

# SR-530 Slide Oso, Washington Canine Illness and Injury Report



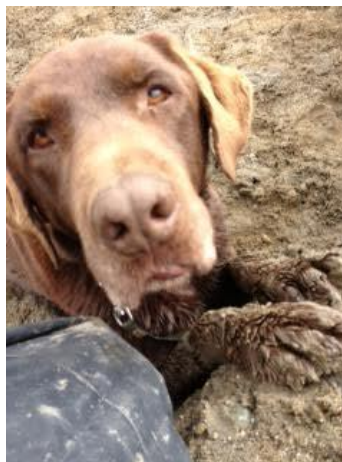
Lori Gordon, DVM  
IST Blue

Twenty-two FEMA-Certified Human Remains Detection Canine Search Teams were activated from 9 Urban Search & Rescue Task Forces to create a modular deployment team for search and recovery operations at a catastrophic mud slide in Oso, Washington. The Incident Support Team Veterinary Officer was also deployed to provide their medical care. Along with local veterinary support, detailed medical records were maintained and available for review.

April\*2014

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Search K9 Zeus

## INTRODUCTION

This is the sixth in a series of reports dedicated to documenting the illnesses and injuries incurred by search canines on deployment. A survey was sent to each of the handlers, medical records collected, and post-mission test results made available for review. Prior deployment information collection thus far includes the Haiti Earthquake (2010), Joplin Tornado (2011), Hurricane Sandy (2012), Moore Tornado (2013), and Colorado Floods (2013).

Although each deployment is unique, patterns of data are emerging. Similar illness and injury occurrence are also seen when these reports are compared to data from the Oklahoma Bombing and World Trade Center urban disaster incidents. This data provides insight into the medical and supportive needs of our search canines, allows for tailored medical training, and streamlining of the cache in the form of medications, supplies, and equipment.

The mission to the Oso, Washington Mudslide is unique in several ways. This is the first time Canine Search Teams for Human Remains Detection (CST-HRD) were deployed as a modular unit, involving 22 teams from 10 FEMA US&R teams, deploying without their home Task Forces (TFs). It is also the first time the Incident Support Team Veterinary Officer (IST-VO) was successfully deployed (an earlier activation to Haiti was unsuccessful). The disaster itself was a landslide of unprecedented size and scope, presenting multiple challenges for search operations at all levels, including the potential for more slides in and around the search areas.

For the first time there are detailed medical records available for review, written documentation of findings and treatments. Local veterinary presence via the Washington State Department of Agriculture Reserve Veterinary Corps (WSDA-RVC) was established throughout the mission, providing veterinary and logistical support initially to local canine search teams, then to the FEMA Search Teams. There are also post-mission canine tests available for evaluation, (US&R Program Directive 2014-006 – Washington Mudslide Response Post-Mission Medical and Veterinary Screening) revealing other less obvious conditions search canines may have contracted during their deployment.



IST Veterinary Officer Lori Gordon, DVM  
Record keeping on site



IST Medical officer Dr. Ken Miller with  
WSDA-RVC Chief Minden Buswell, DVM



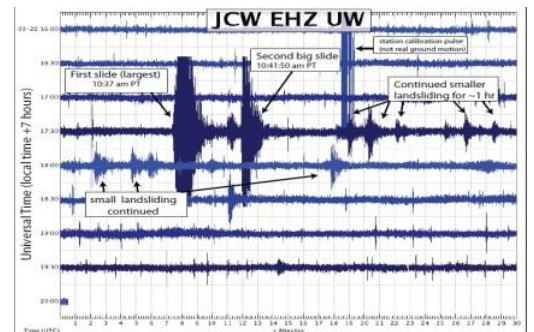
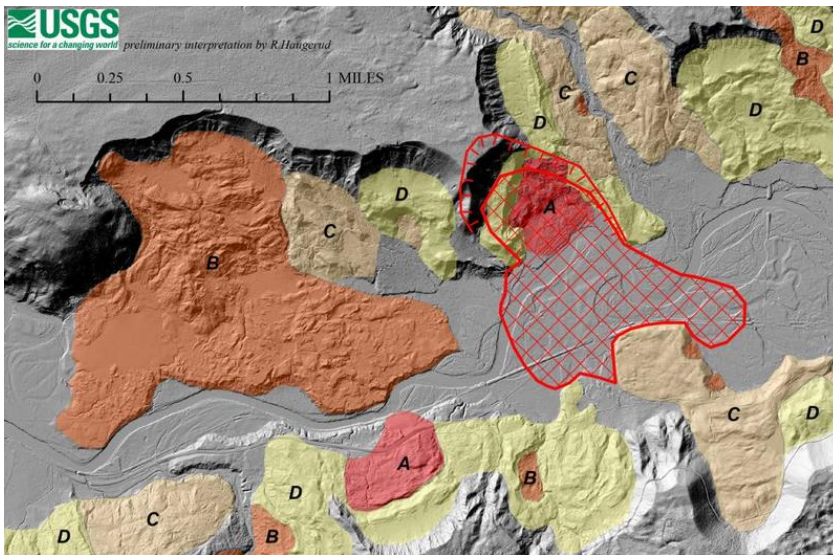
## Landslide Occurrence

On Saturday, March 22, 2014, a massive landslide occurred 4 miles east of Oso, Washington, at the southeastern edge of *Whitman Bench*, a land terrace about 800 feet (240 m) above the valley floor consisting of gravel and sand deposited during the most recent glaciation. The initial collapse began at 10:37:22 a.m. local time (PDT; 17:37:22 UTC), lasting approximately 2.5 minutes. Debris loosened by initial collapse is believed to contain material previously disturbed and weakened by a 2006 slide.

Following the initial event was another large slide occurring at 10:41:53 PDT. Additional events, most likely smaller landslides breaking off the head scarp, continued for several hours. The last notable signal came at 14:10:15.

The collapse sent mud and debris across the North Fork of the Stillaguamish River, engulfing a rural neighborhood known as Steelhead Haven 4 miles east of Oso, engulfing 49 homes and other structures. The mud, soil and rock debris left from the mudslide covered an area 1,500 feet (460 m) long, 4,400 feet (1,300 m) wide and deposited debris 30 to 70 feet (9.1 to 21.3 m) deep.

The slide blocked the North Fork of the Stillaguamish River, causing it to back up eastward, leading to extensive flooding upstream as well as blocking State Route 530, the main route to the town of Darrington (population 1,347), approximately 15 miles east of Oso.



Shaded-relief geomorphologic map of Oso Landslide of 2014 and adjacent areas. Oso is two miles west of this map, Hazel, one mile east. Colored areas are older landslides, "D" being the oldest. Upper "A" is the March 2014 landslide, lower "A", Skaglund Hill. Topography shown is from 2006; red line is approximate location of the current head scarp. Red cross-hatching is the runout area, now buried in mud and debris. Terrace on the upper-left is Whitman Bench. Image from [USGS OFR 2014-1065](https://www.usgs.gov/ofr/2014-1065).

## HRD Modular Deployment Timeline

Twenty FEMA US&R Canine Human Remains Detection Teams were activated April 2, 2014, Day 12 of the incident, from 9 Task Forces (AZ-TF1, CA-TF5, FL-TF2, MD-TF1, NY-TF1, OH-TF1, TX-TF1, UT-TF1, and VA-TF1). They began search operations April 3, Day 13 of the incident. WA-TF1 had 4 K9s working Live Find, 2 of whom were in training for HRD and also searched in that capacity. Two additional FEMA US&R Canine HRD Teams (NY1, FL1) were activated April 20, Day 31 of the incident, and began search operations the next day.

The IST Veterinary Officer (IST-VO) was activated on Day 14 of the incident, arriving April 4 and registering at Incident Command Post in Arlington. On April 5, after several briefings, the IST-VO relocated to the BoO at the Fairgrounds with WA-TF1 to begin hands-on canine medical care that evening. At this time 41 of 54 missing persons had been rescued or recovered.

### Timeline

April 2<sup>nd</sup>: 20 CST-HRD Teams activated

April 3<sup>rd</sup>: Blue IST activated, CST-HRD Teams arrive, some operational this day

April 4<sup>th</sup>: Blue IST members arrive

April 5<sup>th</sup>: Blue IST briefings, tour of incident site, shadow White IST

April 6<sup>th</sup>: Blue IST assumes responsibilities, integrated with Type-2 IMT

April 7<sup>th</sup>: White IST demobilized

April 10<sup>th</sup>: 2 CST-HRD Teams demobilized; 18 teams remain

April 16<sup>th</sup>: 14 CST-HRD Teams demobilized, 4 remain

April 18<sup>th</sup>: 2 CST-HRD Teams demobilized, 2 remain

April 20<sup>th</sup>: 2 additional SCST-HRD Teams activated; 4 now present

April 23<sup>rd</sup>: Last 4 CST-HRD Teams and remaining Blue IST members demobilized



STM Davis (WA-TF1), IST-VO Gordon, HRD Search K9 Rogue, K9 Handler Steckler  
East Division 2, C Post Road, Oso, WA



## Search Area Conditions

Canines were asked to search several types of terrain, which included flat areas of mud and debris, 5 to 15 foot hills of mud, woodlands, and pools of water. The mud ranged from a consistency of thick soup to piles of clay-like clots. Handlers sank from their knees to hips, occasionally requiring help in getting out. The debris within the mud included trees and brush, twisted metal, glass, wood slats, clothing, trash, and rotting food. Debris was often visually undetected as it was covered in the thick mud.

## Weather (See also Appendix)

From April 3-22, 2014

- Average day temperature 58°F, range 51°F - 71°F
- Average night temperature 40°F, range 32°F - 46°F
- It rained 7 of those days, rainfall total 1.15 inches
- Winds averaged 5 mph, with a range of 0-26 mph



Deep mud on the road and in the debris field after a rainy day



Vests kept K9s dry and helped maintain core body heat

## Executive Summary

**Survey response** of 100% for handler information, 100% response for canine information, gives the data strong validity. Twenty four of 25 responses were received within 1 month of demobilization, adding to the accuracy of the answers.

### **Deployment Experience – Handlers and Canines**

Most handlers have been FEMA team members for 6 years, and the majority (15 of 25, 60%) had deployed before. In contrast, this was a first FEMA deployment for the majority of canines (20 of 25, 80%) although 2 of those had deployed with another team. Since the approval for HRD canines was very recent, this is not surprising. More than half of them were also certified by other organizations before their FEMA certification.

#### *Comment*

Two FEMA LF certified canines were being cross-trained in HRD. They were deployed as a state asset and used in search operations per their team. Cross-training is not common in the FEMA system however they performed well in the field.

### **Canine Signalment**

Labrador Retrievers continue as the majority breed. Most of the canines were neutered males, most were between 4 and 8 years of age, and most weighed in an average of 50-80 pounds.

### **BoO, Billeting, Transportation**

The Incident Command Post was about 1 hour drive from the BoO at the Darrington Bluegrass Music Park, but cell phones and daily video briefings at the MERS truck allowed for continued communications between these two bases. Billeting was close enough to the search areas to avoid long drives, and transportation was timely and abundant. CA-TF7 and WA-TF1 were outstanding in hosting the modular teams and the IST Veterinarian.



Search K9 Bayou

## Deployment Length

Without exception, every handler was willing to remain beyond their obligated days of deployment. All were happy to stay with the hope of bringing closure to every single family member and friend of those still missing.

### *Comment*

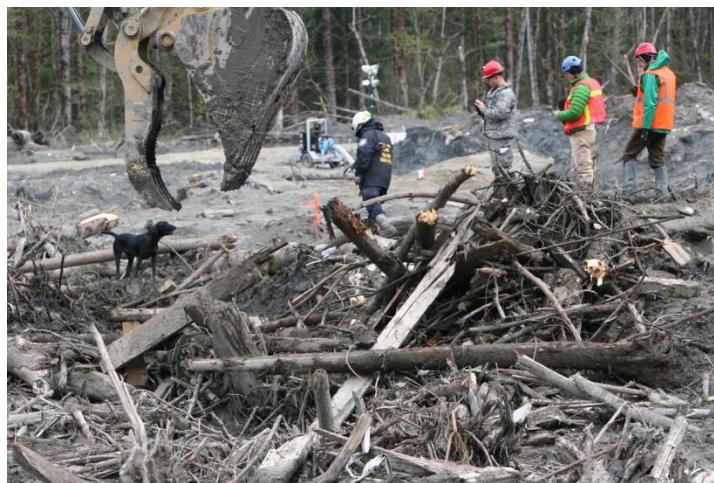
Two handlers that were deployed for 16 days were not allowed to remain the additional 4 days that were requested due to concerns by their program manager about the level of support. Federal host Task Force CA-TF 7 had already demobilized, and state host Task Force WA-TF1 was leaving the next day. There were some difficulties initially with local organizations tasked with our support. They were addressed, but it was decided to move closer to the IST and ICP. If at all possible, support for FEMA Canine Search Team operations should remain with FEMA-based personnel, who are trained and experienced with the needs of our group.

## Search Operations

Initially the canines were searching for extended periods in the cold and rain, with little rest and no place to adequately recover when they did rest. Rescue personnel, Search Team Managers, and local personnel quickly adjusted to shorter, more frequent searches. As search areas became more specific, half-day shifts were incorporated to a degree. Also, crates were acquired and warming vests purchased to increase search operation efficiency and extend the capabilities of the canines to work productively throughout the shift.

### *Comment*

Willingness to adjust search operations went far in elevating the canine capabilities to perform their work at peak efficiency. The creation of divisions and corridors that defined search areas was paramount in creating a well-defined mission and accountability.



[K9 Booter, Handler J. Dean search amidst the debris](#)



## **Veterinary Care**

The search canines received multiple physical examinations and on-site care for their injuries and illnesses between the IST Veterinary Officer (136 recorded exams) and the WSDA Reserve Veterinary Corps (117 recorded exams). Pre-shift, shift, post-shift, and demobilization exams were performed for 96%, 100%, 100%, and 96% of the canines respectively. The need for this level of care can be appreciated with review of the injury and illness data.

### ***Comment***

The size of debris field operations and transportation issues of reaching 3 main sites (East Division 1 and 2, Mid-Division 4 and 5, West Division 6 and 7) made it challenging for the IST-VO to be present for every canine at every site. The WSDA-RVC Veterinarians and Veterinary Technicians provided on-site care while BoO canine care was occurring each morning, as well as staffing all 3 areas each day. They also provided almost instantaneous logistical needs for veterinary supplies, equipment, and medications that the task forces and IST could not obtain as quickly.

### ***Comment***

The reserve Veterinary Corps Veterinarians were made up of large animal, equine, state, and local small animal Veterinarians and Veterinary Technicians. As the IST Veterinarian I gave some just-in-time training talks and they were attentive and eager to learn about veterinary care specific to search canines. Their staff was hard working, supportive, and eager to help. Issues did arise, and they were handled by me and the RVC Coordinators as stated in the After Action Report.

## **Injuries and Illness**

All of the search canines incurred injury and/or illness, ranging from mild to concerning. Pad and limb injuries were most common. Dehydration, dietary indiscretion, and weight loss were the common medical issues. All were addressed in a timely manner so that there were very few instances when a canine could not perform search operations.

### ***Comment***

Bandaging injured paw pads became very important in stopping lameness and pain. The neoprene vests were able to keep the canines dry and warm in wet and rainy conditions. The use of 'bandage boots' and vests did not interfere with nor pose a hazard (slipping, catching on debris) to the canines during search according to the handlers.



**K9 Booter gets his 'Boots' for the day**

## Post-Deployment Testing

Abnormal blood, urine, and fecal test values were revealed for 3, 6, and 4 canines respectively. It is unknown if some of these values and results were present before the deployment, as it is impractical to run blood, urine, and fecal tests just before deploying. The canines were constantly exposed to a potentially hazardous environment, and these tests have already provided the means to investigate the abnormalities and treat them early.

## Decontamination

The National Guard provided state-of-the-art decontamination for the canines in their Mass Decontamination Units (MDUs). Considering the weather conditions, the warm water may have been a key factor in staving off hypothermia in these canines.

### *Comment*

Warm water in cold weather, cool water in hot weather, are both important considerations when performing decontamination on canines. The dish soaps used soon created dry, itchy skin which can be distracting to the canines. Also, scratching caused skin wounds, at least one of which became infected. The purchase of dog shampoo to re-establish coat oils is recommended to include in every decontamination cache.

## Safety Briefings

Communicating information related to safety is extremely important. The Search Team Managers for the handlers hosted by WA-TF1 held a handler meeting each night to debrief the days' events and brief for the next days' schedule. The IST-VO visited the handlers hosted by CA-TF7 to relate all known safety issues so everyone was aware of these concerns.

### *Comment*

Separate briefings from the ones held for the entire Task Force were helpful in relating specific concerns for the canines and handlers and assuring everyone was aware of them. This is recommended for future deployments.

## Handler Comments

Specific handler comments are included for review. They were asked to comment but specific issues were unsolicited and remain unedited. They have been grouped according to subject. Concerns are italicized.

[Handlers and Canines receive much needed decontamination](#)



## IST Veterinary Officer Comments

FEMA's recent approval for missions beyond the long-standing traditional urban search and rescue mission has proven to be a needed response capability. Having in place both the Humans Remains Detection Modular Deployment model (approved 2013) and the IST Veterinary Specialist position (approved 2009) allowed for rapid, smooth deployment of assets to the Oso, Washington Slide disaster once the mission was approved.

My position as the IST Veterinary Officer was, in theory, to involve both managerial and operational duties. This proved to be the case. On-site presence allowed for immediate response to injury and illness care needs. Providing adequate medical care for the search canines also involved the host Task Forces CA-TF7 and WA-TF1, Washington State Department of Agriculture Reserve Veterinary Corps, National Guard, and of course the IST.

Support for my mission from CA-TF7, WA-TF1, Washington State Department of Agriculture Reserve Veterinary Corps, National Guard, Snohomish County Sherriff, Pierce County, Washington IMT, Department of natural Resources, and FEMA IST was outstanding.

These magnificent search canines, and their handlers, worked hard to achieve their goal to find the missing. They incurred several injuries and illnesses we treated to mitigate the condition and stay on task. It was an honor and a privilege to be a part of their care, so they could remain operational and do what they love and do best...search.





## Survey Data

### Deployment Information

30 FEMA Canine Handlers deployed: 26 federally, 4 as a state asset.

- 20 as modular teams from 10 FEMA US&R Task Forces
  - 10 were hosted by WA-TF1, 10 by CA-TF7
- 2 CST-HRDs were deployed under the IST
- 4 WA-TF1 Handlers (state asset)
- 4 CA-TF 7 Handlers (did not perform search operations)

### Task Force Distribution for Modular Deployment

Availability to deploy for HRD operations were made from the Task Force rotational order. Twenty deployed initially, then 2 more were deployed.

- 1 each from CA-TF5, FL-TF1, MD-TF1
- 2 each from AZ-TF1, FL-TF2, TX-TF1, UT-TF1
- 3 each from NY-TF1, VA-TF1
- 5 from OH-TF1

Three WA-TF 1 Caine Search Teams, deployed as a state asset, also continues search operations with the modularly deployed teams.

### Survey Response

The survey was sent electronically to handlers that deployed to the SR-530 Mudslide and performed canine search operations for the modular mission:

- 22 CST-HRDs and 3 WA-TF1 CSTs (total 25)
- Of those, 25 of 25 responded, a **100% response rate**

**\*\*Because of the existence of complete medical records and post-mission tests for all 25 canines, all canine data and percentages are based on a total of 25, a 100% response rate.**



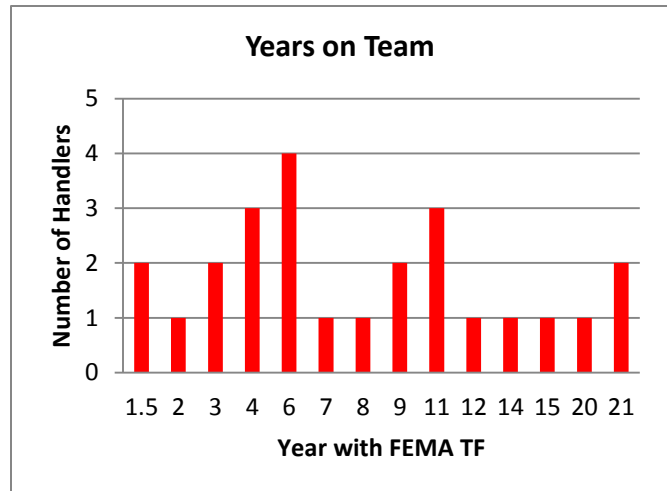
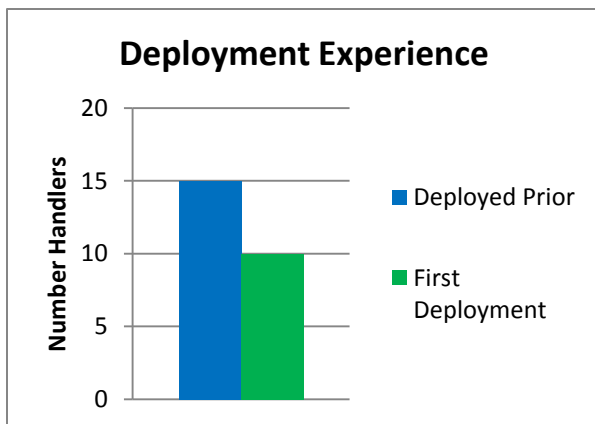
## Handlers' Length of FEMA Team Membership

FEMA team membership ranged from 1.5 years to 21 years.

- Mean = 7.8 years,
- Median and mode = 6.0 years

## Handler Deployment Experience

- First deployment for 10 of 25 Handlers (40%)
- 15 of the 25 (60%) had deployed prior.



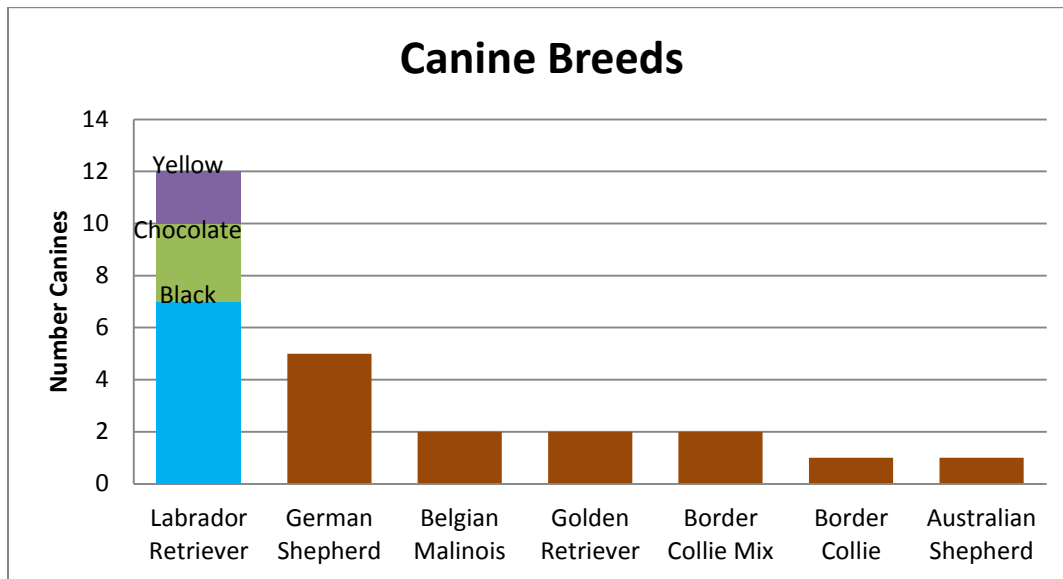
S. Dickinson and K9 Fielder



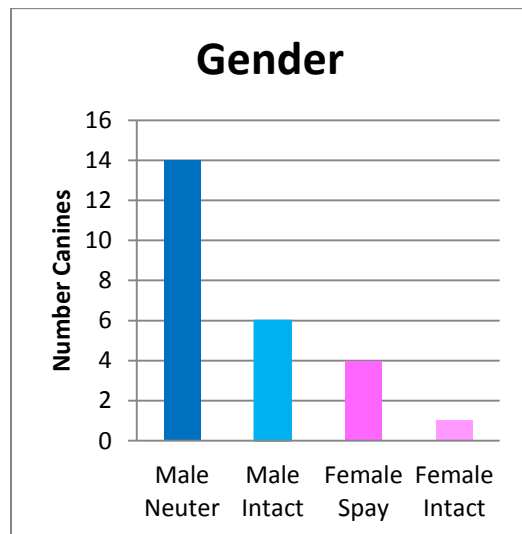
J. P-Jansen & Riot and S. Arango & Radar

## Canine Information

### Breeds

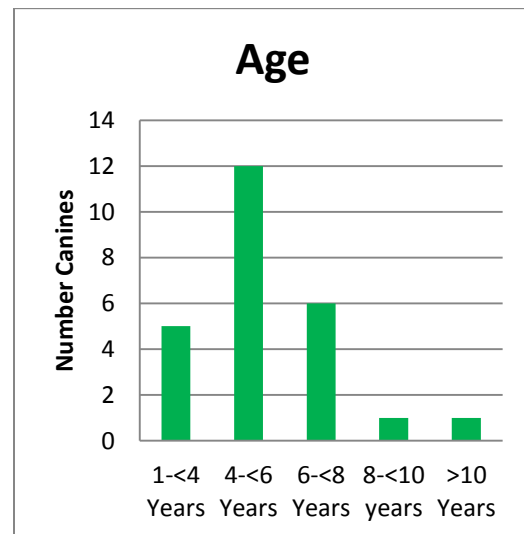


12 Labrador Retrievers (48%)	2	2 Border Collie Mixes (8%)
5 German Shepherds (20%)		2 Golden Retrievers (8%)
2 Belgian Malinois (8%)		1 ea Australian Shep, B Collie (4%)



### Gender

Male Neuter – 14	(56%)
Male Intact - 6	(24%)
Female Spay - 4	(16%)
Female Intact - 1	( 4%)



### Age

Range = 1 year 8 mos to 10 years 1 mo  
 Mean = 5 years 0.5 months  
 Median = 4 years 8.5 months  
 Mode = 4 years 8 months



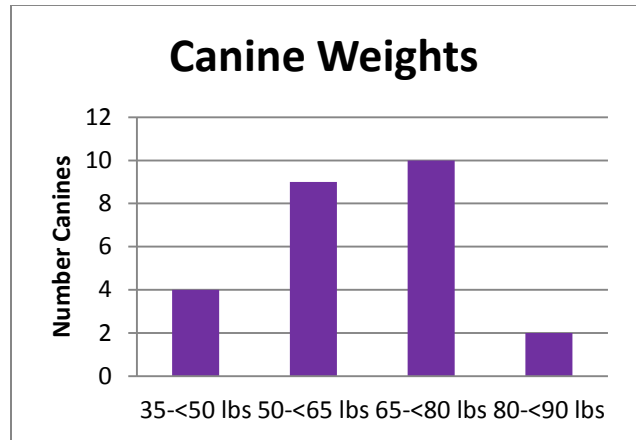
## Weights

Range = 39 lbs (18 kg) to 90 lbs (41 kg)

Mean = 62 lbs (28 kg)

Median = 62 lbs (28 kg)

Mode = 70 lbs (32 kg)

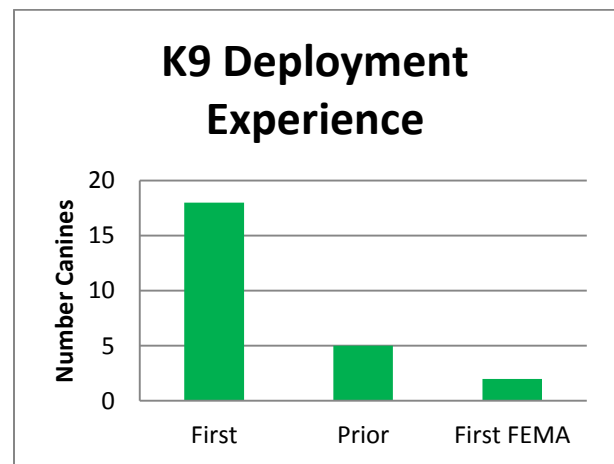


## Certifications

- 22 of 25 (88%) are FEMA HRD certified.
- 14 (56%) are also certified elsewhere.  
These include:

ARDA	NAPWDA
NASAR	NNDDA
SARDUS	USPCA
NY State	VA DEM
US Police K9 Association	

3 (12%) are FEMA Live Find certified;  
2 of these are currently training in HRD



## Deployment Experience

- 18 of 25 (72%) this was first deployment
- 5 of 25 (20%) had deployed with FEMA before
- 2 canines (8%) had deployed with another team, this was their first with FEMA



Handlers B. Colecchia, P.Nee, J. Cain  
Canines Timoshenko, Hondo, Daisy



Canine Booter, Handler J. Dean, STM L. Davis

## Base of Operations

The Incident Support team (IST) was based at the Incident command Post (ICP) located in an old high school in Arlington, WA, approximately 15 miles west of Oso.

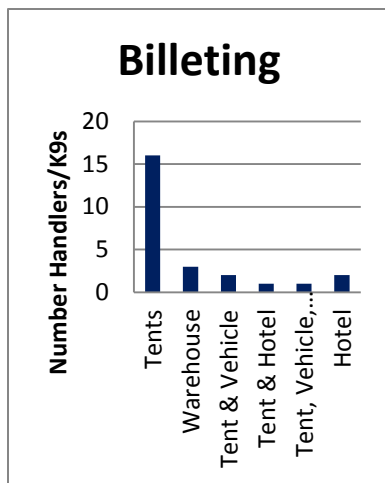
WA-TF 1 and CA-TF 7 Base of Operations was located at the Darrington Bluegrass Music Park (Fairgrounds), approximately 15 miles east of Oso.



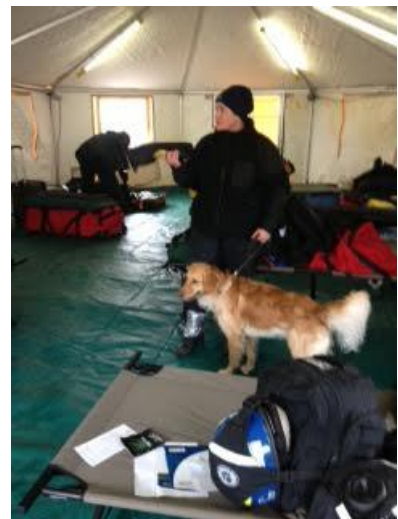
M. Newman and K9 Murphy

## Billeting

Billeting during their deployment, the 24 handlers and canines stayed in the following places:



BoO Tents: 16 (64%)  
 BoO Warehouse: 3 (12%)  
 Tent and vehicle: 2 (8%)  
 Hotel: 2 (8%)  
 Tent and hotel: 1 (4%)  
 Tent, vehicle, hotel: 1 (4%)



## Transportation

A combination of vans, trucks, SUVs, and gators were used for transporting CSTs to and from the BoO and the operation sites in the east and West Divisions.

D. Hudgins and K9 Hunter



T. MacPherson & Bayou, S. Dickinson & Fielder



J. Cain & daisy, Booter and J. Dean

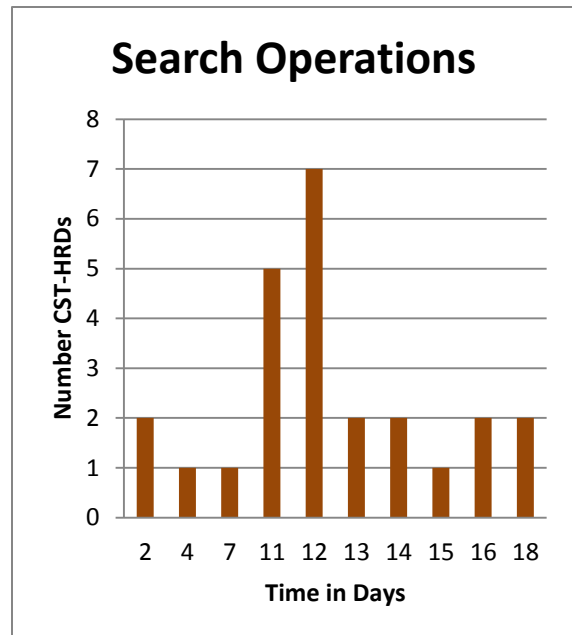
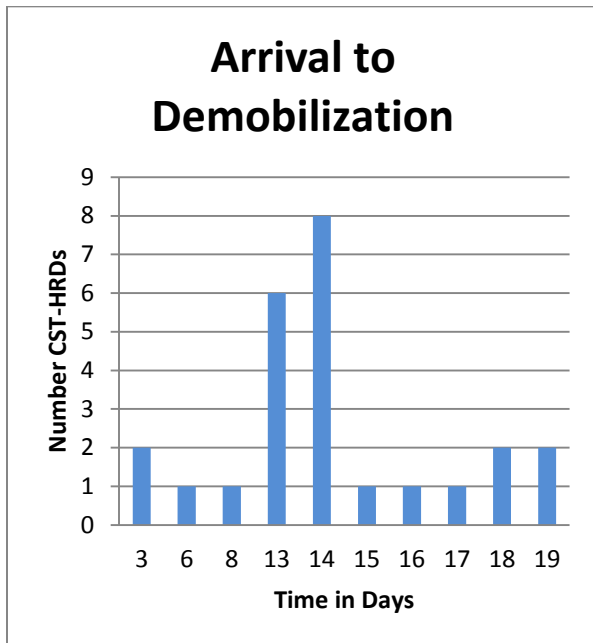
## Deployment Length

Length of arrival to demobilization ranged from 3 days to 19 days.

- Mean = 13 days
- Median = 14 days
- Mode = 14 days

CST-HRD length of days for search operations ranged from 2 days to 18 days.

- Mean = 12 days
- Median = 12 days
- Mode = 12 days



E. Baumgartner & K9 Pax



E. Chaney & K9 Hugo



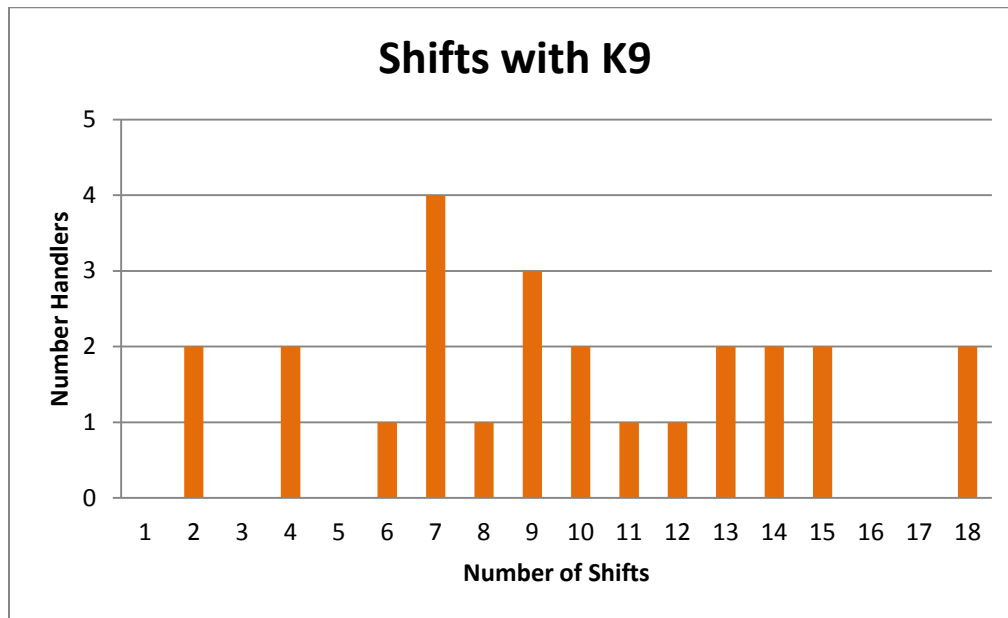
## Search Operations

The 25 CST-HRDs searched a total of 244 shifts: 159 full shifts (average 10 hours), 85 half shifts (average 5 hours, 0700-1200 or 1200-1700) for a total of 2,015 hours.

- Range = 2 to 18 shifts
- Mean = 10 shifts
- Median = 9 shifts
- Mode = 7 shifts

Six Handlers did 24 shifts without their canine, performing other duties such as plans, mapping, STM assistant, logistics, raking through mud, and other non-canine search operations.

- 3 Handlers did 3 shifts each
- 3 Handlers each did 2, 4, and 9 shifts respectively



K9 Wall.E & J. Long  
K9 Daisy and J. Cain



## Canine Physical Examinations

Pre-mission exams performed for 19 canines (76%)

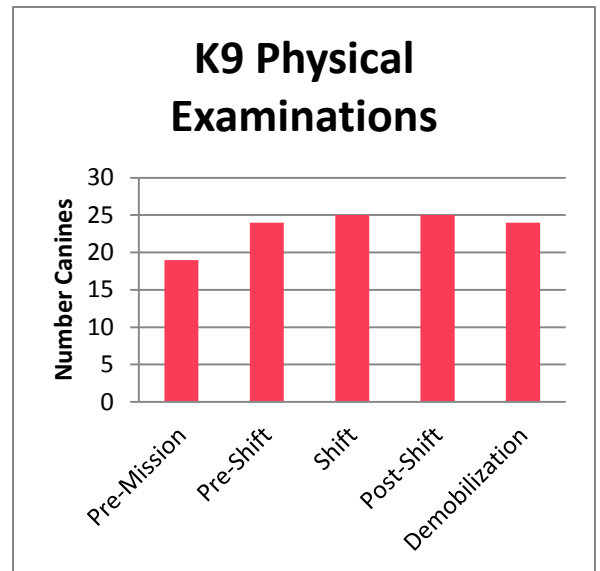
- 18 by a veterinarian
- 1 by the handler

Pre-shift, shift, and post-shift exams performed for 24 (96%), 25 (100%), and 25 (100%) canines respectively

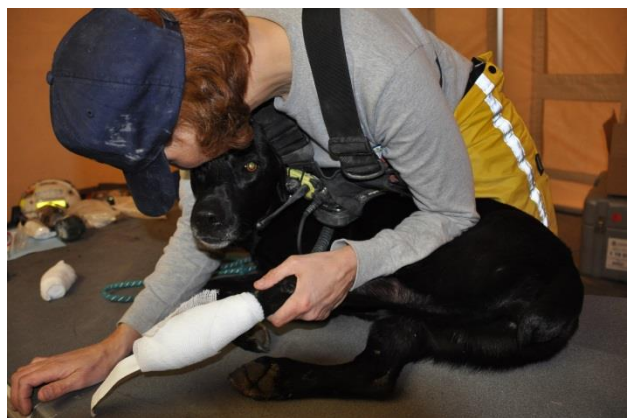
- RVC Veterinarians and Veterinary Technicians
- IST Veterinarian
- Task Force Medic
- Handler

Demobilization exams performed for 24 (96%) K9s

- All 24 by the IST Veterinary Officer



## BoO Site Veterinary Care – Pre and Post Shifts



K9s Booter (L) & Luna (R) at Pre-Shift; Veterinary Call held at 0500-0700 every day at the BoO



Veterinary medical table at the BoO



WSDA-RVC  
Vet technician  
N. Couffer,  
present since  
Day 1, offers  
care at BoO



## Operations Site Veterinary Care

Warming tents and veterinary treatment areas were set up at 4 forward operation sites.

These were staffed by the WSDA-RVC with Veterinarians and Veterinary Technicians.

- East Division 1 and 2 at the Blue House off SR 530
- Midway along the Service Road at Divisions 4 and 5
- West Division along Service Road, Division 6 and 7
- West Division parking lot



RVC Dr. A. Murdock bandages K9 Booter at Division 1,2 Blue House Veterinary Tent



Vet Tech T. Garcia cares for K9s Division 4,5



Warming tent, shelter, K9 care at Div 6,7



RVC Dr. B. Smith checks K9 Rogue W Div. 6,7



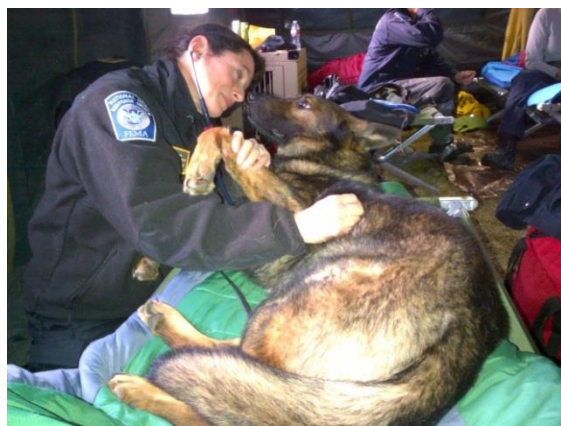
## Injury and Illness Data

### Physical Examinations

Medical records were available to document examinations. These ranged from complete to partial. Partial exams may have concentrated on a quick status check, prior problem(s), a new issue, or all of these. Pre-mission exams were performed by a veterinarian for 18 of 25 (72%) canines.

The IST Veterinary officer performed 136 documented examinations. Consults and confirmation of issues performed for the WSDA-RVC staff during search operations were not documented separately, and are among the 63 exams performed during search listed in the next section.

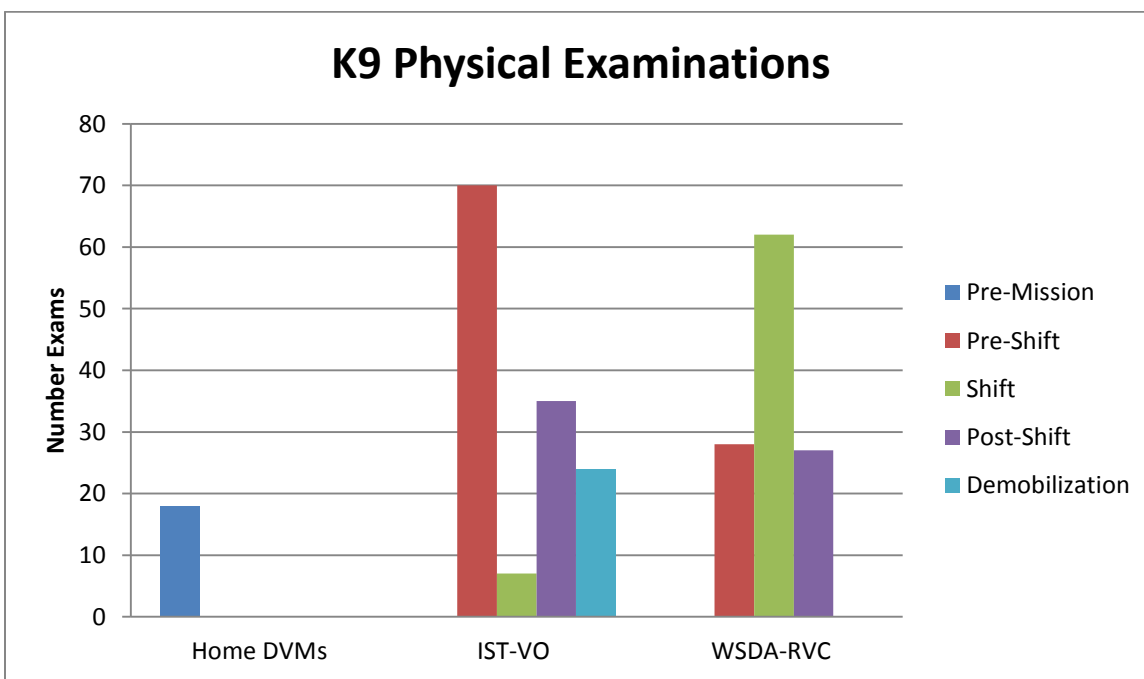
- Pre-shift exams = 70
  - Shift exams = 7
  - Post-shift exams = 35
  - Demobilization = 24
- } Total  
136



‘Tent Call’ for Dr. Gordon  
K9 Hugo during evening veterinary checks

The WSDA Reserve Veterinary Corps personnel, veterinarians and veterinary technicians, performed a documented total of 117 examinations:

- Pre-shift exams = 28
  - Shift exams = 62
  - Post-shift exams = 27
  - Demobilization = 0
- } Total  
117



## **Injuries**

Abrasions - 7 canines incurred 22 abrasions

- Metacarpal, metatarsal pads: 10
- Limbs (forearm, tibia): 7
- Digital paw pads: 2
- Axilla (under arm): 2
- Dewclaw: 1



Lacerations – 4 canines incurred 4 lacerations

- Digital paw pads: 3
- Toe web: 1



Erythematous (Red, Inflamed) Areas – 3 canines incurred 7 of these type irritation lesions

- Paw pads: 3
- Axilla (under arm): 2
- Dewclaw: 1
- Penile shaft: 1



Paw Pad Cracks, Splits – 3 canines incurred splits on 11 paw pads

- One canine had splits on all forepaw pads and both metacarpal pads
- Two canines had deep split of a hind leg digital pad

Paw Pad Wearing – 1 canine had all 16 paw pads worn thin

**Treatments** included a combination of clipping hair, antimicrobial cleansing solution, topical antibiotic ointments, topical drying powders, lanolin-based ointment, oral antibiotics, injectable antibiotics, non-steroid anti-inflammatories (NSAIDs), mild narcotics, and bandages.

Superficial Dermatitis (Hot Spot) – 2 canines had 2 areas

- 1 canine had pre-existing facial lesion which worsened then improved during deployment
- 1 canine developed a lesion on her neck

**Treatments** were the same as for lacerations and abrasions, with the addition of a steroid (oral prednisone) in place of a NSAID. This condition is highly pruritic (itchy) and the steroid stops the itch-scratch-abrasion-infection cycle long enough to allow healing.



Cutaneous (Skin) Mass – 3 canines incurred mass lesion complications

- Ruptured cyst intermandibular (under chin)
- Ruptures cyst on top of head
- Flank mass; got larger when disturbed, then smaller. Mast Cell Tumor, a potentially malignant lesion, was suspected.



**Treatments** for ruptured cystic lesions were cleaned and left open to heal. The flank mass was a concern, the handler told to leave it alone as much as possible and have it removed as soon as possible once home. Biopsy confirmed a mast cell tumor, but was caught early enough to potentially affect a cure with its removal.

Lameness

- 3 canines incurred 3 lameness issues. Pain was elicited from:
  - Right shoulder, a chronic condition in this K9
  - Right hind leg
  - Left foreleg second digit, resolved with rest and meds



Stiffness

- 3 canines exhibited generalized or back stiffness

Acute Caudal Myopathy 'Limber tail'

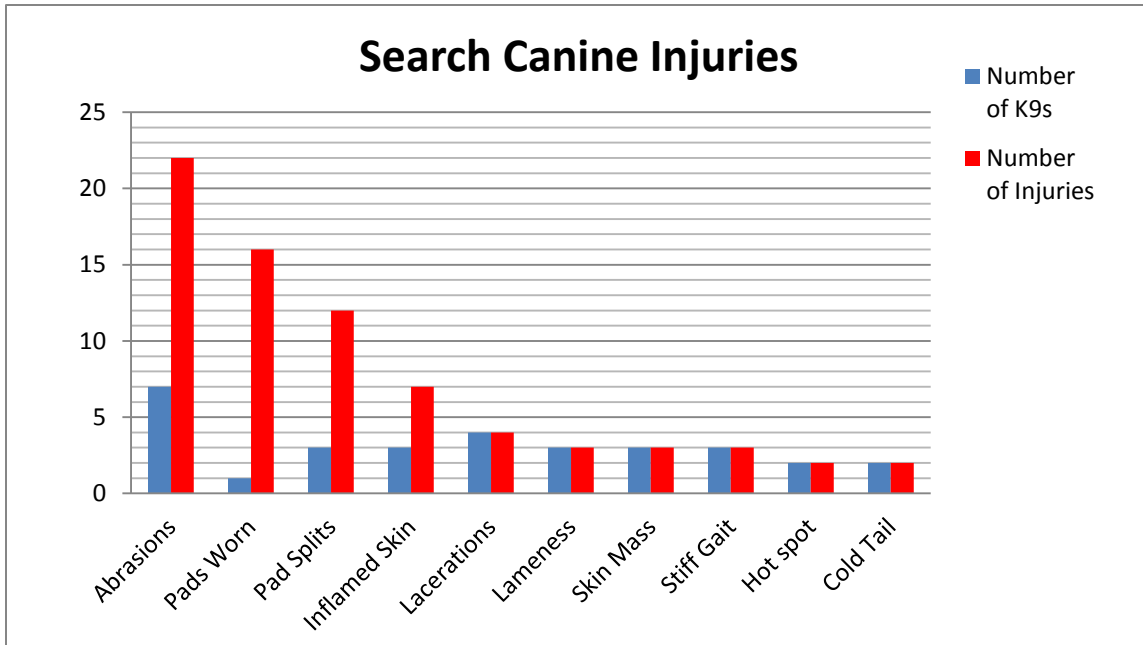
- 2 canines developed temporary tail paralysis

**Treatments** for lameness, stiff gait, and over-worked tail included rest, warming and drying, non-steroid anti-inflammatories (carprofen, metacam), mild narcotics (tramadol), and time.



Warm air is piped in and directed into crates or held under blankets to treat cold canines





## BANDAGING for a MUD FIELD

### The Numbers

- IST Veterinarian placed bandages on 8 canines 74 times during the deployment.
  - 4 Canines had one leg bandaged multiple times
  - 4 Canines had multiple legs bandaged many times
  - Total: **141 bandages**
- WSDA-RVC placed an **additional 23 bandages** per medical records.



Vet Tech N. Couffer holds Remi for bandaging by Dr. Gordon

### The Method

The first couple of bandages fell off fairly quickly in the thick mud. By day 3 we came up with a 6-layered bandage that would hold all day and keep the wounds underneath dry and protected.

1. Antibiotic-treated gauze on wound
2. Cast padding
3. Stretch gauze
4. Vet wrap
5. Elastikon®
6. Duct Tape



## Illnesses

### Attitude Change

- One canine exhibited agitation, hyperactivity, and was inattentive to search
- One canine was extremely quiet, decreased appetite, and stiff gaited

**Treatments:** both received supportive care in the form of warming, drying, IV or subcutaneous fluids, and rest. Both responded well to these treatments.

### Significant Shivering

- 4 Canines were shivering and seemed chilled
- 1 of them had 3 bouts of shivering over the course of the deployment

**Treatments:** All canines were dried if they were wet, and placed in the warming tent or on blankets in crates placed near the warming post. There were others with minor shivering not recorded in the records.



Canines in crates around warming unit



Handler J. Cain, K9 Daisy rest and warm up

### Dehydration

- 10 Canines were subjectively assessed with 3%, 5%, and 8% dehydration levels
- CRT, MM dryness, MM color, and skin elasticity were used in the assessment
  - *Capillary Refill Time* (CRT) was prolonged 2.5-3 seconds) in 12 canines at least once
  - *Mucous Membrane* (MM) Dryness was detected in 8 canines at least once
  - *MM Color* assessed as pale pink in one' pale/muddy in another canine, both received IV fluid treatment and WSDA-RVC veterinarian had blood and urine collected for testing.
  - Poor skin elasticity was documented in 1 canine

**Treatments** included the following:

- IV fluid therapy - 2 canines
- Subcutaneous fluid therapy – 10 canines: 6 had one treatment, 4 had from 3-6 treatments
- Increasing oral water intake - at least 10 canines. Canned dog food (A/D) was often added to water in bowl to encourage drinking and provide added nutrition.

### Temperature Abnormality

- 1 canine had a temperature of 103.5°F. This canine was nervous and panting. Subsequent temperatures were all normal.

**Treatments:** rest, water, and drying wet coat resolved the problem.

### Dietary Indiscretion – 7 canines were seen to have licked, drank, or eaten something in the field

- 3 Canines drinking debris field water which was often very muddy
- 1 Canine was licking at a dead salmon covered in maggots
- 1 Canine was licking at an object suspicious as human remains, which was confirmed
- 1 Canine ate a bag of old dog food found in the field.

**Treatments:** because of a prior diagnosis of Inflammatory Bowel Disease (IBD) the handler was concerned, so canine was given a probiotic and Endosorb® tablets (supportive treatment of intestinal disturbances and non-specific diarrhea) prophylactically.

- 1 Canine ate store-packaged raw chicken found in the field, which had potentially been unrefrigerated for at least 2 weeks.

**Treatments:** hydrogen peroxide was used successfully to induce emesis (vomiting) within 30minutes of the ingestion. No other problems occurred.

### Exhaustion

- 4 Canines, one of them several times, were described as extremely tired

**Treatments:** Many of the canines became tired throughout their shifts, but were given frequent and sufficient rest periods between searches. Acquiring several kennels in which to place them, this made a big difference in their ability to truly rest.



[Search Canines Cody and Luna taking a break between search missions](#)



### Ear Infection

- 1 canine had mild otitis in both ears.

**Treatments:** Cleansing with a mild antibiotic solution was performed a couple of times. No other treatment was prescribed.

### Eye Problem

- 1 Canine had a mild discharge in both eyes, with mild conjunctival hyperemia (redness).

**Treatments:** It was a challenge to rinse or treat the eyes so in light of the mild nature of the discharge no further attempts at treatment were made.

### Loose/Soft Stool

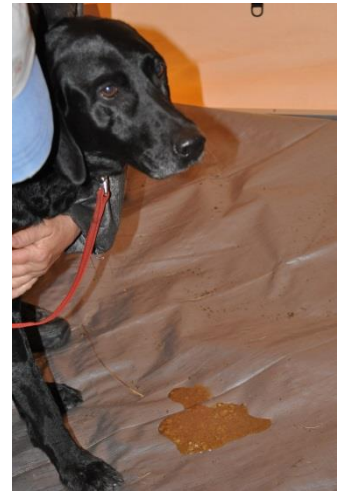
- 4 Canines had loose stools. There was no mucus or blood present. All resolved within 2-4 days.

**Treatments:** Probiotics were distributed for many of these dogs, who were also taking oral antibiotics for their wounds. Metronidazole (Flagyl) was also prescribed. In 2 cases Cephalosporin antibiotics, being taken for wounds, were discontinued for suspicion they were the cause of the loose stools.

### Vomiting

- 1 Canine had vomited a couple of times over a 12 hour period. There was no blood seen. Dietary indiscretion was suspected.

**Treatments:** the canine was not allowed food or water for 24 hours. Subcutaneous fluids, an anti-emetic (Cerenia), and an antacid (Pepcid) were administered. There was no further vomiting episode. Water was introduced the next day, and later a chicken and rice based dog food was given. The canine was able to return to search operations that next day and did well, and returned to normal feeding within 3 days.

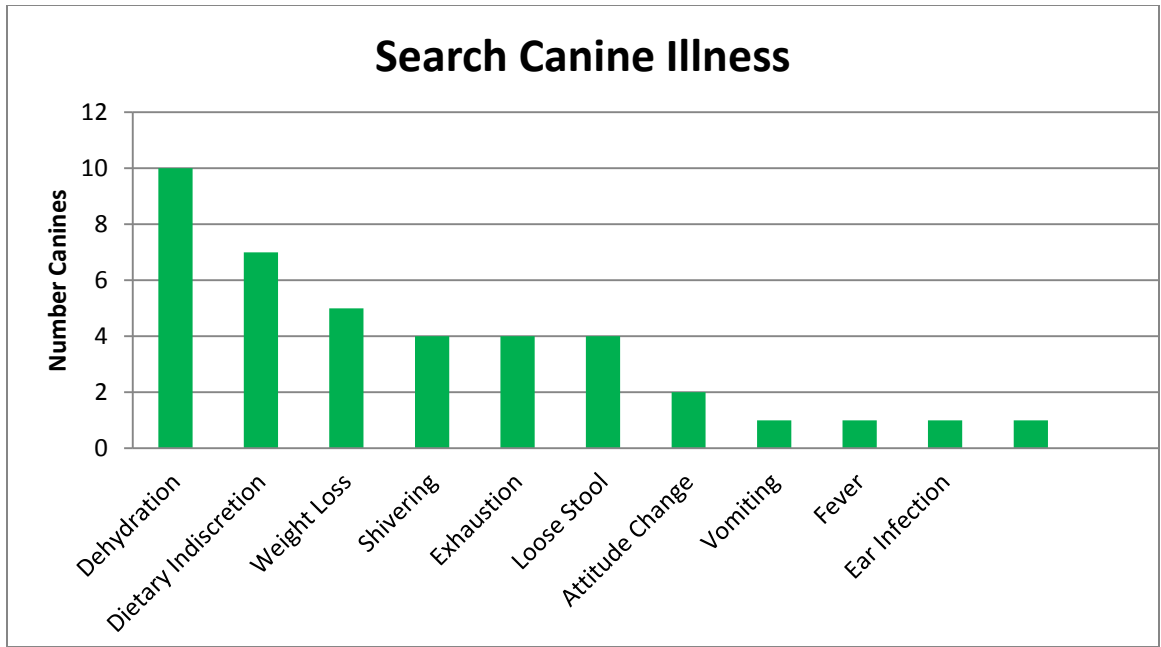


### Weight Loss

- 5 canines had documented weight loss based on pre-mission and post-mission weights. Their loss was 3%, 3.6%, 5%, 10%, and 13% of body weight.

**Treatments:** Handlers increased number of feedings per day, amount of food, and added high-nutrition canned food (A/D) to their meals.





Ocular Discharge



Handlers E. Chaney, T. MacPherson  
 Search K9s Hugo and Bayou  
 East Division 1 and 2



Handlers R. Gaffney, R. Deeds  
 Search Canines Luna and Remington  
 Central Division 4 and 5

## Post-deployment Testing

Complete Blood Count (CBC), Chemistry profile, Urinalysis, and fecal tests for parasites (flotation) and one test for Giardia antigen (ELISA) were approved for the search canines.

*(Thanks to Dr. Deborah Cogan, Dip. ACVIM for her assistance)*

Normal: 15 Canines (60%) - all tests within normal limits

Urinalysis: 4 Canines (16%) - Urinalysis revealed some abnormalities

- 3 Canines had some crystals and low level of protein in their urine. If canines are not clinical for urinary tract issues these results may be considered within normal limits, or results may indicate an early problem. Retesting the urine is advised
- 1 Canine had a significant protein loss in the urine. A protein:creatinine ratio is recommended to confirm and quantitate this result. If confirmed, testing for Lyme disease as well as other tick-borne diseases and leptospirosis may be recommended.

Fecal: 3 Canines (12%) - Fecal results positive for Giardia

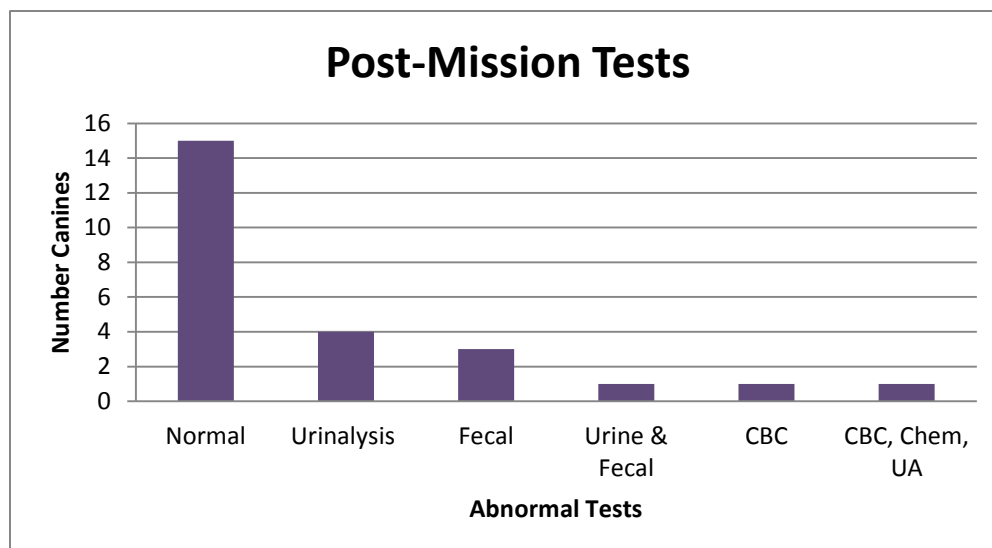
- 2 Canines were positive for the Giardia antigen but negative for seeing cysts. They may be infected with giardia but shedding cysts below detectable level, or this may be a false positive test. A second sample testing may be advised.
- 1 Canine was positive for Giardia in both the flotation and the ELISA test

CBC: 1 Canine (4%) had a high calcium level, which was slightly higher when adjusted for albumin level. The calcium can be repeated to confirm, and if still high then an ionized calcium test should be performed.

Urine and Fecal: 1 Canine (4%) had evidence of a urinary tract infection (blood, WBCs, protein) and had a positive fecal test for Hookworms.

CBC, Chemistry, and Urine: 1 Canine (4%) had elevated eosinophils, kidney value (creatinine) and protein loss in the urine.

- Eosinophils may be allergy or parasite induced. Blood value and urinalysis should be repeated, and a protein:creatinine ratio to confirm and quantitate results. If confirmed, testing for Lyme disease, other tick-borne diseases, and leptospirosis are recommended.





## Decontamination Corridors

National Guard set up 1 vehicle decontamination station and 2 Mass Decontamination Units (MDUs) with warm water, dish soap, dog shampoo, and towels for drying.

- East Division on SR 530 near the east end of the Service Road; this location also had a vehicle decontamination station
- West Division on SR 530 near the west end of the Service Road

WA-TF1 set up an open decontamination station with several hoses, heated water, brushes, and a canine 3-faced shelter with towels and dryers.



Vehicle Decontamination



WA-TF 1 Decontamination

## Canine Decontamination

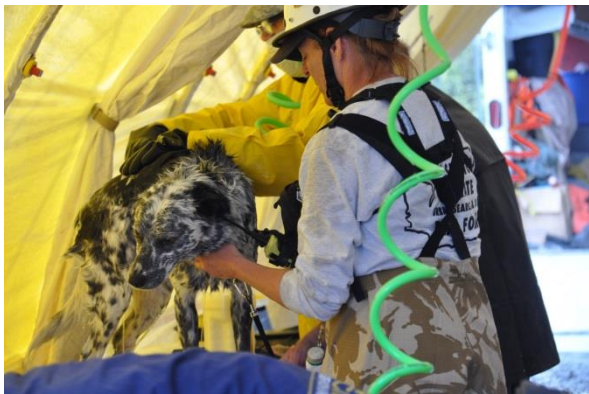
100% of search canines and handlers were decontaminated after every shift.

- Water: initially cold, by the third day it was warm
- Soap: initially dish soap, but canines were developing dry itchy skin as the degreasing effects denuded their protective skin oils; oatmeal dog shampoo was purchased and distributed to the stations within 3 days
- Wet-wipes on hand for facial cleaning
- Drying: hand-held dryers were available; towels used most often then canines placed in warmed vehicles and at BoO into warm tents





East Division National Guard MDU – Canine and Human Decontamination Procedures



Tables for those who preferred K9s elevated



Special attention to the paws and pads



Towel drying, then warm vehicle back to BoO



Equipment decontamination



## Safety Briefings

25 Handlers (100%) recalled receiving safety briefings. Concerns were related during evening debrief meetings by the STMs and IST veterinarian.

Safety and Hazmat concerns included the following:

- Weather-related thermoregulation – hypothermia and hyperthermia
- Sharp debris causing lacerations, abrasions
- Dust from wind-blown dried mud on face and 2 days dry conditions causing eye irritation
- Water pools and mud containing like gas, oil, anti-freeze, chemicals, sewerage
- Water pools and mud may contain biological organisms like Giardia, Leptospirosis, Coliform bacteria, human remains (*see Water Testing in appendix*)
- Heavy equipment operations are close to search operations
- Poison oak, poison sumac are in the woods
- Blackberry thorns of significant length and sharpness
- Widow-maker trees that drop branches at the slightest motion
- Ingestion of dead raw salmon that may contain liver flukes which may carry a parasite that is potentially fatal without treatment
- Snakes (though non-venomous, still may bite)
- Medical concerns for dehydration, hypothermia, wounding
- Local persons' free-roaming dogs present at search areas







Woodland debris, sharp twisted metal, spiked thorns, Widow-maker Tree



Search near heavy equipment operations

Deep mud soup hiding unknown debris



Water pools amid sharp debris and cranes



Giardia, Leptospirosis concerns in water



Nonvenomous snakes, bite will sting



Salomon Poisoning Disease

## Handler Comments

*Issues italicized*



### Canine Search Team Operations

- It was wonderful to have so many teams (local, volunteer, WATF1 and other TF K9 teams) all come together for the mission. Everyone seemed to get along well and worked well with each other. I also felt that we had everything we needed and were very well cared for, both humans and K9's.
- All needs were met
- It was awkward to have teams show up from other areas (for instance, Canadian K9 teams) that weren't specifically invited, especially when their K9's weren't doing the job we expected them to do. Not sure how to alleviate this. We did field evaluations which worked well as we were able to see how the K9's did in the mud, how they searched, what they alerted on, etc., and were able to make an informed decision to have them leave based on our observations
- K9 Teams worked well together, shared experiences, etc.
- All dogs worked great together
- A good working relationship was developed between the rescue team members and the handlers as we worked. We developed a good system to use the K9s wisely so that they stayed available and ready to work when we were called to search.
- Search operations and allowing K9 handlers to give recommendations was positive
- The other handlers and canines worked well with me and my canine even though we have never met beforehand or worked together.
- Search Ops accommodated k9s well.
- Challenges are having odors for HRD K9 so motivations are maintained despite long searches without much reward. Acclimation over a couple of days with positive reinforcement would I believe improved after K9 acclimated to challenges.
- Dogs were effective and made finds in an environment that was difficult to navigate, difficult to scent in and one in which we have not been able to train for realistically.
- The only recommendation I have is have another canine team to verify or switch out after some time. There were instances that I did have a second canine team with me which was great! Also, it is very important to have source (HR) available for the dogs to get positives to keep their drive up. None was available.



### Communications

- Comms was outstanding. Someone from WA met us at the van daily to take our battery and issue a fresh one
- I was provided with a radio for comms and a fresh battery every day

### Decontamination

- Having access to warm water decon and K9 appropriate shampoo
- The warming tents available after decon were key for keeping the dogs from getting too cold while resting between searches.
- Having hot/warm water at decon was very important
- The national guard did a great job with canine decon

### Safety

- Most people were concerned about biologic contamination. My major concern was with the holes being dug by the excavators. I've investigated multiple trenching fatalities and had serious concerns about the safety of these holes. With the exception of a few times, I would not send my dog into one of the holes. If she had scent and went in on her own to more thoroughly search the area I let her. In general, I did not enter these holes.
- The safety and effectiveness of both people and K9s was the front and foremost concern of management



WA-TF1 Water Operations, Handler S. Dickinson and Search K9 Fielder



## Host Task Force Support

- It was a pleasure to be attached to CATF7. They took care of us as if we were their own. WATF1 was also very gracious when we later transferred over to them. The fact that we were paired with live-find K9 handlers who understood canine behavior and search strategies made our work much easier and I believe more effective.
- CA7 was great, we all felt like one of the team very quickly. Facilities were great, food, had clean clothes, warm, hot and even cold tents to sleep in. The showers were the best.
- WA-TF was great. They supported the K9's very well considering the fact that they never had to support 20 dog teams before
- CA-TF 7 placed the safety and health of the dogs and handlers above all else. I was confident that when I couldn't see my dog during a search there were at least one or two other people watching him and making sure he was safe. Having a CA-TF 7 live find handler assigned to every two HRD handlers was very beneficial. CA-TF 7 did a fantastic job integrating 10 HR handlers into their team and treating us like their own.
- I can't say enough positive things about working with CA-TF 7 and the 9 other handlers assigned to them. I would have liked to have had the opportunity to work more with the other 10 handlers assigned to WA-TF 1 but I understand why we were divided between the TFs based on the size of the search area.
- Host TF provided their handlers or STMs to walk along with us, which helped us quite a bit. Local agencies were very supportive of the dogs.
- Being assigned to CA-TF7 was an excellent experience. Having one of their Live Handlers assigned to the HRD team while out in the field was a fantastic idea. Having a Live Find Handler there who can read and understand a dog actions and body language as well as to spot for you was a tremendous help.
- CA7 adopted us as their own! BoO was fantastic with security, showers, food, laundry
- *The CA and WA systems were different. Not saying either was better but the differences were not addressed. When connected to CA we had at least one CA member assigned to two K9 teams. That CA representative was responsible for our accountability, the radio and the GPS. The WA system was different. They apparently gave handlers radios and had just two WA members responsible for all the K9 teams. This worked since each handler had a radio with which to call back if either K9 or handler got into trouble. It did not however work when the teams merged and the previously assigned CA teams had no radios and were not informed what we were expected to do.*
- Everyone was wonderful and supportive to anything needed
- Canine handlers did a great job building a working relationship with rescue squads. Canine teams assigned to WA were very professional and a pleasure to work with.
- The host task force was exemplary
- We had tremendous support during our time with CA-7 (we were only with WA for one operational period) From beginning to end, we were well informed and asked for our recommendations on the most effective methods of utilizing our K9s.



## Incident Support Team

- We were treated very well. I believe IST was happy with our performance and work ethic
- Good to have an STM rep on the IST to liaison with the handlers.
- Overall I think the deployment went very well. The issues were minor, and the dogs and handlers returned home safely and without major injuries or health issues. I feel like we accomplished the goals of the mission and I hope that FEMA views the first deployment of HR dogs and the first modular deployment as a success.
- *There was an IST lack of support*
- *Lack of clear chain of command*
- *Communication between IST, TFs and handlers could be improved. There was much confusion especially during the transitioning from CATF7 to WATF1 (who was staying, housing (etc). and during the demob phase where we were not sure when we were going home, etc. A checklist of required documentation forms that handlers were supposed to complete would have been useful. None of us had copies of the 214 form that IST asked about during our demob interviews.*
- *Communications was a problem particularly after CA7 left. The insertion with WA 1 had a lot of folks telling us what to do but I wasn't sure who was MY boss. We had no accountability particularly in the field which was a concern since I had traveled with four other handlers for which I was responsible. To address the 'Who's the Boss' question I believe I now have a better understanding. We were deployed as IST which makes IST our boss but we are on loan to the host TF for operational use. Therefore the IST should tell us where to live and how to get there and when to leave. The TF should tell us what our tasks are, be accountable for us in the field, and address any issue we encounter while working. I would recommend that short training be developed including a check list/ guidance documents for the modular deployment be developed and available for review prior to getting deployed. This should include airline travel, expenses, demob paperwork, equipment replacement, medical, equipment to take, etc.*
- *The system needs a policy for radios. Should folks bring from home TF, should the IST provide, or will host TF adopt the visitors and provide radios or designated personnel?*
- *It was unclear who was charged with logistic support of the additional canine teams that were assigned to WA. It would seem if the IST was requesting additional resources it would provide the logistical support for them. Having 2 crates per team would have been helpful. Although it eventually happened, I think it should be planned for in an operation that requires a forward BOO. The additional canine teams were supervised by just 2 STM's. I think additional STM's would have been helpful. Canine teams were often sent out on their own to search areas without that extra set of eyes for safety, someone to document activities or communicate with rescue members.*
- *The only negative was not K9 related. We were told we would not be working on the last day, but found out later everyone else had been told we would work. Because of this and the confusion about where we were to sleep at night, it would have been impossible to work because we had to move our beds to another tent.*
- *There were some issues with the heat for the tents housing handlers, STM and Vet at end of deployment*



## Logistics

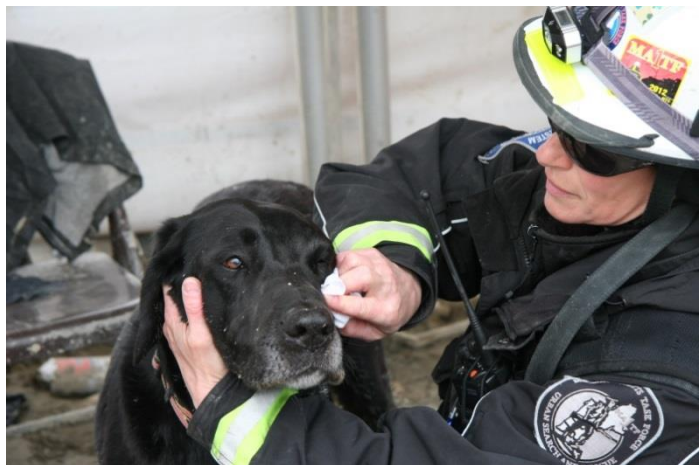
- The logs were responsive in obtaining equipment for the K9s and handlers.
- I'll put WA's logs team against any TF. We never wanted for anything. Outstanding job!
- Transportation in SUV was excellent
- The warming tents to keep the dogs from getting hypothermic between searches.
- *More kennels needed at the beginning of the deployment. Eventually more were available to resting K9s. My dog would only rest when in a kennel and away from the activities of the search area.*
- *Having waterproof warming and/or cooling blankets depending on weather would be ideal for K9's on deployments in cold or hot weather conditions.*
- *Need crates at operation sites*
- *We need more kennels*
- *Some confusion and challenges with tent leaking, heat and some other basic necessities, but most were addressed in a timely manner.*
- *Some problem with rental heaters but we made do.*
- *It was challenging packing and traveling with all of my gear, the dog crate, dog food etc. It would have been nice to have crates and sleeping bags available to the handlers once we arrived so we didn't have to fly with them.*
- *Logs was supportive, but heat (or lack thereof) was sometimes an issue with cold, wet dogs straight from decon. I had plenty of dog food, but logs was generous in getting it for those who ran out. Our tent was not a Western Shelter, but an older army-type model with no floor, no light, leaky roof and no heat. We threw tarps up, got one light, some power and most of the time we had heat. Transport was fine – the usual modes for disasters (vans, trucks, gators) - dogs had to be comfortable being really cozy with other humans and dogs. Human food was excellent, and as I said previously, I had enough dog food, but logs was willing to get it for those who didn't*
- *Need for crates at the forward BoO's, pallets, blankets and warming tents when cold, shade and fans when hot.*
- *Would have liked crates in the vehicles transporting from BoO to operations site and crates at the operations site*
- *It was difficult to travel with crates as excess luggage and would have been more economical if crates had been purchased before arrival. Shipping cost of a crate was \$125.00 each way. Also, having crates available at staging of operational sites and the warming tents is extremely helpful.*





## Veterinary, Medical Support

- I was most grateful for the Veterinary presence not only at the BOO but near to our search areas as well. Knowing that we had that level of support was very much appreciated and comforting. In addition, being able to have our dogs checked out before and after our shifts, I believe, helped keep them strong and able to continue working effectively and efficiently under the most difficult of search conditions.
- Medical care was great (very caring).
- Dr. Lori was awesome, up early wrapping and checking dogs and stayed late. My dog probably wouldn't have done as well as she did without Dr. Lori and other vets support.
- IST Veterinarian and all veterinary support made a big difference, very helpful in maintaining K9s throughout the mission
- It was a huge benefit to have a FEMA Veterinarian assigned to the deployment. Dr. Gordon understood how the K9s worked, how the FEMA handlers worked, and having a vet readily accessible for care of the K9s. I believe this allowed the K9s to continue to work in a very challenging environment.
- Best experience...IST Vet support and locating a victim on Easter morning!!!!!!
- Vet support by FEMA IST was very, VERY good.
- Vet support and availability was positive
- The veterinary care provided by Dr. Gordon and the vet corps members was outstanding.
- Important to have an IST Vet every time. The local vets were great, but we needed the knowledge of the US&R vet.
- I can't say enough about the veterinary care that was provided to the dogs throughout the deployment, it was a huge relief knowing reliable care was always available.
- All vets were very helpful, especially our Dr. Gordon.
- Having Vets and Techs on sight and at the BoO made all the difference in keeping our K9's healthy
- There was great on site vet care available. It was also very helpful to have a vet with the IST that was able to provide some direction and assistance to the vets and techs that had been provided through the IMT
- Having a tent dedicated for vet care was very helpful.
- Veterinary support was excellent over all
- The medical support for the canines was very good
- Many thanks to Dr. Gordon and all the vet techs who checked my K9 out during and after the searches were done
- It was a huge comfort to have a vet (Lori Gordon) deployed with us. While all vets are knowledgeable about treatment, etc., it is a tremendous advantage to have a vet that knows and understands working K9s on site. Lori shared contact info with us upon her arrival and was available 24-7 in the event we needed her.



- Also, several local vets provided towels, crates, dog food, etc and really went the extra mile to supply items beyond what was required.
- Loved having the vet with us especially since we were in a rather remote location. Nice to have a vet that is little more mission oriented as well. Some of the volunteers are really quick to pull a dog.
- *Would have been nice if local support vets had more knowledge of US&R dogs and our mission*
- *I saw a WATF1 doctor stitching a hand up without novocaine as they had none. Not sure why there was no novocaine in their medical supplies, but there needs to be.*
- *All K9's that fly 2 or more hours should have a sub Q bolus of fluids on arrival at the BoO. The k9's are already behind in fluid intake because of flights. I think this would help with some of the dehydration issues we saw in the first few days of deployment.*

#### Other Comments

- It was a great deployment
- The entire operation went well! Flights, vehicle rental, food, showers, decon...very professional!
- Best experience...IST Vet support and locating a victim on Easter morning!!!!!! Worst experience...Leaving two victims unfound.
- When do we go again!!!!!! My K9 had a blast and the experience has provided me with a much better dog. We got in more experiences and training in that 20 days than what we could have accomplished at home over the next 5 years.
- The facilities and services available at the BoO were great. It was so nice to have a hot shower, laundry and warm meals every day.
- I have NO complaints other than arriving late in the deployment and short amount of time to work the scene. K9 would have acclimated better after a couple shifts and I believe become accustomed to scene challenges
- It was an honor to assist in the Oso Mudslide. Although this was a new situation I believe we all adapted well and assist in brining closure. I can promise we will be better prepared to respond the next time we are needed for a modular deployment. Thank you.
- All local support services were above and beyond what I would have expected
- This was my first deployment, and it was an incredible experience!
- Overall it was a very positive experience for both myself and K-9 partner. We were given a great deal of support from all levels.
- *I didn't have or think to bring extra gloves (lost 3 pairs in the mud,) or other "wilderness SAR" items such as gaiters and a walking stick. I have these things in the gear I use locally but didn't add them to my FEMA gear. I will be rethinking my packing for future deployments and adding items to my pack not currently on the FEMA cache list.*
- *I significantly underestimated how much dog food to bring. My dog ended up eating double what he typically eats in a day and he still returned home from deployment about 5 lbs lighter which is considerable for a dog that is lean and fit to start with. In the future I will pack more food. It would also be helpful to provide IST with food lists at the time of deployment so they can have a system of ordering dog food in place within the first 72 hours which could be critical if luggage is lost during travel.*

## Abbreviations

ARDA

CST-HRD = Canine Search Teams for Human Remains Detection

DNR = Department of natural Resources

FEMA = Federal Emergency Management Agency

ICP = Incident Command Post

IST = Incident Support Team

IST-VO = Incident Support Team Veterinary Officer

MDU = Mass Decontamination Unit

NAPWDA = North American Police Working Dog Association

NASAR = National Association for Search and Rescue

NNDDA = National Narcotic Detector Dog Association

PDT = Pacific Daylight Time

SARDUS = Search and Rescue Dogs of the United States

STM = Search Team manager

TF = Task Force

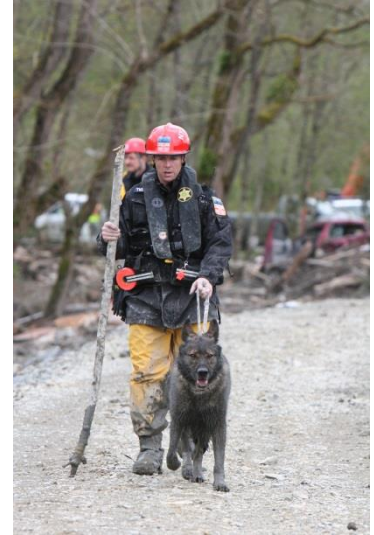
US&R = Urban Search and Rescue

USPCA = United States Police Canine Association

UTC = Universal Time Coordinated

VA DEM – Virginia Department of Emergency Management

WSDA-RVC = Washington State Department of Agriculture Reserve Veterinary Corps



C. Theofield & Brutus

## Definitions for Reference

Mean = the average; the numbers are added and then divide by the number of numbers

Median = the middle value in the list of numbers

Mode = the value that occurs most often; if no number is repeated, there is no mode

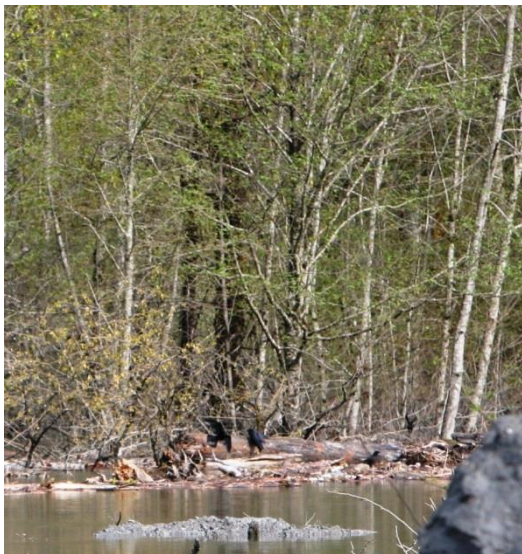
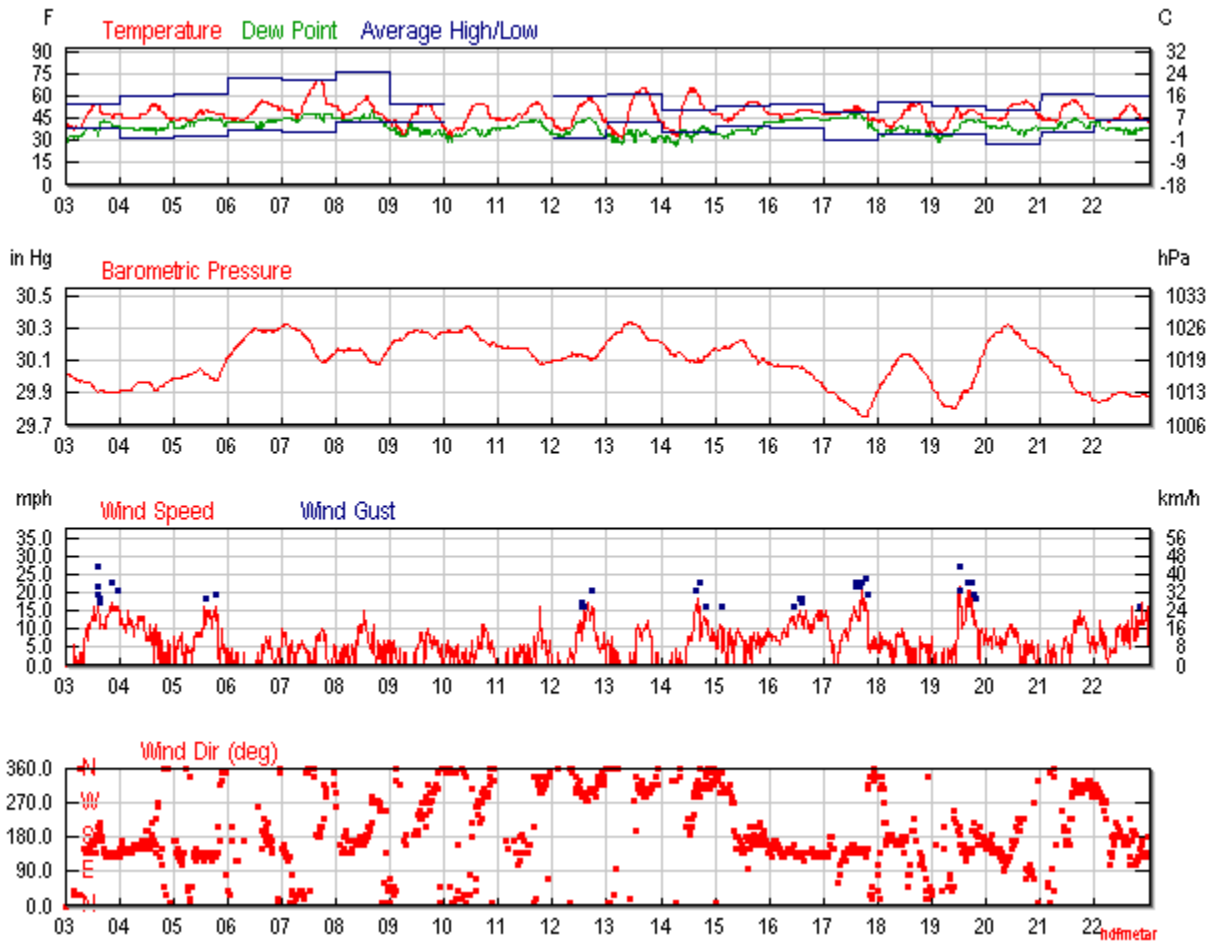
Range = is the difference between the largest and smallest values



The Flag from Division 4 and 5



# Oso, WA: Weather History Graph April 3 – April 22, 2014



HR suspected where Crows gather

Sno County Helo hovers where crows had gathered

## Water Testing Results

### Ecology's analysis of the preliminary chemical data:

**Volatiles** detected are consistent with compounds occurring in gasoline, household paints and solvents, and refrigerants. All compounds were detected at the ug/L (ppb) or sub-ug/L (sub-ppb) concentration. **None of these exceeded the National Primary Drinking Water Standards** [the compounds detected that had NPDWS criteria were benzene (5 ug/L), ethylbenzene (700 ug/L), toluene (1,000 ug/L), and xylenes (total) (10,000 ug/L)]. The only applicable standard I could find to compare the refrigerant (trichlorofluoromethane) to was a California Public Health Goal for Drinking Water at 700 ug/L. The EAP summary document also shares a perspective on these organic results. Note that no PCBs or Pesticides were detected.

David Byers  
Ecology Response Manager

VOCs	1,2,4-Trimethylbenzene	0.79	ug/L
VOCs	1,3,5-Trimethylbenzene	0.26	ug/L
VOCs	4-Isopropyltoluene	0.31	ug/L
VOCs	Acetone	7.9	ug/L
VOCs	Benzene	0.44	ug/L
VOCs	Ethylbenzene	0.59	ug/L
VOCs	m,p-Xylene	2.3	ug/L
VOCs	o-Xylene	1.1	ug/L
VOCs	Toluene	3.5	ug/L
VOCs	Trichlorofluoromethane	0.76	ug/L

### **Fecal Coliform:**

- **Of the 11 samples collected only 1 sample (in inundated area) was greater than Class AA freshwater criteria of 100 cfu/100ml)**

- Three samples (1 in inundated area and 2 downstream of site (1-2 miles) were greater than the median value (17 cfu/100ml) measured during the Stillaguamish TMDL study (Joy et al., 2004).

Stillaguamish River Water Quality Data Assessment, April 11 2014

Will Hobbs and Dale Norton

Sample #	Location	Analysis	Analyte	Result	Units	Sample Date	Location Description
14032001	NS01SW	Coliforms (TAT 24 Hour)	Fecal coliform	7	cfu/100mL	3/29/2014	0.25 mile downstream debris field
14032002	NS02SW	Coliforms (TAT 24 Hour)	Fecal coliform	7	cfu/100mL	3/29/2014	1 mile downstream debris field
14032003	NS03SW	Coliforms (TAT 24 Hour)	Fecal coliform	51	cfu/100mL	3/29/2014	2 miles downstream debris field
14032007	NS01SW	Coliforms (TAT 24 Hour)	Fecal coliform	4	cfu/100mL	3/30/2014	0.25 mile downstream debris field
14032009	NS02SW	Coliforms (TAT 24 Hour)	Fecal coliform	2	cfu/100mL	3/30/2014	1 mile downstream debris field
14032013	BG01SW	Coliforms (TAT 24 Hour)	Fecal coliform	5	cfu/100mL	3/30/2014	Upriver NF Stillaguamish
14032015	IA01SW	Coliforms (TAT 24 Hour)	Fecal coliform	260	cfu/100mL	3/30/2014	Inundated Area South of 530
14032018	BG01SW	Coliforms (TAT 24 Hour)	Fecal coliform	2	cfu/100mL	3/31/2014	Upriver NF Stillaguamish
14032020	IA02SW	Coliforms (TAT 24 Hour)	Fecal coliform	17	cfu/100mL	3/31/2014	Inundated Area North of 530
14032024	NS02SW	Coliforms (TAT 24 Hour)	Fecal coliform	22	cfu/100mL	3/31/2014	1 mile downstream debris field
14032026	NS03SW	Coliforms (TAT 24 Hour)	Fecal coliform	12	cfu/100mL	3/31/2014	2 miles downstream debris field



