2010

A Geographic Assessment of the Risk Posed by Hazardous Materials in Oregon

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Citation Details

Banis, D. A., Urey, K. and Van Dyke, H. (2010). Geographic Assessment of the Risk Posed by Hazardous Materials in Oregon; Center for Spatial Analysis and Research, Portland State University.

Geographic Assessment of Risk
Posed by Hazardous Materials in Oregon

CSAR: David Banis, Katie Urey, and HeatherAnn Van Dyke

What is Risk?

Hazardous material exposure associated with storage at a fixed facility or transport over highways, railroads, or waterways.

Depends upon many factors

- Relative danger of the substance
- Size of the release
- People affected
- Environment impacted

From the Oregon State Fire Marshal
2009 Annual Report

• State Hazmat Team 12–LaGrande
responded to a motor vehicle accident with a spill of 300 gallons of chromic acid.
$500,000 estimated loss.

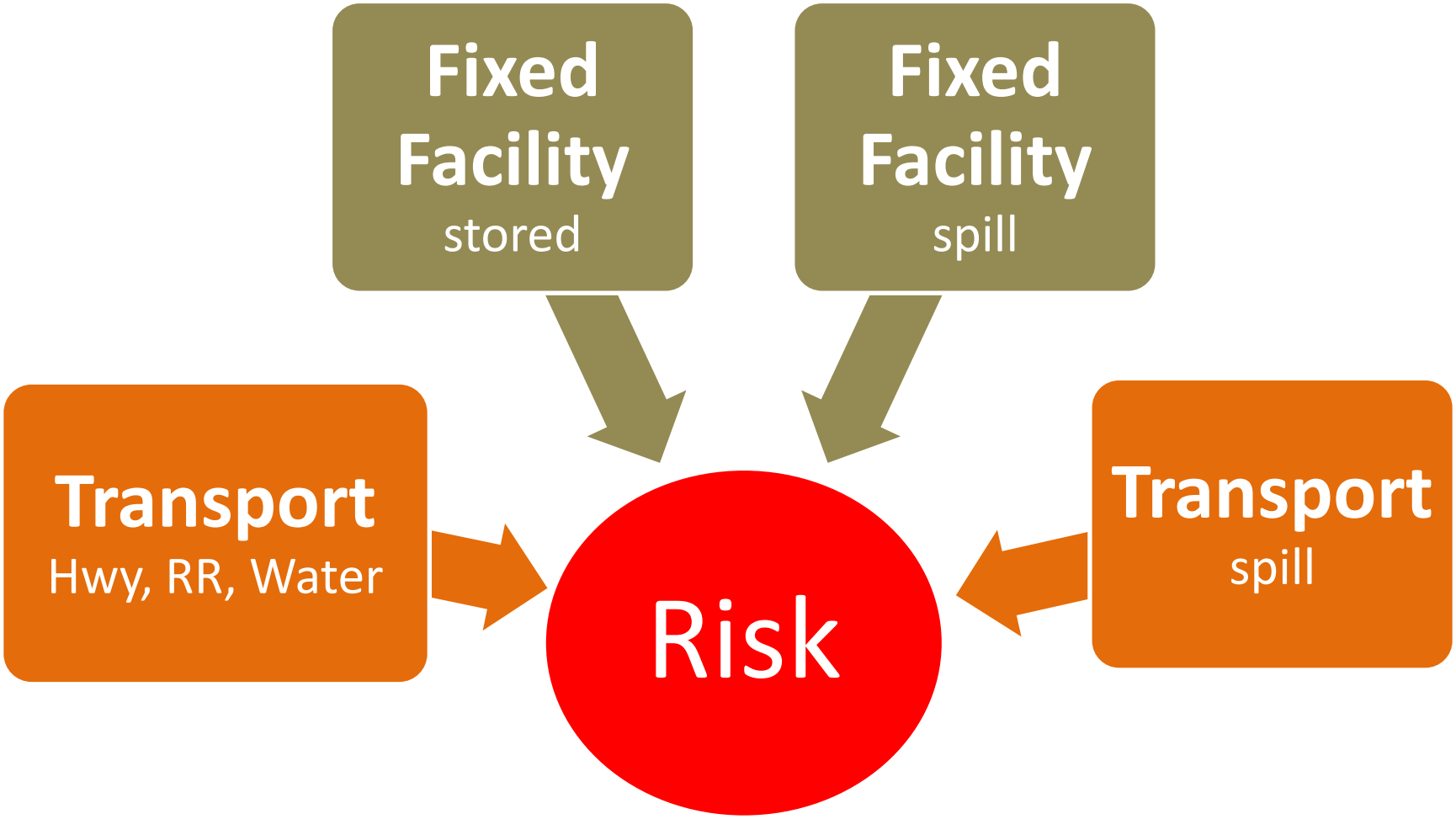
• State Hazmat Team 08–Southern Oregon responded to a motor vehicle accident with a spill of 150 gallons of diesel fuel.
$250,000 estimated loss.

• State Hazmat Team 09–Tualatin Valley F&R
responded to an incident where 680 pounds of Refrigerant 507 leaked from a chiller line.

Purpose of study

- Evaluate datasets that describe the storage, transport and accidental release of hazardous materials.
- Provide emergency planners a broad picture of locations, volumes and characteristics of hazardous material exposure.

Risk Framework



Key Datasets

Fixed Facility

- ERIS
  unplanned release
- HSIS

Transport

- ERIS
  unplanned release
- Highway
- Railway
- Waterborne

- **ERIS** Emergency Response Information System
- **HSIS** Hazardous Substance Information System

UN Risk Classification System

1: Explosive

2: Gas

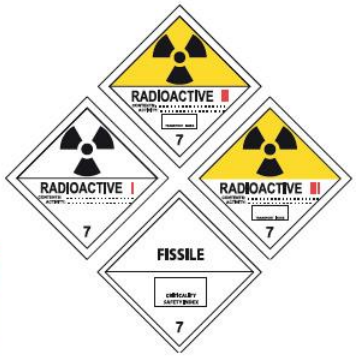
3: Flammable Liquid

4: Flammable Solid

5: Oxidizer and Organic Peroxide

6: Poison

7: Radioactive



8: Corrosive

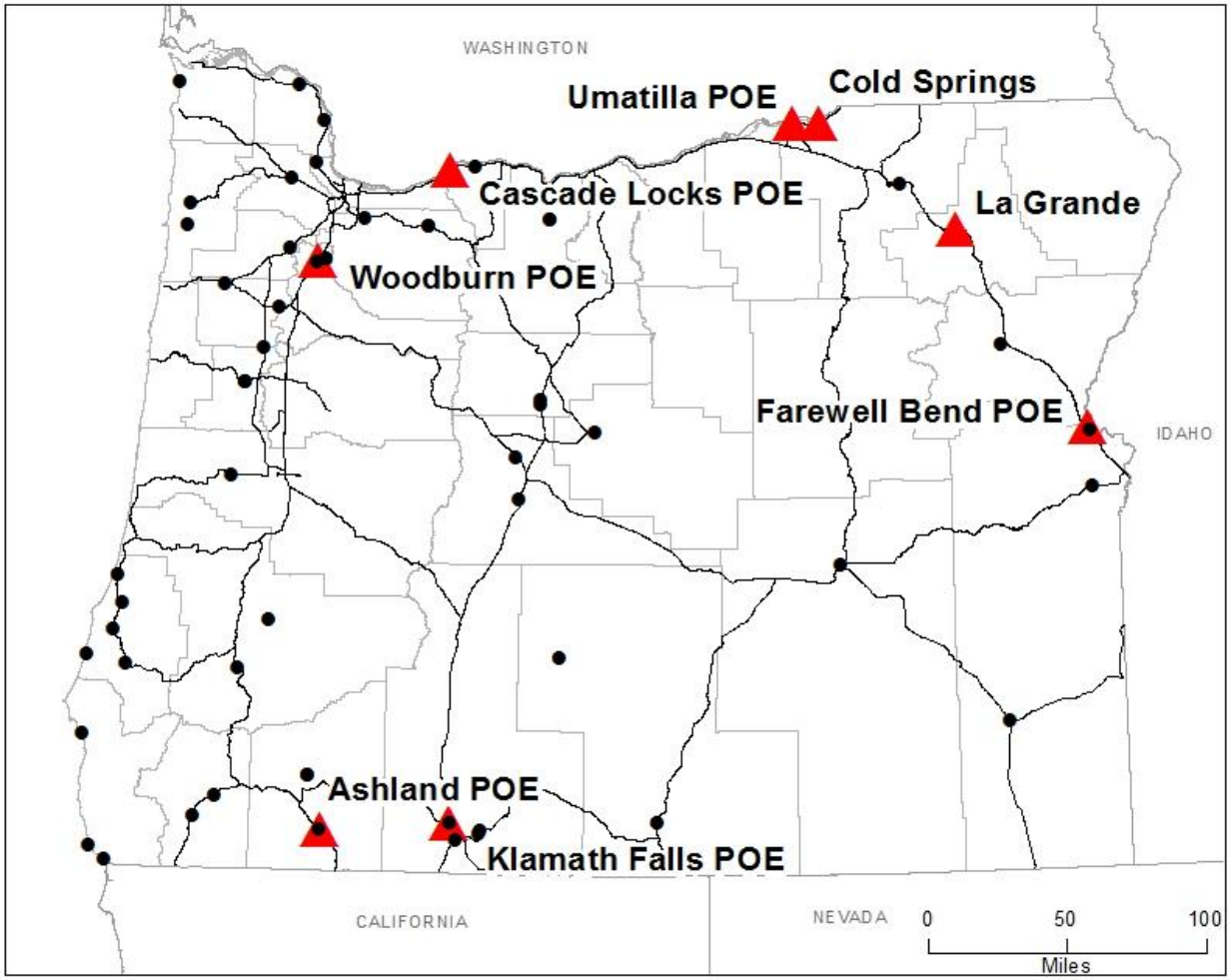
9: Miscellaneous

http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Hazmat/Training/Chart%2014.pdf

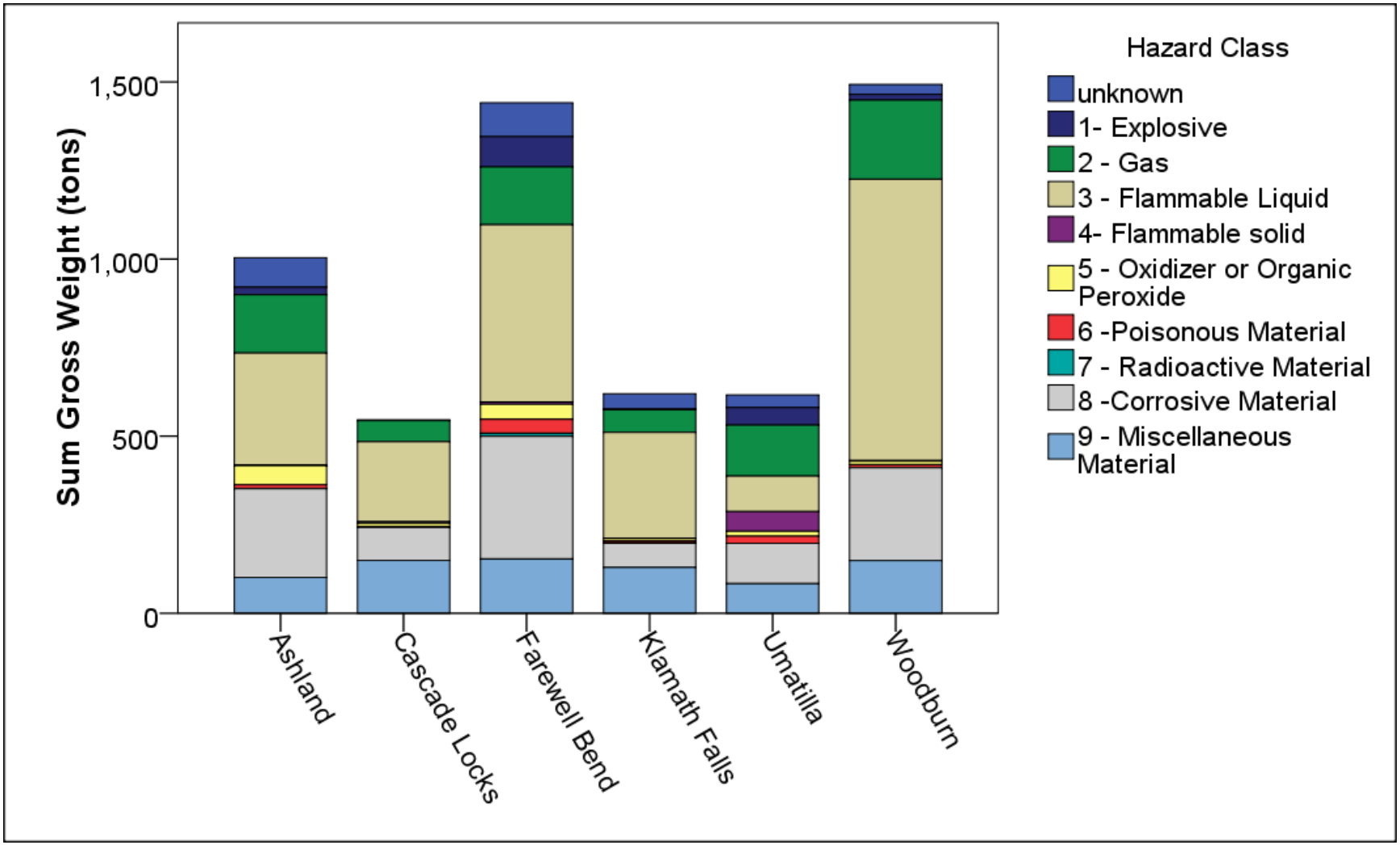
Highway Transport

- ODOT provided one year of records of hazardous materials at 158 weigh stations for 12 months (March 2009 to April 2010)
- Gross Weight in pounds
- ODOT reported that 3.33% of crashes involved hazardous materials in 2008.

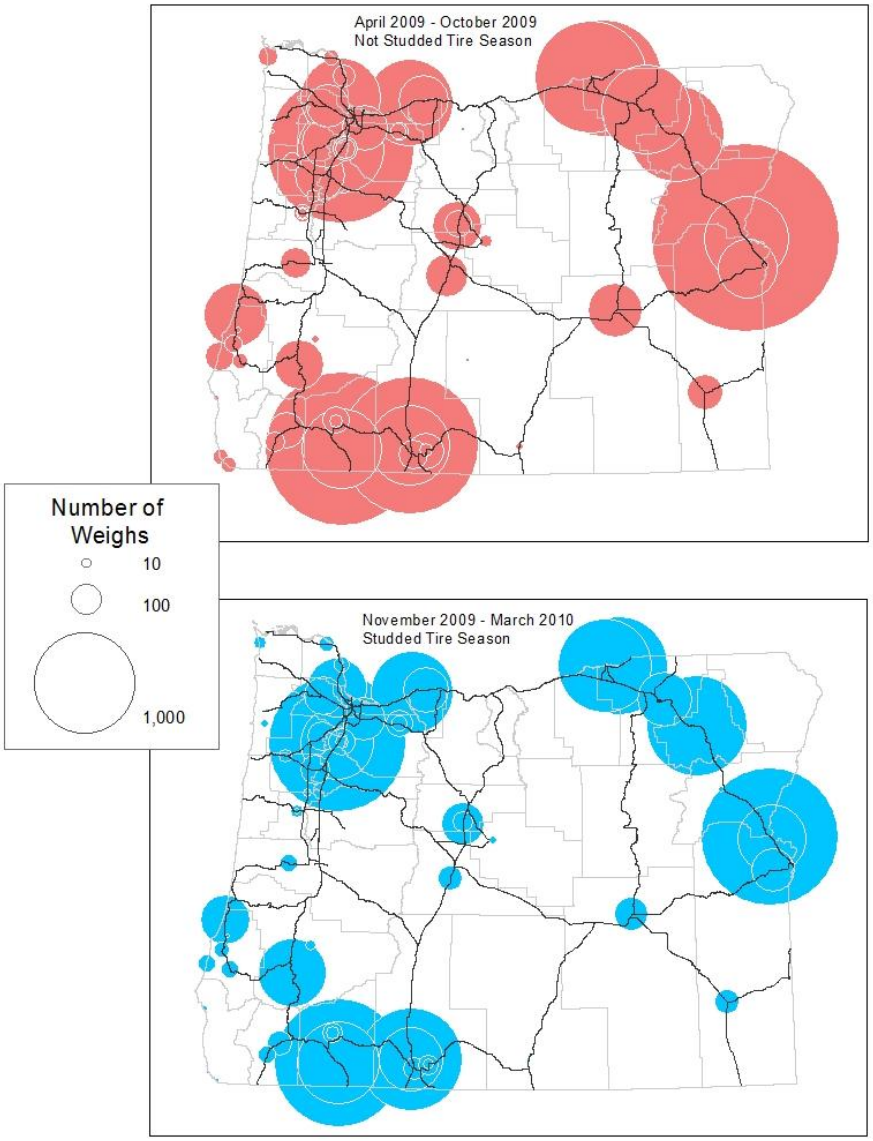
Highway Transport: Weigh Stations



Highway Transport: Weigh Stations and Hazard Classes



Highway Transport: Summer/Winter



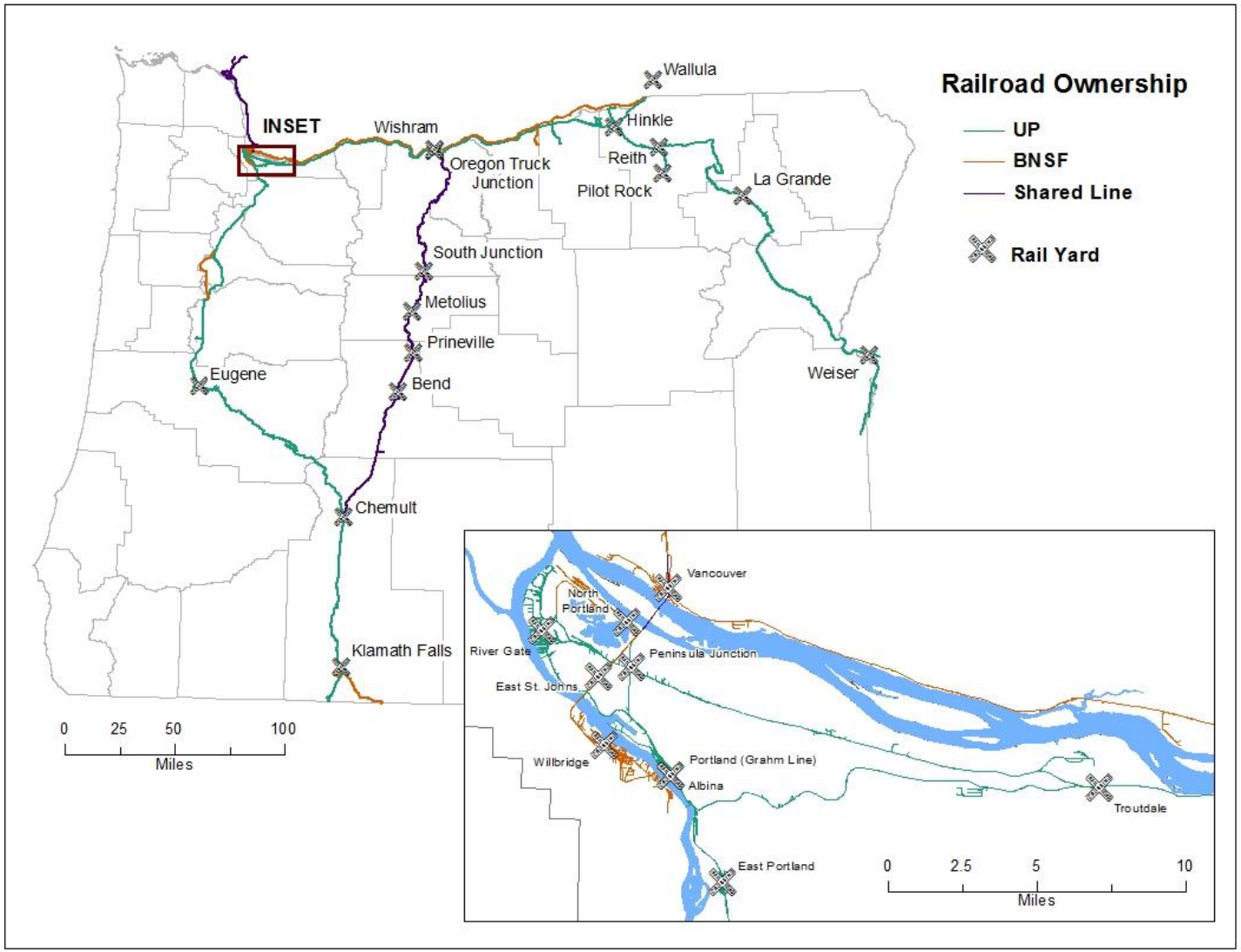
Highway Transport: Limitations

- Data are associated with points rather than a network or routes
- Impossible to assign direction and route of material across state
- Portland Region weigh stations are outside of city limits
- Washington highway data not available
- Data is a sample of weigh events when scales are open
- Make pertinent data publically available

Rail Transport

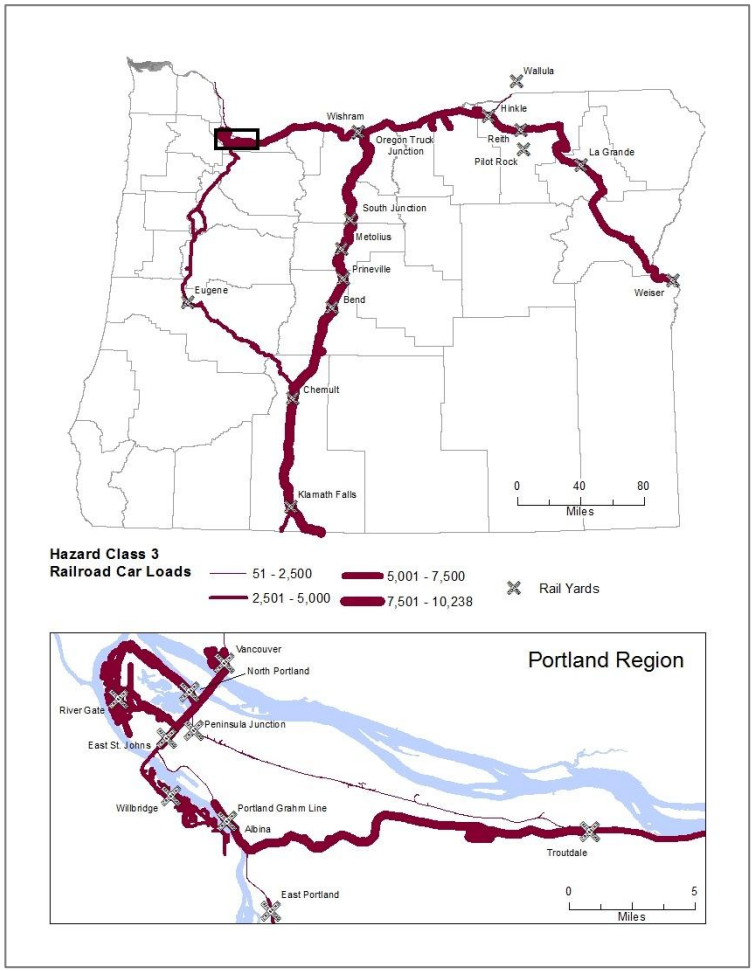
- Two years of rail transport (2008-2009) for UP and BNSF were provided by ODOT
- BNSF averages approximately 19,000 trains and 155,000 loads of hazardous freight annually
- UP averages approximately 33,000 trains and 120,000 loads of hazardous freight annually

Rail Transport: Routes and Yards

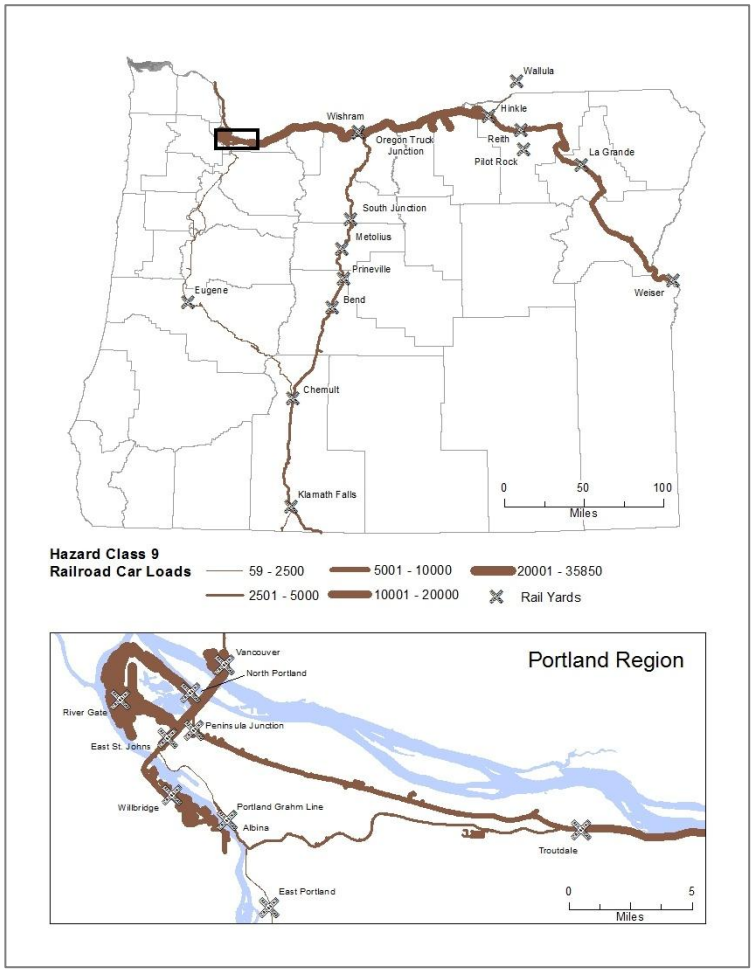


Rail Transport: HC 3 and HC9

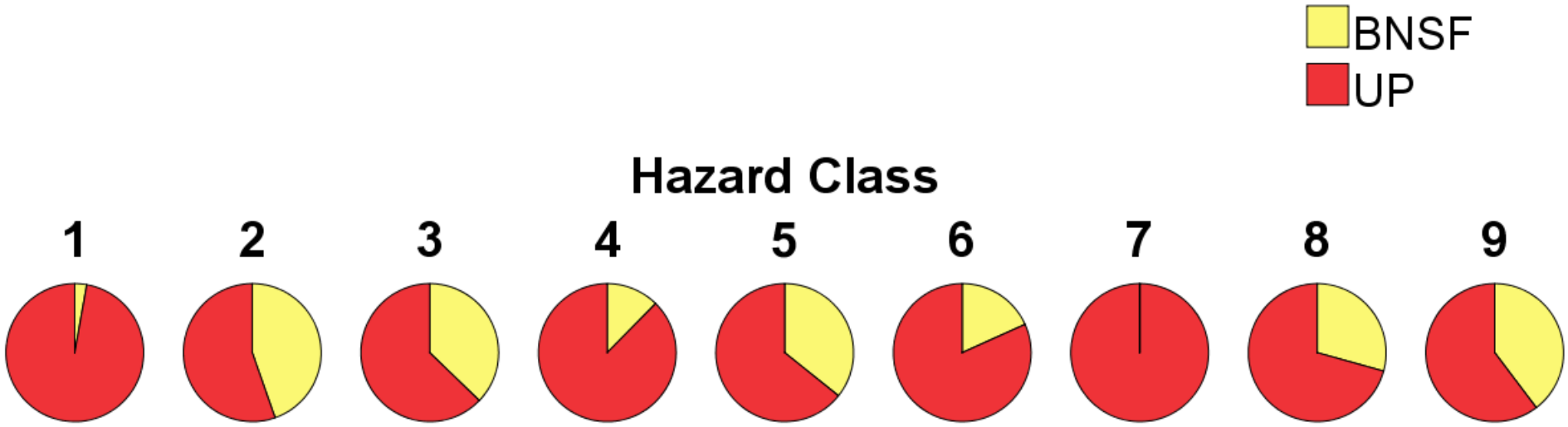
Hazard Class 3



Hazard Class 9



Rail Transport: UP vs. BNSF



Rail Transport: Limitations

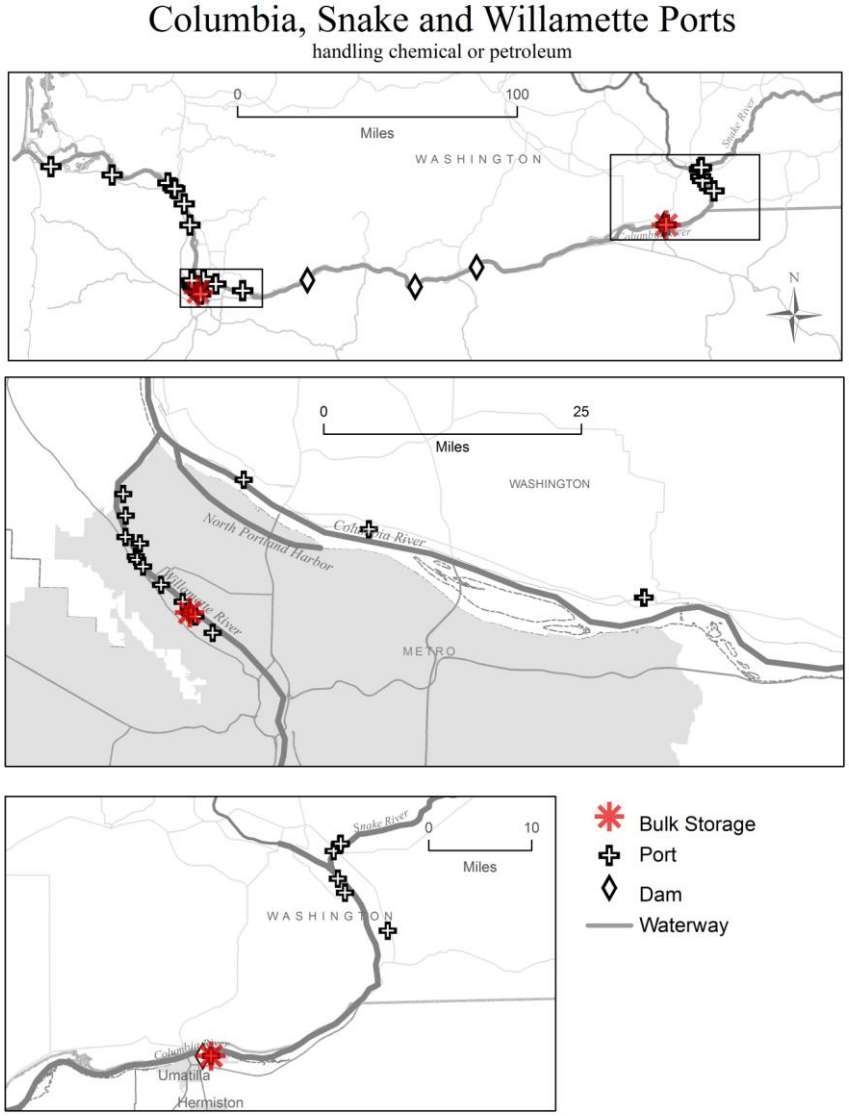
- Data were reported by commodity between segments without origin/destination
- Data were not reported by hazard class
- Yards are shared; yard names are inconsistent
- Data for minor railroads were not available

- Better than highway data!

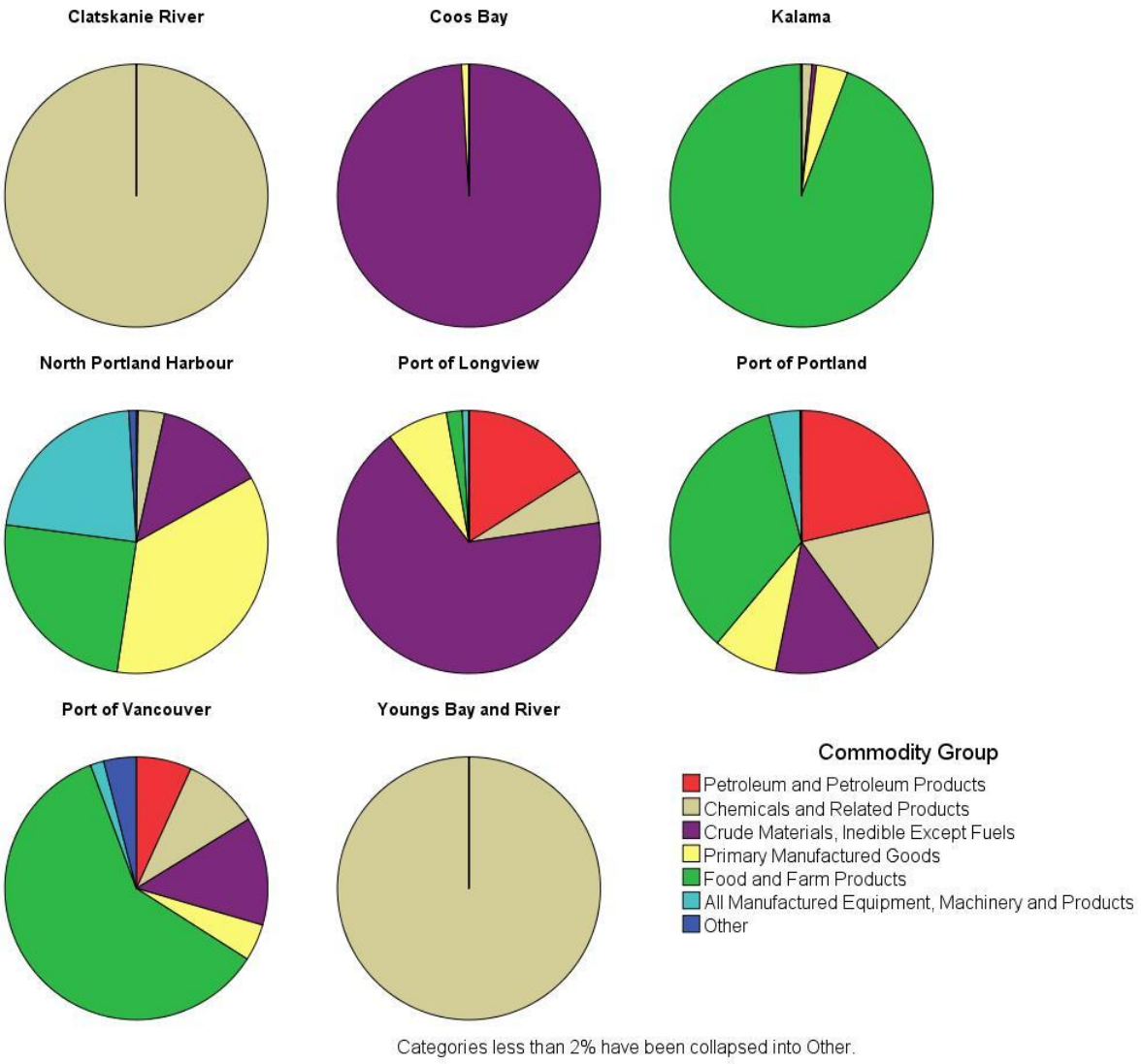
Waterborne Transport

- Five years (2004-2008) of data were downloaded from the US Army Corps of Engineers Navigation Data Center
- Material listed by product groupings
- Columbia, Snake, Willamette River and Oregon Coast ports considered

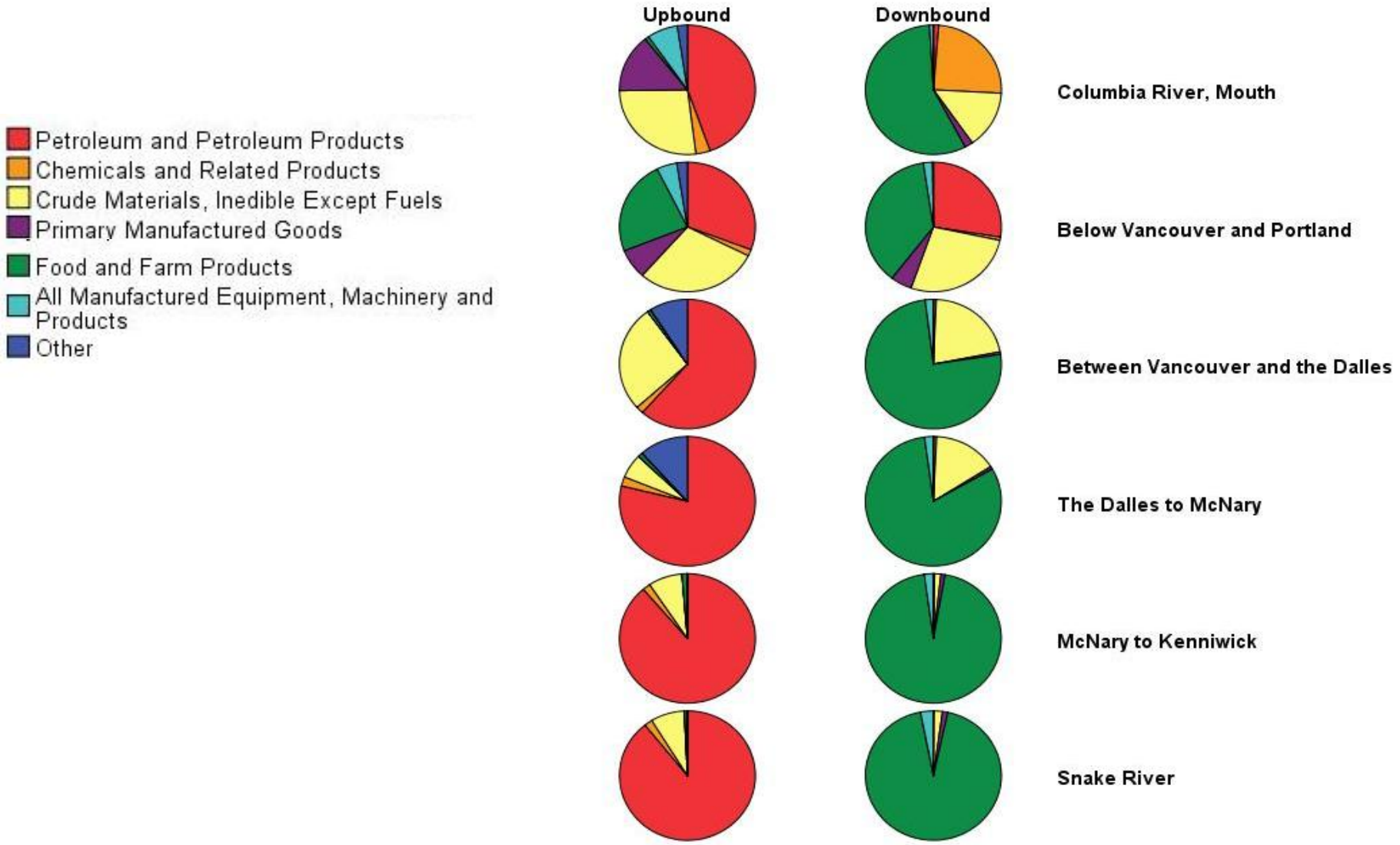
Waterborne Transport: Ports



Waterborne Transport: Ports



Waterborne Transport: Columbia River System



Waterborne Transport: Limitations

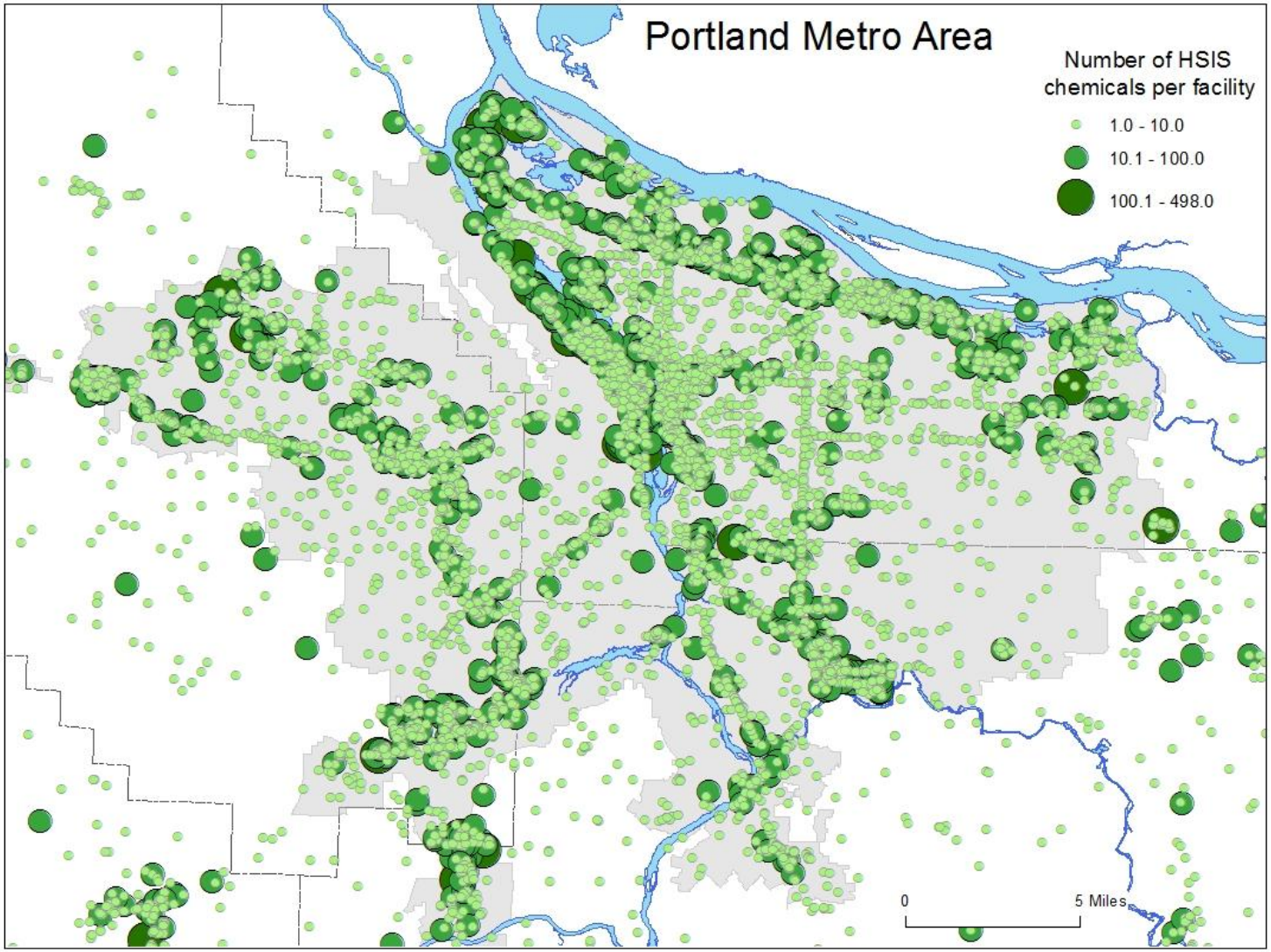
- Not linked to highway or rail data
- No hazard class designation
- No records of hazardous material transported along the coastline

- Better than highway and railroad data!!

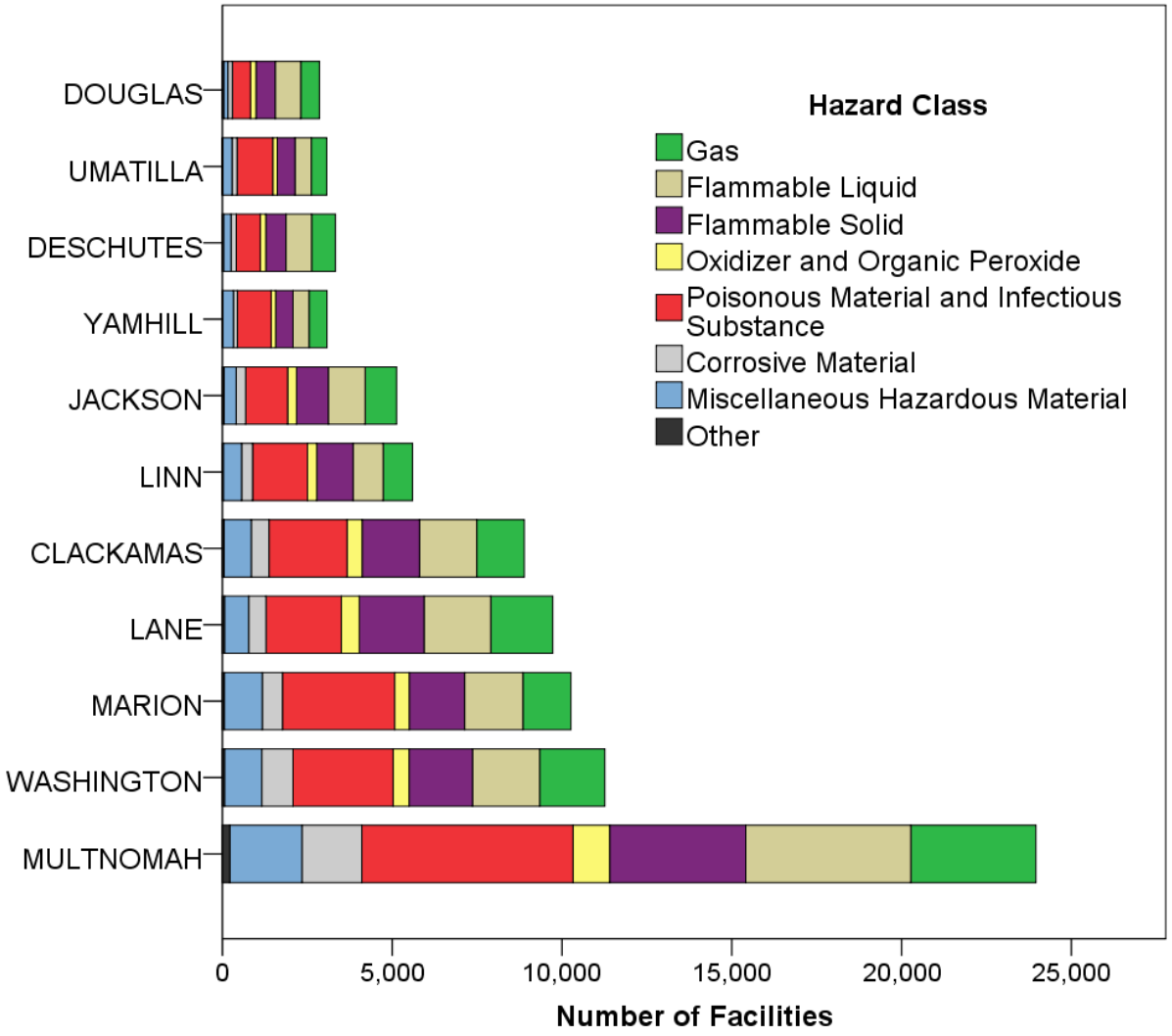
Fixed Facility: HSIS

- Approximately 19,000 facilities with stored hazardous chemicals
- Multiple chemicals at each facility resulting in a total of approximately 108,000 records
- 81 attributes associated per record

Fixed Facility: HSIS

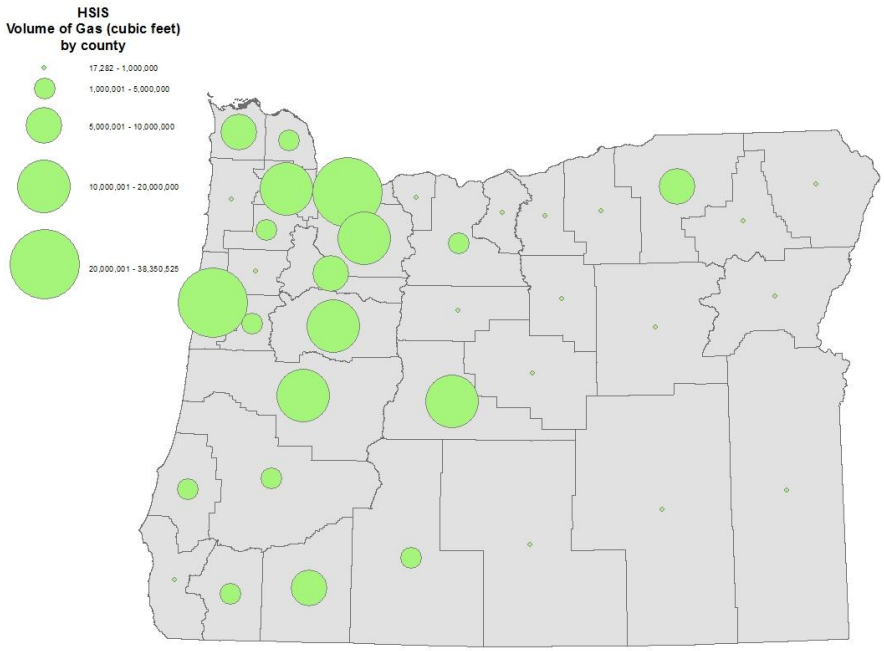


Fixed Facility: HSIS by County & Class

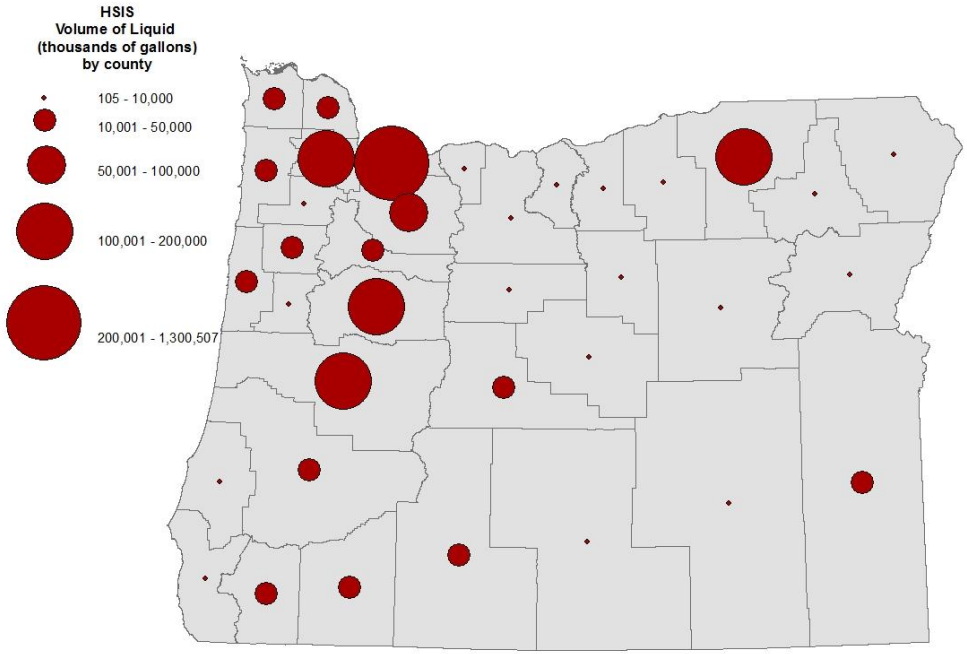


Fixed Facility: HSIS Volume by County

Gas



Liquid

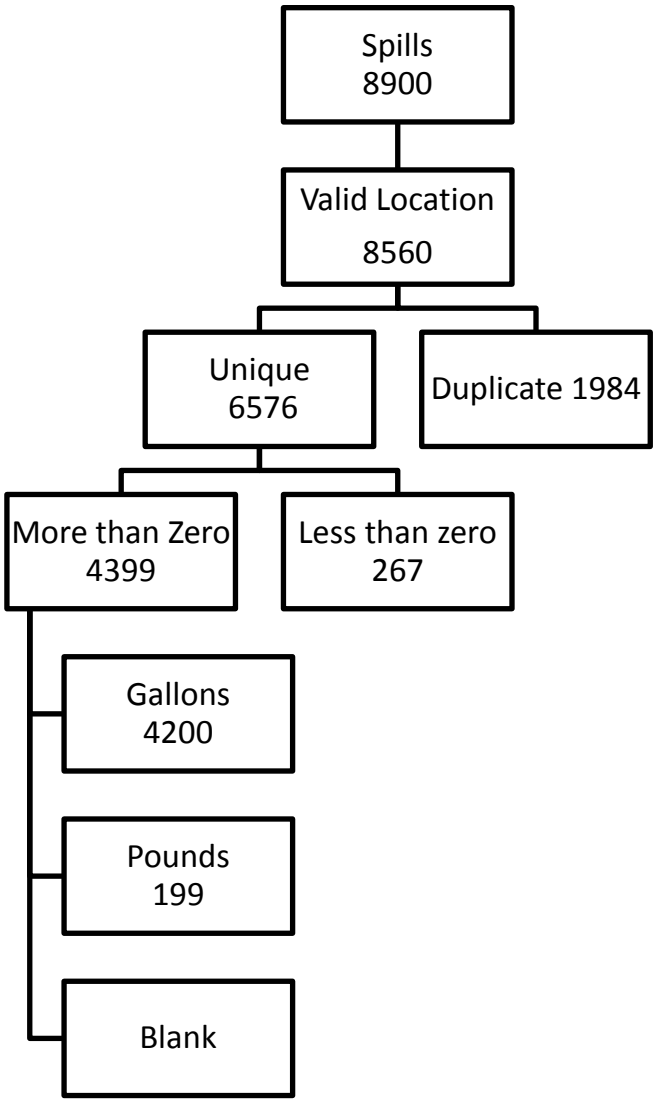


Fixed Facility: HSIS Limitations

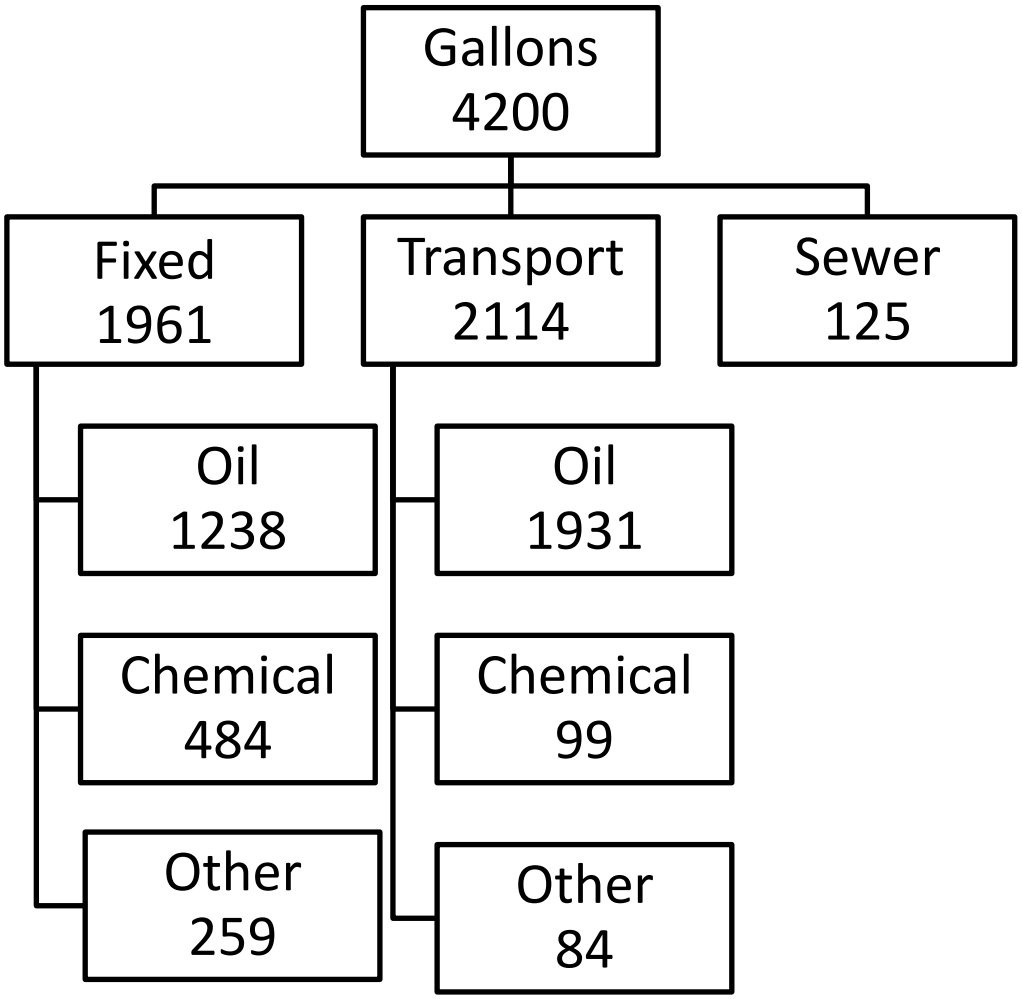
- Need correct and complete geocoding or lat/long
- Audit / qualify the completeness of data
- Not publicly available

- This is a very rich and comprehensive dataset for analysis

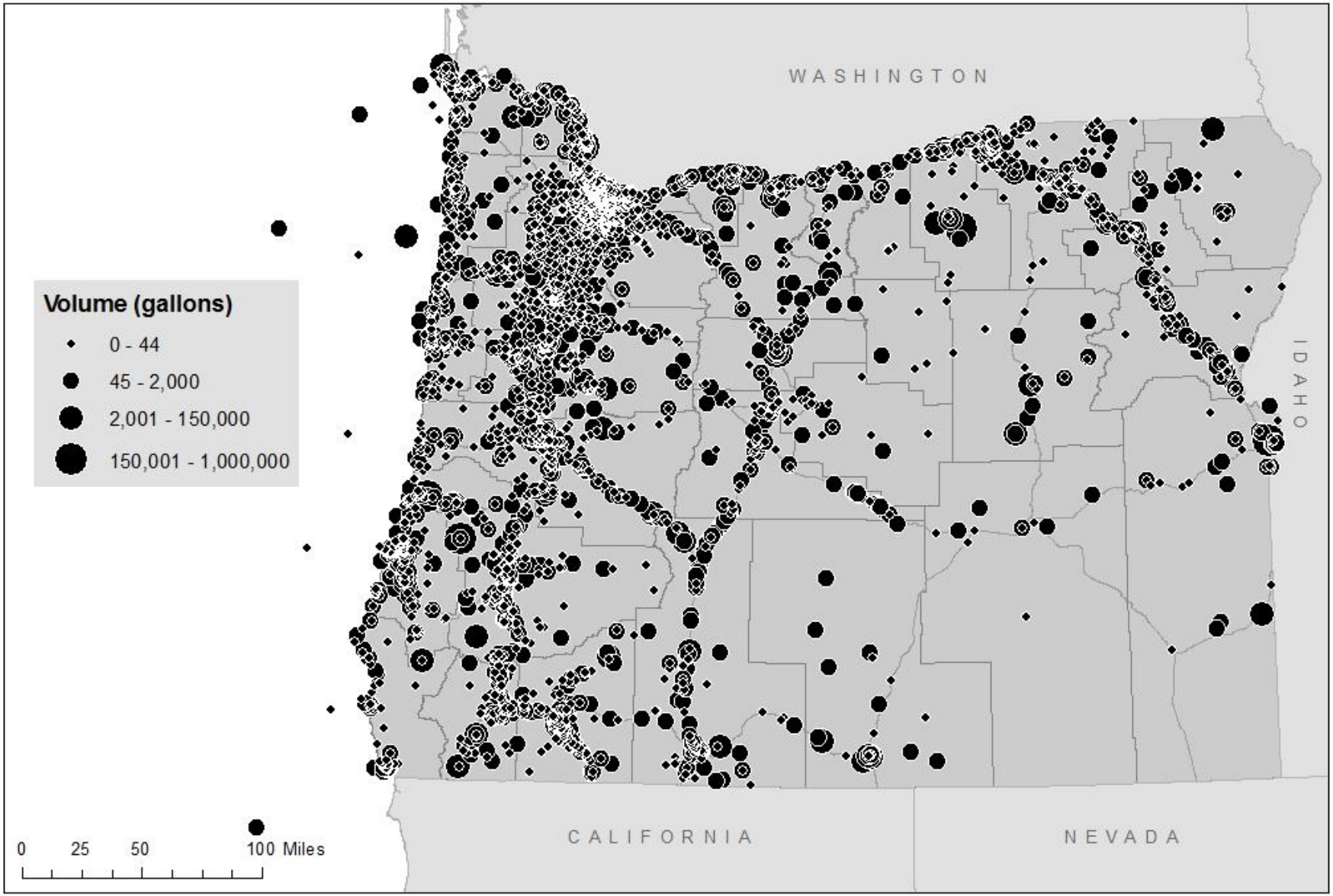
ERIS Spills 2000-2009



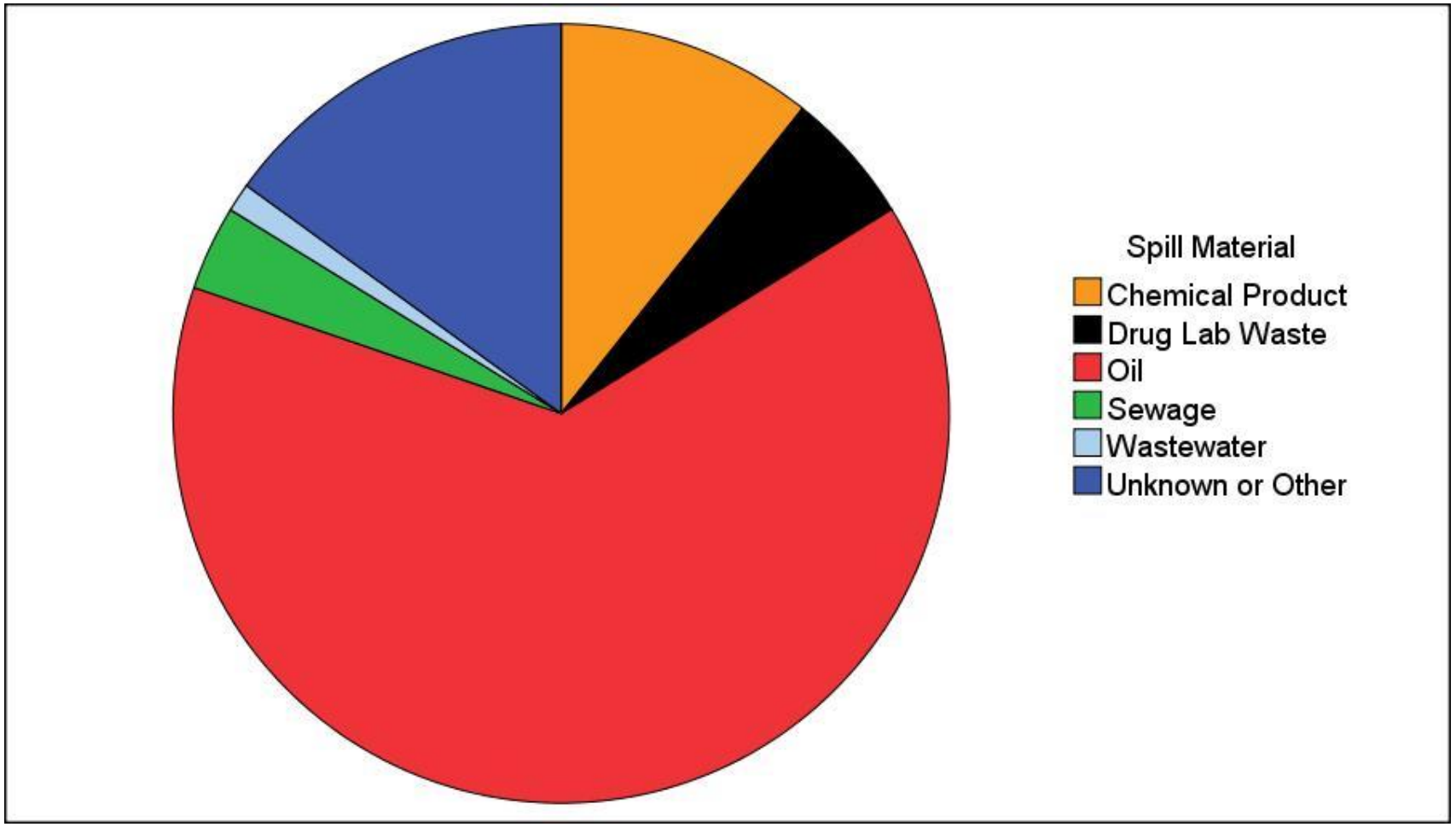
ERIS Spills 2000-2009



ERIS Spills 2000-2009

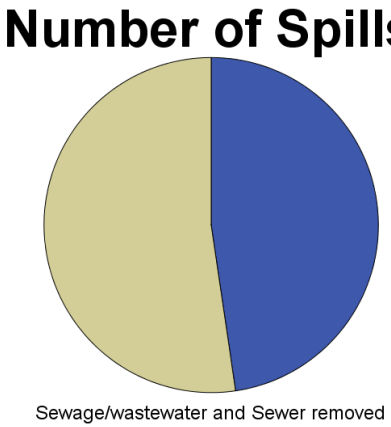


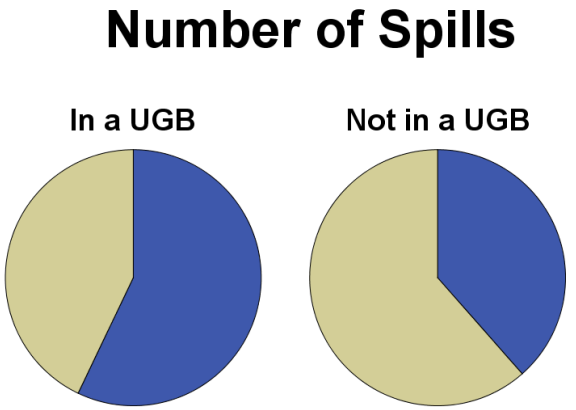
ERIS Spills 2000-2009

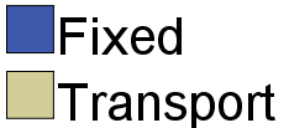


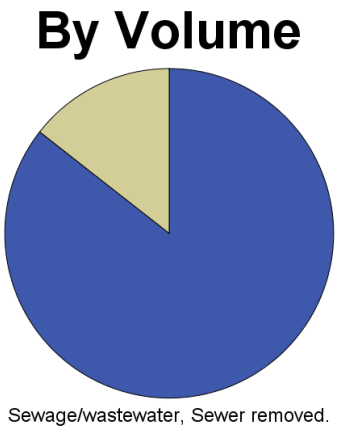
Number of Spills by Material

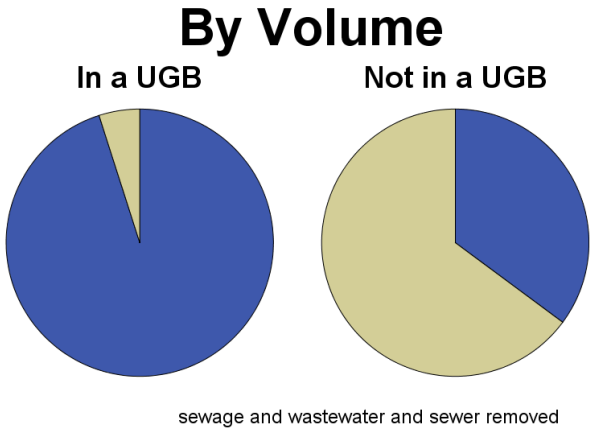
ERIS Spills 2000-2009





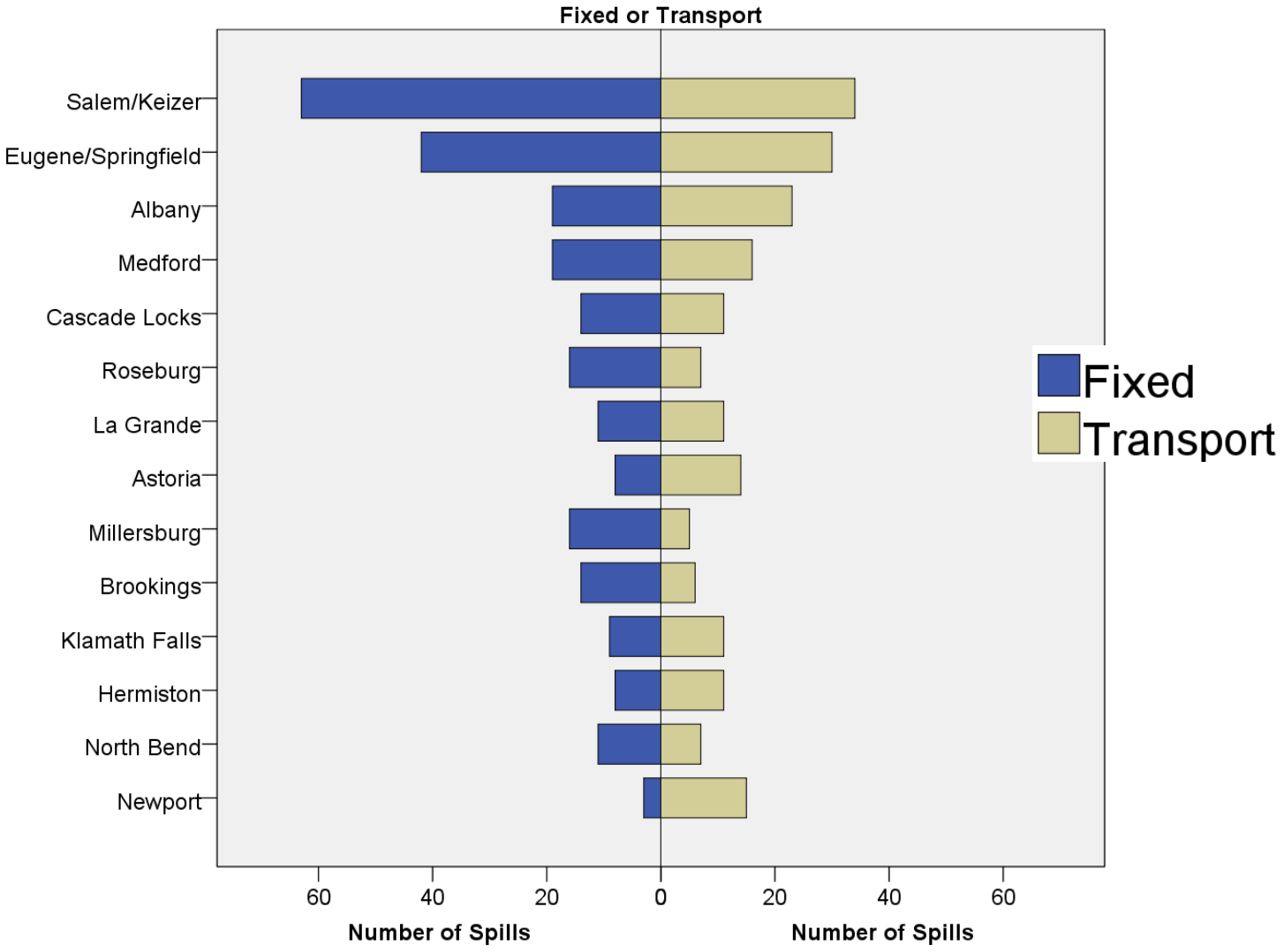




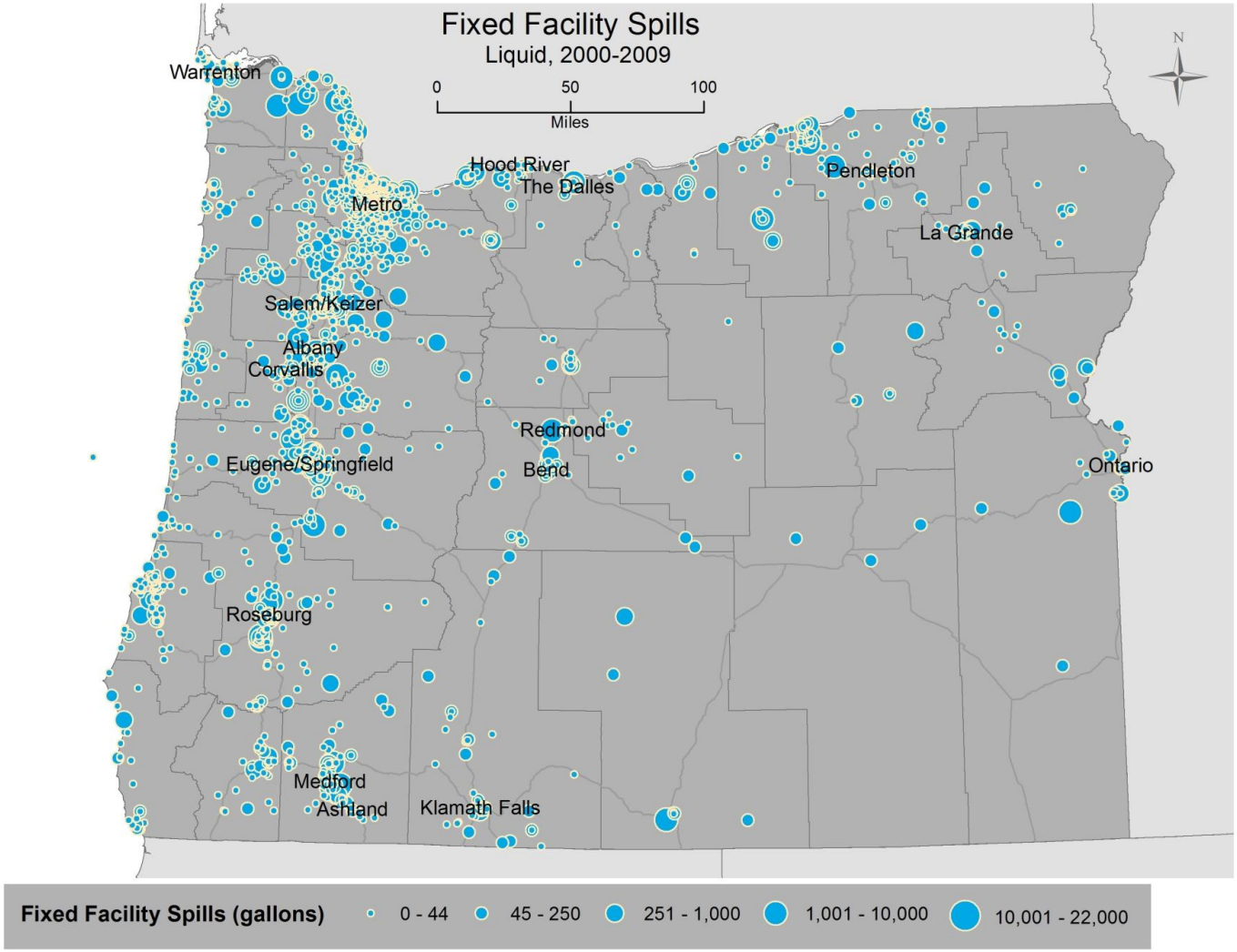


State-Wide and UGB by Transit/Fixed

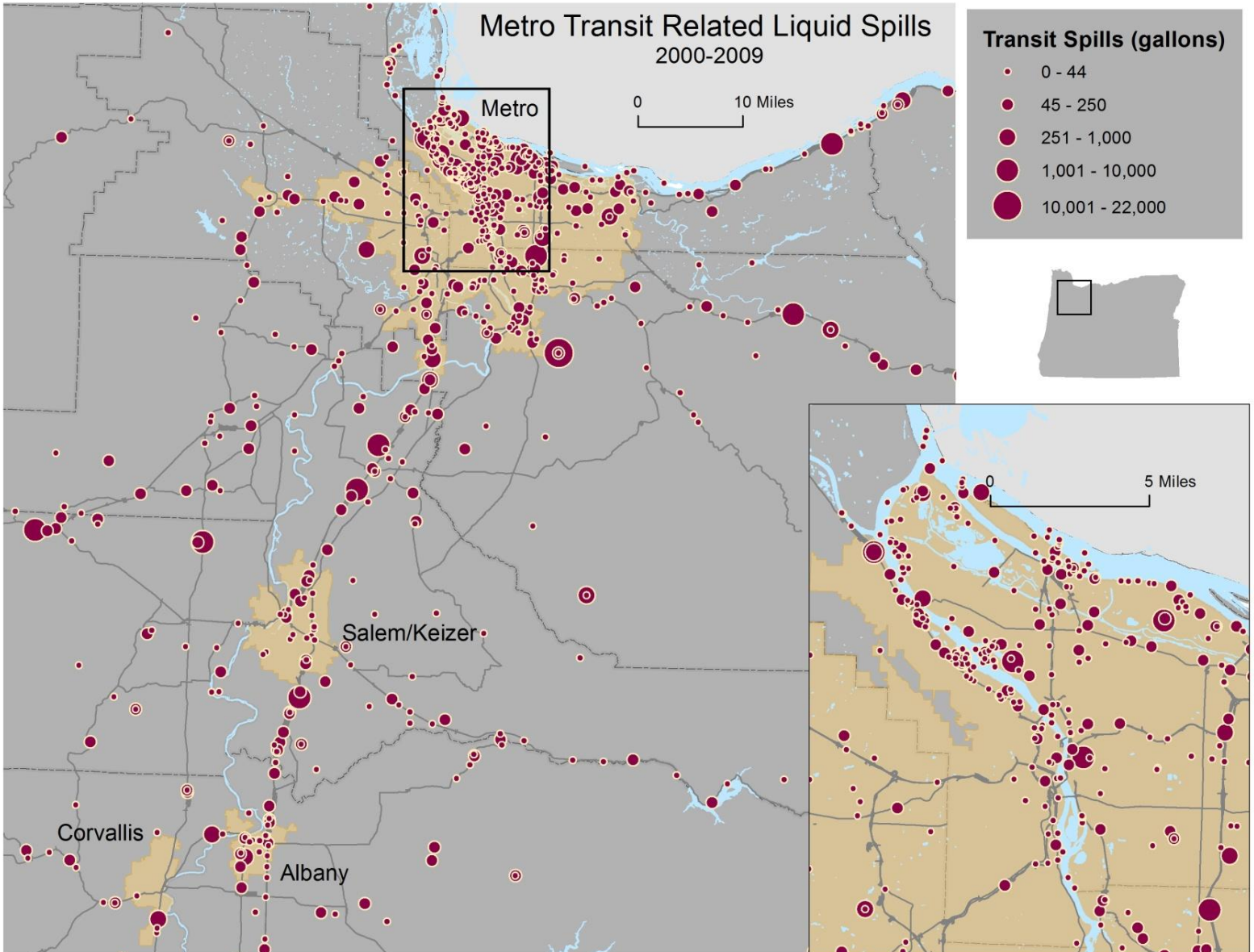
ERIS Spills 2000-2009



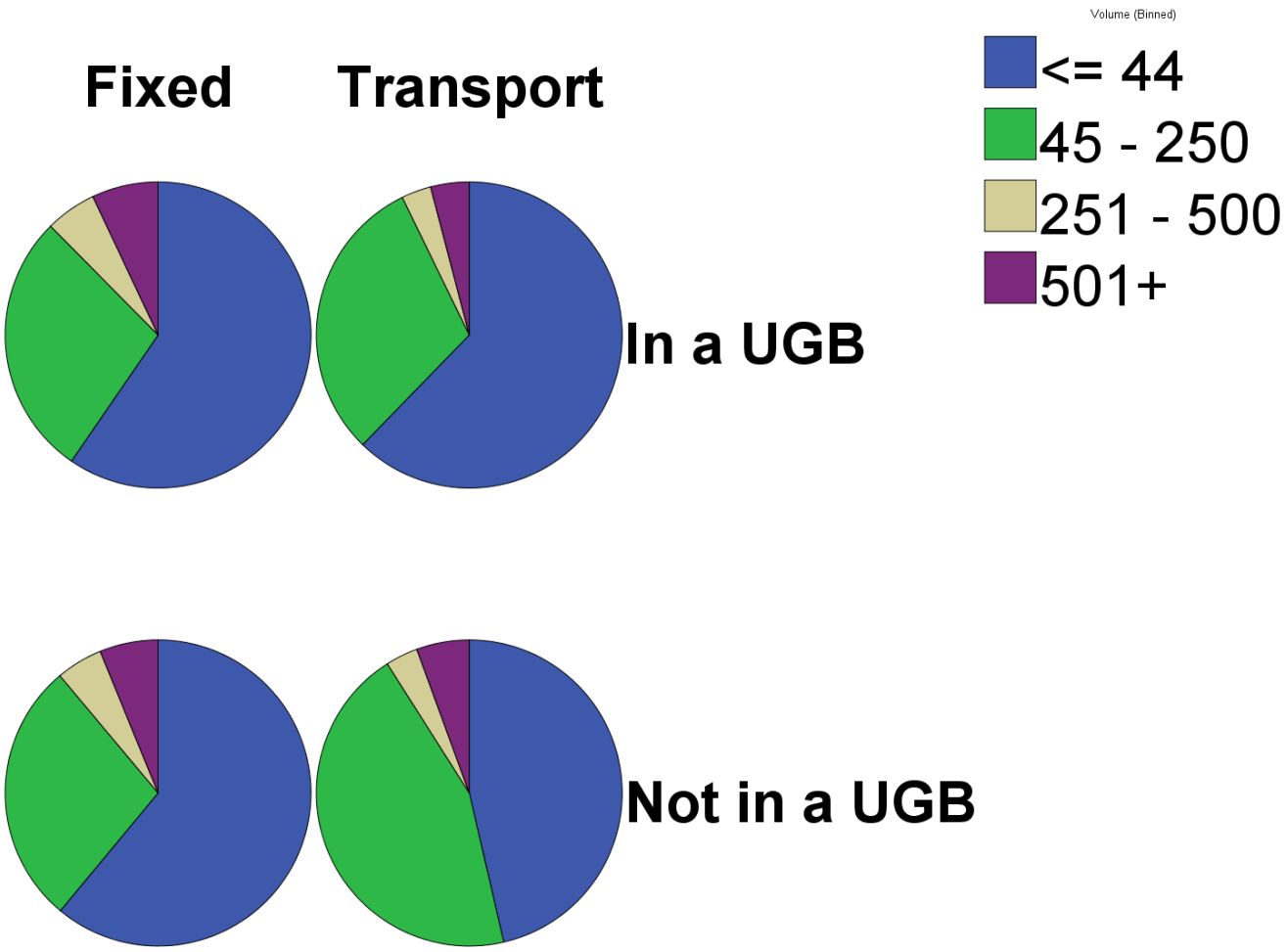
ERIS Spills 2000-2009



ERIS Spills 2000-2009



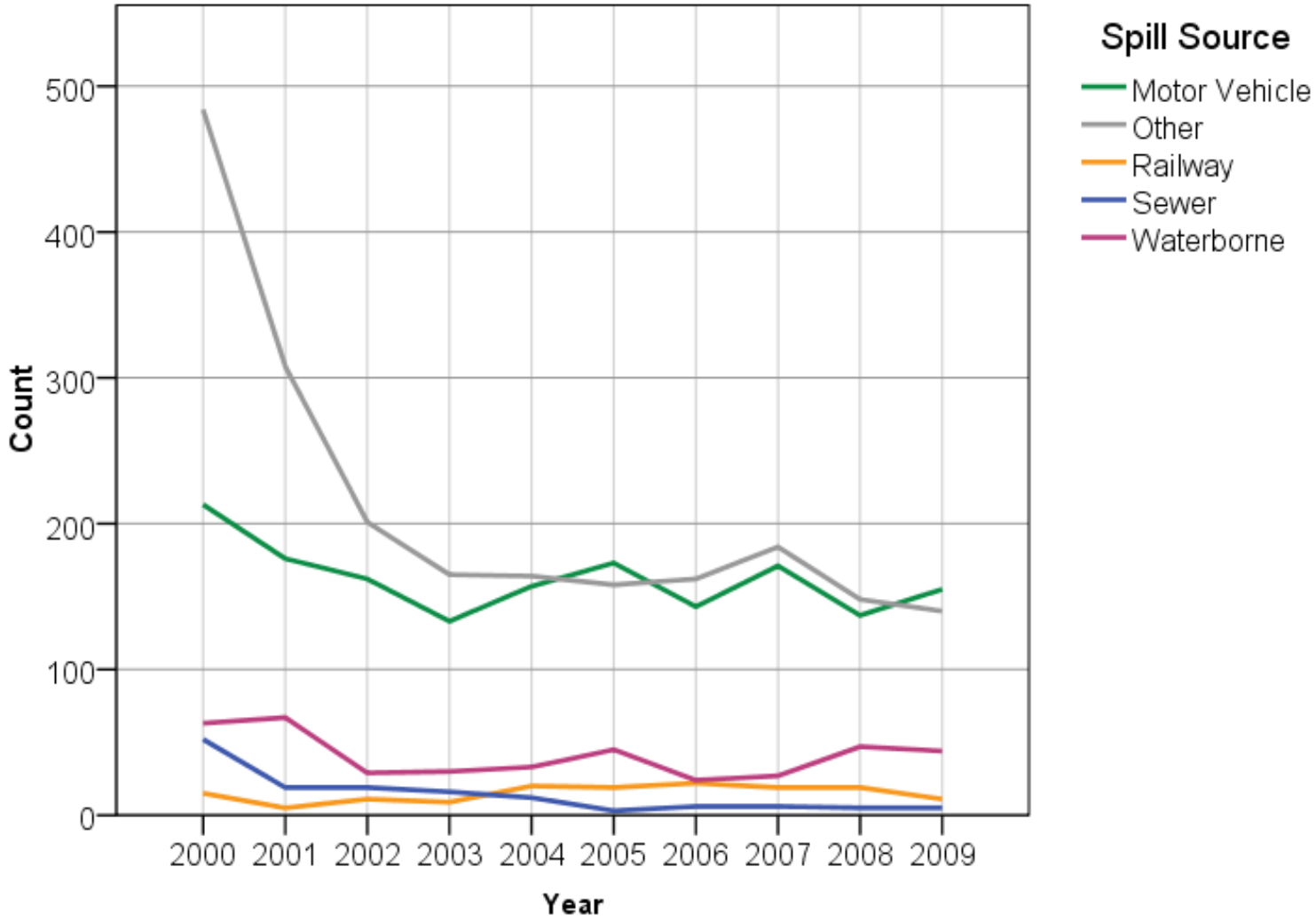
ERIS Spills 2000-2009



ERIS: Limitations

- Duplicate records made summaries difficult
- For some attributes 30% of values are blank
- Locations not provided for all events
- Outliers skew data
- “Other” used indiscriminately

ERIS Spills 2000-2009



Additional Analysis

Compounding chemical exposure are overlays of additional risks including;

- Fire, flood, and tsunami events
- Patterns of high traffic volumes and trends of crashes
- Vulnerable populations such as school and elderly care facilities

Future Directions

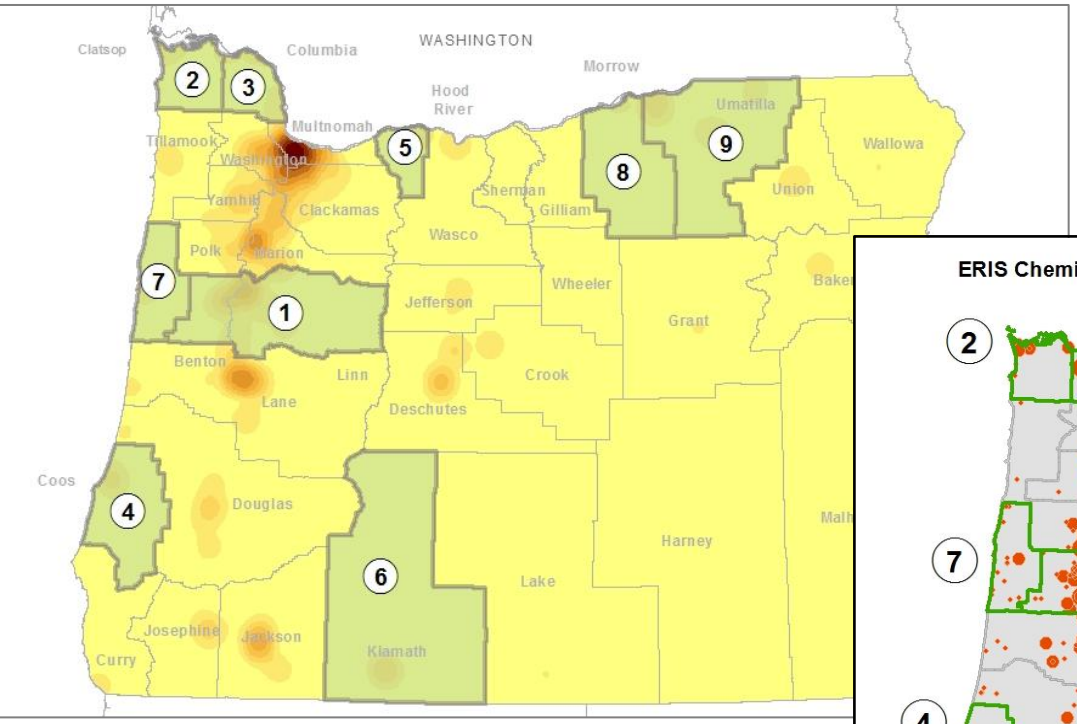
This is a first attempt at determining broad patterns of risk of exposure to hazardous materials

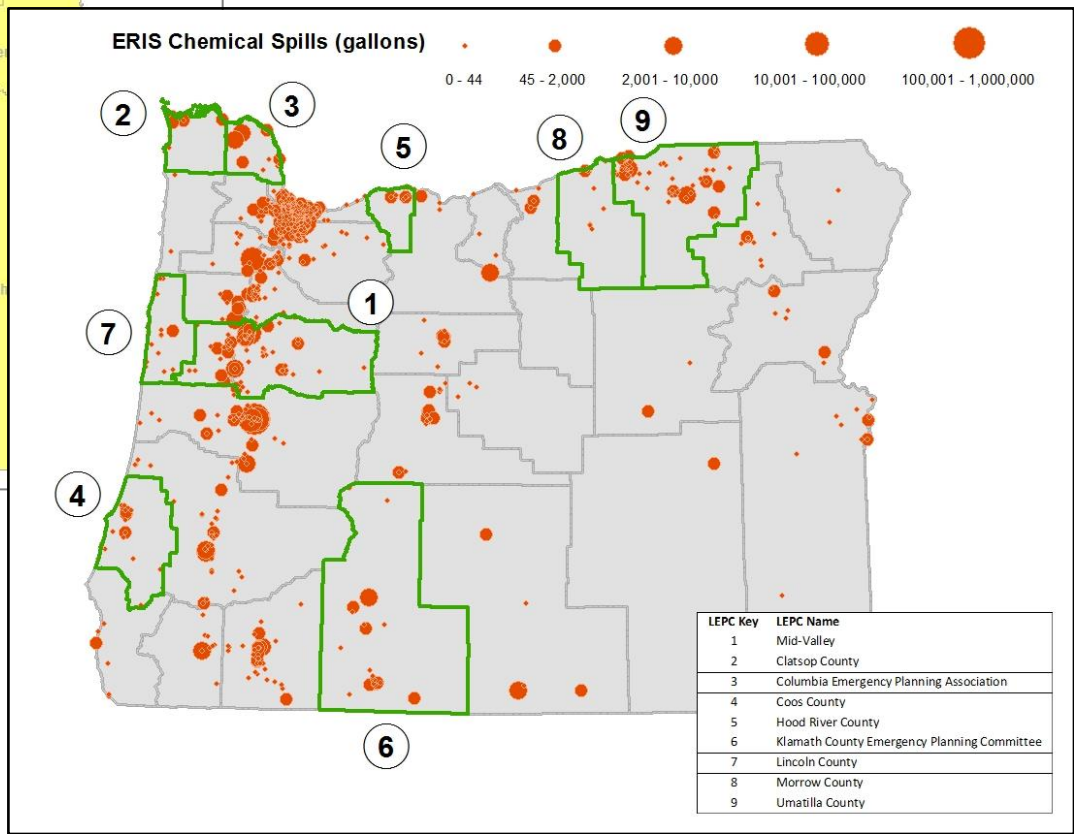
This information will be provided to emergency responders and planners

There are many more research questions to ask

Response and Planning

Local Emergency Planning Committees (LEPC)





Study Funded by the Office of State Fire Marshal

In partnership with the Oregon Department of Environmental Quality
Don Pettit- Senior Emergency Response Planner and
Steven Jett- GIS Analyst Extraordinaire

And in collaboration with fellow CSAR associate,
Christopher Rowlette during the *IRIS* Project