Wildflower Triathlon Communications

Building a Communications System from Scratch

Kenneth Finnegan, W6KWF

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- First licensed in 2008
- BSME from UC Davis, MSEE from Cal Poly SLO
- Master's thesis on APRS: "Examining Ambiguities in the Automatic Packet Reporting System"
- Involved in off-the-grid and temporary radio site deployments; repeaters and DC power systems
- Working as a Solar Test Engineer at Solar Junction testing III-V multi-junction solar cells.
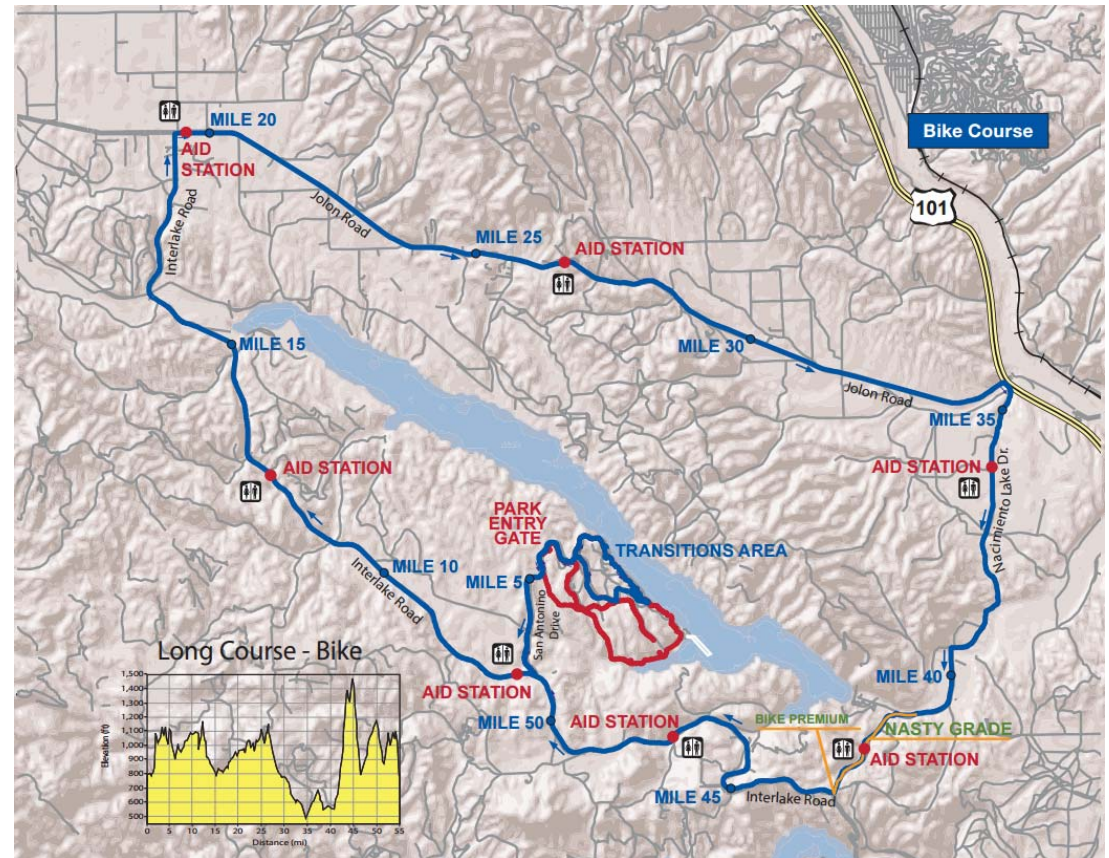
Agenda and Objective

- What is the Wildflower Triathlon?
- Communications Committee
  - What do we do?
  - Radio Sites
  - APRS
  - Repeaters
- Ham vs Commercial

Wildflower Triathlon

- 1.2 mile swim
- 2.2 mile run
- 56 mile bike
- 10.9 mile run

Wildflower Triathlon

- Started in 1983 as a bluegrass festival (with a triathlon)
- First race had 86 athletes
  - Is now 2k – 8k athletes
- Cal Poly volunteers since 1985
- Cal Poly Amateur Radio Club since the 1990s.

We encountered a bit of a hitch...

Communications Committee

Event Support 101

What do amateurs bring to the table?

- Logistics
- Emergency support
- Knowledge
  - What's happening on the course?
- Well trained
  - Radio protocol (despite weekly nets)
  - First aid

Communications by the Numbers

- 40 amateur radio operators
- 200 commercial HTs
- 30 commercial mobile rigs
- 20 APRS trackers + 3 I-gates
  - Entirely insular network from .39
- 18 operating frequencies
  - 4 amateur frequencies
  - 5 commercial repeater pairs
  - 9 commercial simplex channels

Typical Dispatch for any normal event

- 2-3 Amateurs
- 1 amateur base station
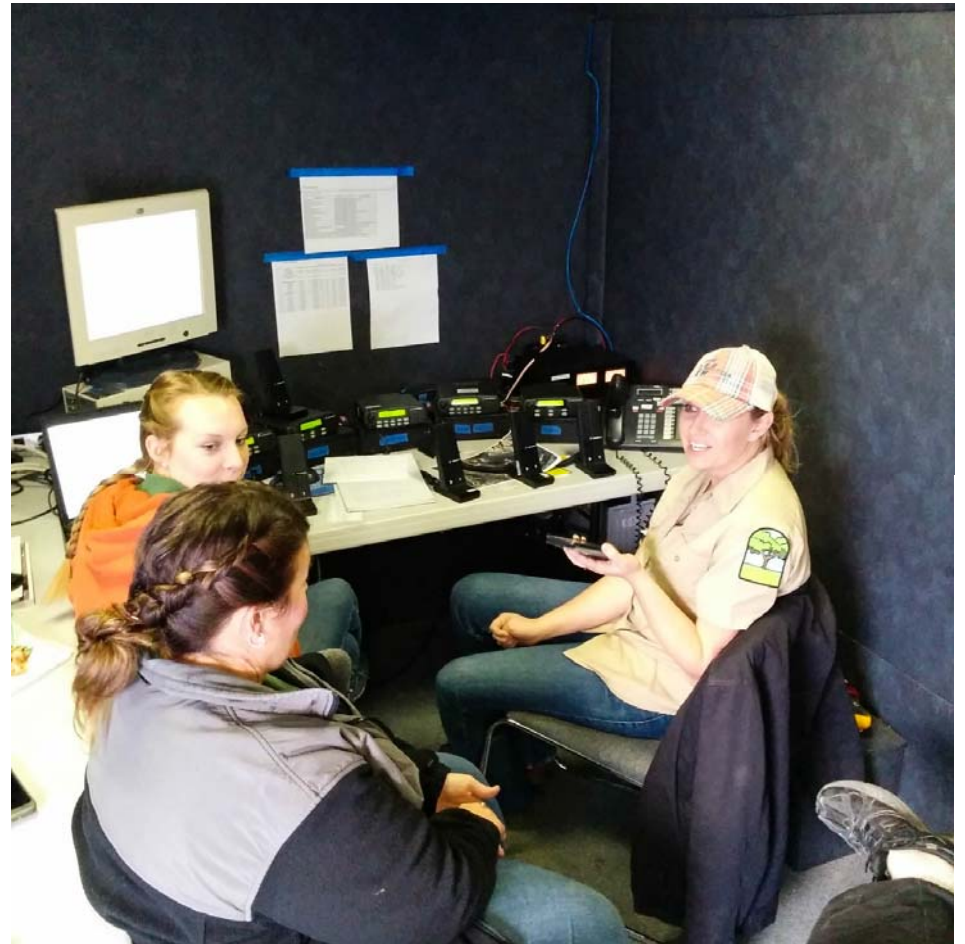- A pad of paper
- Maybe a laptop

Communications Dispatch

- Amateur Station
- APRS I-gate + APRS-IS server
  - APRX + aprsc
  - AGWTracker projected on the wall
- Commercial station (5 radios)
- Computer Aided Dispatch server
  - We use BlackFlower
  - You should look at TicketsCAD

Communications Dispatch

- Things get a bit crazy with this many channels

- "Dispatch Supervisor" becomes a useful roll

- We bring roll-out carpets & hang moving blankets to make rooms quieter

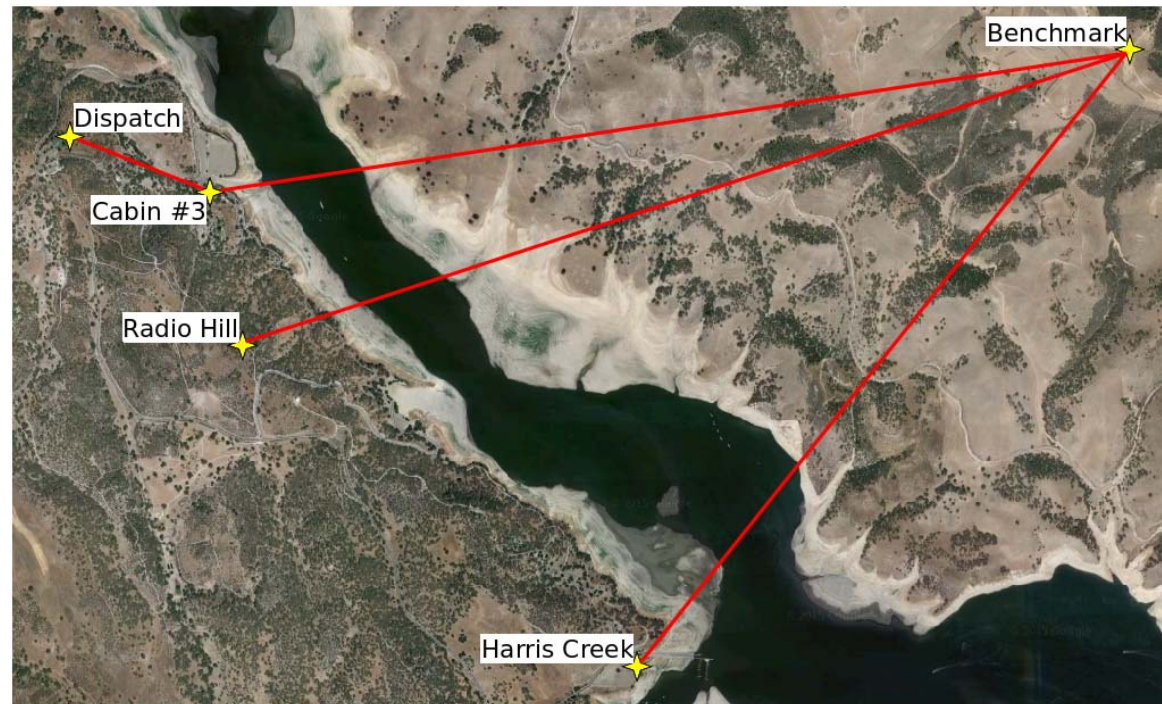- Second set of ears in "Race Command" down the hill from Dispatch

"Radio Hill"

- Solar-powered commercial UHF repeater
  - 12 hour twist timer switch
- APRS digipeater/I-gate
- Commercial crossband repeater
- 5GHz point-to-point IP link

5GHz WiFi links?!

- Point to multipoint IP links used for:
  - Access to CAD server
  - APRS I-gates
  - Linking the RFID Timing mats

  - Ubiquiti
  - Mikrotik
  - EnGenius

Main Radio Site – "Benchmark"

1. Take a random hillside
2. Apply radios
3. ???
4. Profit

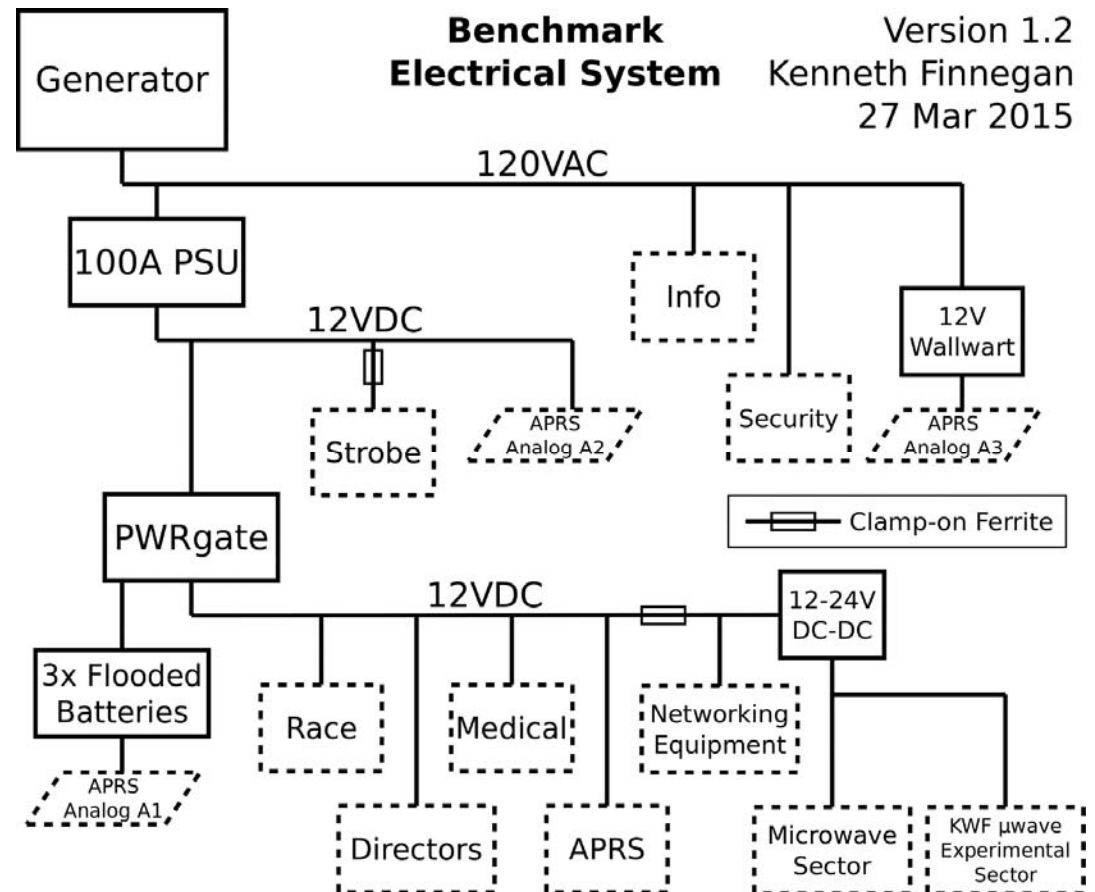(The USGS knows how to pick radio sites)

Benchmark Radios

- Four Itinerant UHF commercial repeaters
- UTAC Interoperability repeater + VTAC link
- APRS Digipeater/I-gate
- 5GHz AP

- Webcam for site statistics
  - Battery voltage
  - Repeater usage

Benchmark Power System

- 12VDC solar pre-event
  - EPSolar Tracer4215BN
- "300Ah" battery backup
- 120VAC generator
  - Honda 2000i

Benchmark Electrical System
Version 1.2
Kenneth Finnegan
27 Mar 2015

Amateur vs Commercial

- For $165 I bought a commercial license (WQXE668)
  - "2 repeaters + 300 mobile units per frequency in the continental US south of line A"

- 20 minute radio class Thursday night:
  - 200 more volunteers with radios

- No silly limitations on using the radio while getting paid

- "That which they lack in skill, they make up for in shear numbers"
- We've been training them for 20 years – They're getting pretty good

Questions and Hardware Demos

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