forestry
		▪ Increase work with landowners by improving coordination with soil and water conservation districts, watershed councils, and other citizen-based groups that work directly with landowners–and provide incentives to landowners to manage/eradicate invasive species.	Soil and Water Conservation Districts, watershed councils, citizen groups
		▪ When dealing with species-specific issues, such as nutria, articulate a strategic initiative	All partners

Lead	Issue	Action Items	Partners
		so that each participating entity clearly understands the role they play in the effort to "manage" the species.	
		▪ Expand Cooperative Weed Management Areas to Cooperative Invasive Species Management Areas to incorporate invasive animals in the scope of local efforts.	Cooperative Weed Management Areas, Soil and Water Conservation Districts
		▪ Support the efforts of the Oregon Invasive Species Council and The Nature Conservancy to establish early detection and rapid response networks throughout the state and shared databases to manage invasive species information.	Oregon Invasive Species Council, The Nature Conservancy, Cooperative Weed Management Areas, watershed councils, Soil and Water Conservation Districts, municipalities
		▪ Consider redirecting existing resources to examine policy shortfalls relative to invasive animals and dedicate resources to enacting legislation and new policies to address those deficiencies.	City bureaus
		▪ Seek industry partners and others to help fund long-term strategies that will lessen the threat of invasive animals in the City of Portland.	Industry partners
		▪ Encourage coordination of resources and information sharing among all entities within the City of Portland to create efficiencies.	All partners
	Regulations		
	Local	▪ Propose local legislation that provides for stiff penalties for abandoning domestic animals.	Audubon Society of Portland, Feral Cat Coalition, Oregon Human Society

Lead	Issue	Action Items	Partners
		▪ Enact local legislation that makes it illegal to feed wildlife, nutria, and other designated invasive animal species in the City of Portland, with the exception of feral cats and dogs.	Oregon Department of Fish and Wildlife, US Fish and Wildlife Service
		▪ Consider local ordinances and regulations that both discourage the spread of animal invasives and provide incentives for people to take action to lessen their spread.	All partners
		▪ Seek long-term funding to adequately support enforcement issues.	All partners
	State	▪ Support state legislation that provides for stiff penalties for the introduction of invasive animal species.	Oregon Invasive Species Council, Audubon Society of Portland, Feral Cat Coalition, Oregon Human Society, Oregon Department of Fish and Wildlife
		▪ Review existing state legislation, and make recommendations to introduce new state-level legislation that provides for humane disposition of invasive animal species.	Oregon Invasive Species Council, Oregon State University, Audubon Society of Portland, Oregon Humane Society, Oregon Department of Fish and Wildlife
		▪ Support changes in state legislation that allow for mandatory boat inspections (note: currently, Oregon's constitution does not allow enforcement authorities to establish and conduct mandatory boat inspection stations).	Oregon Invasive Species Council, Oregon Department of Fish and Wildlife, Oregon State Marine Board, Oregon State Police
		▪ Support the development of state legislation that makes it legal for a public agency to enter private land to manage/control/eradicate invasive animal species and/or that makes it	Oregon Invasive Species Council, Oregon Department of Agriculture, Oregon Department of Fish and Wildlife, Oregon State Police

Lead	Issue	Action Items	Partners
		mandatory for a private landowner to address the issue (with resources available to assist).	
	National	▪ Work with the Oregon Invasive Species Council and the National Invasive Species Council to support national legislation that better regulates the sale of invasive species via the Internet.	Oregon Invasive Species Council, National Invasive Species Council

BACKGROUND

The Oregon Invasive Species Council launched an initiative in early 2009 to conduct a statewide management assessment of invasive species to:

- provide a big picture framework for existing management plans, such as the Noxious Weed Strategic Plan and the Aquatic Nuisance Species Management Plan;
- identify areas where legislation is needed to fill gaps in statutory authority for the effective management of invasive species;
- suggest priority policy issues that state agencies should consider when developing new policies and management plans;
- identify areas where there is overlap or redundancy in addressing invasive species;
- enable invasive species managers, landowners, and other stakeholders to increase coordination, plan projects strategically, and better understand the legal framework;
- enable financial supporters of invasive species projects to allocate dollars to highest priority areas for combating invasive species and to fill gaps in management;
- identify what is working in various parts of Oregon so that successful efforts can be replicated elsewhere; and
- define roles and responsibilities for managing invasive species.

The scope of the project included federal, state, local, and tribal governments, nonprofit organizations, and academic institutions. The City of Portland was included in the statewide management assessment.

However, the City sought to better understand its role specific to invasive animal management. The Portland Watershed Management Plan calls for healthy biological communities in watersheds. In addition, the Terrestrial Ecology Enhancement Strategy and its associated advisory group noted that invasive animals are one of the key management issues that threaten healthy biological communities. Whereas in 2009, the City adopted an Invasive Plant Management Strategy focused on policy and regulations, outreach and education, coordination, and assessment relative to invasive plants, this effort is the first step toward potential development of an invasive animal strategy for the City.

The City sought to conduct this more detailed assessment to:

- identify the abundance and distribution of invasive animal species in the City of Portland (excluding fish and zooplankton);
- identify invasive animal species that might be likely to invade habitats in the City of Portland in the next 5–10 years;

- identify the roles and responsibilities of various entities involved with invasive animal species management and outreach in Portland;
- review existing regulatory authority for invasive animal species management;
- define gaps and overlaps in regulatory authority;
- define opportunities for collaboration; and
- recommend and prioritize invasive terrestrial and aquatic species management actions that could be implemented by the City of Portland to lessen the threat of introductions and spread.

There were four key steps to the City of Portland invasive animal species assessment.

1. CHARACTERIZATION

- Identify invasive animal species currently present in the City of Portland, including their relative abundance and distribution. A 2008 City of Portland summit, "Removing Invasive Species, Restoring Healthy Natural Areas," sought to articulate progress made on invasive species issues since a 2005 summit, highlight regional partnerships, introduce topics relative to invasive animal species, and host sessions to explore invasive species topics in greater detail. One session focused on local actions for management of invasive species; one of the outcomes of that session was the development of the draft "Non-native Terrestrial and Aquatic Wildlife Species of Management Concern in the City of Portland" matrix (Appendix A), which was used as a baseline document to begin to develop a list of invasive animal species present in the City, including information about the level of biological concern and priorities for action.
- Identify invasive animal species present, but not currently established, in the City of Portland, including their relative abundance and distribution.
- Identify invasive animal species that might be likely to invade habitats in the City of Portland in the next 5–10 years, including a description of the likely pathways of introduction. For those species that might invade and be of high concern, describe their current proximity and potential impacts to Portland.

2. EVALUATION OF EXISTING PROGRAMS AND REGULATORY AUTHORITY

- Identify the roles and responsibilities of various entities (e.g., non-profit organizations, government organizations, academic institutions, community groups) involved with invasive animal species management and education in Portland.
- Review existing regulatory authority for invasive animal species management.

3. OPPORTUNITIES FOR COLLABORATION

- Define gaps and overlaps in regulatory authority and invasive animal species management actions.

- Define opportunities for collaboration between entities involved with invasive animal species management.

- Recommend and prioritize invasive terrestrial and aquatic species management actions that could be implemented by the City of Portland to lessen the threat of introductions and spread.

4. SHARE THE RESULTS OF THE ASSESSMENT

- Share the results of the City of Portland assessment at the Urban Ecology Research and Conservation Symposium in early 2010 as well as with the City's Terrestrial Ecology Enhancement Strategy Advisory Group and others.

I. CHARACTERIZATION

METHODS

In preparation for development of a survey instrument, three draft lists were prepared:

- Invasive animal species that are present and established in the City of Portland;
- Invasive animal species that are present, but not yet established, in the City of Portland; and
- Invasive animal species not yet known to occur, but that may invade the City of Portland in the next 5–10 years based on an analysis of pathway vectors and/or current distribution.

The goal was to consult with experts working with invasive animal species (excluding fish and zooplankton) and who are familiar with the City of Portland to validate and update these lists to ensure they adequately represent the invasive animal species found in the City as well as those likely to invade.

The Non-native Terrestrial and Aquatic Wildlife Species of Management Concern in the City of Portland" matrix (Appendices A) was used as a baseline to develop the three draft lists mentioned above. This appendix was developed by the Terrestrial Ecology Enhancement Strategy Advisory Group (TEESAG), individuals with terrestrial ecology experience, particularly in urban areas. The Terrestrial Ecology Enhancement Strategy (TEES) was developed to elevate the priority of integrating a terrestrial component into watershed enhancement, and includes agreed upon priorities for conservation and restoration of terrestrial plant habitats and animal species in the City. Identification of key invasive animal species was an important component of the strategy.

Abundance and distribution information (Appendix B) for each of the species listed in the matrix was developed to provide basic background on each species:

- What is it?
- Where did it come from?
- What is its impact?
- Where is it currently found?

A list of potential survey participants was developed using the list of participants from "Breakout session # 4: Local actions for management of invasive animal species" (http://www.portlandonline.com/Bes/index.cfm?c=49549&a=228237) at the City of Portland 2008 summit. Also, individuals active in terrestrial and aquatic invasive animal issues, TEESAG members, and others identified by Jennifer Goodridge and Claire Puchy were added. A total of 78 individuals representing 41 organizations were invited to participate in the survey via email notification. In addition, these individuals were encouraged to distribute the survey to others they believed could contribute to the outcomes of the assessment.

An 18-question online survey instrument (Appendix C) was developed. The purpose of the survey instrument was to inform the first three steps of the assessment: characterization, evaluation of existing programs and regulatory authority, and opportunities for collaboration. Survey

respondents could reference the abundance and distribution document (Appendix B) as they completed the online survey.

SURVEY RESPONDENTS

A total of 41 individuals representing 28 organizations (Appendix D) completed the assessment survey (Figure 1). These 41 individuals represented local government agencies (N=20), nonprofit organizations (N=8), academic institutions (N=5), federal agencies (N=4), state agencies (N=3), and one private firm.

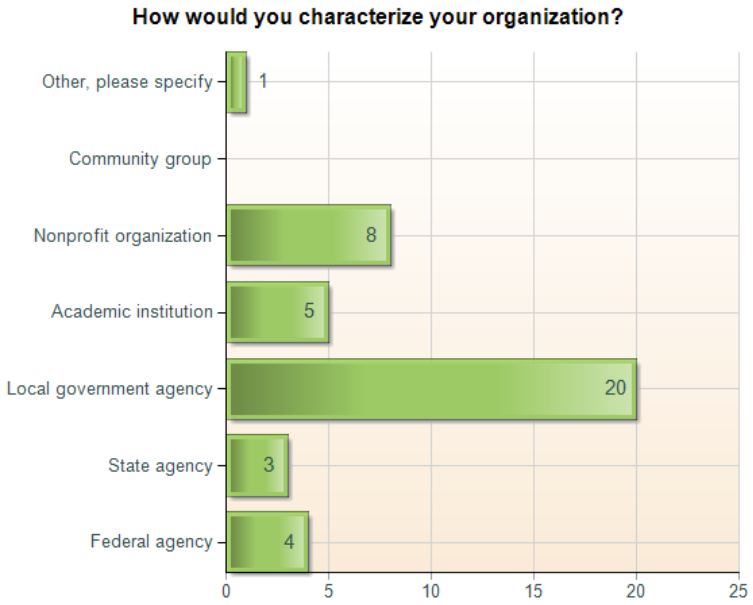


Figure 1. Survey respondents by organization type.

INVASIVE ANIMAL LISTS

Survey respondents were informed that the City of Portland developed three invasive species animal lists and associated abundance and distribution information (Appendix B):

- species that are present and established in the City of Portland;
- species that are present, but not yet established; and
- species not yet known to occur, but that may invade the City of Portland in the next 5-10 years based on an analysis of pathway vectors and/or current distribution.

Respondents were asked to review each of the lists and associated abundance and distribution information for each species. Respondents were asked to assess whether or not species should remain on the lists and provide suggestions for species that should receive consideration for additions to each list.

INVASIVE ANIMAL SPECIES PRESENT AND ESTABLISHED IN THE CITY OF PORTLAND

A total of 40 of the 41 respondents supported not removing any species from this list. The species are listed below (note: none of these species are on the Oregon Invasive Species Council 100 Worst List [Appendix E] because they are considered established in the State of Oregon):

- Brown Garden Snail
- Bullfrog
- Red-eared Slider
- Common Snapping Turtle
- European Starling
- House Sparrow
- Rock Pigeon
- Domestic Duck and Goose Species
- Nutria
- Eastern Gray Squirrel
- Eastern Fox Squirrel
- Virginia Opossum
- Eastern Cottontail
- Black Rat
- Norway Rat
- Feral cats and dogs

One individual recommended removing the following species from the list: brown garden snail, European starling, House sparrow, Rock pigeon, domestic duck and goose species, Virginia opossum, Norway rat, and domestic cats and dogs, however, no information was provided to justify removing these species from this list.

Six individuals recommended adding the following species to this list:

- Eurasian Collared dove (West Multnomah Soil and Water Conservation District Vice President was "not sure if they've crossed the city limit sign yet, but the first one was sighted on Sauvie Island (see Figure 2)[1] in 2006, and 26 were sighted last year. I saw and heard several pairs this year on the island. Wink Gross has statistics on this.")
- Monk Parakeet (N=3); (A Northwest Ecological Research Institute employee, noted that there are "several known breeding colonies" and that "Portland Audubon should be consulted." The Audubon Society of Portland recommended adding Monk Parakeets, noting they are established near Portland International Airport." A US Fish and Wildlife Service biologist noted that "I've seen a few Monk parakeets around the Columbia Slough/airport area and around SE Portland, they used to fly over our house in the evenings.")

[1] Note: Sauvie Island is not within City limits, however, several survey respondents included information on invasive species on the island because of its proximity to the westernmost boundary of the City limits.

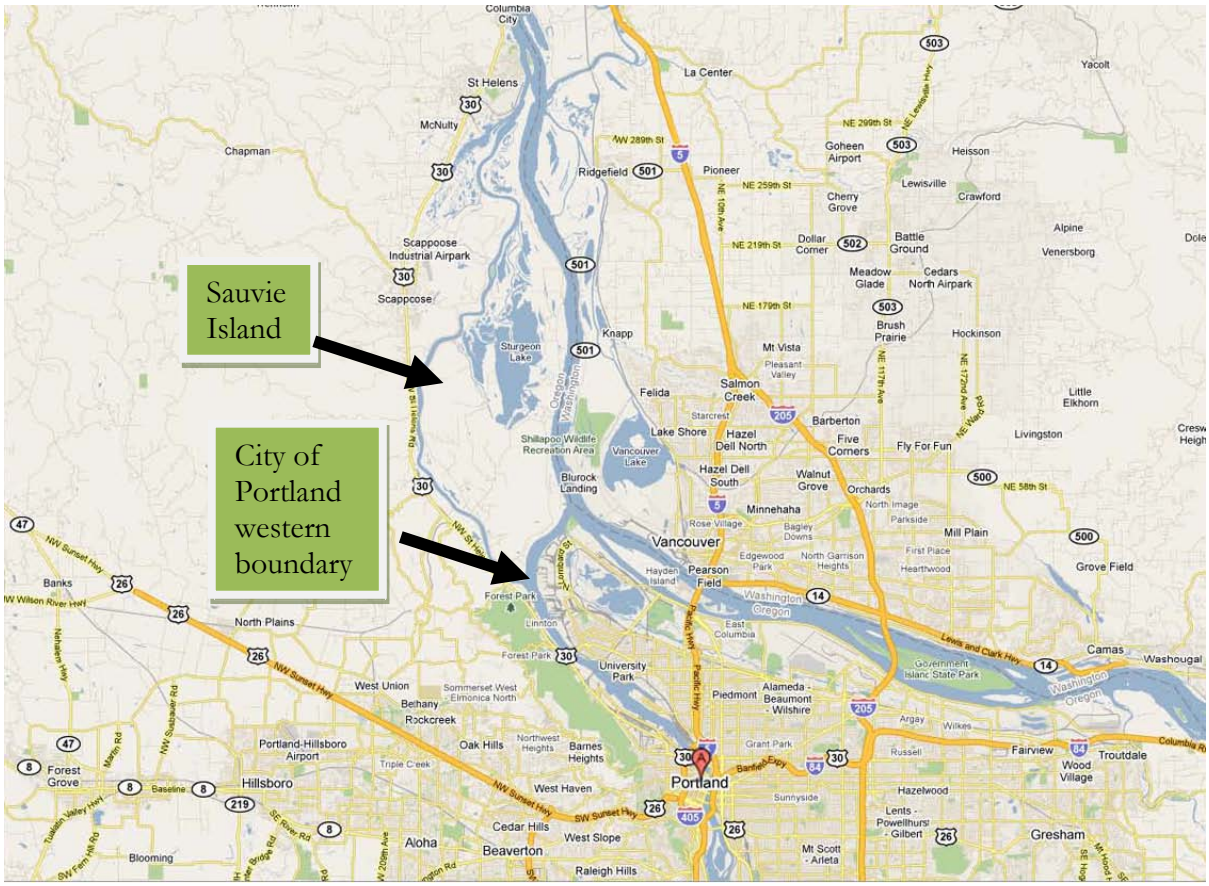


Figure 2. Portland-area map, showing the proximity of Sauvie Island to the westernmost boundary of the City (Source: Google maps).

- 2 species of European garden slugs (The Vice President of Northwest Ecological Research Institute staff person noted that these are "seen in cultivated gardens in several parts of Metro area.")
- Feral cats and dogs* (ODFW's Wildlife Integrity Coordinator recommended adding feral cats and dogs [note: this category has since been changed from domestic cats and dogs to feral cats and dogs.])
- Beaver** (A crew leader with the Multnomah County Drainage District recommended adding beaver, but did not provide a justification.)
- Carp (A crew leader with the Multnomah County Drainage District recommended adding carp, but did not identify species, and did not provide a justification.)
- Brown Marmorated Stink Bug (N=2) (The West Multnomah Soil and Water Conservation District Conservation Planner and USDA-APHIS PPQ Pest Survey Specialist recommended adding this species.)
- Terrestrial mollusks—*Deroceras reticulatum, Lehmannia valentiana, Limacus flavus, Limax maximus, Milax gigates, Oxychilus draparnaudi, Oxychilus alliarius, Testacella haliotidea, Arion rufus complex,* and *Arion subfuscus.* (These mollusks were collected by US Department of Agriculture-Animal Plant Health Inspection Service (USDA-APHIS) Plant Health, Plant Protection and Quarantine (PPQ) staff from industrial and residential sites in Multnomah and Clackamas

counties—USDA-APHIS PPQ Pest Survey Specialist recommended adding these mollusks to the list.)

- Spotted wing drosophila (*Drosophila suzukii*) (USDA-APHIS PPQ Pest Survey Specialist recommended adding this to the list.)
- House mouse (US Fish and Wildlife Service Fish and Wildlife Biologist noted that "House mice are everywhere—I've heard we're one of the top places in the nation for abundance.")
- Peafowl (note: Audubon Society of Portland Conservation Director noted these are "found throughout metro area except most urbanized areas.")
- Ring-necked dove (Audubon Society of Portland Conservation Director noted these are "found periodically throughout metro area.")
- Muscovy Ducks—Wetlands and Ponds*** (Audubon Society of Portland Conservation Director recommended adding these to the list.)
- Chinese Goose*** (Audubon Society of Portland Conservation Director recommended adding to the list.)
- Greylag Goose*** (Audubon Society of Portland Conservation Director recommended adding to the list.)
- Ring-necked pheasant (Audubon Society of Portland Conservation Director noted these are found in "larger natural areas and greenspaces.")
- Red Fox (*Vulpes vulpes*) (Audubon Society of Portland Conservation Director noted these are found in "larger greenspaces, Glendovere Golf Course.")
- Chukar (Audubon Society of Portland Conservation Director noted these are found "throughout metro area.")

* The domestic cats and dogs category on the list is intended to include feral cats and dogs.
** Beaver are native to the state of Oregon and the Portland metropolitan area.
*** The "domestic duck and goose species" category on the established list was intended to include these species.

INVASIVE ANIMAL SPECIES THAT ARE PRESENT, BUT NOT YET ESTABLISHED IN THE CITY OF PORTLAND

A total of 39 of the 41 respondents supported not removing any of the following species from this list, which included (note: species in bold are on the Oregon Invasive Species Council 100 Worst List—Appendix E):

- Banded European Woodsnail
- **Asian Gypsy Moth**
- **European Gypsy Moth**
- **Japanese Beetle**
- **Mute Swan**

Portland Water Bureau's Invasive Species Coordinator recommended removing the Banded European Woodsnail from the list, but did not provide a justification. A USDA-APHIS PPQ member recommended removing Asian Gypsy Moth from this list because the species is not present in the City.

A total of six individuals recommended adding the following species to this list:

- Monk Parakeet (N=2) (Metro's Senior Natural Resource Scientist noted that this species "has, or has had, several established populations in Portland for a few decades. It doesn't appear invasive here yet, but is in other areas and could become invasive here." A US Fish and Wildlife Service Biologist noted that Monk Parakeets could fall into this category.)
- Spotted Wing Drosophila (A West Multnomah Soil and Water Conservation District Conservation Planner noted this species has been spotted in Portland, and a task force may be forming. For details, visit http://www.oregon.gov/ODA/PLANT/docs/pdf/ippm_alert_d_suzukii.pdf.)
- Softshell turtle, other turtles (The Vice President of the NW Ecological Research Institute noted that breeding populations have been reported on Sauvie Island and the Banks area).
- Eurasian Collared-dove (The ODFW Wildlife Integrity Coordinator noted that this species has been seen on Sauvie Island and the Banks area.)
- Banded European woodsnail (Portland Parks and Recreation Ecologist Botanist noted "one recorded observation at Clatsop Butte Nature Park, GPS information: Latitude: N 45°28.431' (45°28'25.8"), Longitude: W 122°30.133' (122°30'8.0"), Altitude:168.00m, Altitude Reference: Sea level, Heading: UTC: 11/7/2009 16:45:13.00.")
- Various species of box turtle (Audubon Society of Portland Conservation Director noted these are "found periodically.")

INVASIVE ANIMAL SPECIES NOT YET KNOWN TO OCCUR, BUT THAT MAY INVADE THE CITY OF PORTLAND IN THE NEXT 5-10 YEARS BASED ON AN ANALYSIS OF PATHWAY VECTORS AND/OR CURRENT DISTRIBUTION

A total of 39 of the 41 respondents supported not removing any of the following species from this list, which included (note: the species in bold are on the Oregon Invasive Species Council 100 Worst List—Appendix E):

- Wrinkled Dune Snail
- **Rosy Gypsy Moth**
- **Nun Moth**
- **Light Brown Apple Moth**
- Oak Splendour Beetle
- Oak Ambrosia Beetle
- **Woodwasps**
- **Emerald Ash Borer**
- Apple Snails
- Chinese Mystery Snails
- **Rusty Crayfish**
- Virile Crayfish
- Ringed Crayfish
- New Zealand Mudsnails
- **Mitten Crab**
- **Spiny Waterflea**
- **Fishhook Waterflea**
- **Zebra Mussel**
- **Western Quagga Mussel**
- Eurasian Collared-dove
- **Feral Swine**

Portland State University's Center for Lakes and Reservoirs recommended removing Mitten crab from this list because it could not survive and reproduce in the Columbia River Basin system. A risk assessment conducted by PSU showed that Coos Bay is the only place in the State of Oregon where this species could survive. Mitten crabs are already a Federal Listed Species under the Lacey Act.

ODFW's Wildlife Integrity Coordinator recommended removing Eurasian Collared-dove from this list because "breeding populations have been observed on Sauvie Island and the Banks area."

The Oregon Department of Agriculture Integrated Pest Management Program Manager recommended adding Asian ambrosia beetle (*Xylosandrus crassiusculus*) to this list. This species "was detected in Forest Park, was eradicated in The Dalles."

A USDA-APHIS PPQ Pest Survey Specialist recommended adding Vibernum Leaf Beetle (*Pyrrhalta viburni*) and European chafer (*Rhizotrogus majalis*) to this list. This respondent noted that Viburnum Leaf Beetle has "not yet detected in Portland area, but occurs in British Columbia. Vibernum Leaf Beetle has also been found in Whatcom County, Washington, and is moving south. Likely vectors are nursery stock (VLB), and turf movement (Echafer)."

Likely vectors (*in parenthesis*) for introduction of these species include:

- Wrinkled Dune Snail (*Commerce*)[2]
- Rosy Gypsy Moth (*Commerce—they oviposit on containers and ship superstructures, among other structures.*)[3]
- Nun Moth (*Nun moth has a high potential to be transported via commerce because although eggs are normally laid in tree bark crevices they also could be deposited in crevices on containers, pallets, ships, etc. Regions of highest risk in North America, based on host plant availability and climate, include some 70,000 ha of western forests west of the Cascade Range, high-elevation spruce/fir/pine, and northeastern North America.*)[4]
- Light Brown Apple Moth (*Nursery products*)[5]
- Oak Splendour Beetle (*Adults are relatively strong fliers, capable of flying several km in search of suitable hosts. This insect could also be spread via unprocessed oak logs or wood products containing strips of bark.*)[6]
- Oak Ambrosia Beetle (*Commerce—has been found to hitchhike into Oregon on raw ties imported from the southeastern United States.*)[7]
- Woodwasps (*Wood wasps are likely to occur anywhere that infested timber is used for construction. Even though salvaged timber is adequate for restricted, lower grade construction purposes (such as studs and subflooring), it is not valuable enough to warrant kiln-drying. Kiln-drying or vacuum fumigation of lumber is the only effective way to kill wood wasp larvae that have survived milling operations, but treatment is costly. Fumigation of milled lumber in boxcars, under tarpaulins, and in standing buildings has not been successful.*)[8]
- Emerald Ash Borer (*Wood*)[9]
- Apple Snails (*Nursery stock*)[10]

[2] http://oregonstate.edu/dept/nurspest/Candidula.htm
[3] http://www.padil.gov.au/pbt/index.php?q=node/46&pbtID=115
[4] http://www.nrs.fs.fed.us/disturbance/invasive_species/nun_moth/
[5] http://www.montereycountyfarmbureau.org/Issues/light_brown_apple_moth.htm
[6] http://extension.entm.purdue.edu/CAPS/pestInfo/oakSplendour.htm
[7] http://extension.oregonstate.edu/wasco/horticulture/Pesticide%20Management/ambrosiabeetle.php
[8] http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7407.html
[9] http://www.oregon.gov/ODA/PLANT/IPPM/profile_eab.shtml
[10] http://www.oan.org/displaycommon.cfm?an=1&subarticlenbr=15

- Chinese Mystery Snails (*Aquarium releases*)[11]
- Rusty Crayfish (*Anglers and classroom releases*)[12]
- Virile Crayfish (*Anglers and classroom releases*)[13]
- Ringed Crayfish (*Anglers and classroom releases*)
- New Zealand Mudsnails (*Anglers*)[14]
- Mitten Crab (*Commerce*)[15]
- Spiny Waterflea (*Ballast water and anglers*)[16]
- Fishhook Waterflea (*Ballast water and anglers*)[17]
- Zebra Mussel (*Ballast water and Boaters*)[18]
- Western Quagga Mussel (*Ballast water and Boaters*)[19]
- Eurasian Collared-dove (*Originally entered the United States in Florida, and has since spread*)[20]
- Feral Swine (*Populations reproducing and spreading in Oregon*)[21]

RECOMMENDATIONS FOR TEESAG TO CONSIDER WHEN FINALIZING THE THREE INVASIVE ANIMAL LISTS

The process used to ultimately determine the species TEESAG should consider for placement or removal on each of the three lists was the quality of information provided by survey respondents, recommendations by professionals in their respective fields (this included follow-up phone calls and emails with individuals considered experts in their respective disciplines), and information available on the species, including risk assessments.

The species listed in bold on the "invasive animal species not yet known to occur, but that may invade the City of Portland in the next 5-10 years," are considered the highest priority species for detection and eradication because of their occurrence on the Council's 100 Worst List of dangerous invaders to keep out of the state. However, this list should be updated annually because the Council's list changes annually to continually target the worst potential invaders. The potential economic and environmental effects of the remaining species on these lists are significant. Opportunities to develop strategies by taxa or groupings of species (e.g., surveillance, monitoring, and prevention for insects) should be explored to reduce the population expansion of existing species and prevent the introduction of new infestations.

The Terrestrial Ecology Enhancement Strategy Advisory Group (TEESAG) is a technical working group of the City of Portland Watershed Science Advisory Group, and consists of representatives from a variety of natural resource organizations. TEESAG should review the input

[11] http://www.clr.pdx.edu/projects/volunteer/mystery.php
[12] http://www.iisgcp.org/EXOTICSP/rusty_crayfish.htm
[13] http://fl.biology.usgs.gov/posters/Nonindigenous/Nonindigenous_Crustaceans/nonindigenous_crustaceans.html
[14] http://seagrant.oregonstate.edu/sgpubs/onlinepubs/g06006_highres.pdf
[15] http://www.invasivespeciesinfo.gov/aquatics/mittencrab.shtml
[16] http://www.serconline.org/ballast/fact.html
[17] http://www.protectyourwaters.net/hitchhikers/crustaceans_spiny_water_flea.php
[18] http://www.clr.pdx.edu/projects/volunteer/zebra.php
[19] http://www.clr.pdx.edu/projects/volunteer/zebra.php
[20] http://www.birds.cornell.edu/pfw/AboutBirdsandFeeding/EucdovRitdovID.htm
[21] http://www.dfw.state.or.us/wildlife/hot_topics/swine.asp

from survey respondents regarding species that should and should not be included on each of the three lists and seek consensus to finalize these lists.

The category of invasive insects is, for the most part, a highly specialized and technical field.

According to Oregon Department of Agriculture Taxonomic Entomologist Jim Labonte, "many other insects and other invertebrates could be added to the list. . . Even allowing for exotic not being equivalent to invasive, the potential list is still vast." In addition, "most of the time, if something has been detected, it is probably established, with the exceptions of those critters that are either very noticeable or for which we have excellent survey technologies." This makes it very difficult to differentiate between the three category lists developed primarily for terrestrial and aquatic species. Therefore, the City should consider including on its list a few high profile insects that pose great economic and environmental risk to the City, such as Asian Gypsy Moth, but focus on terrestrial and aquatic-related species and defer the focus on insects to another working group, or partners such as the Oregon Department of Agriculture or U.S. Department of Agriculture Animal Plant Health Inspection Service.

Jim Labonte was also consulted regarding the abundance and distribution of Brown Marmorated Stink Bug (BMSB) and Spotted winged drosophila, as there was some discrepancy from survey respondents regarding their establishment. Jim confirmed both species are considered "established" in the City of Portland proper as well as the Metro area. The Oregon Invasive Species Council, via its invasive species hotline (www.oregoninvasiveshotline.org), has been communicating this information to the public as well.

The City should focus on the vectors of those species threatening to invade the City of Portland in the next 5–10 years and develop priority strategies to lessen the threat of invasion. For some species, such as crayfish and waterfleas, outreach and education targeted to the boating and angling communities could lessen the threat. For other species, such as woodwasps and emerald ash borer, supporting initiatives to make solid wood packaging and crating material insect- and disease-free or replace it with synthetic materials, and participating in education and outreach campaigns to encourage people to not move firewood could lessen the threat of invasion.

THE FOLLOWING SPECIFIC RECOMMENDATIONS ARE MADE FOR TEESAG TO CONSIDER AS THEY FINALIZE THE THREE LISTS:

1. Recommendations for changes to "invasive animal species present and established in the City of Portland" list:
    - Retain all species currently on this list.
    - Add Monk parakeets, brown marmorated stink bugs, Spotted wing drosophila, terrestrial mollusks (*Deroceras reticulatum, Lehmannia valentiana, Limacus flavus, Limax maximus, Milax gigates, Oxychilus draparnaudi, Oxychilus alliarius, Testacella haliotidea, Arion rufus complex,* and *Arion subfuscus*), house mouse, peafowl, ring-necked pheasant, red fox, and chukar.

2. Recommendations for changes to "invasive animal species that are present, but not yet established in the City of Portland" list:
    - Retain all species currently on this list, except for Asian Gypsy Moth.
    - Remove the Asian Gypsy Moth from this list. The Oregon Department of Agriculture and U.S. Department of Agriculture Animal Plant Health Inspection Service just completed the third year of negative trapping data

after treatment in St. Helens, and they declared Asian Gypsy moth officially eradicated (Mark Hitchcox, pers. comm.).
- Add soft-shelled turtle and box turtle.

3. Recommendations for changes to "Invasive animal species not yet known to occur, but that may invade the City of Portland in the next 5-10 years based on an analysis of pathway vectors and/or current distribution" list:
- Retain all species currently on this list, except for Chinese mitten crab.
- Remove Chinese mitten crab from this list.
- Add Asian ambrosia beetle (*Xylosandrus crassiusculus*) to the list.
- Add Vibernum Leaf Beetle (*Pyrrhalta viburni*) and European chafer (*Rhizotrogus majalis*) to this list.

MANAGEMENT ACTIVITIES

Survey respondents were asked how they would characterize the work they do on/with invasive animals in the City of Portland. Of the 35 individuals that responded to this question, 66% (N=23) conduct outreach and education activities, 49% (N=17) conduct monitoring/surveillance activities, 43% (N=15) conduct management activities, 34% (N=13) conduct prevention activities, 34% (N=13) conduct policy work, 31% (N=11) conduct early detection and rapid response activities, 29% (N=10) conduct coordination, 15% (N=5) conduct research, 15% (N=5) conduct effectiveness monitoring, and 3% (N=1) conduct fundraising activities (Table 1).

Table 1. Invasive animal-related activities in the City of Portland by category and entity.

Category	Federal	State	Local	Nonprofit organization	Academic institution	Value
Outreach and education	2	3	8	6	4	**23**
Monitoring/surveillance	2	2	7	4	2	**17**
Management activities	3	3	5	2	2	**15**
Prevention activities	3	4	3	2	1	**13**
Policy Work	0	3	6	3	1	**13**
EDRR	2	2	3	3	1	**11**
Coordination	1	3	3	1	2	**10**
Research	0	1	1	1	2	**5**
Effectiveness monitoring	2	1	0	2	0	**5**
Fundraising	0	0	0	0	1	**1**
	15	**22**	**36**	**24**	**16**	**113**

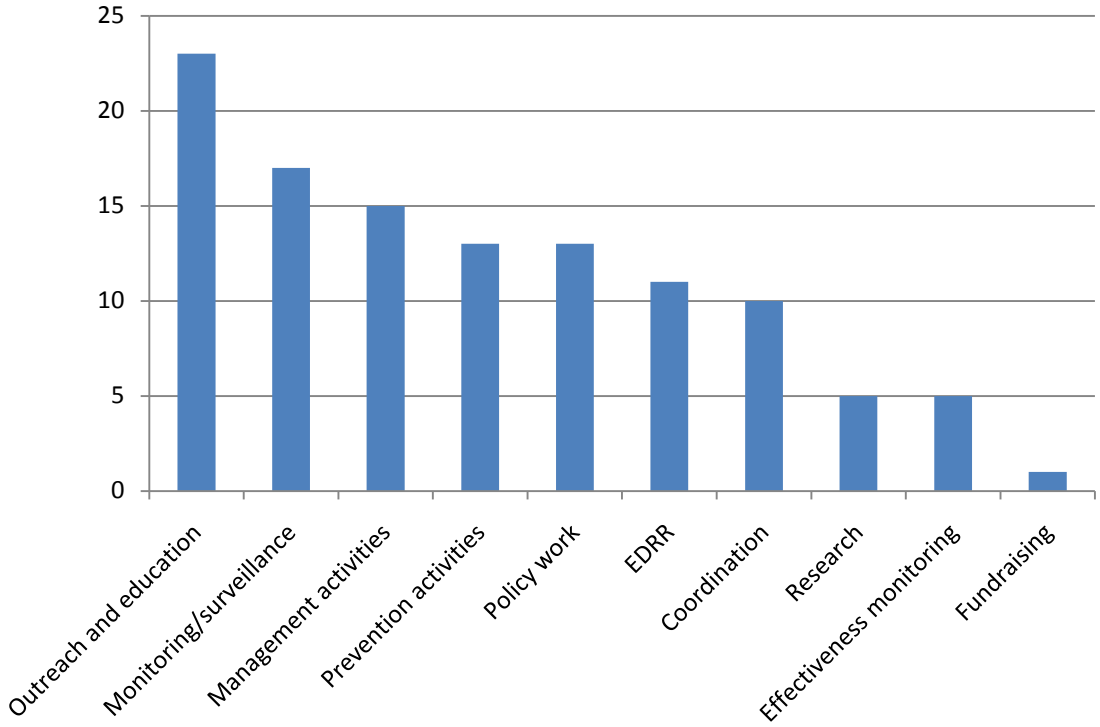


Figure 3. Invasive animal management activities in the City of Portland by category.

RECOMMENDATIONS FOR THE CITY OF PORTLAND TO CONSIDER TO ENHANCE INVASIVE ANIMAL MANAGEMENT ACTIVITIES

1. A total of 66% of survey respondents indicated they spend time and resources on outreach and education related to invasive animal species, however, the need for education initiatives was articulated by respondents to questions 10 and 13. Therefore, the City should identify all outreach efforts relative to invasive animal species and determine if a strategic initiative that pools resources would better serve the City long-term. Through this strategic approach, government, nonprofit, and industry partners could leverage resources to create efficiencies.

2. Effectiveness Monitoring can play a key role in demonstrating the accountability, success, and value in terrestrial and aquatic invasive animal species investments. Yet survey respondents indicated that only 15% of their total activities are dedicated toward effectiveness monitoring. The City should consider whether this percentage is adequate to monitor the effectiveness of activities relative to animal invasives.

II. EVALUATION OF EXISTING PROGRAMS AND REGULATORY AUTHORITY

REGULATIONS

The City of Portland sought to identify the roles and responsibilities of various entities involved with invasive animal species management and education in Portland as well as review existing regulatory authority for invasive animal species management.

Survey respondents were asked what regulations, resolutions, and ordinances or other laws govern the work each one does with invasive animal species (excluding fish and zooplankton). A total of 28 out of 41 respondents answered this question. The results were grouped by type of organization—federal agencies, state agencies, local government agencies, nonprofit organizations, academic institutions, and industry. The entity that provided the regulatory information is noted in italics and in parenthesis after each citation.

FEDERAL AGENCIES

Several federal agencies participate in animal invasive species issues in the City of Portland. The key role for federal agencies is prevention. For example, the USDA-APHIS PPQ is the primary federal agency charged with preventing entry of invasive plant pests in to the United States. USDA APHIS–Wildlife Services provides federal leadership and expertise to resolve wildlife conflicts. The U.S. Fish and Wildlife Service works with federal and state agencies and private groups to implement national, regional and local-level invasive species management activities and share information and new techniques for fighting invasive species—this includes prevention, early detection, rapid response, and control and management. Federal agency respondents cited these sources of statutory authority:

- National Environmental Protection Act (*USDA-Natural Resources Conservation Service (NRCS)*)
- State and local ordinances (*USDA-NRCS*)
- Plant Protection Act of 2000 (*USDA-APHIS PPQ*)
- State and federal regulations (*Tualatin River National Wildlife Refuge*)
- See http://www.fws.gov/invasives/laws.html (*US Fish and Wildlife Service*)

STATE AGENCIES

The Oregon Department of Fish and Wildlife and Oregon Department of Agriculture are the two primary state agencies in the City of Portland that deal with terrestrial and aquatic invasive animal issues. State statutes provide authority to regulate plant pests, domestic or imported wildlife, control noxious rodents and predators, and deal with issues associated with unprotected mammals, nonnative wildlife, and wildlife control operators. State agency respondents cited these sources of statutory authority:

- Oregon Revised Statutes (ORS) 570 (Plants; Inspection, Quarantine, Pest and Weed Control) (*ODA*)
- ORS 498.052 (Releasing domestically raised or imported wildlife without permit prohibited) (*ODFW*)
- ORS 561.685-691 (Definition of invasive species; Invasive Species Council duties; Invasive Species Council; membership; terms; Officers; quorum; schedule; Invasive Species Coordinator; administrative expenses of Invasive Species Council) (*ODFW*)
- ORS 610.105 (Authority to control noxious rodents or predatory animals) (*ODFW*)

- OAR Div. 050 (Furbearing and unprotected mammal regulations) *(ODFW)*
- OAR Div. 56 (Importation, possession, confinement, transportation, and sale of nonnative wildlife) (*ODFW*)
- OAR Div 435 (Wildlife control operators) (*ODFW*)
- Oregon Revised Statutes and Oregon Administrative Rules (*ODFW*)

LOCAL GOVERNMENT AGENCIES

Numerous local entities within the City of Portland work on terrestrial and aquatic invasive species issues, including the City and its bureaus, other local governments, soil and water conservation districts, watershed councils, etc. Most of these organizations listed state and federal statutes and policies that govern their work:

- ODFW rules on predatory and other unprotected species (*City of Gresham Natural Resources Program Coordinator*).
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, INSECT AND DISEASE CONTROL; FOREST PRACTICES 527.310 (Integrated Pest Management) Definitions for ORS 527.310 to 527.370, ODA Invasive Animal Definitions (education): 603-011-0700 Definitions (Exotic animals) (*West Multnomah Soil and Water Conservation District*)
- Invasive animals are an unofficial part of our EDRR and riparian work (*East Multnomah Soil and Water Conservation District*)
- ODFW regulations (*Portland Parks and Recreation*)
- Standard local, state and federal regulations; Metro has no specific rules or regulations (*Metro*).
- Wildlife Code—State of Oregon (*Metro*)
- Portland environmental zoning (*City of Portland*)
- USDA, USFWS, ODFW (*Oregon Zoo*)
- We don't have any specific regulations that address invasive animal species. We have included potential measures with enhancement/restoration projects for the control of invasive animal species (*City of Wilsonville*).
- City of Portland code does not speak to invasive animal management—Title 13 would be a logical location for code language to regulate invasive animals in the City (*City of Portland*).

NONPROFIT ORGANIZATIONS

Several nonprofit organizations in the City of Portland are very active in the terrestrial and aquatic invasive animal arena, such as the Audubon Society of Portland, which works closely with numerous federal, state, and local government entities to manage these species and conduct outreach and education in the City. Entities, such as The Nature Conservancy and Audubon Society of Portland, span geopolitical lines by working with federal, state, and local governments as well as academic institutions and industry.

- ODFW Permits for handling wildlife, USDA permitting for interstate transport of wildlife (*Audubon Society of Portland*)

ACADEMIC INSTITUTIONS

Academic institutions, such as Portland State University, play a pivotal role in the terrestrial and aquatic invasive animal arena, by conducting research on invasives, making that information

available to the public online and through scientific forums, engaging in policy development, and conducting strategic planning (e.g., Portland State University is taking the lead on updating the State Aquatic Nuisance Species Management Plan and developed the Feral Swine Action Plan for the State of Oregon). Academic institutions cited these sources of statutory authority:

- Animal handling permit—U.S. Fish and Wildlife Service (*Portland State University*)
- OAR 635-056 (nutria listed as prohibited species) (*Portland State University*)
- State Aquatic Nuisance Species Management Plan, Oregon Wildlife Integrity Rules (OAR 635-056), Oregon Noxious Weed Laws (*Portland State University*)
- Local efforts in general education and education about research concerning amphibians requires a State Taking Permit. Bullfrogs captured in the wild are to be removed from captivity (*Reed College*).
- Oregon Administrative rules on ballast water management, ODFW importation, rules (*Portland State University*)

ONE PRIVATE FIRM

One private company, PBS Engineering, participated in the survey:

- Wetland creation design to avoid bullfrog habitat; usually policy rather than legislation (*PBS Engineering*).

PREVENTION

A total of 33 of 41 respondents answered the question: Do you believe the laws and regulations that pertain to ***prevention*** of invasive animals in the State of Oregon are adequate and/or how they could be improved? A total of 82% (N=27) responded "No," while 18% (N=6) responded "Yes" (Figure 4).

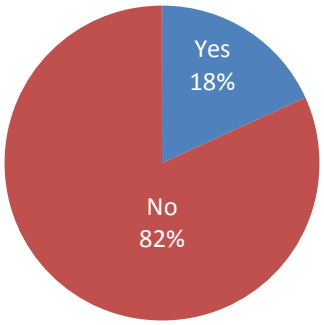


Figure 4. Responses to the question about the adequacy of laws and regulations that pertain to the prevention of invasive animals in the State of Oregon.

Respondents that answered "No" to this question were asked to explain why they believe Oregon's laws and regulations pertaining to ***prevention*** of invasive species are inadequate. Of the 27 people that answered "No," a total of 26 provided an explanation (Appendix F). A summary of their input is included below and is grouped by thematic area—Enforcement and Penalties, Inspections, Funding, and Outreach and Education.

ENFORCEMENT AND PENALTIES

Respondents expressed disapproval for lack of penalties for introduction of invasive animals beyond apprehension by U.S. Customs at border stations as well as lack of penalties and ability to monitor/quarantine for nursery propagation of invasive plants. One respondent noted that enforcement is the greatest concern in the invasive species prevention arena, while several others noted that current laws are not enforced, and that funding is inadequate for enforcement.

One respondent noted that our judicial system is overwhelmed with higher priority cases, and that laws needs to be amended frequently, developed in clear language that is easy for the general public to understand, and comprehensive enough to prevent the spread of invasive species that are already established. One shortcoming of existing laws is the failure to address final disposition of invasive species (humanely).

The ability to purchase invasive species via the Internet was mentioned as a barrier to prevention by several respondents.

Two respondents noted that an improved system for prevention would require vendors to demonstrate species are non-invasive before they are legal to sell versus only preventing species that are known to cause harm.

One respondent commented on the importance of enforcing abandonment statutes as well as supervising the pet industry, in general.

Numerous respondents discussed the need for more inspections, noting Oregon needs the constitutional authority to inspect boats and establish mandatory border check stations. It was noted that more resources are needed to conduct inspections.

FUNDING

Survey respondents noted that funding is inadequate for early detection and rapid response, a prevention system, and enforcement.

OUTREACH AND EDUCATION

A total of eight respondents commented on the need for more effective outreach and education, including the suggestion the City participate in a rigorous education campaign that is adequately funded and staffed and that helps people understand invasive species regulations and why they exist. One respondent noted that increased immigration from other cultures and a growing human population is creating an environment in which people are generally less aware of the problems caused by invasive species.

CONTROL/ERADICATION

A total of 32 of the 41 respondents answered the question: Do you believe the laws and regulations that pertain to ***control/eradication*** of invasive animals in the State of Oregon are adequate? A total of 91% (N=29) answered, "No," and 9% (N=3) answered, "Yes" (Figure 5). Of the 29 respondents that answered, "No," a total of 27 provided an explanation (Appendix G). A summary of their responses is included below and is grouped by thematic area— Enforcement and Penalties, Funding, Outreach and Education, and Other.

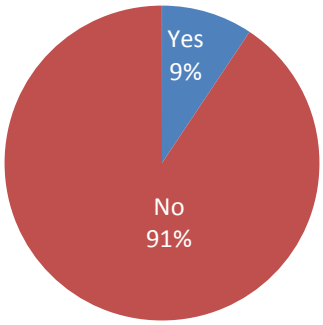


Figure 5. Responses to the question about the adequacy of laws and regulations that pertain to the control/eradication of invasive animals in the State of Oregon.

ENFORCEMENT AND PENALTIES

A total of 16 respondents commented on lack of enforcement and penalties for violations of invasive species laws. They commented on the need for stiffer penalties for violations of the control or eradication actions, monitoring, more personnel, incentives, enforcement, the ability to quarantine a water body, inability of the state to enter private land to treat an invasive species (unless the landowner provides consent), strict prohibition of feeding domestic ducks and geese, laws that make it mandatory for landowners to eradicate invasives on their property, clear identification of agencies responsible for control/eradication, and stricter controls and monitoring of the sale on non-native species.

FUNDING

A total of seven respondents noted that funding was inadequate for invasive species programs. They mentioned inadequate funding for control and eradication programs, including staff, outreach, tracking of species, and resources to encourage landowners to manage invasive species.

OUTREACH AND EDUCATION

Two respondents commented on the need for more education as well as a rigorous education campaign.

OTHER

One respondent commented on the need for monitoring to determine control effectiveness and to develop criteria for success. Another noted the need for better coordination among agencies.

RECOMMENDATIONS FOR THE CITY OF PORTLAND TO CONSIDER REGARDING REGULATIONS

The majority (82%) of survey respondents believe that Oregon's laws and regulations that pertain to ***prevention*** of invasive animals are inadequate. An even greater percentage of survey respondents (91%) believe Oregon's laws and regulations that pertain to the **control/eradication** of invasive animals are inadequate. The following list is a series of recommendations, which if implemented, could improve the City's ability to protect itself from the expansion of existing invasive animal species as well as introductions of new infestations:

NATIONAL

1. Work with the Oregon Invasive Species Council and the National Invasive Species Council to support national legislation that better regulates the sale of invasive species via the Internet.

STATE-LEVEL REGULATIONS

2. Support state legislation that provides for stiff penalties for the introduction of invasive animal species.

3. Review existing state legislation, and make recommendations to introduce new state-level legislation that provides for humane disposition of invasive animal species.

4. Support changes in state legislation that allow for mandatory boat inspections (note: currently, Oregon's constitution does not allow enforcement authorities to establish and conduct mandatory boat inspection stations).

5. Support the development of state legislation that makes it legal for a public agency to enter private land to manage/control/eradicate invasive animal species and/or that makes it mandatory for a private landowner to address the issue (with resources available to assist).

LOCAL

6. Propose local legislation that provides for stiff penalties for abandoning domestic animals.

7. Enact local legislation that makes it illegal to feed wildlife, nutria, and other designated invasive animal species in the City of Portland, with the exception of feral cats and dogs.

8. Seek long-term funding to adequately support enforcement issues.

9. Participate with partner organizations to promote outreach and education initiatives relative to invasive animal species in the City of Portland.

10. Provide incentives to landowners to manage/eradicate invasive animal species.

11. Provide consistent information to the public regarding resources available to address invasive animal issues, including clear explanations of invasive species laws.

12. Develop performance measures to track progress in preventing the introduction of invasive animal species and controlling/eradicating existing invasive animal species in the City of Portland.

13. Because of the emphasis on lack of adequate enforcement and laws by survey respondents, the City of Portland should consider redirecting existing resources to examine policy shortfalls relative to invasive animals and dedicate resources to enacting legislation and new policies to address those deficiencies. For example, Title 13 could be expanded beyond invasive plant species to incorporate issues relative to terrestrial and aquatic animal invasive species.

III. COLLABORATION

Survey respondents were asked to list the organizations they currently partner with to conduct invasive animal-related activities in the City of Portland (Appendix H). A total of 25 of 41 respondents answered this question.

Survey respondents were asked to describe additional opportunities, if any, for entities ***within the City of Portland*** to collaborate on invasive animal issues. A total of nine of 41 respondents answered this question. Several respondents listed organizations and entities as potential partners—U.S. Coast Guard, Power Squadrons, marinas, fishing organizations and businesses, ODOT, homeowners associations, realtors, Department of Motor Vehicles, Oregon Humane Society, various "rescue" orgs, feed stores, and pet stores.

One respondent noted "it would be great if the EDRR pathway for the species outlined were clear and if there was a good information clearinghouse website specifically for invasive animals."

Two respondents suggested the need for a CIAMA—Cooperative Invasive Animal Management Area or CISMA—Cooperative Invasive Species Management Area.

One nutria-focused response suggested enhanced partnerships with the City of Portland Bureau of Environmental Services, Metro and Audubon Society could further collaboration.

One respondent commented that "having a City of Portland representative on the OISC is a great start."

The need for a comprehensive plan—"if we had an overall plan, we could coordinate and share tasks" was suggested.

And one respondent noted that "there should be more educational outreach about the impact of invasive species and also more enforcement of animal abandonment laws. Audubon and the Feral Cat Coalition are looking for partners to address cat-related issues."

Survey respondents were asked to describe additional opportunities, if any, for entities ***outside the City of Portland*** to collaborate with organizations within the City of Portland on invasive animal issues. A total of 10 of 41 respondents answered this question.

Four respondents offered similar responses to the previous question.

Another noted "it would be great to collaborate with OR marine board and ODFW on this issue."

One respondent indicated that more "work with Soil and Water Conservation Districts staff that can provide education, technical assistance, grant support to landowners" could improve results on the ground.

It was suggested that coordinating with state science teachers (OSTA), enhanced enforcement at the import/export level, and a broader coalition could make a difference.

RECOMMENDATIONS FOR THE CITY OF PORTLAND TO CONSIDER TO ENHANCE COLLABORATION WITHIN AND OUTSIDE THE CITY

1. Consider the development of an invasive animal strategic plan for the City of Portland that includes involvement by federal, state, and local governments, academic institutions, nonprofit organizations, and industry.

2. Consider broadening the scope of entities that work on invasive animal issues by reaching out to organizations listed in survey responses— U.S. Coast Guard, Power Squadrons, marinas, fishing organizations and businesses, ODOT, homeowners associations, realtors,

DVMs, Oregon Humane Society, various "rescue" orgs, feed stores, and pet stores—and articulating a clear niche for them to participate.

3. When dealing with species-specific issues, such as nutria, articulate a strategic initiative so that each participating entity clearly understands the role they play in the effort to "manage" the species.

4. Expand the partnerships created by the Audubon Society of Portland and the Feral Cat Coalition to enhance awareness and education about abandonment and feral pet issues and reduce the number of animals in the City over time.

5. Expand Cooperative Weed Management Areas to Cooperative Invasive Species Management Areas to incorporate invasive animals in the scope of local efforts.

6. Increase work with landowners by improving coordination with soil and water conservation districts, watershed councils, and other citizen-based groups that work directly with landowners.

LESSENING THE SPREAD OF INVASIVES

Survey respondents were asked to describe what, if any, management actions the City of Portland could implement to lessen the threat of introductions and spread of invasive animal species. A total of 25 of 41 respondents addressed this question (Appendix I). Respondents emphasized four primary areas—increasing education and outreach relative to animal invasives; stricter local laws and more enforcement of all laws; funding for invasive animal programs; and enhanced management and coordination activities.

OUTREACH AND EDUCATION

There was general consensus among the respondents that there was a need to increase outreach and education using a variety of media outlets. Respondents suggested informing the public of simple ways to document sightings of new invasives, developing education programs for middle and high school children, and working with target audiences, such as pet shops and recreational boaters. Respondents emphasized educating the public about vectors and treatments, and providing facilities for people to take personal action to make a difference, e.g., using a boat washing facility.

ENFORCEMENT

Respondents commented on the need to enforce existing laws, and to develop "rigorous" city laws, including better regulation of the pet industry. It was suggested there be strict prohibition of possession or ownership of any potential invaders, and penalties for people that possess those species that are not yet well established in the City. Giving the City authority to enter private property for the purpose of searching for and eradicating listed species was recommended.

One respondent suggested making it mandatory to wash boats at major boat ramps in the city to deal potential transmission of zebra mussel and other aquatic invertebrates.

FUNDING

It was suggested that monitoring and emergency response funds be available, as well as basic operational funds to manage a program, which includes personnel, equipment, and funding to private landowners to spray for weeds.

MANAGEMENT AND COORDINATION

There are numerous entities with authority to manage aspects of invasive animal management in the City. Better coordination between agencies and clear delineation of agency roles would further management efforts and help to ensure priority species are being addressed. It was acknowledged that the City could play a leadership role in demonstrating how cooperative proactive efforts can lessen the threat of invasive animals.

An effective regional early detection and rapid response network that would allow for sharing of information would help to pool resources and enhance coordination.

It was suggested that assistance be provided to people in rural areas just outside the city limits, similar to existing plans for invasive plants.

RECOMMENDATIONS FOR THE CITY OF PORTLAND TO LESSEN THE SPREAD OF INVASIVE ANIMAL SPECIES

1. Develop a prioritized list of invasive animal species in the City of Portland and a steering committee comprised of entities with statutory authority for management to develop a long-range strategic plan.

2. In concert with federal, state, and local governments, nonprofit agencies, academic institutions, and industry partners, conduct a year-long awareness and engagement campaign in the City of Portland targeting specific audiences with key messages about animal invasives prevention and control.

3. Consider local ordinances and regulations that both discourage the spread of animal invasives and provide incentives for people to take action to lessen their spread.

4. Seek industry partners and others to help fund long-term strategies that will lessen the threat of invasive animals in the City of Portland.

5. Encourage coordination of resources and sharing of information among all entities within the City of Portland to create efficiencies and pool resources.

6. Support the efforts of the Oregon Invasive Species Council and The Nature Conservancy to establish early detection and rapid response networks throughout the state and shared databases to manage invasive species information.

CONCLUSIONS AND RECOMMENDATIONS

Numerous recommendations were made to improve the City of Portland's response to the threat of invasive animal species. The following chart summarizes those recommendations. Action items are not prioritized among categories—outreach and education, collaboration, leadership, funding, and legislation, because several of these actions can occur simultaneously. However, action items are prioritized within category (note: the three action items for TEESAG are not listed in priority order as they are the recommended changes to the three invasive animal species lists).

Lead	Issue	Action Items	Partners
TEESAG	**Invasive animal species present and established in the City of Portland list**	▪ Retain all species currently on this list. ▪ Add Monk parakeets, brown marmorated stink bugs, Spotted wing drosophila, terrestrial mollusks (*Deroceras reticulatum, Lehmannia valentiana, Limacus flavus, Limax maximus, Milax gigates, Oxychilus draparnaudi, Oxychilus alliarius, Testacella haliotidea, Arion rufus complex,* and *Arion subfuscus*), house mouse, peafowl, ring-necked pheasant, red fox, and chukar.	TEES and TEESAG
	Invasive animal species present, but not yet established in the City of Portland list	▪ Retain all species currently on this list, except for Asian Gypsy Moth. ▪ Remove the Asian Gypsy Moth from this list. The Oregon Department of Agriculture and U.S. Department of Agriculture Animal Plant Health Inspection Service just completed the third year of negative trapping data after treatment in St. Helens, and they declared Asian Gypsy moth officially eradicated (Mark Hitchcox, pers. comm.). ▪ Add soft-shelled turtle and box turtle.	TEES and TEESAG

Lead	Issue	Action Items	Partners
	Invasive animal species not yet known to occur, but that may invade the City of Portland in the next 5-10 years list	▪ Retain all species currently on this list, except for Chinese mitten crab. ▪ Remove Chinese mitten crab from this list. ▪ Add Asian ambrosia beetle (*Xylosandrus crassiusculus*) to the list. ▪ Add Vibernum Leaf Beetle (*Pyrrhalta viburni*) and European chafer (*Rhizotrogus majalis*) to this list.	TEES and TEESAG
		▪ Develop performance measures to track progress in preventing the introduction of invasive animal species and controlling/eradicating existing invasive animal species in the City of Portland.	TEESAG
		▪ Consider whether the percentage of effectiveness monitoring is adequate to monitor the effectiveness of activities relative to animal invasives.	TEESAG and partner organizations, City of Portland
City of Portland	**Outreach and Education**	▪ Identify all outreach efforts relative to invasive animal species and determine if a strategic initiative that pools resources would better serve the City long-term.	All partners
		▪ Conduct a year-long awareness and engagement campaign in the City of Portland targeting specific audiences with key messages about animal invasives prevention and control.	Federal, state, and local governments, nonprofit agencies, academic institutions, industry partners
		▪ Provide consistent information to the public regarding resources available to address invasive animal issues, including clear explanations of invasive species laws.	All partners

Lead	Issue	Action Items	Partners
		▪ Expand the partnerships created by the Audubon Society of Portland and the Feral Cat Coalition to enhance awareness and education about abandonment and feral pet issues and reduce the number of animals in the City over time.	Animal rescue organizations, veterinarians, animal licensing facilities, pet stores
		▪ Broaden the scope of entities that work on invasive animal issues by reaching out to organizations listed in survey responses and articulating a clear niche for them to participate.	U.S. Coast Guard, Power Squadrons, marinas, fishing organizations and businesses, Oregon Department of Transportation, homeowners associations, realtors, Department of Motor Vehicles, Oregon Humane Society, various "rescue" orgs, feed stores, and pet stores
	Collaboration	▪ Consider the development of an invasive animal strategic plan for the City of Portland that includes involvement by federal, state, and local governments, academic institutions, nonprofit organizations, and industry.	All partners
		▪ Develop a prioritized list of invasive animal species in the City of Portland and a steering committee comprised of entities with statutory authority for management to develop a long-range strategic plan.	TEESAG and partner organizations, US Department of Agriculture-Animal Plant Health Inspection Service, US Fish and Wildlife Service, US Forest Service, Oregon Department of Fish and Wildlife, Oregon Department of Agriculture, Department of Environmental Quality, Oregon Department of Forestry, other partners
		▪ Focus on the vectors of invasive animal species threatening to invade the	US Department of Agriculture-Animal Plant Health Inspection Service,

Lead	Issue	Action Items	Partners
		City of Portland in the next 5–10 years, and develop priority strategies to lessen the threat of invasion.	US Fish and Wildlife Service, US Forest Service, Bureau of Land Management, Oregon Department of Fish and Wildlife, Oregon Department of Agriculture, Department of Environmental Quality, Oregon Department of Forestry
		▪ Increase work with landowners by improving coordination with soil and water conservation districts, watershed councils, and other citizen-based groups that work directly with landowners–and provide incentives to landowners to manage/eradicate invasive species.	Soil and Water Conservation Districts, watershed councils, citizen groups
		▪ When dealing with species-specific issues, such as nutria, articulate a strategic initiative so that each participating entity clearly understands the role they play in the effort to "manage" the species.	All partners
		▪ Expand Cooperative Weed Management Areas to Cooperative Invasive Species Management Areas to incorporate invasive animals in the scope of local efforts.	Cooperative Weed Management Areas, Soil and Water Conservation Districts
		▪ Support the efforts of the Oregon Invasive Species Council and The Nature Conservancy to establish early detection and rapid response networks throughout the state and shared databases to manage invasive species information.	Oregon Invasive Species Council, The Nature Conservancy, Cooperative Weed Management Areas, watershed councils, Soil and Water Conservation Districts, municipalities

Lead	Issue	Action Items	Partners
		▪ Consider redirecting existing resources to examine policy shortfalls relative to invasive animals and dedicate resources to enacting legislation and new policies to address those deficiencies.	City bureaus
		▪ Seek industry partners and others to help fund long-term strategies that will lessen the threat of invasive animals in the City of Portland.	Industry partners
		▪ Encourage coordination of resources and information sharing among all entities within the City of Portland to create efficiencies.	All partners
	Regulations		
	Local	▪ Propose local legislation that provides for stiff penalties for abandoning domestic animals.	Audubon Society of Portland, Feral Cat Coalition, Oregon Human Society
		▪ Enact local legislation that makes it illegal to feed wildlife, nutria, and other designated invasive animal species in the City of Portland, with the exception of feral cats and dogs.	Oregon Department of Fish and Wildlife, US Fish and Wildlife Service
		▪ Consider local ordinances and regulations that both discourage the spread of animal invasives and provide incentives for people to take action to lessen their spread.	All partners
		▪ Seek long-term funding to adequately support enforcement issues.	All partners
	State	▪ Support state legislation that provides for stiff penalties for the introduction of invasive animal species.	Oregon Invasive Species Council, Audubon Society of Portland, Feral Cat Coalition, Oregon Human Society, Oregon

Lead	Issue	Action Items	Partners
			Department of Fish and Wildlife
		▪ Review existing state legislation, and make recommendations to introduce new state-level legislation that provides for humane disposition of invasive animal species.	Oregon Invasive Species Council, Oregon State University, Audubon Society of Portland, Oregon Humane Society, Oregon Department of Fish and Wildlife
		▪ Support changes in state legislation that allow for mandatory boat inspections (note: currently, Oregon's constitution does not allow enforcement authorities to establish and conduct mandatory boat inspection stations).	Oregon Invasive Species Council, Oregon Department of Fish and Wildlife, Oregon State Marine Board, Oregon State Police
		▪ Support the development of state legislation that makes it legal for a public agency to enter private land to manage/control/eradicate invasive animal species and/or that makes it mandatory for a private landowner to address the issue (with resources available to assist).	Oregon Invasive Species Council, Oregon Department of Agriculture, Oregon Department of Fish and Wildlife, Oregon State Police
	National	▪ Work with the Oregon Invasive Species Council and the National Invasive Species Council to support national legislation that better regulates the sale of invasive species via the Internet.	Oregon Invasive Species Council, National Invasive Species Council

APPENDICES

Appendix A. DRAFT non-native terrestrial and aquatic wildlife species of management concern in the City of Portland. Developed by TEESAG and presented at the 2008 invasive species summit in the City of Portland. 35

Appendix B. Abundance and distribution information of invasive animal species present and established in the City of Portland, invasive animal species present but not yet established in the City of Portland, and invasive animal species not yet known to occur in the City of Portland, but that pose a threat to introduction in the next 5-10 years because of pathway vectors and/or current distribution. 37

Appendix C. The City of Portland invasive animal assessment survey instrument. 63

Appendix D. List of 29 organizations that participated in the City of Portland assessment survey. 69

Appendix E. Oregon Invasive Species Council 100 Worst List. 70

Appendix F. Survey respondent's answers to the question: Why do you believe Oregon's laws and regulations pertaining to prevention of invasive species are inadequate? 76

Appendix G. Survey respondent's answers to the question: Why do you believe the laws and regulations that pertain to control/eradication of invasive animals in the State of Oregon are inadequate? 79

Appendix H. Survey respondent's answer to the question: what, if any, management actions the City of Portland could implement to lessen the threat of introductions and spread of invasive animal species? 81

Appendix I. Survey respondent's list of organizations they currently partner with to conduct invasive animal-related activities in the City of Portland. The rows denote the partner organizations. The columns denote survey respondent organizations. 83

Appendix A. DRAFT non-native terrestrial and aquatic wildlife species of management concern in the City of Portland. Developed by TEESAG and presented at the 2008 invasive species summit in the City of Portland.

NON-NATIVE TERRESTRIAL AND AQUATIC WILDLIFE SPECIES OF MANAGEMENT CONCERN IN THE CITY OF PORTLAND

Priority for Action	Level of Biological Concern	Species	Management Actions (in addition to eduction)	More Specific Actions	Lead	Partners	City Role
	High						
	High	**Bullfrog*** *Rana catesbeiana*	Collect eggs Enforcement Prevent sale Report sightings Hydraulic management		ODFW OSP	Turtle Working Group Pet and garden stores	Report sightings Remove eggs on city properties Limit perennial ponds in natural areas when designing restoration projects
	High	**Red-eared Slider** *Trachemys scripta elegans*	Collect eggs Collect adults Enforcement Prevent sale Report sightings		ODFW OSP	Turtle Working Group Pet and garden stores Audubon	Report sightings Education
	High	**Common Snapping Turtle*** *Chelydra serpentine*	Collect eggs Enforcement Prevent sale Report sightings Lethal control when captured		ODFW	Turtle Working Group Pet and garden stores THPRD Audubon	Education Report sightings
	High	**Nutria*** *Myocastor coypus*	Trapping		ODFW	Audubon 2007 Nutria Workshop Attendees	Trapping
	High	**Domestic Cat** (house and feral) *Felis domesticus*	Remove from natural areas Education about feeding cats/dogs outdoors Keep domestic cats indoors "campaign" Work with Feral Cat Coalition on spaying/neutering		Audubon	Feral Cat Coalition Multnomah County Animal Control Humane Society Migratory Bird Treaty Partners	Education Trap out of city natural areas
	High	**Zebra Mussel** *Dreissena polymorpha*	Educate boaters Establish inspection and Enforce ballast water exchange off-shore		ODFW OSP DEQ	Oregon Marine Board	Report sightings Educate boaters Boat washing stations
	High	**Western Quagga Mussel** *Dreissena rostriformis bugensis*	Educate boaters Establish inspection and wash stations Enforce ballast water exchange off-shore		ODFW OSP DEQ	Oregon Marine Board	Report sightings Educate boaters Boat washing stations
	Medium	**Asian and Other Introduced Zooplankton** *Misc. species*	Standards regarding ballast water		USDA ODA Port of Portland DEQ		
	Medium	**Domestic Duck and Goose Species** *Misc. species*	Exotic duck and goose round-ups Enforcement of abandonment statutes		ODFW	Audubon THPRD	Portland Parks & Recreation parks management
	Low	**European Starling*** *Sturnus vulgaris*				Audubon	
	Low	**House Sparrow*** *Passer domesticus*	Habitat improvement projects			Audubon	Education Habitat improvement projects
	Low	**Eastern Gray Squirrel*** *Sciurus carolinensis*	Ban on relocation Require lethal control whenever captured		ODFW	Audubon	
	Low	**Eastern Fox Squirrel*** *Sciurus niger*	Ban on relocation Require lethal control whenever captured		ODFW	Audubon	

NON-NATIVE TERRESTRIAL AND AQUATIC WILDLIFE SPECIES OF MANAGEMENT CONCERN IN THE CITY OF PORTLAND

Priority for Action	Level of Biological Concern: Medium					
	Species	**Management Actions (in addition to education)**	**More Specific Actions**	**Lead**	**Partners**	**City Role**
High	**Asian Gypsy Moth** *Lymantria dispar*	Report sightings Control (spraying)		ODA	ODFW	
High	**Mosquitofish** *Gambusia affinis*	Possible review by ODFW Wildlife Integrity Task Force for additional restrictions	Educational outreach to prevent introduction into non-isolated waterways	ODFW County Extension Agents	Vector Control Agencies	Education
Medium	**Banded European Woodsnail** *Cepaea nemoralis*	Report sightings		USDA ODA		
Medium	**Domestic Dog** *Misc.*	Enforce off-leash areas to reduce dogs off leash in natural areas				Portland Parks & Recreation parks management
Low	**Brown Garden Snail** *Helix aspersa*	Report sightings		USDA ODA		Education
Low	**Virginia Opossum*** *Didelphis virginiana*	Establish ban on relocation Lethal control when captured		ODFW	Audubon	

NON-NATIVE TERRESTRIAL AND AQUATIC WILDLIFE SPECIES OF MANAGEMENT CONCERN IN THE CITY OF PORTLAND

Priority for Action	Level of Biological Concern: Low					
	Species	**Management Actions (in addition to education)**	**More Specific Actions**	**Lead**	**Partners**	**City Role**
High	None					
Medium	None					
Low	**Mute Swan*** *Cygnus olor*	Report sightings Swan round-ups		ODFW OSP		Report sightings
Low	**Rock Pigeon** *Columba livia*				POT Audubon	
Low	**Eastern Cottontail** *Sylvilagus floridanus*			ODFW	Audubon	
Low	**Black Rat** *Rattus rattus*	Lethal control			Vector control agencies	
Low	**Norway Rat*** *Rattus norvegicus*	Lethal control			Vector control agencies	
Low	**Wrinkled Dune Snail**	Report sightings		USDA ODA		

Acronyms:

ODFW	Oregon Department of Fish and Wildlife
OSP	Oregon State Police (enforcement)
ODA	Oregon Department of Agriculture
USDA	United States Department of Agriculture
DEQ	Department of Environmental Quality
THPRD	Tualatin Hills Parks and Recreation District
POT	Portland Office of Transportation

*Oregon Conservation Strategy Species for the Willamette Valley Ecoregion

Appendix B. Abundance and distribution information of invasive animal species present and established in the City of Portland, invasive animal species present but not yet established in the City of Portland, and invasive animal species not yet known to occur in the City of Portland, but that pose a threat to introduction in the next 5-10 years because of pathway vectors and/or current distribution. These lists were developed using baseline information from Appendix A as well as additional information provided by invasive species experts.

TERRESTRIAL AND AQUATIC ANIMAL INVASIVE SPECIES ASSESSMENT CITY OF PORTLAND

INVASIVE ANIMAL SPECIES** PRESENT AND ESTABLISHED IN THE CITY OF PORTLAND:

Terrestrial Invertebrates

Snails — Wrinkled dune snail, Brown garden snail, Banded European woodsnail)

Aquatic Vertebrates

Bullfrog *(Rana catesbeiana*)
Red-eared slider (*Trachemys scripta elegans*)
Common snapping turtle *(Chelydra serpentine serpentina*)

Birds

European starling (*Sturnus vulgaris*)
House sparrow (*Passer domesticus*)
Rock pigeon (*Columba livia*)
Domestic duck and goose species

Mammals

Nutria (*Myocastor coypus*)
Eastern gray squirrel (*Sciurus carolinensis*) and Eastern fox squirrel (*Sciurus niger*)
Virginia opossum (*Didelphis virginiana*)
Eastern cottontail (*Sylvilagus floridanus*)
Black rat (*Rattus rattus*) and Norway rat (*Rattus norvegicus*)
Domestic dogs and cats

***Excluding fish and zooplankton*
**Oregon Invasive Species Council 100 Worst List*

INVASIVE ANIMAL SPECIES** PRESENT, BUT NOT YET ESTABLISHED IN THE CITY OF PORTLAND:

Terrestrial Invertebrates

Snails — Wrinkled dune snail, Brown garden snail, Banded European woodsnail

Insects

Japanese beetle (*Popillia japonica)*

Birds

Mute swan (*Cygnus olor)*

***Excluding fish and zooplankton*
**Oregon Invasive Species Council 100 Worst List*

INVASIVE ANIMAL SPECIES NOT YET KNOWN TO OCCUR IN THE CITY OF PORTLAND, BUT THAT POSE A THREAT TO INTRODUCTION IN THE NEXT 5-10 YEARS BECAUSE OF PATHWAY VECTORS AND/OR CURRENT DISTRIBUTION:

Terrestrial Invertebrates

Snails — Wrinkled dune snail, Brown garden snail, Banded European woodsnail

Insects

Asian Gypsy Moth* (*Lymantria dispar dispar*) and European Gypsy Moth* (*Lymantria dispar*)
Rosy Gypsy Moth* (*Lymantria mathura*)
Nun Moth* (*Lymantria monacha*)
Light Brown Apple Moth* (*Epiphyas postvittana*)
Oak splendour beetle (*Agrilus biguttatus*)
Oak ambrosia beetle (*Platypus quercivorus*)
Woodwasps* (*Sirex noctilio* and *Tremex* spp.)
Emerald Ash borer* (*Agrilus planipennis* Fairmaire)

Terrestrial Invertebrates

Channeled apple snail (and other apple snails) (*Ampullariidae* spp.)
Chinese mystery snails (*Cipangopaludina chinensis*)

Aquatic Invertebrates

Rusty crayfish* (*Orconectes rusticus*), virile crayfish (*Orconectes virilis*), and/or ringed crayfish (*Orconectes neglectus*)
New Zealand mudsnails (*Potamopyrgus antipodarum*)
Mitten crab* (*Eriocheir sinensis*)
Spiny waterflea* (*Bythotrephes cederstroemi*) and fishhook waterflea* (*Cercopagis pengoi*)
Zebra mussel *(*Dreissena polymorpha*) and Western quagga mussel *(*Dreissena rostriformis bugensis*)

Avian Species

Mute swans* (*Cygnus olor*)
Eurasian Collared-dove (*Streptopelia decaocto*)

Mammals

Feral swine* (*Sus scrofa*)

***Excluding fish and zooplankton*
**Oregon Invasive Species Council 100 Worst List*

Asian gypsy moth (*Lymantria dispar dispar*)

What is it? The gypsy moth is a moth in the family Lymantriidae of Eurasian origin. It is on the Oregon Invasive Species Council's 100 Worst List.

Where did it come from? Originally ranging from Europe to Asia, it was introduced to North America in the late 1860s and has been expanding its range ever since.

What is its impact? The European gypsy moth has an exceptionally broad host range (>250 species), but the host range of the Asian gypsy moth (AGM) is broader. Oaks, poplars, willows, lindens, birches, and apple, are preferred hosts by both forms. In addition, larches, elms, and persimmon, are highly preferred by this insect. Larch and broadleaf trees are preferred by AGM. However, other conifers growing in mixture with preferred hosts can be defoliated during high insect densities. European gypsy moths defoliate 4 million acres of forests each year; because female AGM can fly, their potential to spread and defoliate large tracts of forestland is great.

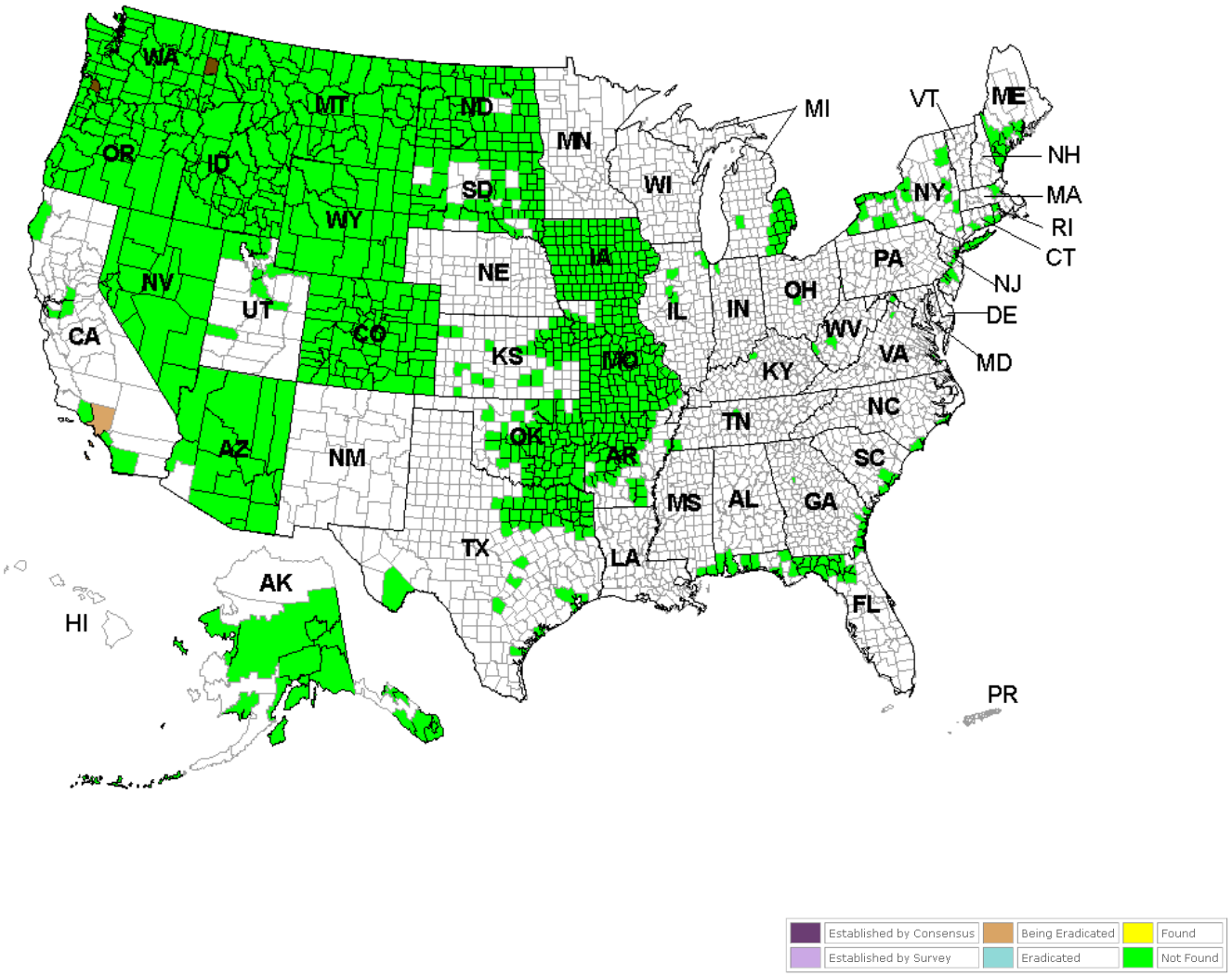
The AGM is of great concern due to its potential for rapid establishment and spread. The pest can cause severe damage to trees over a large area; heavy infestations may result in repeated and complete defoliation of trees. The ability of AGM females to fly long distances (up to 25 miles) makes it probable that it could quickly infest and spread throughout the United States. Defoliation can kill trees directly or reduce vigor leading to secondary insect infestation or disease infection, also resulting in tree death. As well as having direct economic effects on commercial forestry and horticulture, AGM has the potential to reduce the aesthetic, recreational and biodiversity values of parks, rangelands, and wilderness areas.[22]

USDA-APHIS considers AGM a high-risk pest, and there are several levels of safeguarding in place to keep it out of Oregon (Mark Hitchcox, pers. comm.). APHIS funds trapping surveys targeting AGM along the Columbia River and in Coos Bay. This is in addition to the 15,000 traps placed to monitor for North American (European) Gypsy Moth. Any moths caught with either program are screened molecularly to verify origin and subspecies (to determine Asian versus North American strain), and thus help plan the scope of response. Customs and Border Protection continues to find AGM egg masses on ships traveling up the Columbia River, and detection surveys continue to monitor for domestic infestations.

Where is it currently found? AGM was first identified in North America late in 1991 near the Port of Vancouver in British Columbia, Canada. Asian Gypsy Moth has been detected twice: once in Forest Park (2000) and in St. Helens, OR (2006) (Mark Hitchcox, USDA-APHIS). Eradication and 3 years of monitoring trapping were funded by APHIS, and carried out by Oregon Department of Agriculture.

[22] http://www.ag.purdue.edu/entm/Pages/Programs.aspx

REPORTED STATUS OF ASIAN GYPSY MOTH –
DISPLAY DATE: 08/10/2009 LAST SURVEY: 05/31/2009



The following is a detection summary of gypsy moths in Oregon. Note that there is one occurrence of Asian gypsy moths among the many detections of European gypsy moths.

2008 Gypsy Moth Detection Summary				
County	**City or Area**	**Previous Detection History**	**No. GMs 2008**	**2008 Trap Density**
2006 detection sites				
Clackamas	Damascus	1 moth in 2006 0 moth in 2007	0	16-25/mi^2
Josephine	O'Brien	1 moth in 2006 0 moth in 2007	0	16-25/mi^2
Lane	Eugene, Hawkins Heights	1 moth in 2006 0 moth in 2007	0	16-25/mi^2
Multnomah	N Portland, Holman St & Burrage Ave	1 moth in 2006 0 moth in 2007	0	16-25/mi^2
	N Portland, Kenton Park	1 moth in 2006 0 moth in 2007	0	16-25/mi^2
	SW Portland, Council Crest Park	1 moth in 2006 0 moth in 2007	0	16-25/mi^2
2007 detection sites				
Columbia	Clatskanie	1 moth in 2007	0	25-49/mi^2
Deschutes	Sunriver	1 moth in 2007	0	25-49/mi^2
Lane	Eugene, SE	2 moths in 2007	7	25-49/mi^2 (increased)
Josephine	Murphy	1 moth in 2007	0	25-49/mi^2
Sherman	Wasco	1 moth in 2007	0	25-49/mi^2
2008 detection sites				
Lane	Near Eugene, SW		2	1-2/mi^2
Multnomah	Portland, NE		1	9/mi^2
	Portland, NW		1	9/mi^2
Washington	Portland, NW		1	9/mi^2
2007 eradication sites				
Columbia	St Helens, 3 applications of Btk by air to 640 acres	1 Asian GM in 2006 0 moth in 2007	0	25-49/mi^2
Deschutes	Bend, 3 applications of Btk by air to 533 acres	1 moth in 2005 57 moths 2006 0 moth in 2007	0	16-25/mi^2, 1-3/acre in core
2008 eradication site				
Jackson	Shady Cove, 3 applications of Btk by air to 336 acres	2 moths in 2005 2 moths in 2006 6 moths in 2007	0	25-49/mi^2, 1-3/acre in core
		Total	**12**	

Japanese beetle (*Popillia japonica*)

What is it? The Japanese beetle is about 0.6 inches long and 0.4 inches wide, with iridescent copper-colored elytra and green thorax and head. It is on the Oregon Invasive Species Council's 100 Worst List.

Where did it come from? It is not very destructive in Japan, where it is controlled by natural enemies.

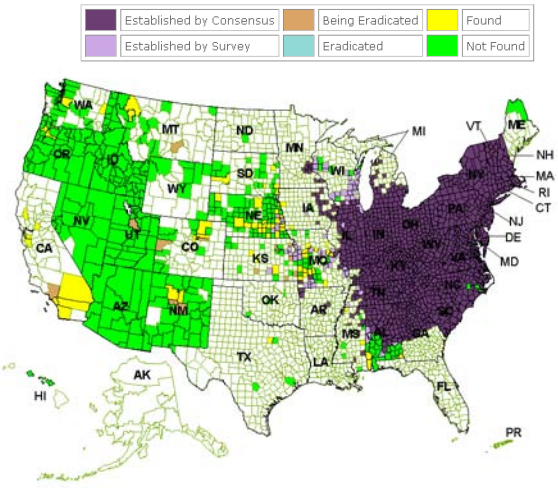
What is its impact? The Japanese beetle is a serious pest of about 200 species of plants, including rose bushes, grapes, hops, canna, crape myrtles, and other plants. Western Oregon's relatively wet and mild climate, abundant suitable habitat and preferred host material are favorable for Japanese beetle survival and establishment. Many of Oregon's top agricultural commodities and urban and rural environments would be affected if the Japanese beetle becomes established. If it does become established in Oregon and disperses throughout the state, the economic impact to all crops, commodities, and other related businesses could be over $34 million.[23]

Where is it currently found? ODA has trapped 202 Japanese beetles and has conducted three successful eradication programs, all in residential areas, since 1988. Eradication treatments continued at Portland International Airport's (PDX) Airtrans Center due to continued JB trap catches (three males, one female) in the area. This is the same area where 11 JBs were trapped in 2002, three in 2003 and three in 2004, prompting eradication treatments in each year. Eradication treatments initiated in 2004 were continued in 2005 at two new sites near PDX where JBs were found in 2004, the Portland Air National Guard (ANG) base adjacent to the Airtrans Center (one JB), and Colwood National Golf Course adjacent to the Portland ANGB (four JBs). Maintaining effective exterior quarantines, regulatory programs, and annual statewide detection programs are the best way to keep Oregon free from JB.

About 5,126 JB traps were placed in 2005, most in western Oregon. However, all cities and towns statewide are considered at risk by the Oregon Department of Agriculture.

REPORTED STATUS OF JAPANESE BEETLE

Display Date: 08/11/2009
Last Survey: 05/31/2009
This map represents survey data over the last three years.



[23] http://www.oregon.gov/ODA/PLANT/docs/pdf/ippm_jb_pra_or08.pdf

Snails — Wrinkled dune snail, Brown garden snail, Banded European woodsnail

Snails are mollusks, more specifically, gastropods. Much of the concern of alien snail establishment is concentrated on several families of snails, in particular snails which originate from locales with Mediterranean climates. Some of the most problematic species are in the families Helicidae, Hygromiidae, and Succineidae. These snails may easily adapt to the mild conditions presented in the Pacific Northwest. When hot or cold temperatures arrive they withdraw into their shells. They seal the opening with a thin layer of hardened mucus and calcium called an epiphragm. This tactic, termed aestivation during hot weather and hibernation or diapause when induced by short photoperiods and cold, allows them to siesta until conditions are more favorable, namely warm, moist and humid.[24]

Wrinkled dune snail (*Candidula intersecta)*

Where did it come from? The species originates in northern Europe, but is also naturalized in New Zealand and Australia, where it is commonly reported in open, dry environments, including pastures,[25] and "habitats such as coastal dunes, exposed limestone outcrops, open scrub…".[26]

What is its impact? Wrinkled dune snails are frequently intercepted at the Port of Portland on cargo containers from Italy, Colombia, and Chile and are considered "Actionable" by USDA-APHIS Plant Health, Plant Protection and Quarantine.[27] Based on historical observations, wrinkled dune snails may exhibit behaviors that can cause agricultural impacts in the state of Oregon. In Europe, these snails are a recognized pest of apples, pears, plums and peaches, damaging fruit while still on the tree (they break the skin of the fruit, which allows fungal attack and fruit rot).[28] These snails are also reported to cause feeding damage to seeds, seedlings and young plants of spring grain. When populations reach high numbers, this species may exhibit a "massing behavior" where the snails climb and enter a dormant state on plants or other structures. This massing behavior has been reported to contaminate grain fields during harvest, resulting in downgraded quality and loss of marketability. The USDA New Pest Advisory Group is reviewing the known background information and preparing a pest risk assessment for this species. Further surveys are being planned. There is no current estimate on the economic impact of wrinkled dune snails, however, these and other land snails are considered to have high risk economic impacts to Oregon's nursery, agricultural, and livestock industries.

Where is it currently found? — Wrinkled Dune Snail is known from several sites in Coos, and Curry Counties, and from one site in Douglas County. It is not known to occur in the Portland area, although there is certainly a pathway, climate and history that would support the introduction (Mark Hitchcox, USDA-APHIS, pers. comm.).

[24] http://nwrec.hort.oregonstate.edu/robin%27sw.html
[25] Barker, G., ed. 2002. *Molluscs as Crop Pests*. CABI Publishing, 468pp.
[26] Barker, G., ed. 1993. *Fauna of New Zealand*. Department of Scientific and Industrial Research, 70pp.
[27] http://oregonstate.edu/dept/nurspest/Candidula.htm
[28] Godan, D. 1983. Pest Slugs and Snails. In: D. Goden, Editor, *Biology and Control*, Springer, Berlin, New York.

Brown garden snail (*Cantareus aspersus*)

Photo: Robin Rosetta, OSU

Where did it come from? The brown garden snail (formerly *Helix aspersa* and *Cryptomphalus aspersus*) is a member of the family Helicidae, and originates from Britain, western Europe, and along borders of the Mediterranean and Black Seas.

What is its impact? This snail is reported to cost the state of California $7-10 million annually in agricultural losses and control costs. Currently, brown garden snails pose risks to nurseries; it is a quarantine pest and is established in sites around Oregon and Washington. The brown garden snail feeds on a wide range of host material and can commonly be found climbing into trees and shrubs.

Where is it currently found? — In the United States, it is reported from California north to British Columbia, Canada, in most southeastern states and along the east coast north to New Jersey. The brown garden snail is the most well established exotic snail in Oregon. The brown Garden snail is established in several residential sites in the Portland area, though in spotty distribution (Mark Hitchcox, USDA-APHIS, pers. comm.). It has primarily been spread through the movement of plants and soil.

Banded European woodsnail (*Cepaea nemoralis*)

Photo: © 2005 Kristina Ovaska

Where did it come from? The banded European woodsnail is native to central and western Europe. It can be found in gardens and parks in urban areas, on and under plants, and sometimes up trees, well off the ground. This is a species that people may intentionally introduce because of its colorful shell.

What is its impact? While introduced populations of wood snails seem to have had only minor impact as agricultural pests, they may have the potential to competitively exclude some native species of snails.[29]

Photo: www.nutbatch.typepad.com

Where is it currently found? The banded European woodsnail was introduced to southern Vancouver Island, Greater Vancouver, the Fraser Valley, the Okanagan (Westbank) and the Columbia Basin. It has been found at 2 sites in Portland, with one industrial site supporting a known population (ODA survey 2009). USDA-APHIS is uncertain of the type of response, if any, there will be to this particular species of snail (Mark Hitchcox, USDA-APHIS).

[29] Whitson, M. 2005. Cepaea nemoralis (Gastropoda, Helicidae): The Invited Invader. Journal of the Kentucky Academy of Science 66(2):82-88.

Bullfrog (*Rana catesbeiana*)

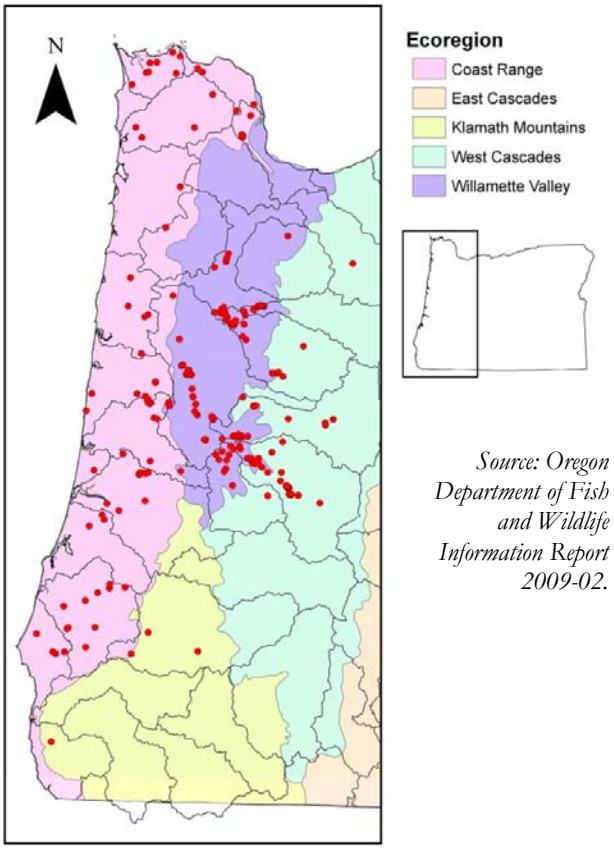
Photo: Bill Leonard, DOI, USGS

What is it? The bullfrog is an aquatic frog, a member of the family Ranidae, or "true frogs," native to much of North America, but not Oregon. This is a frog of larger, permanent water bodies, swamps, ponds, lakes, where it is usually found along the water's edge.

Where did it come from? Bullfrogs were first introduced to Oregon in the 1920s to provide frog legs for the West Coast market. The frog leg industry declined in the 1930s, but the bullfrogs remain.

What is its impact? The bullfrog is highly adaptable to a number of aquatic habitats and it is an opportunistic species that will eat anything it can catch and swallow. Because of its voracious appetite, there is concern about the effect on several rare or declining species in the Pacific Northwest, including the spotted frog (*Rana pretiosa*), Western pond turtle (*Clemmys marmorata*), Western Painted Turtle (*Chrysemys picta bellii), a*nd Oregon chub (*Oregonichthys crameri*) (*Oregon Department of Fish and Wildlife, Non-native Wildlife in Oregon*).

Where is it currently found? — In a study on 21 natural areas in Portland in 2008, bullfrogs were associated with ponds that do not dry in the summer.[30] Bullfrogs are designated as "established" in the Tualatin River Wildlife Refuge.[31] An ODFW study conducted in 2007 documented bullfrogs at 318 sites in western Oregon; they were the most commonly observed amphibian in the state. Although bullfrogs were present at sites in the Coast Range and West Cascades ecoregions, the bulk of the observations were in the Willamette Valley ecoregion. Bullfrogs were typically observed in isolated ponds, beaver ponds, off-channel habitats and other slow water environments.[32] Bullfrogs are found in all local 4th field subbasins in the Portland metro area.[33] In 2003, the Port of Portland observed bullfrogs in emergent wetlands at the Vanport wetland tract in NE Portland (Port of Portland 2004.[34] The City of Hillsboro's Integrated Pest Management Plan (2009) designates bullfrogs as "most invasive."



Source: Oregon Department of Fish and Wildlife Information Report 2009-02.

[30] Holzer, Katie. 2008. Bike Paths and New Ponds: Amphibian Restoration in the Pacific Northwest. Paper presented at the annual meeting of the International Congress for Conservation Biology, Convention Center, Chattanooga, TN, July 10, 2008.
[31] http://nas.er.usgs.gov/queries/FactSheet.asp?speciesID=71
[32] https://nrimp.dfw.state.or.us/CRL/Reports/Info/AmphibianInformationReport2007_2.pdf
[33] http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Rana%20catesbeiana
[34] http://www.portofportland.com/PDFPOP/Miti_Vanport_Wetlands.pdf

RED-EARED SLIDER (*Trachemys scripta elegans*)

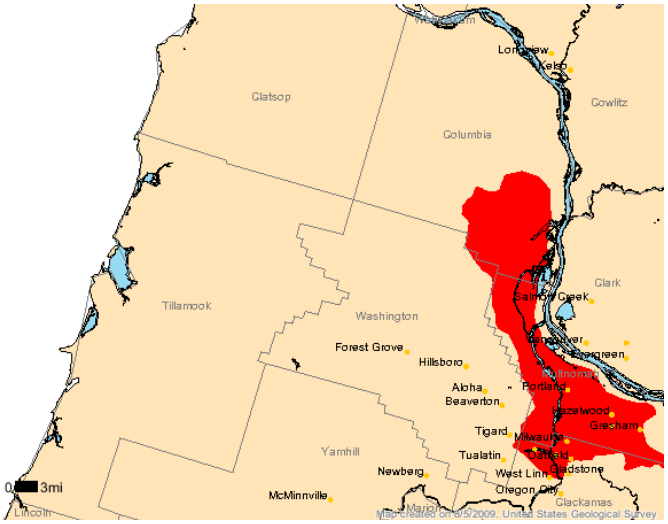
Photo: Wikimedia.org

What is it? The Red-Eared Slider is a semi-aquatic turtle belonging to the family Emydidae. It is a subspecies of pond slider.

Where did it come from? It is a native of the southern United States, but has become common in various areas of the world due to the pet trade. They are very popular pets in the United States, the Netherlands, Canada, Japan, and the United Kingdom.

What is its impact? Red-eared sliders are illegal in Oregon because they compete with native turtles for food and nesting, basking, and cover habitat. Red-eared sliders can transmit parasites and diseases, and carry *Salmonella*. Most of the red-eared sliders in Oregon are pets that have been released to the wild.

Where is it currently found? Red-eared sliders occur in large numbers throughout the Willamette Valley and in other areas of Oregon.[35] The following map shows the mapped collection data for red-eared sliders in the Portland metropolitan area.[36] Red-eared sliders currently occur at Smith and Bybee lakes (Elaine Stewart, Metro and Sue Beilke, ODFW, pers. comm..) as well as the adjacent Ramsey Lakes area (Sue Beilke, ODFW, pers. comm..). There are confirmed sightings of red-eared sliders in the Columbia Slough to the east, in Johnson Creek in Gresham, in both Fanno and Summer Creeks in Tigard (tributaries of The Tualatin River, which also has sliders), in Beaverton in Beaverton Creek, in Milwaukee in a pond off the Willamette, and on Sauvie Island. A red-eared slider removal program was initiated by ODFW in 2006 on the Willamette River.



Source: USGS NAS database.

[35] http://www.dfw.state.or.us/conservationstrategy/invasive_species/docs/red-eared_slider_fact_sheet.pdf
[36] http://nas.er.usgs.gov/queries/FactSheet.asp?speciesID=1261

Common snapping turtle (*Chelydra serpentine serpentina*)

Photo: www.torontozoo.com

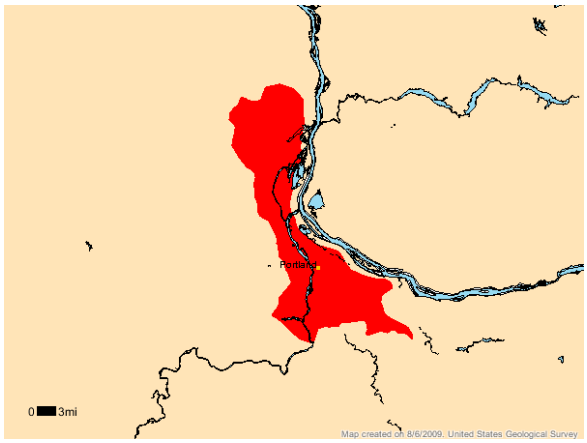
What is it? The common snapping turtle is a freshwater turtle of the family Chelydridae, and is the largest freshwater turtle in the United States. Snapping turtles are found in ponds, lakes, sloughs, and slow moving rivers; they prefer water bodies with mud bottoms. This species is on the Oregon Invasive Species Council's 100 Worst List.

Where did it come from? Common snapping turtles are found from southern Alberta and east Nova Scotia southward to the Gulf of Mexico and into central Texas.

What is its impact? Common snapping turtles are prohibited in Oregon because they compete with native turtles for food, nesting, and cover habitat. They will eat anything that can fit between their jaws, including vegetation, amphibians, crayfish, worms, birds, small mammals, carrion, and other turtles.[37] In addition, they transmit parasites and diseases.

Where is it currently found? Common snapping turtles have been collected in Portland and Multnomah County.[38] Snapping turtles occur in Lake Oswego (nest building has been observed), lower Tualatin River, Fanno Creek (nest building has been observed) and River Mill Dam on the Clackamas River. ODFW initiated an effort in 2006 to collect snapping turtles from the Willamette River (100th Meridian meeting notes, October 2006). Snapping turtles have been observed at the confluence of the Columbia and Sandy Rivers, the streets in the city of Portland (one was found in a storm water drain a number of years ago), Fanno Creek in Beaverton and down through Tigard almost to the mouth of the Tualatin River, Lake Oswego (reports since the early '90s), Estacada, and east of Lebanon (Sue Beilke, ODFW, pers. comm.). The table on the following page lists known locations of snapping turtles in the Portland metro region.[39]

Source: USGS NAS database.



[37] http://www.dfw.state.or.us/conservationstrategy/invasive_species/docs/snapping_turtles_fact_sheet.pdf
[38] Brown, H. A., R. B. Bury, D. M. Darda, L. V. Diller, C. R. Peterson, and R. M. Storm. 1995. Reptiles of Washington and Oregon. Seattle Audubon Society, Seattle. 176 pp.
[39] http://www.dfw.state.or.us/conservationstrategy/news/2007/April2007.asp

Zebra mussel (*Dreissena polymorpha*) and Western quagga mussel (*Dreissena rostriformis bugensis*)

What are they? Zebra and quagga mussels are mollusks. Zebra mussels are named for the striped pattern of their shells. Color patterns can vary to the point of having only dark or light colored shells and no stripes. They are typically found attached to objects, surfaces, or each other by threads underneath the shells. Zebra mussels can be easily distinguished from quagga mussels; when placed on a surface, zebra mussels are stable on their flattened underside while quagga mussels, lacking a flat underside, will fall over.[40]

Where did they come from? Quagga mussels are indigenous to the Dneiper River drainage of Ukraine. They were discovered in the Bug River in 1890 by Andrusov, who named the species in 1897. Canals built in Europe have allowed range expansion of this species, and it now occurs in almost all Dneiper reservoirs in the eastern and southern regions of Ukraine and deltas of the Dnieper River tributaries. Zebra mussels are native to the Black, Caspian, and Azov Seas. In 1769, Pallas first described populations of this species from the Caspian Sea and Ural River.

What is its impact? Zebra mussels (top photo) and their cousins, quagga mussels (bottom photo), are perhaps the greatest impending threat to our water resources because of their ability to clog water intake structures. If they were to become established in the Columbia River, it would cost $25 million per year in additional maintenance costs at 13 mainstem hydroelectric plants; these costs will be passed on to electric customers. Costs to irrigators and industrial and municipal water users have not been estimated precisely, but we do know that the Metropolitan Water District in Southern California is now spending $10 million per year to treat quagga mussels in their water system. Costs to water users statewide in Oregon would be significant if these mussels were to become established, as would the losses in recreation and fish and wildlife resources. These mussels are slowly moving closer to Oregon.

Where are they currently found? USGS has a map that shows, real-time, the current distribution of zebra and quagga mussels in the United States.[41] Currently, there have been no reports of zebra or quagga mussels in Oregon waterways, although boats with these species of mussels attached have been sighted traveling through Oregon.

[40] Mackie, G. L., and D. W. Schlosser, 1996, Comparative biology of zebra mussels in Europe and North America: an overview, *American Zoologist* 36:244-258.
[41] http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/quaggamusseldistribution.asp

European starling (*Sturnus vulgaris*)

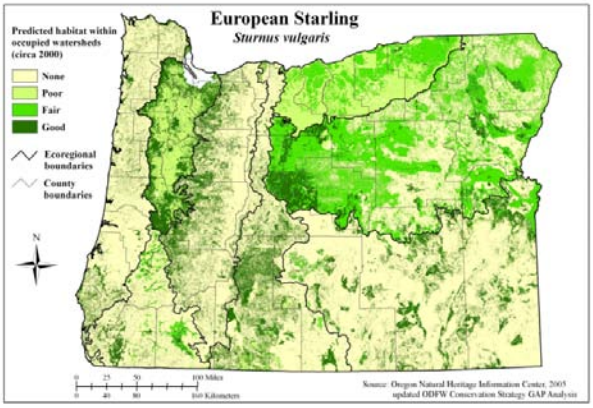
Photo: Lee Karney
USDA, Agricultural Research Service,
Invasive.org.

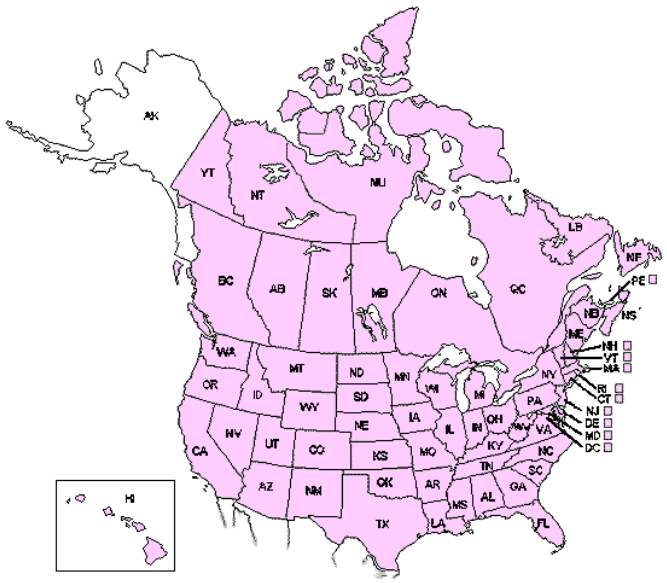
What is it? Starlings are chunky and blackbird-sized, but with short tails and long, slender beaks. In flight their wings are short and pointed, making them look rather like small, four-pointed stars (and giving them their name).[42]

Where did it come from? In May of 1889, 20 pairs of starlings were released in Portland, but failed to survive, although a few were found nesting in 1901. Starlings were introduced in Central Park (New York) in 1890 and have since spread throughout North America.

What is its impact? This recent and extremely successful arrival to North America is a fierce competitor for nest cavities. Starlings often take over the nests of native birds, expelling the occupants. With so many starlings around, this causes some concern about their effect on native bird populations. Nevertheless, a study in 2003 found few actual effects on populations of 27 native species. Only sapsuckers showed declines due to starlings; other species appeared to be holding their own against the invaders.[43]

Where is it currently found? — A 1999 study that included 54 riparian sites, and 2003-2004 surveys of 25 sites in Clackamas County indicated that European starlings are widespread in the Portland metropolitan area, and are most closely associated with edge and urban habitats (Hennings, pers. comm.). They can dominate narrow riparian areas during the breeding season (Hennings, pers. comm.). Breeding bird surveys from the Tualatin Route show a 5.8% increase from 1966-1979 and a 0.3% increase from 1980-2007.





Source:NatureServe 2009. Map depicts locations (pink) where starlings are "exotic."

[42] Cornell Lab of Ornithology, http://www.allaboutbirds.org.
[43] Ibid.

House sparrow (*Passer domesticus*)

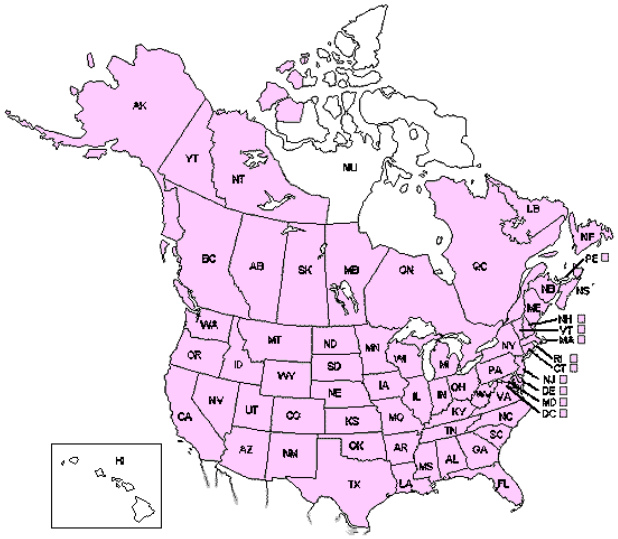
Photo: Wikimedia.org

What is it? House Sparrows aren't related to other North American sparrows, and they're differently shaped. House Sparrows are chunkier, fuller in the chest, with a larger, rounded head, shorter tail, and stouter bill than most American sparrows. They have lived around humans for centuries. Look for them on city streets, taking handouts in parks and zoos, or cheeping from a perch on a roof or backyard trees. House Sparrows are absent from undisturbed forests and grasslands, but are common in rural areas around farms.[44]

Where did it come from? The House Sparrow is native to Old World (northern Scandinavia and northern Siberia south to northern Africa, Arabia, India, and southeast Asia). It was introduced into Brooklyn, New York, in 1851. By 1900, it had spread to the Rocky Mountains. Two more introductions in the early 1870s, in San Francisco and Salt Lake City, aided the bird's spread throughout the West. House Sparrows are now common across all of North America except Alaska and far northern Canada.[45]

What is its impact? The House Sparrow prefers to nest in manmade structures such as eaves or walls of buildings, street lights, and nest boxes instead of in natural nest sites such as holes in trees. House Sparrows aggressively defend their nest holes. A scientist in 1889 reported cases of House Sparrows attacking 70 different bird species. House Sparrows sometimes evict other birds from nest holes, including Eastern Bluebirds, Purple Martins, and Tree Swallows.

Where is it currently found? — The house sparrow is widespread in the City of Portland.



Source:NatureServe 2009. Map depicts locations (pink) where how sparrows are "exotic."

[44] Cornell Lab of Ornithology, http://www.allaboutbirds.org.
[45] Ibid.

Mute swan (*Cygnus olor*)

Photo: Wickimedia.org

What is it? Mute swans are large white birds with a long curved neck, black face, and orange bill. Mute swans prefer shallow coastal ponds, estuaries, ponds, bogs, and streams flowing into lakes. Mute swans are on the Oregon Invasive Species Council's 100 Worst List.

Where did it come from? A native of northern and central Eurasia, the mute swan was introduced into North America from northern and central Eurasia.

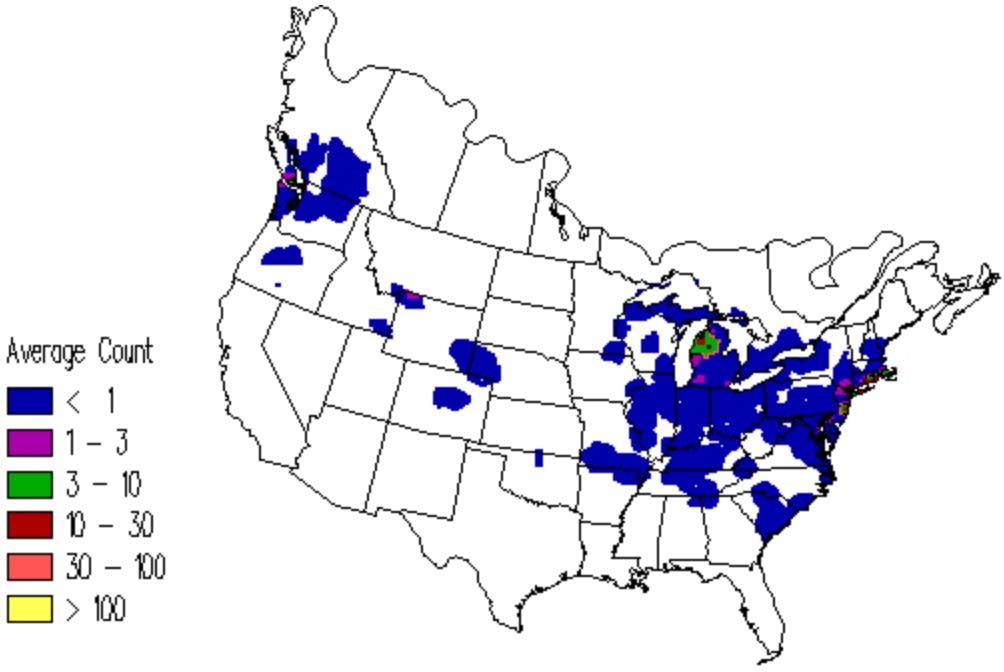
What is its impact? Escaped individuals have established breeding populations in several areas, where their aggressive behavior threatens native waterfowl.[46] Mute Swans have been devastating to freshwater submerged aquatic vegetation communities in the United States.[47] While feeding, the birds uproot and dislodge three times the amount of submerged plants than they ingest. When populations of mute swans reach numbers in the thousands, the result is a substantial loss of submerged aquatic vegetation. Grazing by mute swans has been so severe that they have caused rapid local extinction of a number of plant species. Submerged aquatic vegetation provides food, shelter and breeding areas for economically and ecologically important species of fish, invertebrates, and shellfish; provides food and nesting sites for resident and migratory waterfowl; and improves water quality through filtering out sediments and pollutants from runoff. Mute swans out-compete native waterfowl for habitat and food, and because mute swans are non-migratory, they reduce the available habitat for native breeding and wintering birds year round. Their aggressive territorial behavior cause nest abandonment of native species. They have also been known to kill adult and juveniles geese, ducks, and other wetland birds, and mute swans hybridize with trumpeter swans and tundra swans. Mute swans have attacked and critically injured children and pets. They are also nuisance problem causing serious property damage which results in economic losses. They significantly affect the structure and functioning of ecosystems and are reducing the biodiversity of wetlands.

Where is it currently found? One mute swan was reported seen on Steigerwald NWR in Clark County, Washington in January of 2006 and February and October of 2005 (Oregon bird watch listserv) – birders continue to report sightings of one bird at Steigerwald (Sumner Sharpe, pers. comm.). In 2006, 1 bird was reported at Oregon City Old Acres.[48] About 2004, a few mute swans were removed from Sauvie Island (Rick Boatner, ODFW, pers. comm.). Lakeside Gardens on Foster Road in Portland has mute swans (Lisa DeBruyckere). Mute swans have also been reported in the following locations (birdnotes.net):

Bend 1990, 1991, 1992, 1993, 1995, 1996, 2007, 2008
Redmond 2009
Florence, Lane County, 1991
Columbia Estuary, 1995
Simpson Park, Linn County 1998
Lake Selmac County Park, Josephine County 2000, 2004
Deschutes County 2002, 2004, 2009

[46] Cornell Lab of Ornithology, http://www.allaboutbirds.org.
[47] http://www.columbia.edu/itc/cerc/danoff-burg/invasion_bio/inv_spp_summ/Cygnus_olor.html.
[48] www.ebird.org.

Winter distribution map of mute swans:



Rock pigeon (*Columba livia*)

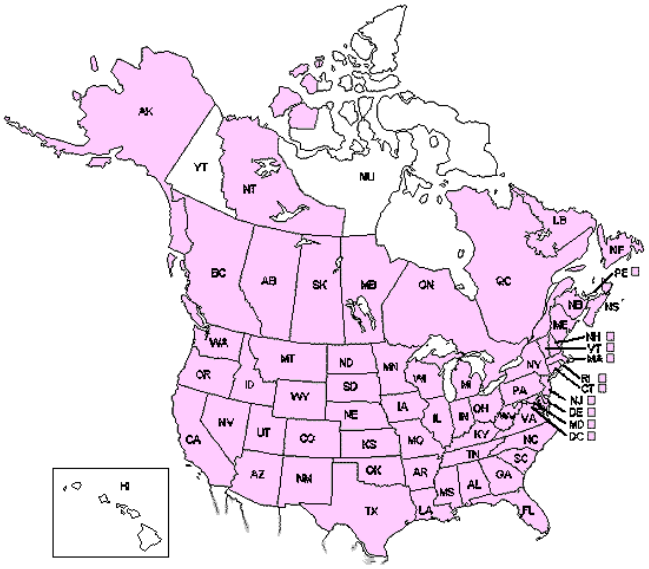
Photo: Wickimedia.org

What is it? The Rock Pigeon is a member of the bird family Columbidae (doves and pigeons). Rock pigeons live on discarded food and offerings of birdseed. In addition to the typical blue-gray bird with two dark wingbars, you'll often see flocks with plain, spotted, pale, or rusty-red birds in them.

Where did it come from? Introduced to North America from Europe in the early 1600s, pigeons nest on buildings, window ledges, barns and grain towers, under bridges, and on cliffs.

What is its impact? In areas where pigeons are considered pests, some cities have ordinances against feeding pigeons. Contact with pigeon droppings poses a minor risk of contracting histoplasmosis, cryptococcosis, and psittacosis.

Where is it currently found? Rock pigeons are widespread in urban and agricultural habitats, and present, but rare, in suburban areas (Hennings, pers. comm.). They are a year-round resident in the City of Portland,[49] and are considered common and widespread throughout their range.



Source:NatureServe 2009. Map depicts locations (pink) where rock pigeons are "exotic."

[49] Cornell Lab of Ornithology, http://www.allaboutbirds.org.

Domestic duck and goose species

Photo: Majestic Waterfowl Sanctuary

What is it? Domestic ducks and geese are flightless birds. They are not classified as companion animals by animal shelters, and not considered wild by wildlife rescue organizations.

Where do they come from? Domestic ducks and geese have usually been abandoned by people and persist in natural areas.

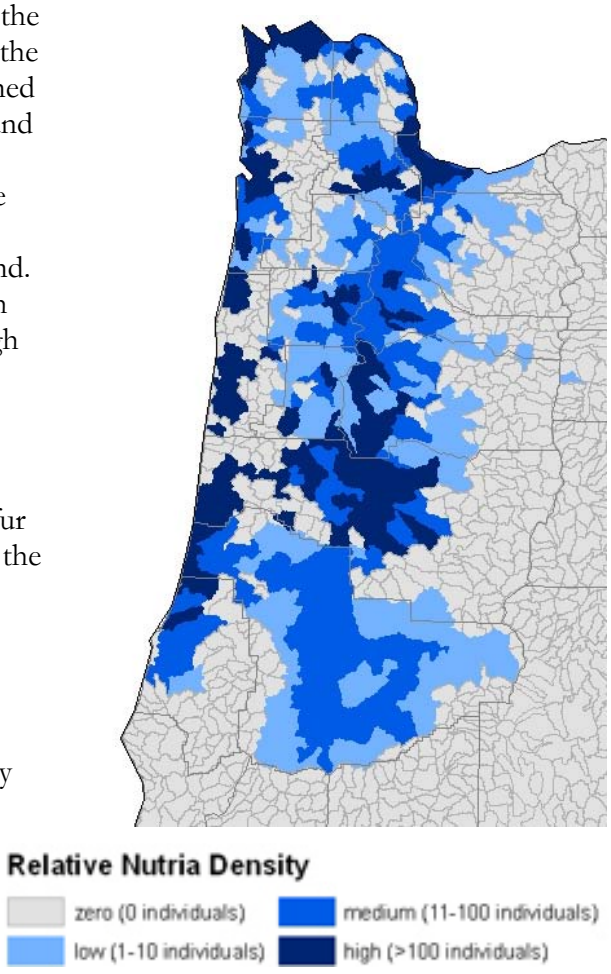
What are their impacts? Many of the large domestic ducks and geese left in urban parks are flightless and unable to escape predators or withstand the breeding season; those animals that are able to survive often displace native wildlife, destroy valuable habitat, and have the potential to introduce diseases and parasites.[50] New Castle Disease, duck virus enteritis (DVE), fowl cholera, paratyphoid, avian tuberculosis, chlamydiosis, bird flu, and West Nile virus are just some of the diseases that domestic ducks can transmit to wild flocks.[51] The Audubon Society of Portland notes the following about domestic ducks and geese: Many of the ducks and geese inhabiting urban parks are domestic ducks that have escaped or been deliberately released from captivity. Many of these birds then successfully breed in the wild. They include the domestic Mallard (usually much larger than the native wild mallard), the Muscovy duck, Indian runner ducks, and a variety of mixed duck breeds, the Chinese goose, the Graylag goose, Toulouse goose, and the "white" goose. The presence of these mostly flightless, non-migratory ducks in urban wetlands and parks causes overcrowding and reduces the already scant urban habitat available to native waterfowl.

Where is it currently found? Domestic ducks and geese are widespread and common in the City of Portland. Their preferred habitat is human-made ponds.

[50] http://www.audubonportland.org/
[51] http://www.ibrrc.org/

Nutria (*Myocastor coypus*)

What is it? Nutria are large semi-aquatic mammals. They are often confused with beavers or muskrats, but are distinct in that nutria are much smaller than the beaver and much larger than the muskrat. One of the most distinguishing features of the nutria is a thin, rounded, rat-like tail pointed at the tip, as opposed to the horizontally flattened tail of the beaver and the vertically flattened tail of the muskrat. The hind legs of the nutria are much longer than the front legs, giving the species a hunched appearance when on land. The nutria also has webbed hind feet, and eyes and ears set high on the head. These adaptations allow the nutria to move through aquatic environments efficiently and stay underwater for long periods of time.[52]



Source: Sheffels and Sytsma (2007)

Where did it come from? Nutria are native to South America and have been introduced throughout the world, primarily for fur farming. Nutria were introduced in Oregon and Washington in the 1930s. An unknown number escaped from a fur farm in Tillamook County during a flood in 1937.

What is its impact? Populations are expanding in Oregon and Washington, and nutria damage and nuisance complaints have increased in recent years, primarily because of damage caused by nutria feeding and burrowing. Nutria are also capable of transporting parasites and pathogens transmittable to humans, livestock, and pets.[53] Nutria burrow under and through water control structures such as levees, dikes, and dams, weakening the strength of these structures.[54] Their burrows also weaken and collapse banks and road beds, especially in locations where the soil is saturated and the slope is greater than forty-five degrees.[55] Much of the Columbia River floodplain within Portland is protected by dikes.

[52] Sheffels, T. and M. Sytsma. 2007. *Report on nutria management and research in the Pacific Northwest.* Portland State University. 49pp.
[53] Ibid.
[54] http://www.clr.pdx.edu/docs/CLR_nutria_report.pdf
[55] Peterson, R. 1998. Beaver, Muskrat and Nutria on Small Woodlands. *Woodland Fish and Wildlife,* MISCO196:1-8.

Where is it currently found? — Sheffels and Sytsma[56] asked ODFW wildlife biologists to estimate the relative number of nutria in each sub-watershed for which they were responsible by choosing one of four predetermined categories — 0 individuals (zero density), 1-10 individuals (low density), 11-100 individuals (medium density), and >100 individuals (high density). Information received was based on the working knowledge of wildlife biologists who are very familiar with the watersheds in which they work. However, this approach left a void because of the large number of HUCs for which district biologists did not have enough information to estimate relative nutria densities. Nutria populations are known to exist in the coastal regions of both Oregon and Washington. There are high densities of nutria in the City of Portland.

[56] Sheffels, T. and M. Sytsma. 2007. *Report on nutria management and research in the Pacific Northwest*. Portland State University. 49pp.

Eastern gray squirrel (*Sciurus carolinensis*) and Eastern fox squirrel (*Sciurus niger*)

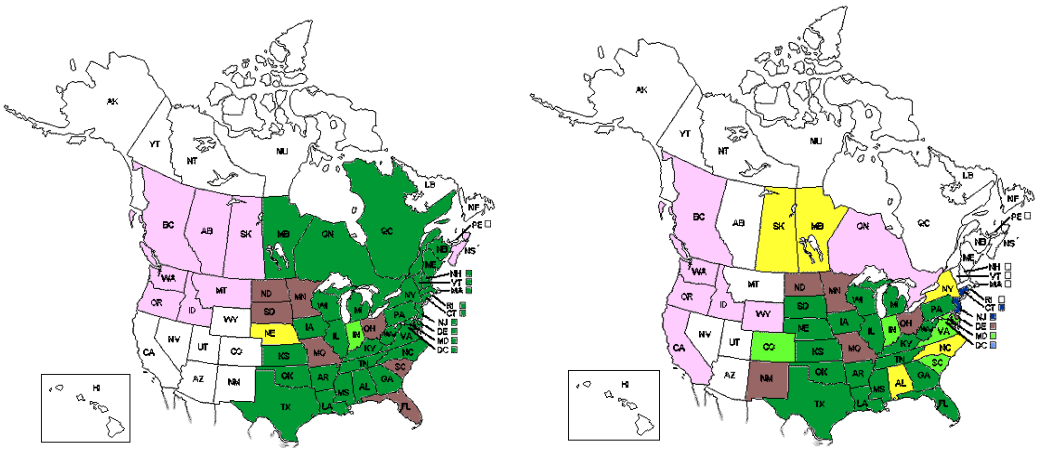
What are they? The native Western Gray squirrel (*Sciurus griseus*) (bottom photo) is slightly smaller than the fox squirrel (middle photo) and slightly larger than the Eastern Gray Squirrel (top photo). All three squirrels are ecologically similar and use the same resources for food and nesting.

Where did they come from? The Eastern gray squirrel and Eastern fox squirrel are both native to eastern North America, from southern Canada to Florida and east to the Great Plains. The Eastern gray squirrel has been introduced in several western states; fox squirrels have been introduced to several western states and provinces. In 1919, Eastern gray squirrels were first introduced to Oregon when several were released on the Capital grounds in Salem. It is unknown when and where fox squirrels were introduced, but both species have been released in parks, campuses, and residential areas throughout the state. In several areas, native Western gray squirrel populations have declined or been displaced as fox squirrel or Eastern gray squirrel populations have become established.

What are their impacts? Non-native squirrels have many negative impacts, including causing damage to trees and agriculture, competition with native squirrels, transmission of disease to native species, and nuisance activities, such as nesting in home attics.

Photos: Top and middle photos: Wikimedia.org. Bottom photo: Alan and Elaine Wilson.

Where are they currently found? Fox squirrels and Eastern Gray squirrels can be found in most urban areas in Oregon and in areas with nut orchards. These two large squirrels are the most common tree squirrels in Portland.



Eastern gray squirrel (left map) and eastern fox squirrel (right map), showing locations of "exotic" distributions (pink). Source: NatureServe.

Virginia opossum (*Didelphis virginiana*)

Photo: California Academy of Sciences Alden M. Johnson

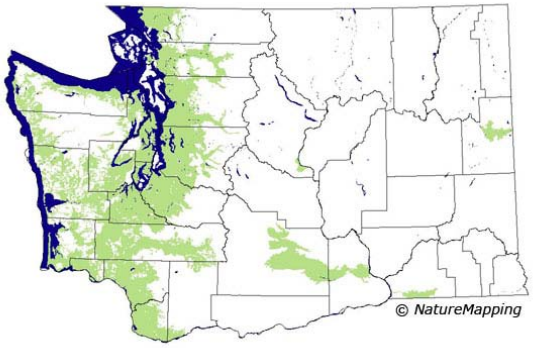
What is it? Opossums are small to medium-sized marsupials, and are omnivorous, with long snouts. They have prehensile tails, and hind feet with opposable digits.

Where did it come from? The Virginia opossum is a native species in North America east of the Rocky Mountains and in Central America. Nonnative opossum also occur in Washington, coastal California, and southwestern British Columbia. The opossum was first introduced in Oregon in Umatilla Co., between 1910 and 1921, and in Clatsop Co. in the 1920s. These animals were originally held as pets and novelties, and escaped from captivity or were intentionally released. Although relatively short-lived, opossums are very adaptable, have high birth rates, are opportunistic omnivores, and will eat practically anything. These traits make opossums very successful in colonizing new areas.

What is its impact? Opossums prey on native invertebrates, small mammals, amphibians, reptiles, and ground nesting birds, nestlings and eggs.

Where are they currently found? Populations are now established throughout the Willamette Valley, other interior valleys, and along the entire Pacific Coast. A Virginia opossum was killed in Marion County in 1948, Clatsop County was the only county that was considered to have opossums in 1955.[57] No estimates of density in Oregon are currently available, however, the greatest densities are suspected in urban areas.[58]

Source: Washington Gap Analysis Project. Green areas indicate core (breeding) habitat for Virginia opossum in Washington State.



[57] Kebbe, C.E. 1955. Status of the opossum in Oregon. *The Murrelet*, 38-42.
[58] Verts, B., and L. Carraway. 1998. *Land Mammals of Oregon*. Berkeley, CA: University of California Press.

Eastern cottontail (*Sylvilagus floridanus*)

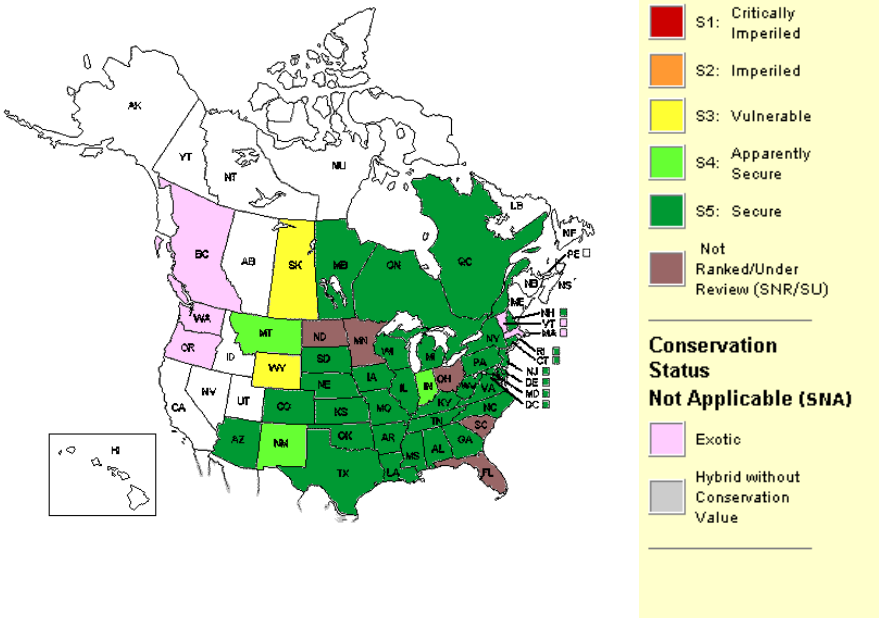
Photo: National Park Service

What is it? The eastern cottontail is a New World cottontail rabbit of the family Leporidae, one of the most common rabbit species in North America. The eastern cottontail has speckled brown-gray fur above, reddish-brown fur around its neck and shoulders and lighter fur around its nose and on its undersides. It has big eyes and a tail that is puffy white on the underside. In the winter its fur may be more gray than brown.

Where did it come from? The Eastern cottontail was introduced into Oregon, Washington, and British Columbia. It was introduced in Oregon from the 1930s–1950s for hunting purposes in Benton, Linn, Umatilla, and Multnomah counties.

What is its impact? The eastern cottontail is larger than Oregon's two native cottontail species, and may compete with both the brush rabbit (*Sylvilagus bachmani*) in western Oregon and the desert cottontail (*Sylvilagus nuttalli*) in eastern Oregon. The more aggressive Eastern cottontail may sometimes kill the smaller native brush rabbits and may hybridize with brush rabbits.

Where is it currently found? Currently, Eastern cottontails can be found through the mid-Willamette Valley, Multnomah County, and in northeastern Oregon. Eastern cottontails have established large breeding populations in Washington and Oregon.[59] NatureServe lists the eastern cottontail as exotic in Oregon, Washington, and British Columbia (see pink areas in map below).



Pink areas show "exotic" distributions of eastern cottontails. Source: NatureServe.

[59] Nowak, R., J. Paradiso. 1983. *Walker's Mammals of the World.* Baltimore: John Hopkins University Press.

Black rat (*Rattus rattus*) and Norway rat (*Rattus norvegicus*)

Photo: Discover Life

Photo: Wikipedia

What are they? The black rat (top photo) is a common long-tailed rodent in the subfamily Murinae (murine rodents). It is nocturnal and omnivorous, although it prefers grains. Compared to the Norway rat (bottom photo), it is a relatively poor swimmer, but an agile and competent climber. It can breed throughout the year, producing as many as 60 young annually. Norway rats, also called brown rats, are good swimmers, but cannot climb as well as black rats.

Where did they come from? Although the Black Rat is now found throughout the world, it is thought to have originated in Asia. Black Rats first arrived in Puerto Rico and the West Indies in the late 1400s as "old-world migrants" on Spanish ships of exploration. The Norway rat is thought to have arrived in North America on ships about 1775 and has since spread over most of the continent.[60] It is native to Japan and possibly the eastern mainland of Asia.

What are their impacts? Both rat species are vectors for numerous diseases caused by exposure to the rat's fleas, urine, and dirt.

Where are they currently found? Parks and recreational areas, older industrial areas, rail yards and back alleys are a real breeding ground for both species. Sewers, abandoned warehouses and garbage refuges are also places that rats frequent due to the abundance of food. The Norway rat typically likes to live in burrows underground or inside walls, whereas the black rat loves to climb and can be found in upper levels of buildings more often than Norway rats. Black rats use nests and make their home in trees or vines. Norway rats are found nearly everywhere humans have settled.

[60] Silver, J. 1927. The introduction and spread of house rats in the United States. *Journal of Mammalogy* 8 (1): 58-60.

Domestic dogs and cats

What are they? Feral dogs and cats are untamed domestic dogs and cats either born outside or abandoned and over time have become unsocialized to people.

Where do they come from? They have been abandoned by people or are unsocialized offspring of abandoned pets.

What are their impacts? Free-roaming cats kill tens of thousands of birds each year in the Portland Metro Area and are one of the primary causes of cat overpopulation. Feral dogs commonly kill house cats, and they may injure or kill domestic dogs. In areas where people have not hunted and trapped feral dogs, the dogs may not have developed fear of humans, and in those instances such dogs may attack people, especially children. This can be a serious problem in areas where feral dogs feed and live around garbage dumps near human dwellings.[61] There is no documentation of the effects feral dogs have in the City of Portland.

Where are they currently found? Feral cats live wherever they can scavenge for food—near dumpsters, behind businesses, in parks and backyards.[62] The Audubon Society of Portland and the Feral Cat Coalition of Oregon encourage Oregonians not to allow their cats to roam. Both organizations encourage cat owners to house cats indoors, in outside enclosures, or to walk cats on a leash. Cat predation is consistently the leading cause of injury for wild animals treated at Audubon's Wildlife Care Center, accounting for nearly 40 percent of intakes. The Feral Cat Coalition of Oregon has been conducting spay and neuter clinics for feral cats since 1995. During that time the Coalition has spayed and neutered more than 35,000 feral cats. Treating cat-caught wildlife and spay and neutering feral cats, while important, ultimately only treat symptoms of the problem. To prevent cat predation on wild birds and reduce the flow of new cats into feral cat populations requires responsible cat ownership (Portland Audubon Society). It is estimated that there are about 100,000 feral cats in the Portland metro area, including strays (those that once had homes, but were abandoned).[63] In 2007, 26,478 cats and kittens were taken in by Portland metro area shelters (4 counties). The Animal Shelter Alliance of Portland (ASAP) has determined that if about 10,000 more cats are spayed and neutered in the Portland-Vancouver area each year, the number coming into shelters will equal the number of people who want them. Roughly 60,000 spay and neuter surgeries are performed each year in the Portland area in private clinics, shelters and subsidized programs, according to ASAP member Joyce Briggs, Executive Director of the Alliance for Contraception in Cats & Dogs.

[61] Internet Center for Wildlife Damage Management, http://icwdm.org/handbook/carnivor/FeralDog.asp
[62] Feral Cat Coalition of Oregon, http://www.feralcats.com/
[63] Ibid.

Appendix C. The City of Portland invasive animal assessment survey instrument.

The City of Portland is conducting an invasive animal assessment to:

- identify the abundance and distribution of invasive animal species in the City of Portland (excluding fish and zooplankton);
- identify invasive animal species that might be likely to invade habitats in the City of Portland in the next 5–10 years;
- identify the roles and responsibilities of various entities involved with invasive animal species management and outreach in Portland;
- review existing regulatory authority for invasive animal species management;
- define gaps and overlaps in regulatory authority;
- define opportunities for collaboration; and
- recommend and prioritize invasive terrestrial and aquatic species management actions that could be implemented by the City of Portland to lessen the threat of introductions and spread.

You have been selected to participate in this survey because of your knowledge, experience, and work with natural resources in the Portland metropolitan area. Thank you for taking the time to complete the survey. The results of the survey will be shared with you and others in a final report.

Question 1

Please provide your contact information.

- Name
- Title
- Organization
- Address
- Address
- City
- State
- Zipcode
- Email Address

Question 2

How would you characterize your organization?

- ○ Federal agency
- ○ State agency
- ○ Local government agency
- ○ Academic institution
- ○ Nonprofit organization
- ○ Community group
- ○ Other, please specify

Invasive Animal Lists

The City of Portland has developed three invasive species animal lists:

Species that are present and established in the City of Portland;
Species that are present, but not yet established; and
Species not yet known to occur, but that may invade the City of Portland in the next 5-10 years based on an analysis of pathway vectors and/or current distribution.

We would like your input to help finalize these three lists.
Click here (Appendix B) for more information about each of the lists and species distribution information.

Question 3

Species that are present and established in the City of Portland.
Please check the box if you think this species should be removed from this list. Please write in species in the "Other" category if they should be added to this list.

- ❑ Brown Garden Snail
- ❑ Bullfrog
- ❑ Red-eared Slider
- ❑ Common Snapping Turtle
- ❑ European Starling
- ❑ House Sparrow
- ❑ Rock Pigeon
- ❑ Domestic Duck and Goose Species
- ❑ Nutria
- ❑ Eastern Gray Squirrel
- ❑ Eastern Fox Squirrel
- ❑ Virginia Opossum
- ❑ Eastern Cottontail
- ❑ Black Rat
- ❑ Norway Rat
- ❑ Domestic Cats and Dogs
- ❑ Other, please specify

Question 4

If you inserted the name of a species in the "Other" box in question 3 above, please provide abundance and distribution information that supports your recommendation.

Question 5

Species that are present, but not yet established in the City of Portland.
Please check the box if you think this species should be removed from this list. Please write in species in the "Other" category if they should be added to this list.

- ❑ Banded European Woodsnail
- ❑ Asian Gypsy Moth
- ❑ European Gypsy Moth
- ❑ Japanese Beetle
- ❑ Mute Swan
- ❑ Other, please specify

Question 6

If you inserted the name of a species in the "Other" box in question 5 above, please provide abundance and distribution information that supports your recommendation.

Question 7

Species that are not yet known to occur in the City of Portland, but that may invade the City of Portland in the next 5-10 years based on an analysis of pathway vectors and/or current distribution.
Please check the box if you think this species should be removed from this list. Please write in species in the "Other" category if they should be added to this list.

- ❑ Wrinkled Dune Snail
- ❑ Rosy Gypsy Moth
- ❑ Nun Moth
- ❑ Light Brown Apple Moth
- ❑ Oak Splendour Beetle
- ❑ Oak Ambrosia Beetle
- ❑ Woodwasps
- ❑ Emerald Ash Borer
- ❑ Apple Snails
- ❑ Chinese Mystery Snails
- ❑ Rusty Crayfish
- ❑ Virile Crayfish
- ❑ Ringed Crayfish
- ❑ New Zealand Mudsnails
- ❑ Mitten Crab
- ❑ Spiny Waterflea
- ❑ Fishhook Waterflea
- ❑ Zebra Mussel
- ❑ Western Quagga Mussel
- ❑ Eurasian Collared-dove
- ❑ Feral Swine
- ❑ Other, please specify

Question 8

If you inserted the name of a species in the “Other” box in question 7 above, please provide abundance and distribution information that supports your recommendation.

Regulations

Question 9

What regulations/resolutions/ordinances or other laws govern the work you do with invasive animal species (excluding fish and zooplankton)? Please list them in the comments box below. Separate each with a comma.

Question 10

Do you believe the laws and regulations that pertain to prevention of invasive animals in the State of Oregon are adequate and/or how they could be improved?

- ○ Yes
- ○ No

Question 11

If you answered “No” to question 10, explain why you believe Oregon's laws and regulations pertaining to prevention of invasive species are inadequate.

Question 12

Do you believe the laws and regulations that pertain to control/eradication of invasive animals in the State of Oregon are adequate?

- ○ Yes
- ○ No

Question 13

If you answered no to question 12, explain why you believe Oregon's laws regarding control/eradication of invasive species are inadequate and/or how they could be improved.

Invasive Animal-Related Activities

Question 14

How would you characterize the work you do on/with invasive animals (excluding fish and zooplankton) in the City of Portland? You may check more than 1 box, if applicable.

- ❑ Monitoring/surveillance
- ❑ EDRR
- ❑ Prevention activities
- ❑ Management activities
- ❑ Outreach and education
- ❑ Research
- ❑ Effectiveness monitoring
- ❑ Coordination
- ❑ Fundraising
- ❑ Policy work
- ❑ Other, please specify

Question 15

What organizations do you currently partner with to conduct invasive animal-related activities (excluding fish and zooplankton) in the City of Portland? Please insert the name of the entity to the right of the category, if applicable.

- Federal
- State
- Local government
- Nonprofit organization
- Community organization
- Industry
- Academic institution
- Other

Question 16

If you believe there are additional opportunities for entities within the City of Portland to collaborate on invasive animal issues, please describe them below. Otherwise, leave the answer to this question blank.

Question 17

If you believe there are additional opportunities for entities outside of the City of Portland to collaborate with organizations within the City of Portland on invasive animal issues, please describe them below. Otherwise, leave the answer to this question blank.

The Future of Invasive Animal Management in the City of Portland

Question 18

Describe what, if any, management actions the City of Portland could implement to lessen the threat of introductions and spread of invasive animal species.

Thank you for taking the time and making the effort to complete this survey. The results of this survey will help the City of Portland formulate strategies and implement actions to lessen the threat of terrestrial and aquatic invasive species.

Appendix D. List of 29 organizations that participated in the City of Portland assessment survey.

1. Audubon Society of Portland
2. Portland State University—Center for Lakes and Reservoirs
3. City of Gresham
4. City of Portland Bureau of Environmental Services
5. City of Wilsonville
6. East Multnomah Soil and Water Conservation District
7. Johnson Creek Watershed Council
8. Metro
9. Multnomah County Drainage District No.1
10. National Marine Fisheries Service
11. NW Ecological Research Institute
12. Oregon Department of Agriculture
13. Oregon Department of Fish and Wildlife
14. Oregon Zoo
15. PBS Engineering + Environmental
16. Port of Portland
17. Portland Parks & Recreation
18. Portland Water Bureau
19. PSU Environmental Science & Management Department
20. Reed College
21. The Nature Conservancy in Oregon
22. The Xerces Society for Invertebrate Conservation
23. Tualatin River National Wildlife Refuge
24. U.S. Fish and Wildlife Service
25. U.S. Department of Agriculture—Animal Plant Health Inspection Service Plant Health, Plant Protection and Quarantine
26. U.S. Department of Agriculture—Natural Resource Conservation Service
27. West Multnomah Soil and Water Conservation District
28. Wildlife Conservation Society
29. Willamette Riverkeeper

100 Most Dangerous Invaders To Keep Out of Oregon in 2009

Highlighted species are those species that have had risk assessments completed.

Micro-Organisms

alder root rot	*Phytophthora alni* subsp.
bacterial blight of grape	*Xylophilus ampelinus*
blackberry yellow vein disease, blackberry yellow vein-associated virus (BYVaV) and blackberry virus Y (BVY)	
chronic wasting disease	CWD prion
elm yellows	elm yellows phytoplasma
hazelnut bacteria canker	*Pseudomonas avellanae|*
infectious salmon anemia virus	ISAV
oak wilt	*Ceratocystis fagacearum*
Phytophthora taxon C	*Phytophthora kernoviae*
plum pox	plum pox potyvirus (PPV)
poplar canker	*Xanthomonas populi*
potato cyst nematodes	*Globodera rostochiensis* and *G. pallida*
potato wart	*Synchytrium endobioticum*
ramorum canker and blight (sudden oak death)	*Phytophthora ramorum***
blueberry hill carlavirus - New Jersey strain	(BBScV-NJ)
Southern wilt, bacteria wilt	*Ralstonia solanacearum* Race 3 Biovar 2
viral hemorrhagic septicemia virus (VHSV)	*Novirhabdovirus* spp.
whirling disease	*Myxobolus cerebralis***
willow watermark disease	*Brenneria salicis*

Aquatic Plants

African waterweed	*Lagarosiphon major*
caulerpa seaweed	*Caulerpa taxifolia*
cordgrasses	*Spartina alterniflora*, S. densiflora, S. anglica, S. patens***
dead man's fingers	*Codium fragile tomentosoides*
European water chestnut	*Trapa natans*
flowering rush	*Butomus umbellatus*
giant salvinia	*Salvinia molesta*
golden algae	*Prymnesium parvum*
hydrilla	*Hydrilla verticillata*
rock snot	*Didymosphenia geminate*
toxic cyanobacteria	*Cylindrospermopsis raciborskii*
yellow floating heart	*Nymphoides peltata***

Land Plants

African rue	*Peganum harmala***
camelthorn	*Alhagi pseudalhagi*
coltsfoot (not *Petasities frigidus*)	*Tussilago farfara***
giant hogweed	*Heracleum mantegazzianum***
goatgrasses (barbed, ovate)	*Aegilops triuncialis, A. ovata*
goat's rue	*Galega officinalis*
hawkweeds (king-devil, meadow, mouse-ear, orange, yellow)	*Hieracium piloselloides, H. pratense**,H. pilosella, H. aurantiacum**, H. floribundum*
kudzu	*Pueraria lobata**
matgrass	*Nardus stricta**
oblong spurge	*Euphorbia oblongata*
Paterson's curse	*Echium plantagineum**
purple nutsedge	*Cyperus rotundus*
silverleaf nightshade	*Solanum elaegnifolium*
skeletonleaf bursage	*Ambrosia tomentosa*
squarrose knapweed	*Centaurea virgata**
starthistles (Iberian, purple)	*Centaurea iberica**, *C. calcitrapa***
Syrian bean-caper	*Zygophyllum fabago*
Texas blueweed	*Helianthus ciliaris*
thistles (plumeless, smooth distaff, woolly distaff, taurian)	*Carduus alanthoides**, *Carthamus baeticus, Carthamus lanatus**, Onopordum tauricum
white bryonia	*Bryonia alba*

Aquatic Invertebrates

Asian clam	*Potamocurbula amurenisis*
Asian tapeworm	*Bothriocephalus acheilognath*
fishhook waterflea	*Cercopagis pengoi*
Japanese shore crab	*Hemigrapsus sanguineus*
Leidy's comb jelly	*Mnemiopsis leidyi*
mitten crabs	*Eriocheir spp.**
New Zealand sea slug	*Philine auriformis***
rusty crayfish, red swamp crayfish (non-native crayfish)	*Orconectes rusticus, Procambarus clarkia*
sea squirt	*Didemnum sp.*
spiny waterflea	*Bythotrephes cederstroemi*
transparent tunicate	*Ciona savignyi*
club tunicate	*Styela clava*
veined rapa whelk	*Rapana venosa*
zebra mussel, quagga mussel	*Dreissena polymorpha, Dreissena rostriformis bugensis*

Land Invertebrates

Africanized honey bee	*Apis mellifera scutellata*
Argentine ant	*Linepithema humile**
Asian longhorned beetles	*Anoplophora glabripennis, A. chinensis*
brown spruce longhorn beetles	*Tetropium fuscum, T. castaneum**
emerald ash borer	*Agrilus planipennis*
European chafer	*Rhizotrogus majalis*
European corn borer	*Ostrinia nubilalis*
European woodwasp	*Sirex noctilio*
granulate ambrosia beetle	*Xylosandrus crassiusculus**
gypsy moths (European, Asian, pink, nun moth)	*Lymantria dispar**, *L. mathura**, *L. monacha*
imported fire ants (red, black)	*Solenopsis invicta**, *S. richteri*
Japanese beetle	*Popillia japonica***
Japanese wax scale	*Ceroplastes japonicus*
khapra beetle	*Trogoderma granarium**
light brown apple moth	*Epiphyas postvittana*
Mexican bean beetle	*Epilachna varivestis*
old world bollworm	*Helicoverpa armigera*
Oriental beetle	*Anomala orientalis*
plum curculio	*Conotrachelus nenuphar*
Siberian moth	*Dendrolimus superans*
silver Y moth	*Autographa gamma*
spruce bark beetle	*Ips typographus*
Swede midge	*Contarinia nasturtii*
White garden snail, vineyard snail, and heath snail (terrestrial snails)	*Theba pisana, Cernuella virgata, Xerolenta obvia*

Fish

Amur goby, round goby, Shimofuri goby	*Rhinogobius brunneus, Neogobius melanostomas, Tridentiger bifasciatus*
Asian carp (bighead, silver), black carp	*Hypophthalmichthys nobilis, H. molitrix, Mylopharyngodon piceus*
Atlantic salmon	*Salmo salar*
golden Shiner	*Noteigonus crysoleucas*
muskellunge, northern pike, tiger muskie	*Esox spp.**
ruffe	*Gymnocephalus cernuus*
snakeheads	*Channa spp.*
threadfin Shad (yellow tails, shad and shad minnow)	*Dorosoma petenense*

Birds

mute swan	*Cygnus olor***

Mammals

feral swine	*Sus scrofa***

Reptiles

eastern snapping turtle	*Chelydra serpentine serpentina*

*Detected previously in Oregon, but eradicated or did not establish.
**Currently under eradication or restricted to a small area in Oregon.

Changes that were made in the 100 Worst List from 2008 to 2009:

Micro-organisms

The following were removed from the list:
1. cherry leaf roll nepovirus (CLRV)is found in Oregon, although on an alternate host. It has failed to move to cherries. Also, like pear trellis rust, the damage it is capable of causing is significantly less than the new species we added to the list.
2. pear trellis rust (*Gymnosporangium fuscum)* is established in WA and is a manageable disease. Also, it is not fatal to its host, unlike the others.

The spelling was corrected:
1. sudden oak death *Phytophthora ramorum*** (corrected spelling)

There was a name change for:
1. Sheep pen hill virus blueberry hill carlavirus - New Jersey strain (BBScV-NJ) carlavirus (BBScV-NJ) (corrected name change)

The following were added to the list:
1. blackberry yellow vein disease, blackberry yellow vein-associated virus (BYVaV) and blackberry virus Y (BVY) (this disease is caused by the two viruses acting synergistically) (Nancy K. Osterbauer, ODA)
2. bacterial blight of grape *Xylophilus ampelinus*

Aquatic Plants

The following was added to the list:
1. Flowering rush, *Butomus umbellatus*—Montana is asserting that this plant could eventually spread through much of the Columbia Basin. It's not far from the northeast and southeast Oregon borders

Land Plants

The following were removed from the list:
1. mile-a-minute weed (*Polygonum perfoliatum)** This species is not listed in either Oregon or Washington.
2. Portugese broom (*Cytisus striatus)*** (Note: *Note this would be a removal because it "got away," and therefore would count against our benchmark.) This plant is a "B" rated plant in Oregon. Though Portuguese broom is a high priority for protection of our forest lands in the state, programs implementing control projects have moved from eradication mode into containment mode with this plant.

The following were added to the list:
1. white bryonia - *Bryonia alba*—White bryonia is a vigorous herbaceous perennial vine resembling kudzu in appearance and growth habit. Infestations will overgrow and smother small trees and shrubs forming dense mats which shade out all the vegetation it grows upon. If established in areas with no structure to climb, it will form a dense mat covering the ground. Vines emerge each spring from a large fleshy parsnip-shaped tuber and grow rapidly, sometimes to 30 feet. Populations are documented from south-east Washington State, Idaho, Utah and Montana. Should white bryonia become established in Eastern Oregon it poses a huge threat for forest and range land, not to mention ecosystems of the Hells Canyon/Snake River area.
2. goat's rue, *Galega officinalis*—Goat's rue, *Galega officinalis.L.*, is a USDA federally listed noxious weed. A member of the legume family, it was introduced into Utah in 1891 as a potential forage crop. Escaping cultivation, it now occupies in excess of 60 square miles in Cache, County, Utah. Within this area, goat's rue infests cropland, fence lines, pastures, roadsides, waterways, and wet, marshy areas (Evans and Ashcroft 1982). The plant's stems and leaves contain a poisonous alkaloid, galegin, which renders the plant unpalatable to livestock, and toxic in large quantities. It is particularly lethal to sheep. Because of these issues, goat's rue invasion can reduce forage availability and quality.
3. oblong spurge, *Euphorbia oblongata*—Oblong spurge is a weedy escaped ornamental species of *Euphorbia* known from only one site in Salem, Oregon. Suspected to have been introduced from California in contaminated flax or machinery that was used at the State Penitentiary flax mill in the early part of the 1900's, it has slowly expanded its territory on the penitentiary property. Growing up to 3' tall, this species is capable of forming dense stands in more arid climates and could be expected to be a troublesome weed to control should it spread and establish in eastern Oregon.

Aquatic Invertebrates

The following were removed from the list:
1. Unnamed estuarine snail (Coos Bay), *Assiminea* sp. (Increasingly widespread establishment is one of our criteria for bumping a species off the 100 worst list. The small brackish water snail we saw on the rip-rap of the Yaquina river, capable of carrying the human liver flukes parasite is *Assiminea* parasitological.

The following was added to the list (with other nonnative crayfish):
1. Red swamp crayfish (Louisiana crayfish), *Procambarus clarkia*— Native to south central United States, this species has been found in California, Idaho, Oregon and Washington. Noted for its burrowing activity which could damage dams, levees, and water control structures. Introduced into Oregon as a bait species and releases from classroom science experiments.

Land Invertebrates

The following were removed from the list:
1. pine shoot beetle (*Tomicus piniperda)* PSB does not appear to present a threat to forest ecosystems, primarily being a threat to Christmas tree plantations. Granted, the latter commodity is important, but pines are being phased out as Christmas trees in favor of other species which are not hosts known to support PSB reproduction.
2. sawyers (*Monochamus urussovi*, M. alternatus)** (I think there is too little information to support the two Monochamus spp. as major threats to our forests).

The following were added to the list with the other terrestrial snail:
1. vineyard snail, *Cernuella virgata and heath snail,* Xerolenta obvia—These two snails have the potential to be pests of many more commodities (cereals, forage crops, grapes, orchards, etc.) and would greatly increase molluscicide use. They are certainly much more difficult to control or eradicate than PSB and probably more so than *Monochamus* species. The technologies for detection and delimitation are also much less effective (try "primitive"). At least one of these species can also vector human and animal parasites and both can vector plant diseases.

Fish

The following was grouped with other non-native carp:
1. black carp (*Mylopharyngodon piceus)* (Move black carp with Asian carp to group like species).

The following were added to the list:
1. Threadfin Shad (yellow tails, shad and shad minnow), *Dorosoma petenense*— Native to the south-central United States and introduced into parts of the northern United States. Arizona and California as a forge and baitfish for warm water fish species such as largemouth bass, crappie and walleye. Feeds on zooplankton, and breeds quickly.

2. Golden Shiner, *Noteigonus crysoleucas*— Native to eastern United States. Introduced as a baitfish, ornamental and forage fish. Impact to Oregon is through competition with native fish for food and habitat. Lays up to 200, 000 eggs and may spawn more than once during a breeding season.

Appendix F. Survey respondent's answers to the question: Why do you believe Oregon's laws and regulations pertaining to ***prevention*** *of invasive species are inadequate?*

ENFORCEMENT AND PENALTIES

- There are no penalties for introduction of invasive animals beyond apprehension by Custom at borders. Also, I don't know of any laws that penalize nursery propagation of the vast majority of invasive plants.
- There is an enforcement issue with so many vectors.
- I believe the issue of enforcement is the biggest concern with invasive species prevention.
- Current laws/regulations are often not enforced.
- Enforcement is inadequately funded.
- No enforcement.
- Timing of laws and issues (laws need to be amended frequently); it can be challenging to amend laws. Laws are the start but a system has to be created to implement the law. Prosecutors are overwhelmed with other "higher priority" cases. Laws are challenging to read and interpret, most people are not familiar with the laws (education issue). Laws are too permissive in some circumstances / language is too general or vague so the intent is not clear or common situations are not adequately addressed, penalties for violations are weak. We have some wildlife laws that make it challenging for those public wanting to participate in control efforts. Laws do not adequately address final disposition of invasive species (e.g., humane euthanasia should be required unless ODFW or other regulatory agency authorizes other outcome). There is lack of support within the legal system to respond to invasive species cases.
- I'm very concerned about the ability to purchase virtually anything on the Internet. It's a huge gap. (That may not actually be an inadequacy of regulations so much as inadequacy/inability to enforce.)
- Little regulation of sale and purchase of invasive animals over the internet/Craigslist.
- I would prefer a system where vendors of non-native species, including horticultural varieties, need to demonstrate the species is non-invasive before selling/using the species.
- I think we and all states should only allow in species that are known not to harm rather than blocking ones that are known to cause harm. Other than that, the laws and regulations have just improved from the latest legislative session, which is good.
- Not much authority to monitor and enforce quarantines from interstate movement of plant products.
- Oregon Dept. of Fish and Wildlife has rules relating to invasive animal species, but I don't believe they are comprehensive enough to curtail invasive species that are already established here. I am not aware of an EDRR program for animal invasives at the state level. Capacity to enforce the laws we do have is lacking.
- The existing laws are poorly publicized and poorly enforced.

- There is also a need to be more aggressive in supervising the pet industry including the internet based pet industry. Finally there is a need to more strictly enforce abandonment statutes.
- Pet ferrets should not be allowed in Oregon, or any other state.
- Incentives would be nice, but ideally would not be necessary.
- Internet access is not policable, need more consequences for breaking laws, laws hard for lay people to understand.
    - Subcategory of Enforcement and Penalties— Inspections
        - We need inspections of boats and other vectors.
        - Limited ability for inspections (especially with regard to recreational transport of aquatic invaders) per state constitution.
        - Our inability to set up border check points to search for invasives is critical.
        - There is not an efficient early detection and rapid response program, even for species with potential to cause enormous damage.
        - Increase inspection staff, and regulation of means of entry [containers, ship ballast, etc.].
        - Need more manpower.

FUNDING

- Inadequate funding for early detection approach.
- There is lack of funding to support a prevention system. There is lack of funding to support enforcement.
- Resources are inadequate, which may be more critical than the need for additional regulations.
- Capacity to enforce the laws appears to be underfunded.

OUTREACH AND EDUCATION

- They need a rigorous education campaign, funding and staff to be implemented successfully.
- We need more outreach.
- Very little education.
- Putting resources toward enforcing and informing people about the existing laws. We've done a lot to get the word out about the illegality of keeping or releasing non-native turtles, and people seem very unaware of the laws.

- Because conditions have changed (global warming, increased human population, more immigrants from other cultures), in general less awareness of problems from invasives.

- There is a need for more educational outreach to the public.

- Need more public education.

Appendix G. Survey respondents answers to the question: Why do you believe the laws and regulations that pertain to ***control/eradication*** *of invasive animals in the State of Oregon are inadequate?*

FUNDING

- Inadequate funding for control and eradication programs.
- They need funding and staff to be implemented successfully.
- No money to track these species. Need funding for outreach.
- We need to legislate more resources for encouraging and incentivizing landowners (including government agencies) to trap out nutria, bullfrogs and other non-natives.
- Funding needed!!!
- It would take a lot of resources (time and money) to implement adequate controls.
- I think it may be a resource issue rather than the need for additional regulations.

ENFORCEMENT AND PENALTIES

- The laws need to carry stiffer penalties for violations of the control or eradication actions.
- I believe if eradication is an objective there needs to be sufficient effort and follow up monitoring to ensure it is successful.
- They do not provide enough incentives for removal and extermination of invasive animals.
- I'm not sure what the laws and regulations are, but I haven't seen much enforcement in terms of sale and release locally.
- Regarding nutria, state laws do not adequately identify agencies responsible for control/eradication.
- I don't think there are laws and policies to encourage control.
- ODA has excellent language governing their ability to respond to invasive plants and plant pests, other agencies that deal with invasive fish, wildlife and invertebrates have nothing similar and lack clear ability to quarantine a water body to prevent further spread.
- Can the state enter private land to control invasive species?
- Increases state and port staff.
- Pet industry sale of exotics needs to be much more stringently controlled/prohibited AND monitored! Increasing invasives is proof that control/eradication is inadequate.

- For control and eradication we would need to be able to enter private property without a warrant to do specific control or eradication work. Or be able to force the private landowner to carry out control or eradication work.
- I'm not aware of any regulatory process to require people to correct situations, except where vector control could enforce nuisance situations.
- Not enough staff to implement laws and eradicate invasives.
- There should be laws and regulations that require land owners to eradicate the invasive species from their property.
- In general, there is not enough enforcement.
- Feeding of domestic ducks and geese, as well as nutrias in local parks should be strictly prohibited.

OUTREACH AND EDUCATION

- They need a rigorous education campaign.
- Massive education needed.

OTHER

- Need to have a monitoring element to better understand how control efforts are effective, how they affect species responses, if they are successful. Need to develop criteria for "success."
- Better coordination between federal, state and local agencies is needed.
- Only if they are EDRR based or focus on rare species/habitats.

Appendix H. Survey respondents list of organizations they currently partner with to conduct invasive animal-related activities in the City of Portland. The rows denote the partner organizations. The columns denote survey respondent organizations.

		USDA-NRCS	USDA-APHIS PPQ	USFWS	ODA	ODFW	Tualatin River NWR	Portland State University	West Multnomah SWCD	Oregon Zoo	City of Portland (several bureaus)	The Nature Conservancy	Johnson Creek Watershed Council	NW Ecological Research Institute	Willamette Riverkeeper	Audubon Society of Portland
Federal agencies																
BLM						X					X					
USDA Forest Service			X								X			X		
USGS							X	X								
USFWS		X	X			X		X	X		X					X
USDA-APHIS					X	X		X								X
USDA NISC									X							
PSMFC								X								
State agencies																
ODFW		X		X				X	X	X	X		X	X	X	X
OSP						X										
DEQ											X					
OSMB								X								
ODA			X					X	X		X					
ODF			X													
OWEB															X	
OPRD						X										
OR Invasive Species Council											X					
Local governments																
City of Portland		X	X	X		X			X		X			X		
Tualatin Hills PRD						X										
City of Gresham														X		

Multnomah County Animal Control						X										X
Oregon Zoo									X							
Port of Portland			X			X		X	X							
Metro				X		X		X	X					X		
Neighborhood Associations			X													
Academic institutions																
Concordia		X														
Portland State University		X	X	X		X	X		X		X	X				
Oregon State University					X				X						X	
Nonprofit organizations																
Oregon Assn. Nurseries					X											
Meyer Memorial Trust															X	
The Nature Conservancy			X					X	X		X					
NW Zoo and Aquarium Alliance										X						
RCDC		X														
Xerces Society			X		X											
OMSI			X													
Friends of Tualatin River NWR							X									
Audubon Society				X		X					X			X	X	
Three Rivers Land Conservancy				X												
Lower Columbia Native Turtle Working Group									X							
SWCDs		X							X							
CWMAs									X							
Watershed Councils		X		X					X							

Appendix I. Survey respondent's answer to the question: what, if any, management actions the City of Portland could implement to lessen the threat of introductions and spread of invasive animal species?

OUTREACH AND EDUCATION

- Increase educational component. For example, lawns attract starlings, and so do narrow riparian corridors (during breeding season). Tree cover repels starlings and also helps reduce invasive plant problems.
- Outreach to citizens regarding potential threat of invasives.
- More effort to inform public of importance of invasive EDRR and how to prevent and control organisms.
- Education campaign.
- Education where boating occurs and at ports.
- Utilize TV and the web.
- Re: nutria—public education.
- Increasing awareness is a great start, also Portland is a gateway for many new residents to the state and as such should position itself as a resource on what new or potentially new residents can do to help prevent the unintentional introduction of new nonnative species.
- More education about how landowners can trapping out nutria, bullfrogs, etc.—More publicity for avenues of reporting new invaders.
- T.V, Radio, News, and any other media that explains what invasive animals are and why they are a problem. I would say most people do not understand the concept of invasive animals.
- Educate citizens, businesses, etc.
- Develop educational programs to get to middle & high school kids. Educ. programs for new residents of the state/city.
- Education and increased awareness; work with pet shops, the Port of Portland, recreational boaters, nurseries, etc.
- Educational outreach.
- Further increase public awareness about vectors, problems, treatments (e.g., okay to spray for gypsy & apple moths).
- More education to public about threats of invasive animals. People think they are doing good by making homes for invasives or don't realize that their actions may introduce invasives.

- Provide good trailer/boat washing facilities with corresponding education at boat ramps and canoe launches.

ENFORCEMENT

- Strict prohibition of possession or ownership of any of the potential invaders and the ones that are not well established with penalties attached. Ability to enter private property for the purpose of searching for and eradicating listed species.
- Initiate control regulations and field staff.
- Develop rigorous city laws.
- Enforce laws.
- More enforcement for existing laws.
- Better regulation of pet industry.
- Require boat washing at major boat ramps in the city to deal potential transmission of zebra mussel and other aquatic invertebrates.
- Enforcement of current rules.

FUNDING

- Monitoring and emergency response funds.
- Fund a program.
- Supply personnel, equipment, or funding to private landowners to spray for weeds.

MANAGEMENT AND COORDINATION

- Management coordination between agencies, determination of agency roles.
- EDRR Program.
- Assistance to people in rural areas just outside the city limits like you are planning to do for invasive plants.
- Actions taken at the city scale without engagement elsewhere are probably doomed to fail, but City action could spur engagement of others and that would be a great thing.
- Coordinate with applicable entities.
- Early detection monitoring and mapping in a manner that is shared regionally.

- Pool resources and coordinate programs with other partners to tackle problems and develop solutions together.

- Work with state agencies and NGOs to develop strategies to control invasive birds, reptiles and amphibians, including the possibility of local codes and programs.

- Coordinate with ODA, ODFW, and other state and federal agencies in control programs for invasive insects, terrestrial and aquatic invertebrates.

- Continue to work with other areas for joint eradication and prevention efforts.

Work cooperatively with Metro to involve other jurisdictions in assessing and prioritizing invasive animal species.