July 2012: What we knew then.

~ 80% of all Monitored Fishers in CA Exposed to AR

- Four Mortalities were due to AR poisoning statewide.
- Spatial modeling: exposure was throughout study areas.
- Neonatal or milk transfer of AR to fisher kit.

July 2012: What we knew then.

- **Four Mortalities** were due to AR poisoning.
  - Two in Northwest California (Hoopa Reservation)
  - Two in Southern Sierras (SNAMP/SugarPine)

Brief Review of cases
July 2012: What we knew then.

Brief Review of cases

SNAMP M13: April 2009
- Discovered completely intact with no indication of predation wounds.

Necropsy
- No Infectious disease or predation
- Massive Hemothorax & Hemoabdomen (bleeding in these cavities)

Toxicology
- Exposed to 2 different ARs
  brodifacoum
  bromadiolone

July 2012: What we knew then.

Brief Review of cases

SNAMP F25: May 2010
- Discovered completely intact on/near Hwy 41
- Suspected roadkill

Necropsy
- No infectious disease or predation
- No abrasions, broken, or fractured paw pads, fur, nails, teeth, bones or torn viscera (organs) as seen in ALL fisher roadkills.
- Hemothorax (bleeding in these cavities)
- Hemorrhaging in muscles that does not extend deep in tissue: Typical sign of clinical AR toxicosis

Toxicology
- Exposed to 3 different ARs
  Brodifacoum @ 0.6 ppm, Bromadiolone @ 0.17 ppm
  Diphacinone (trace)
New Cases: What we Know Now.

SNAMP M40: February 2013
- Discovered completely intact

**Necropsy**
- No Infectious disease or predation
- Hemothorax (bleeding in cavities; 10 cc of blood)
- Hemorrhaging in muscles that does not extend deep in tissue:
  Typical sign of clinical AR toxicosis

**Toxicology**
- Exposed to 2 different ARs
  - Brodifacoum @ 0.53 ppm
  - Bromadiolone @ 0.097 ppm
  - Diphacinone (trace)

Micro-hemorrhages seen in much of the fishers tissues

New Cases: What we Know Now.

SNAMP M45: April 2013
- Discovered completely intact with blood near mouth

**Necropsy**
- No Infectious disease or predation
- Hemothorax (bleeding in cavities; 60 cc of blood)
- Blood found throughout the GI track (10-15 cc of blood)
- Feces had blood

**Toxicology**
- Exposed to 3 different ARs
  - Brodifacoum
  - Bromadiolone
  - Diphacinone
New Cases: What we Know Now.

Case that prompted review by Primary Pathologist due to current findings

SNAMP M07: February 2008
- Discovered completely intact on/near Hwy 41: Suspected roadkill

Necropsy
- No Infectious disease or predation
- No abrasions, broken, or fractured paw pads, fur, nails, teeth, bones or torn viscera (organs) as seen in ALL fisher roadkills.
- Over 200 cc of loose blood (Hemothorax)

New Cases: What we Know Now.

Preliminary Data: Suggestive of AR Toxicosis
Final Ruling Soon

Kings River F60: July 2014
- Discovered completely intact near MJ grow site.
- An old wound on hind leg

Gross Necropsy
- No Predation
- Hemorrhaging in muscles that does not extend deep in tissue:
  Typical sign of clinical AR toxicosis
July 2014: What we know now

Plos Paper (2008-mid-2012)
- 79% CA fishers exposed
  Sierras (83%), N. CA (72%)
- 4 mortalities (2 N. Cal & 2 Sierra)

Post-Plos (mid 2012 - 2014)
- 20 of 21 (95%) fishers tested (2012-2014)
- All Sierra Fishers: Up to 86%
- SNMP/Sugarpine from 88% to 92%
- All SNMP/Sugarpine fishers post-Plos 100% positive (n=11)
- 2 new mortalities (SNAMP)
- 2 additional likely AR mortalities (SNAMP/KR)
July 2014: What we know now

Northern California (Post-Plos paper: 2012 – 2014)

- 3 more AR fisher mortalities
- 3 more other toxicant toxicosis cases
  - 1 cholecalciferol, 2 unknown
- 1 additional uncollared mortality - methomyl
Ongoing Research Efforts

1. Mapping “high-risk” areas – G. Wengert & M. Higley
   • Based on known 2010-2012 trespass sites
   • Map to include several T&E species:
     Marten, spotted owl, fishers, etc.

2. Multi-carnivore monitoring –
   C. Thompson, G. Wengert, K. Purcell, B. Nichols
   • Collecting weekly scat samples from collared lions
   • Evaluate for AR exposure
   • Compare results to movement patterns and trespass grow site locations
   • Evaluate population-level exposure risk

Acknowledgements:

Dr. Mourad Gabriel
Dr. Greta Wengert
Integral Ecology Research Center
Mark Higley
Hoopa Valley Tribal Forestry
Rick Flemming
High Sierra Volunteer Trail Crew
Numerous federal, state, & private organizations...