



Environmental and Fauna Hardening

NetOps VIII Workshop

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Environmental Hardening

- **Protect your field site from the elements:**
 - Snow and Ice
 - Flooding
 - Lightning
 - Temperature
 - Fire
 - Corrosion



Problem: Snow and Ice

Big concern at higher latitudes



Snow and Ice Load Damage

Can crush enclosures, PV frames, and vaults



Solutions: Better Enclosures, Reinforced PV Frames

- **Fiberglass Enclosures (AVO and CVO)**
- **Large volume allows for up to 20 batteries to maintain power through winter**
 - Currently CVO uses 8-10 100 A-hr batteries at all sites with Air Cells for backup at some stations.
- **Additional equipment can be added without increasing footprint of the site.**
 - gas monitoring, camera, rain gauge, etc.



Problem: Frost Jacking



- **Solutions:**
 - Direct instrument burial
 - Decouple pad from vault walls

Problem: Flooding



- **Solutions:**
 - Seal openings
 - Install drain
 - Bilge pumps
 - Dessicant for small volumes

Problem: Lightning

■ Solutions:

- Grounding protection
- Avoiding long conductors
- Site selection



Fauna (and Flora) Hardening

- Protect your field site from animals, insects:
 - Bears
 - Rodents
 - Insects
 - Other animals (goats, cows, etc.)
 - ... and People
- Plant overgrowth



Problem: Bears

They are curious and persistent!



Problem: Bears



Bear Solutions

- Run cables inside masts.
- Bury all conduits.
- Minimize “handles” for grabbing.
- Bury or cover vaults.



Problem: Rodent Chewing



- **Solutions:**
 - Bury cables or run in conduit.
 - Steel wool, fiberglass, copper wool, drier sheets
 - Wipe with alcohol
 - Seal enclosures.

Problem: Vandalism



- **Solutions:**
 - Hide stations
 - Signage
 - Community Education
 - Cost of doing business

Problem: Plant overgrowth

- **Solutions:**
 - Build high towers
 - Clear trees
 - Try other radios
 - Move stations



Key Takeaways

- Follow best practices.
- Learn and adapt to your local situation.
- Keep trying new things.

That's all folks!

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