
2011 – 2020 Descriptive Analysis of PEST Cases*

* The data in this presentation are provisional and subject to change. The results presented in the final report may differ.

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Background

- OHA's Pesticide Exposure, Safety and Tracking program (PEST) seeks to determine the burden of human pesticide-related illness in Oregon
- Unique focus on human-health implications of pesticide incidents reported to the Pesticide Analytical and Response Center (PARC)

Methodology – Connecting a specific pesticide event with an individual’s signs and symptoms

- A pesticide “exposure” is defined as an acute onset of symptoms that is attributed to a pesticide “event”
- A pesticide “event” is defined as a single, specific release of a pesticide product
 - Pesticide events can lead to multiple exposures
- Signs are objective findings that are observed and described by a health care professional (e.g., rash)
- Symptoms are subjective evidence reported by the patient (e.g., pain)

Methodology – Connecting a specific pesticide event with an individual's signs and symptoms (cont.)

- PEST assesses the likelihood of a causal pathway between a person's symptoms, the toxicology of the product implicated, and the person's reported exposure to the pesticide
- Specific variables needed to construct a causal pathway include:
 - Toxicity of the pesticide product(s)
 - Duration of time an individual spent in proximity to the product(s) during application
 - Distance from the application
 - Use of personal protective equipment (PPE)
 - Reported route of the person's exposure
 - Weather patterns, if available
 - Period of time that elapsed between exposure and onset of symptoms
 - Duration of symptoms

Methodology – PEST investigation and classification of cases

- PEST uses a variety of sources to gather information on exposures, including interviews with those who report exposures, interviews with bystanders, review of investigative reports from other agencies, and review of medical records

Case classification	Plausible evidence of exposure	Plausible evidence of health effects
Definite	Laboratory, clinical, or environmental evidence corroborates exposure	Two or more post-exposure health effects (where one is a sign) or lab findings are reported by a health care provider
Probable	Laboratory, clinical, or environmental evidence corroborates exposure	Two or more post-exposure symptoms are reported by the individual or a health care provider
Possible	Evidence of exposure is based on report from case, witness, application, observation of residue, or contamination	Two or more post-exposure health effects (one a sign) or lab findings are reported by a licensed health care provider OR two or more post-exposure symptoms are reported by the individual or a health care provider

Source: Pesticide Data Report Washington State, 2010 – 2011 Agency Data

Methodology – PEST investigation and classification of cases (cont.)

Severity category	Description
Fatal	Human fatality resulting from exposure to one or more pesticides
High	Illness or injury is severe enough to be considered life threatening and typically requires treatment. Commonly involves hospitalization to prevent death. Signs and symptoms include, but are not limited to, coma, cardiac arrest, renal failure, and/or respiratory depression. Individual sustains substantial loss of time (>5 days) from regular work or normal activities. Individual may sustain permanent functional impairment
Moderate	Less severe illness or injury often involving systemic manifestations. Individual able to return to normal functioning without any residual disability. Usually less time is lost from work or normal activities (≥ 3-5 days). No residual impairment present, although effects may be persistent
Low	Often manifested by skin, eye, or upper respiratory irritation. May also include fever, headache, fatigue, or dizziness. Typically resolves without treatment. Minimal lost time (<3) days from work or normal activities

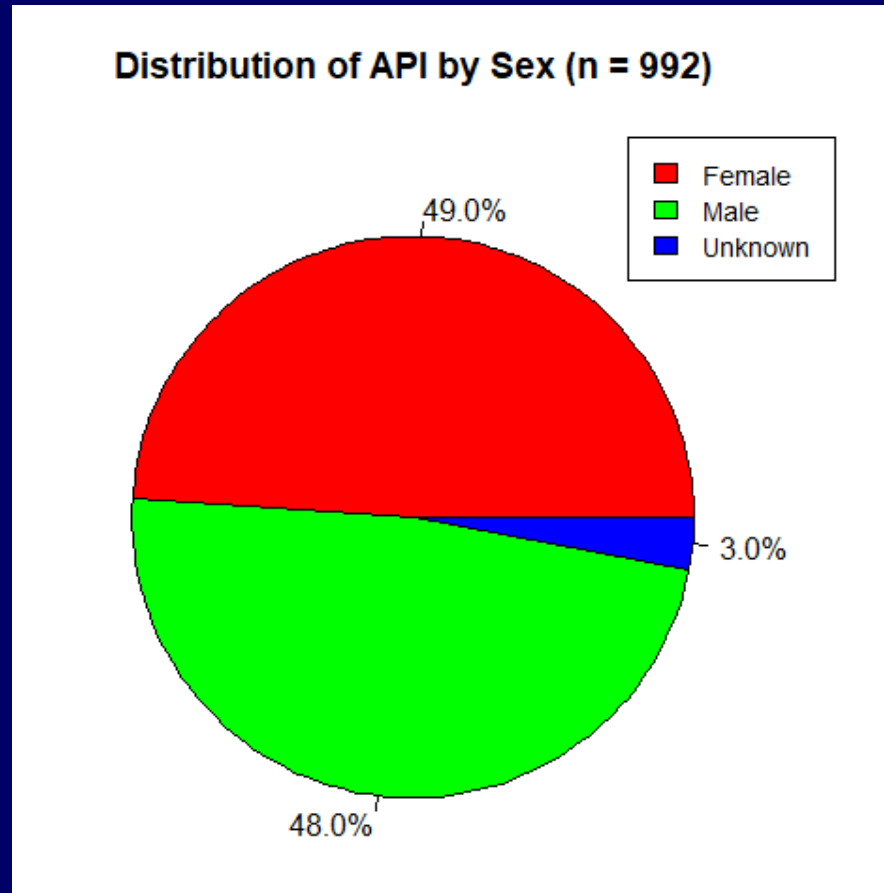
Source: CDC NIOSH Severity Index for Use in State-based Surveillance of Acute Pesticide-Related Illness and Injury

What did this analysis find?

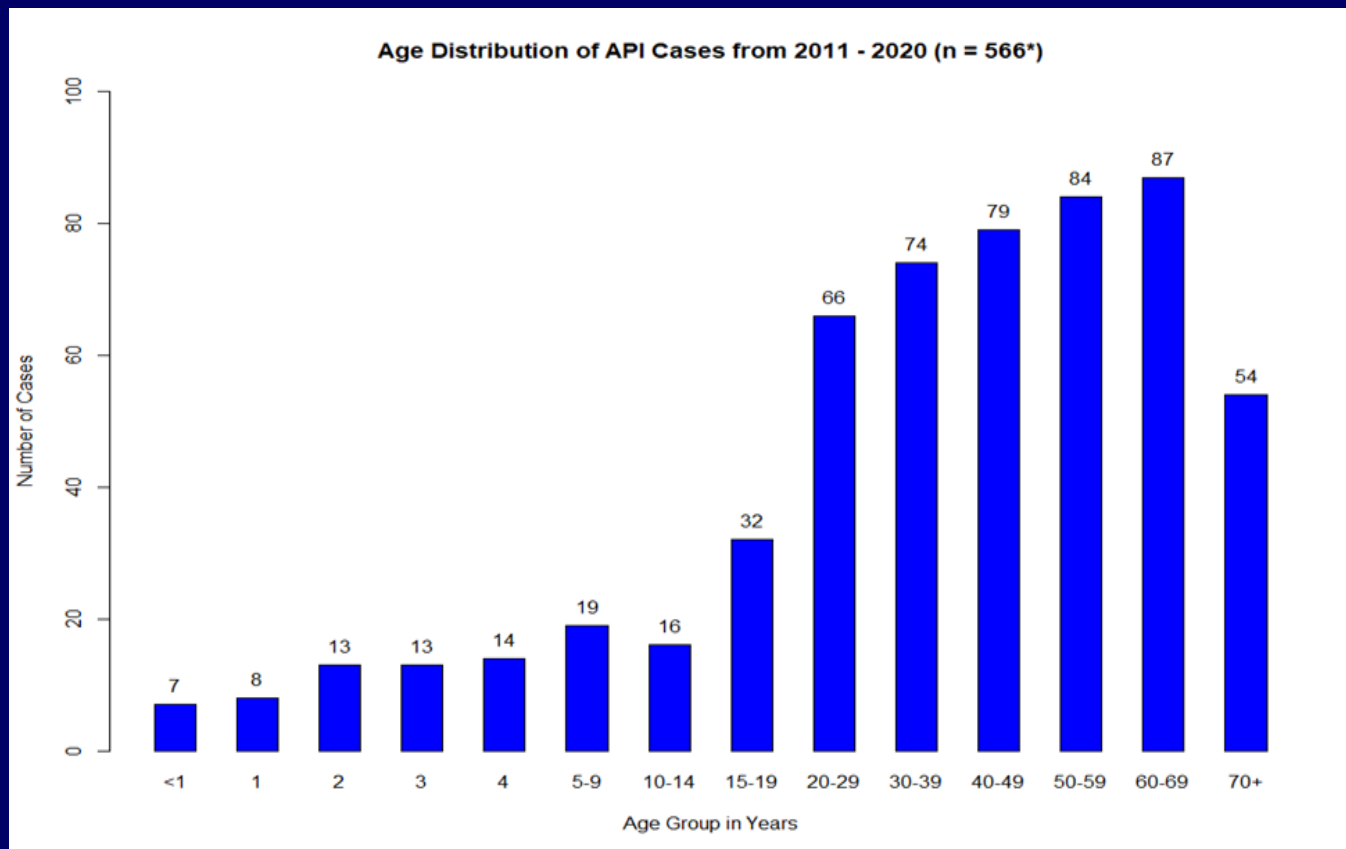
- 1,439 valid reports of acute pesticide-related illnesses from 2011 - 2020
- 796 pesticide events
- 992 pesticide cases

Status	Number	Percent
Definite	138	9.6%
Probable	103	7.2%
Possible	751	52.2%
Suspicious	18	1.3%
Unlikely	98	6.8%
Insufficient information	233	16.2%
Exposed/asymptomatic	63	4.4%
Unrelated	35	2.4%
Total	1,439	100.0%

Who was involved? (Demographics – Sex)



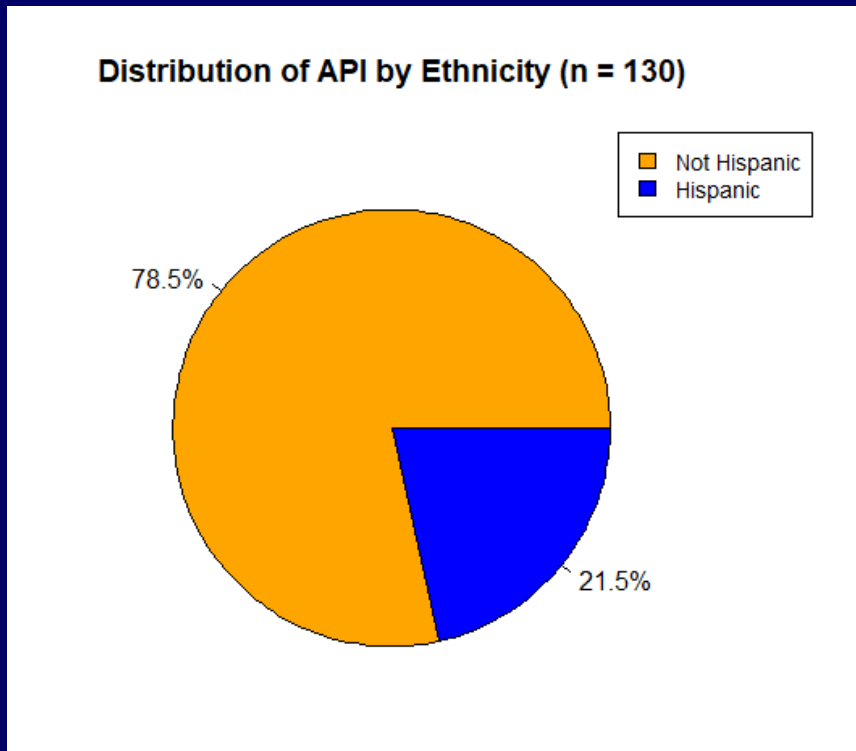
Who was involved? (Demographics – Age)



Who was involved? (Demographics – Race)

Race	Number	Percent	2015 population estimate in Oregon (%)
White	118	86.1%	85.1%
Black	5	3.6%	1.8%
Other	5	3.6%	3.4%
AI/AN	2	1.5%	1.2%
Pacific Islander	2	1.5%	0.4%
Asian	1	0.7%	4.0%
Two or more races	4	2.9%	4.1%
Total	137	99.9%*	100.0%

Who was involved? (Demographics - Ethnicity)



- The only ethnicity variable with enough data to analyze was Hispanic (y/n), where 130 cases had data
- Oregon 2015 census data shows estimated 12.3% of the population is Hispanic

What were the results of the exposure? (Signs & symptoms)

Sign and symptoms categories	Number
Respiratory: health effects involving the lungs or upper respiratory system	497
Neurological: health effects involving the nervous or sensory systems	456
Gastrointestinal: health effects involving the gastrointestinal tract	326
Ocular: health effects involving the eye	320
Dermatological: health effects involving irritation or sensitization of the skin	278
General: health effects not captured by other health effects categories	123
Cardiovascular: health effects involving the heart or circulatory system	73
Renal: health effects involving renal/genitourinary systems	12
Total	2,085

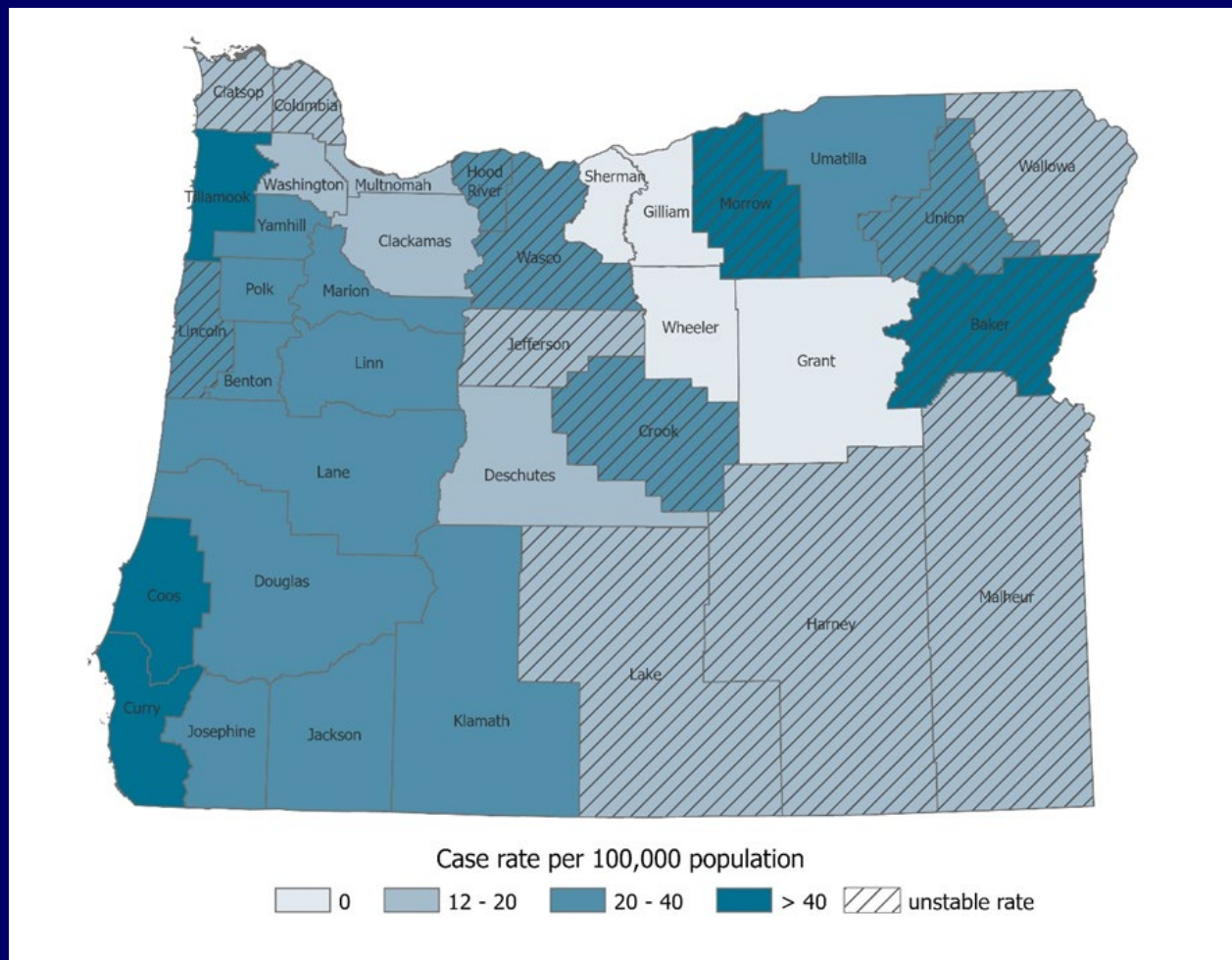
What were the results of the exposure? (Severity)

Severity of adverse health effects	Number	Percent
Fatal	14	1.4%
High	8	0.8%
Moderate	84	8.5%
Low	880	89.2%
Total	986	99.9%*

What were the rates of exposures?

- Oregon overall case rate was 24.7 cases per 100,000 population
- Oregon overall event rate was 19.8 events per 100,000 population

Where did the exposure occur? (County)



Where did the exposure occur? (Location type of pesticide events and exposures)

Site category	Number of pesticide releases by site	Cases of acute pesticide-related illnesses by site	Percent of pesticide releases by site	Percent of acute pesticide-related illnesses by site
Private residence	511	682	64.2%	68.8%
Agricultural (farms, nurseries, forests, etc.)	131	77	16.5%	7.8%
Unknown	57	45	7.2%	4.5%
Other	38	42	4.8%	4.2%
Non-manufacturing commercial facilities	31	54	3.9%	5.4%
Institutions (residential institutions, schools, day cares, prisons, hospitals, etc.)	16	70	2.0%	7.1%
Manufacturing	10	19	1.3%	1.9%
More than one site	2	1	0.3%	0.1%
Not applicable	0	2	0.0%	0.2%
Total	796	992	100.0%	100.0%

What activities were involved? (non-occupational and occupational)

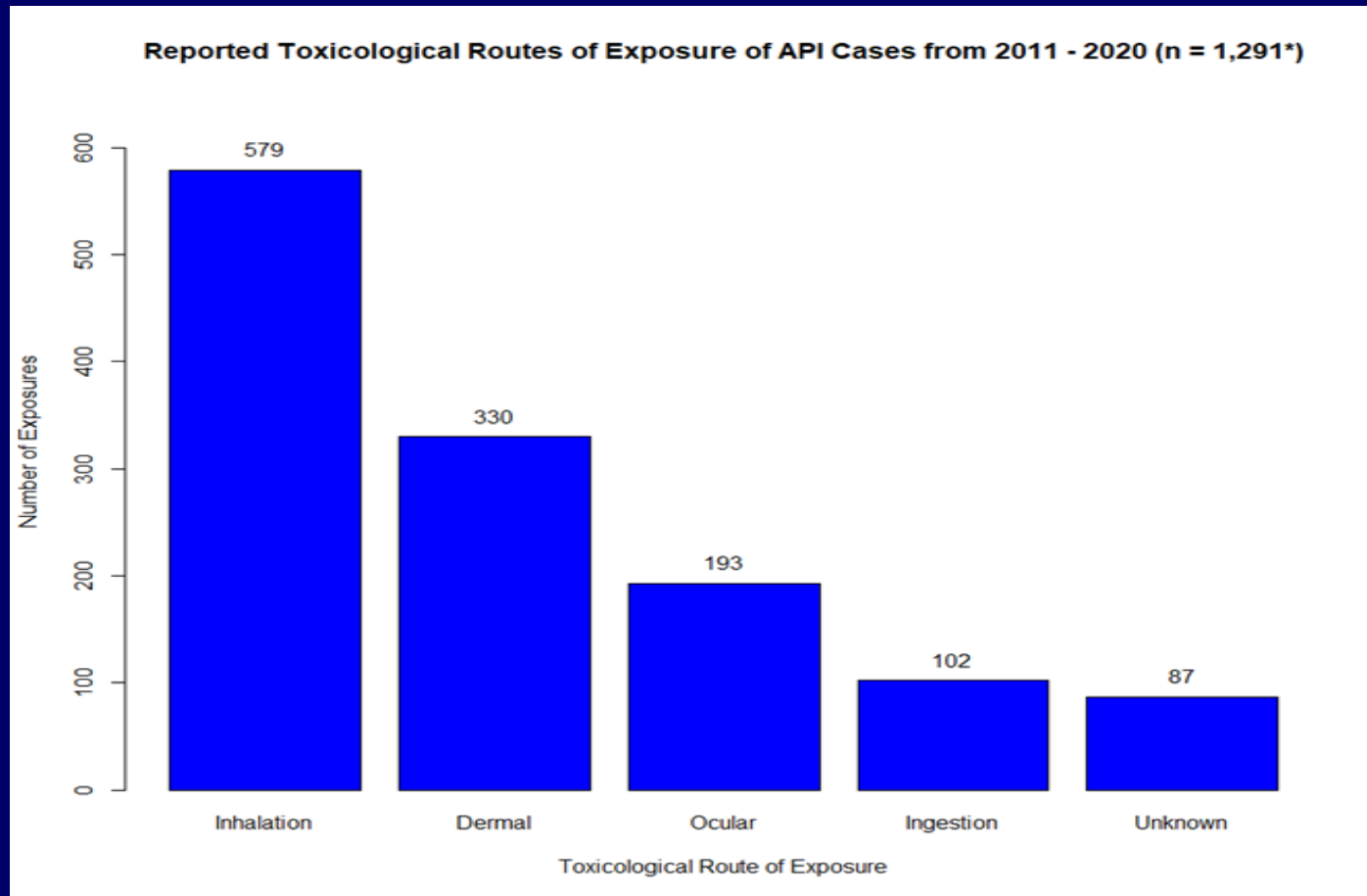
Reported activity accompanying exposure	Number	Percent
Routine outdoor living activities not involved with pesticide application	259	32.5%
Applying pesticide	239	30.0%
Routine indoor living activities not involved with pesticide application	200	25.1%
Unknown	55	6.9%
Routine work activity not involved with pesticide application (includes exposure to field residue)	19	2.4%
Application to self or another human of a pesticide intended to be used on human skin, hair, or clothing	11	1.4%
Mixing/loading pesticide	6	0.8%
Transport or disposal of pesticide	3	0.4%
Combination of activities	3	0.4%
Repair or maintenance of pesticide application equipment	1	0.1%
Emergency response	1	0.1%
Total	797	100.1%*

Reported activity at work	Number	Percent
Routine work activity not involved with pesticide application (includes exposure to field residue)	75	45.7%
Applying pesticide	49	29.9%
Mixing/loading pesticide	12	7.3%
Routine indoor living activities not involved with pesticide application	9	5.5%
Transport or disposal of pesticide	6	3.7%
Routine outdoor living activities not involved with pesticide application	5	3.0%
Combination of activities	3	1.8%
Unknown	3	1.8%
Repair or maintenance of pesticide application equipment	1	0.6%
Application to self or another human of a pesticide intended to be used on human skin, hair, or clothing	1	0.6%
Total	164	100.0%

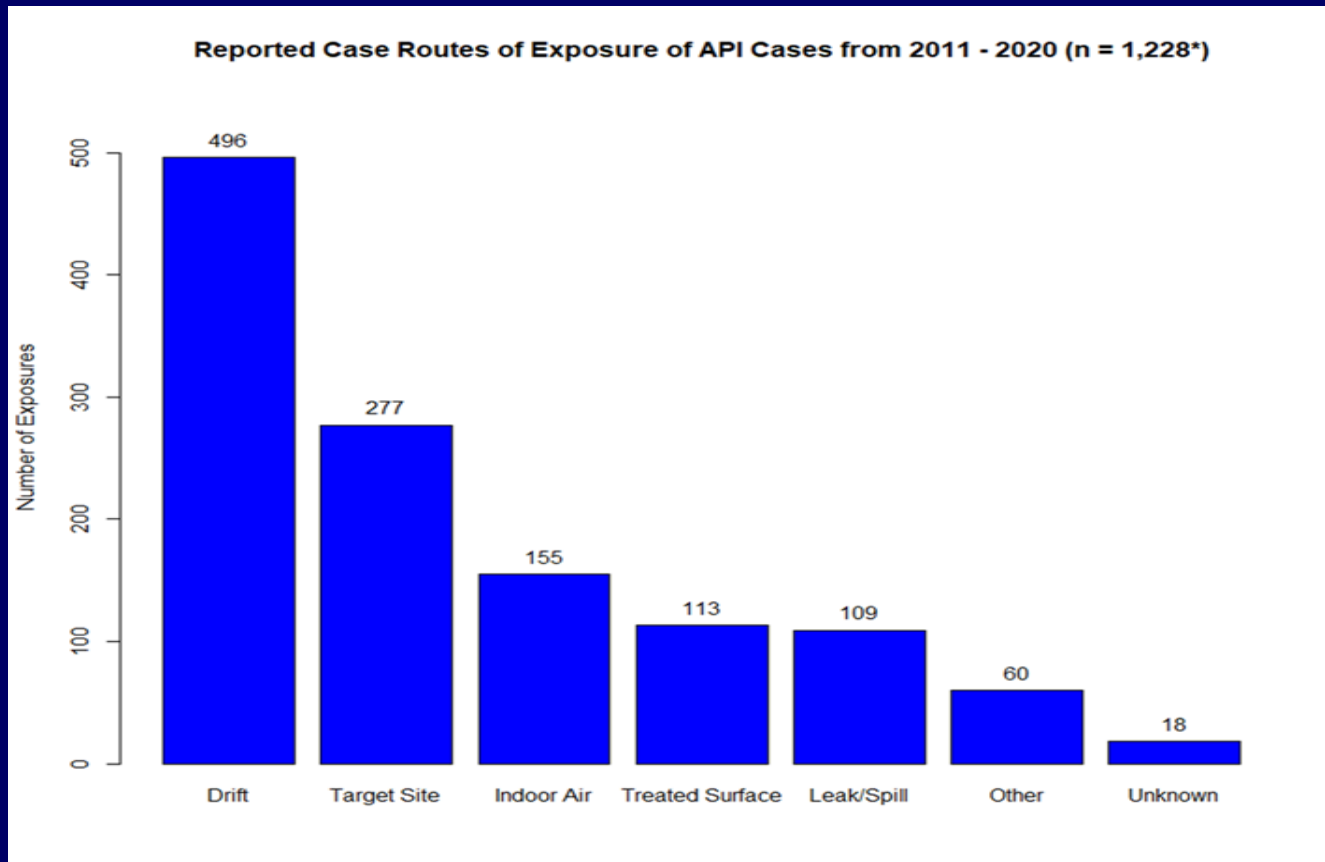
What was the intended application site?

Intended application target	Number	Percent
Building treatment (space, structure, surface)	208	26.1%
Unknown	139	17.5%
Landscape/ornamental	80	10.1%
Undesired plant	79	9.9%
Crops	78	9.8%
Not applicable (no intended target, accidental release)	60	7.5%
Forest	42	5.3%
Other	29	3.6%
Human (Skin/hair, clothing)	26	3.3%
Veterinary - domestic	24	3.0%
Bait for rodent, bird, or predator	12	1.5%
Pools (swimming pools, Jacuzzis, whirlpools, hot tubs, fountains)	6	0.8%
Veterinary - livestock	5	0.6%
Community-wide application target	4	0.5%
Wood product	4	0.5%
Total	796	100.0%

How did the exposure occur? (Toxicological route)



How did the exposure occur? (Case route)



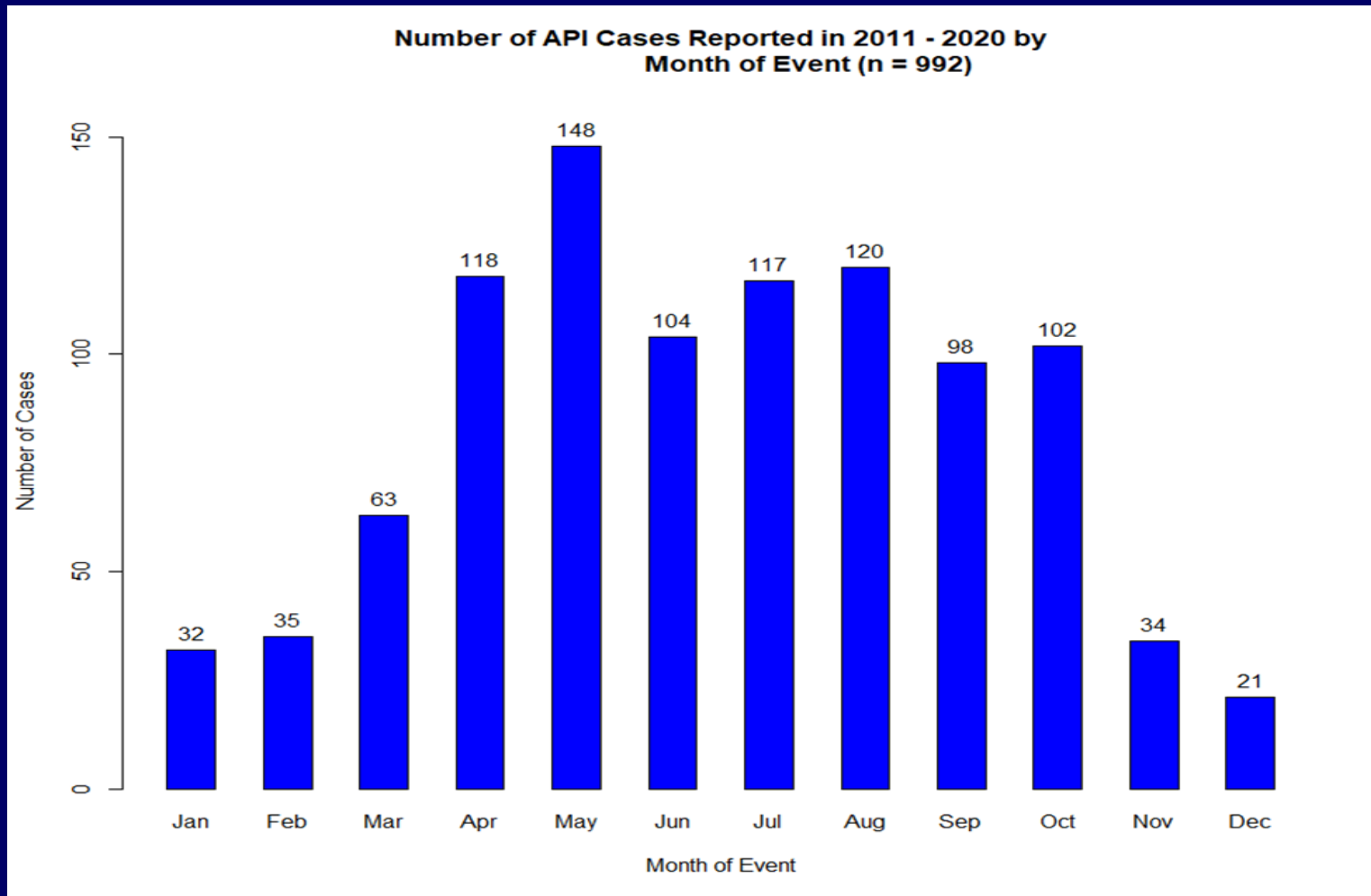
What contributed to the exposure?

Contributing factor	Number
Drift	184
People were in the treated area in during application	114
Notification/posting lacking or ineffective	107
Unknown	103
Decontamination not adequate or timely	86
Early re-entry	75
Spill/splash of liquid or dust (not involving application equipment failure)	72
Required respirator not worn or was inadequate	62
Inadequate ventilation of treated area before re-entry	59
Required eye protection not worn or was inadequate	42
Other required PPE not worn or was inadequate	35
Intentional harm	35
Applicator not properly trained or supervised	34
Excessive application of pesticide	32
Application equipment failure	30
Pesticide stored within reach of child or other improper storage	25
Required gloves not worn or were inadequate	21
Label violations not otherwise specified	10
No label violation identified but person still ill/exposed	7
Illegal pesticide used/illegal dumping of pesticide	4
Mixing of incompatible products	4
Total	1,141

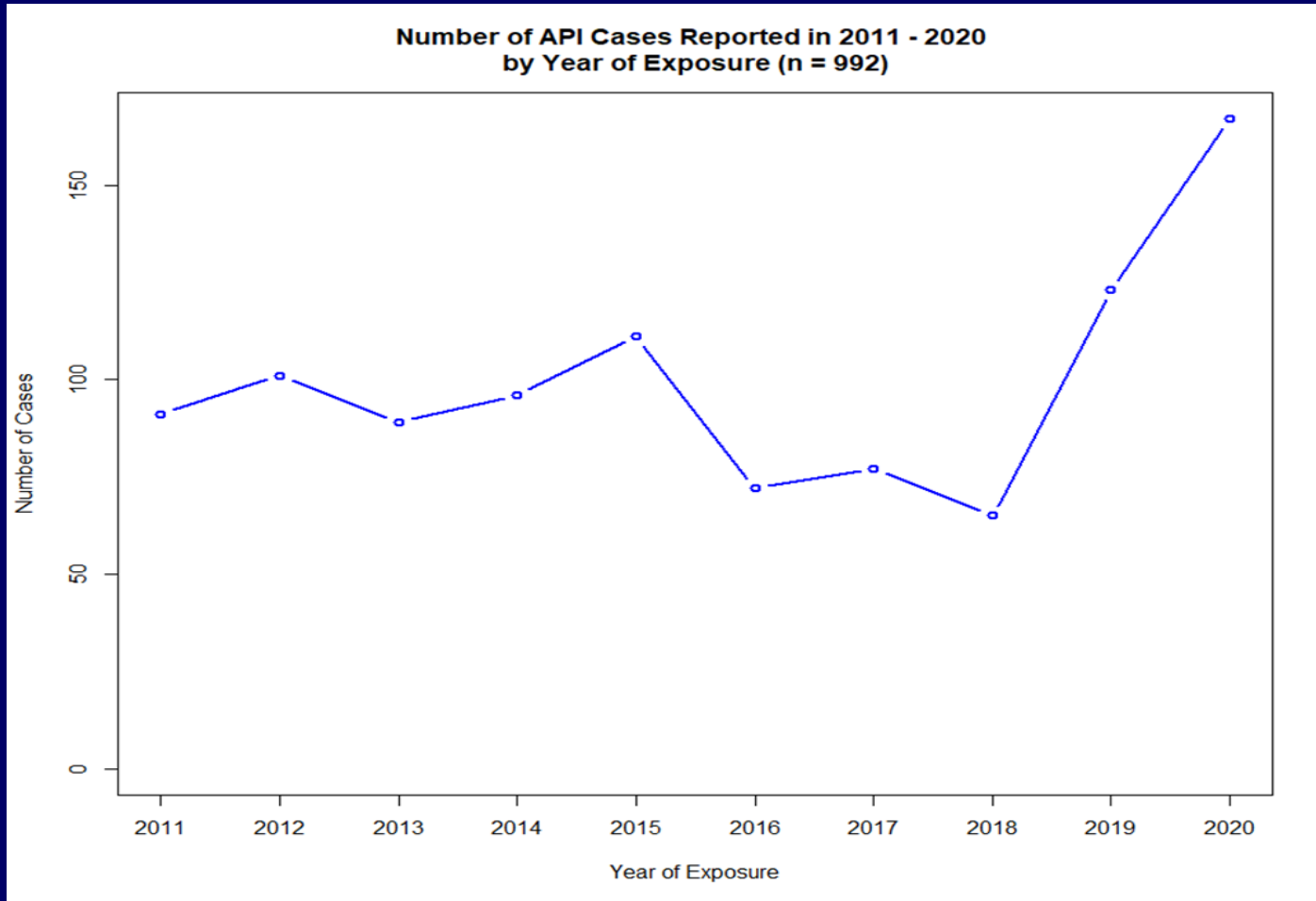
What contributed to the exposure? (Intent)

- 36 (3.6%) of cases were intentional
- Includes self-harm, suicides and suicide attempts, tampering, and assault
- 2020 had markedly more suicide and self-harm cases than previous years

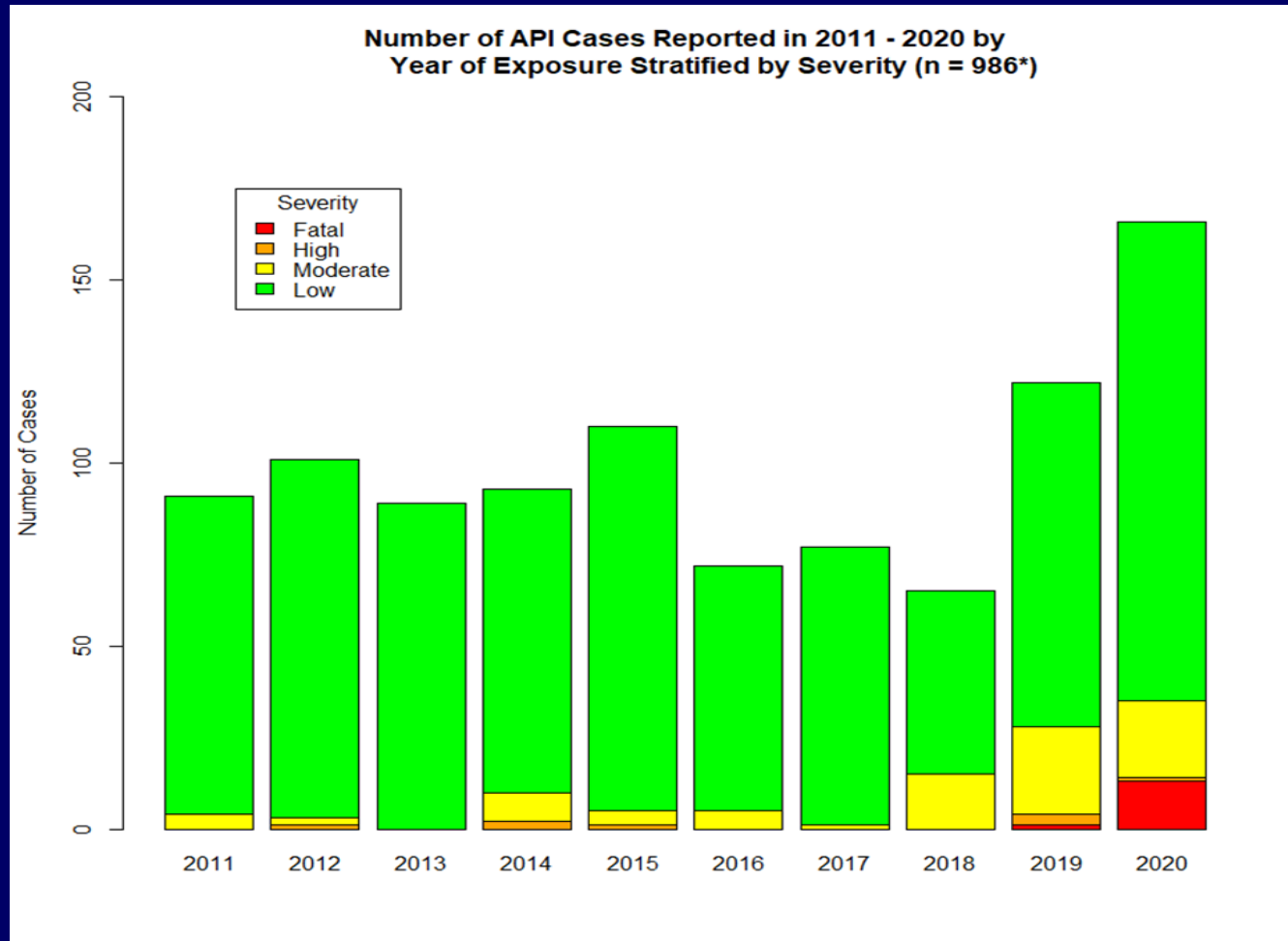
When did the exposure occur? (Month)



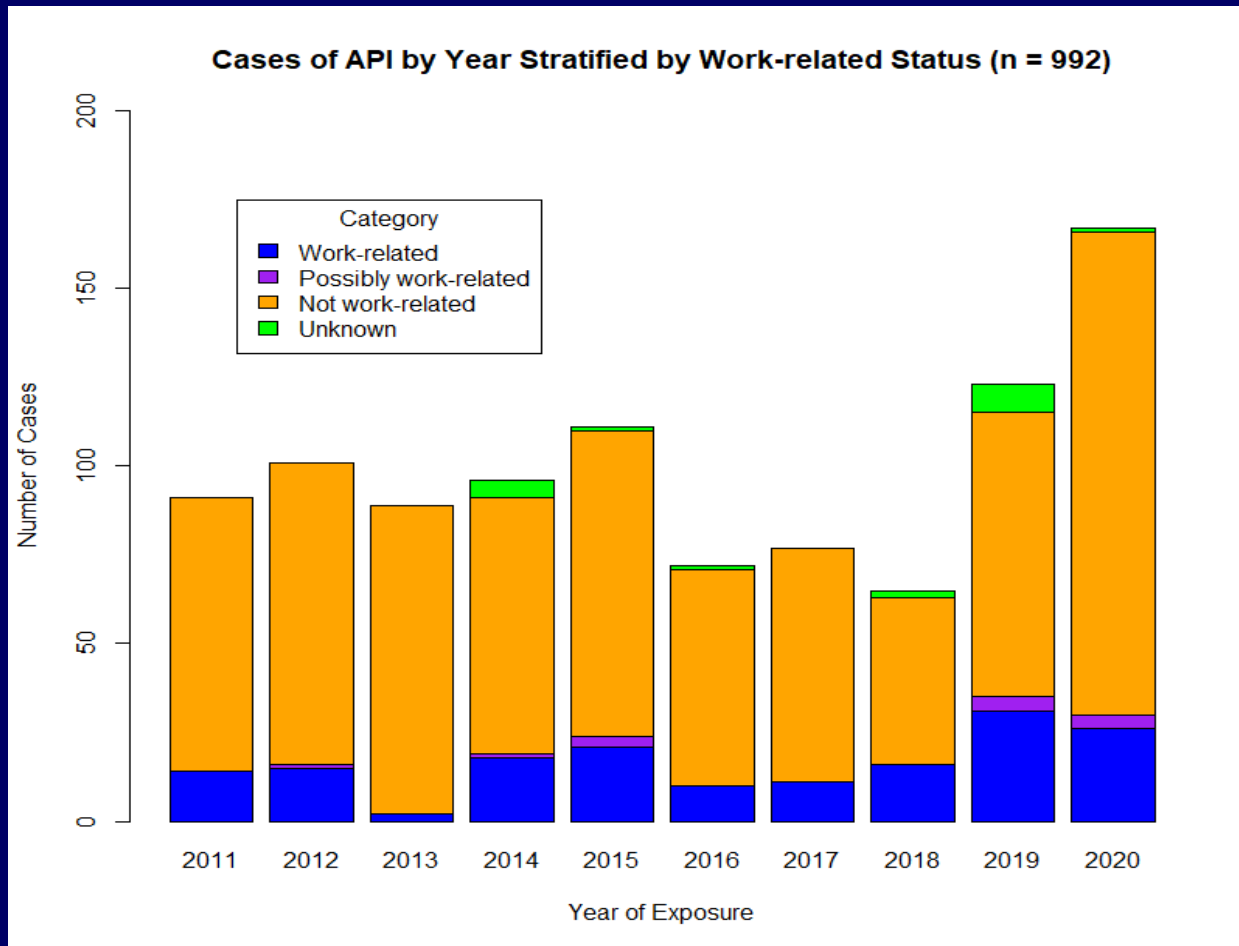
When did the exposure occur? (Year)



Changes over time – severity by year



Changes over time - occupational and non-occupational cases by year



Where did the report come from? (Source of first report)

Source	Number	Percent
Poison control center	499	50.3%
Report or referral from governmental agency	387	39.0%
ESSENCE	36	3.6%
Physician report	27	2.7%
Unknown	21	2.1%
State health department	13	1.3%
Self-report	4	0.4%
Other health care provider report (including emergency room or hospital report)	3	0.3%
Co-worker report	2	0.2%
Total	992	100.0%

What products were involved? (Functional class)

Functional class of product	Number	Percent
Insecticide	419	42.2%
Herbicide\Algaecide	306	30.8%
Disinfectant	65	6.6%
Fungicide	54	5.4%
Multiple	31	3.1%
Insect Repellent	26	2.6%
Unknown (functional class undetermined)	26	2.6%
Other (plant growth regulators, etc.)	19	1.9%
Insecticide & Fungicide	15	1.5%
Insecticide & Herbicide	11	1.1%
Rodenticide	7	0.7%
Fumigant	4	0.4%
Herbicide & Fungicide	4	0.4%
Insecticide & Insect Repellent	4	0.4%
Insecticide & Other	1	0.1%
Total	992	100.0%

Limitations

- Reporting sources of data
 - Data to classify cases is not always readily available
- Data collection methods
 - Data system switched from the CDC provided database, SENSOR-Pesticide Incident Data Entry Reporting Software (SPIDER), to Oregon Public Health Epidemiologists' User System (Orpheus)
 - Lack of data on race, ethnicity, language, disability, gender identity, and sexual orientation
- Specification of pesticide's EPA registration number
 - Lack of consistency may have led to incorrect registration numbers being selected
- Inert or "other" ingredients
 - These ingredients are not required to be listed by the EPA but can have health implications
- Chronic diseases reported after pesticide exposures
 - Pesticide exposures have been linked to chronic disease, but PEST focuses on acute cases

Key findings

- Acute pesticide-related illnesses have started to increase since 2019, with increasing severity and fatalities.
- Hispanic people are overrepresented in pesticide exposures in Oregon.
- Some rural counties in Oregon continue to be disproportionately burdened by cases of acute pesticide-related illnesses.
- Residences continue to be where the majority of pesticide exposures occur.
- Most pesticide exposures are not work-related.
- Drift is a leading contributing factor of pesticide exposures.

Questions?

Thank you!

- Special thanks to Crystal Weston, Dave Dreher, Justin Waltz, and Eric Main for their technical assistance and contributions to this report.
- Special thanks to Curtis Cude for taking on preceptor responsibilities and supporting this project.