



Meshtastic vs APRS

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An Introduction to Meshtastic

Off-Grid, Decentralized Communication for Everyone



What is Meshtastic?

Meshtastic is an open-source project that uses inexpensive LoRa radios to create an off-grid, long-range, decentralized mesh network.

- **Goal:** To enable private, encrypted, and reliable messaging without needing cell service or the internet.
- **Technology:** It uses LoRa (LOng RAnge) radio technology, which allows for communication over several kilometers.
- **Core Idea:** Your phone connects to a small, low-power Meshtastic device via Bluetooth. This device then relays your messages through a mesh of other nearby devices.
- **Key Takeaway:** Think of it as your own private communication network, perfect for hiking, emergencies, or connecting with a group in remote areas.

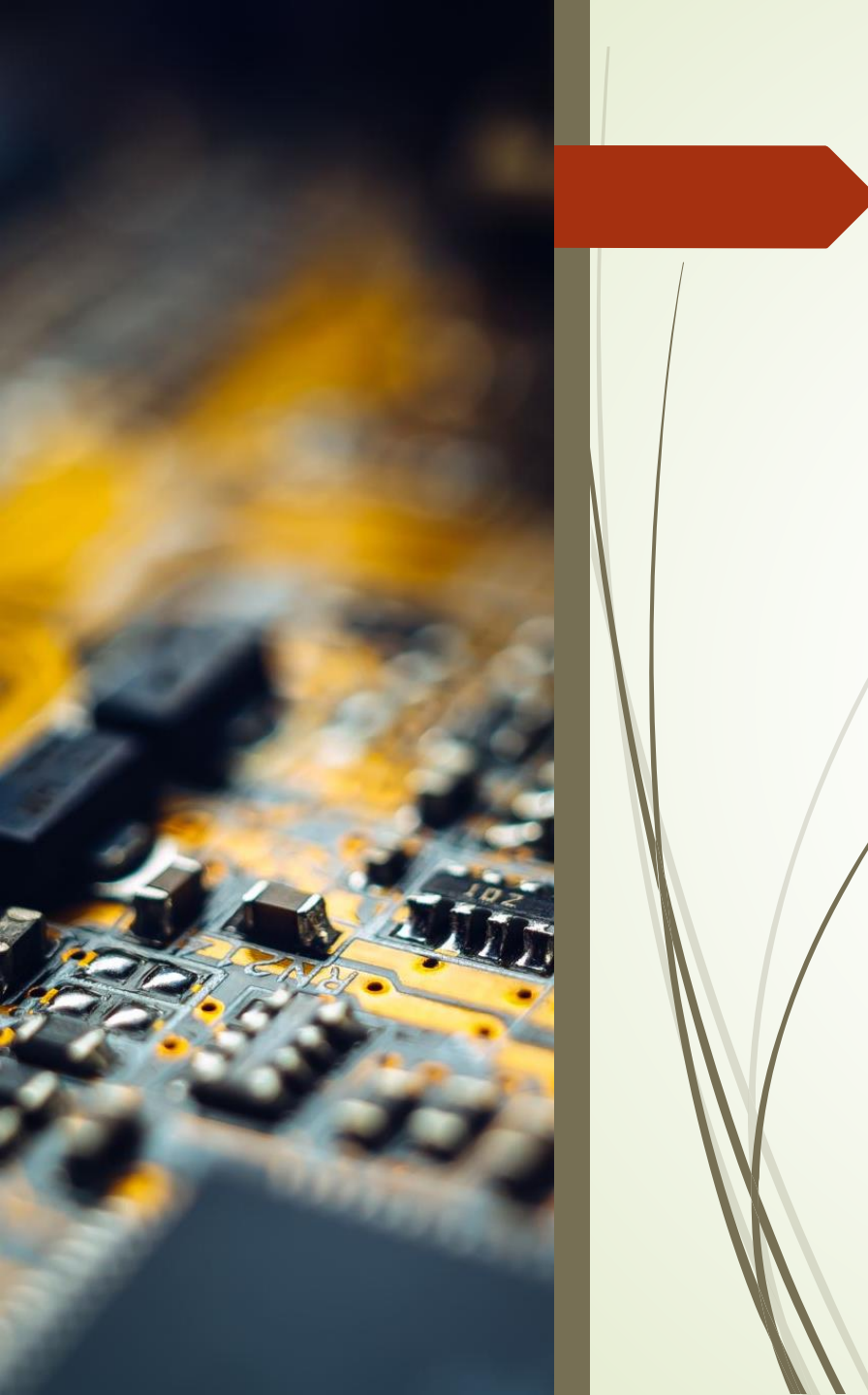


A Word of Caution: It's Beta!

Meshtastic is under active development and should be considered BETA software. This has important implications:

- **Features Evolve:** What works today might change tomorrow. New features are constantly being added.
- **Expect Bugs:** Some functions might not work as expected, and you may encounter occasional glitches.
- **Regressions Happen:** Sometimes, a software update can temporarily break a feature that was previously working.
- **Patience is Key:** The project is driven by a community of developers and enthusiasts. It's a journey of experimentation and improvement!

The community is very active and helpful, but remember you are on the cutting edge.



Hardware Architectures

Meshtastic runs on a variety of low-cost, low-power hardware boards, typically combining a microcontroller with a LoRa radio chip.

- **All-in-One Boards:**

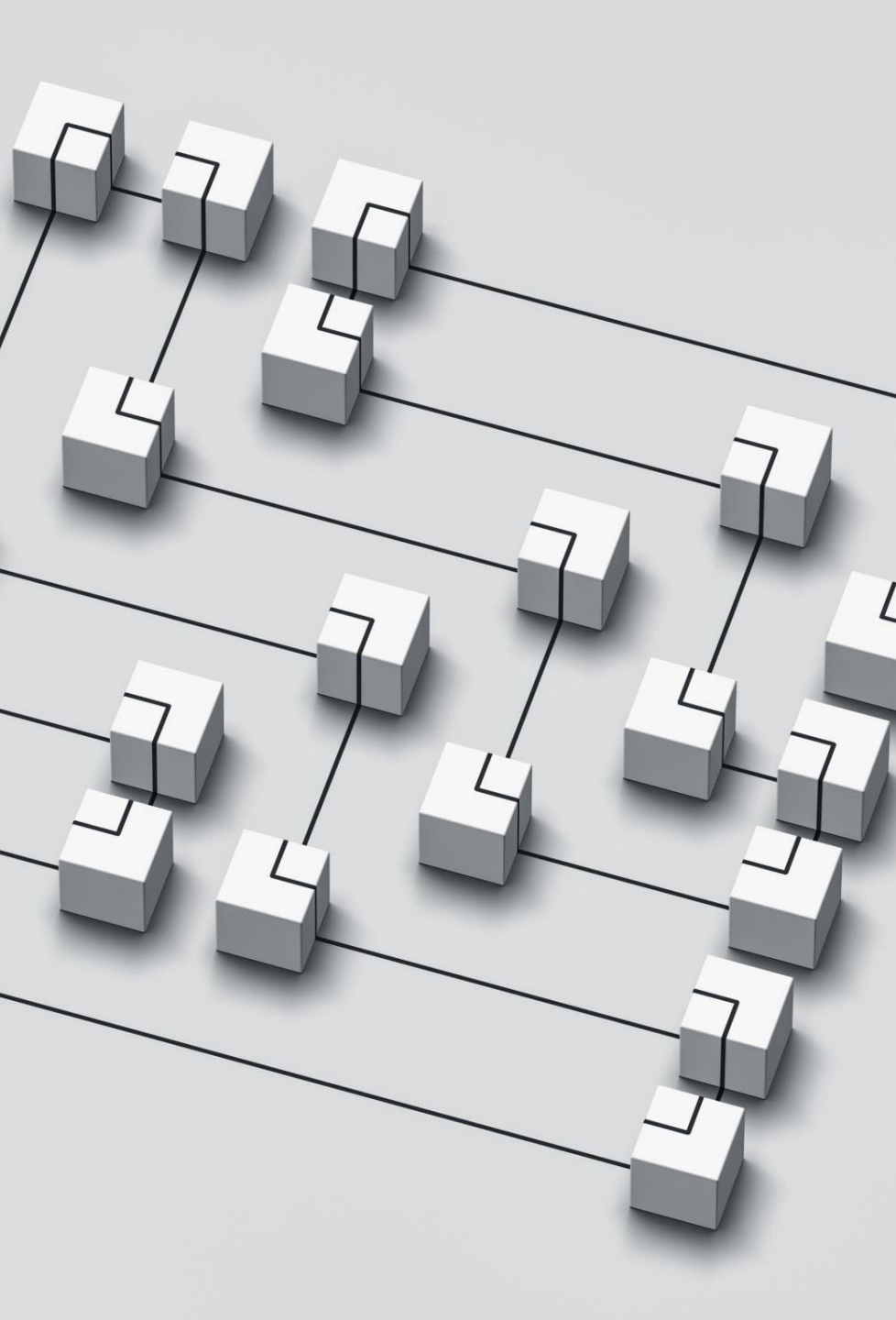
- These are the easiest to start with.
- They integrate the CPU, LoRa radio, GPS, screen, and battery management on a single board.
- **Examples:** LILYGO T-Echo, LILYGO T-Beam, Heltec Wireless Stick.

- **DIY / Component-Based:**

- For more advanced users who want to customize their setup.
- Involves connecting a supported microcontroller (like an ESP32) to a separate LoRa radio module (like a HopeRF RFM95).
- Offers flexibility but requires more setup and soldering.

- **Ready-to-Use Devices:**

- Some manufacturers are beginning to sell pre-assembled devices in durable cases, making it even easier to get started.



Core Capabilities: The Mesh Network

➤ Automatic Mesh Joining:

- Simply turn on your device! As long as it's configured to the same channel (frequency, name, encryption key), it will automatically discover and connect to other nodes in range. No complex setup is needed.

➤ Routing Configuration:

- The network is self-healing and self-managing.
- Each node keeps a map of the other nodes it can see.
- Messages are automatically "hopped" from one node to the next to reach their destination. You don't need to manage this manually.
- The firmware intelligently routes messages through the most efficient path.



What are "Hops"?

In a mesh network, not all devices need to be in direct range of each other. **Hops** are the secret sauce that extends the network's range.

- A "hop" is the act of a message jumping from one node to another.
- Example:
 - You want to send a message to **Alice**.
 - You are not in direct radio range of Alice, but you are in range of **Bob**. Alice is in range of Bob.
 - Your device sends the message to **Bob's** device (Hop 1).
 - Bob's device sees the message is for Alice and forwards it to her device (Hop 2).

The message reached its destination in **2 hops**. Meshtastic supports a default maximum of 3 hops (configurable up to 7) to prevent messages from endlessly bouncing around the network.

Messaging & Data Options

Meshtastic is more than just a text messenger.

- **Direct Messaging:** Send private, encrypted messages to a specific person on the network.
- **Group Messaging:** All nodes on the same channel can participate in a group chat, similar to a walkie-talkie channel.
- **Telemetry Data:** Nodes can periodically broadcast sensor data (e.g., temperature, humidity, barometric pressure) or their GPS location to the mesh.
- **Map Display:** Use the companion app (on iOS or Android) to see the location of other nodes on a map. This is useful for keeping track of a group.

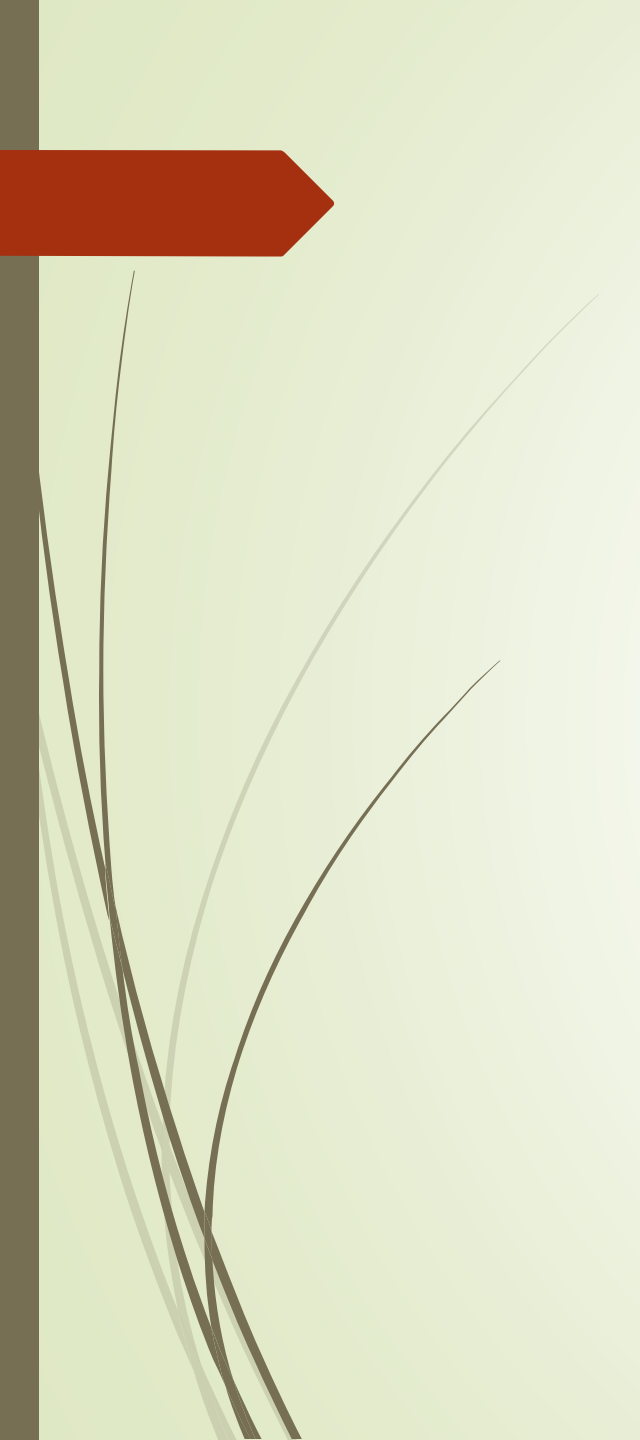




Map Options & Visualization

Visualizing your network is a key feature.

- **Live Map:** The Meshtastic app displays a map showing the current location of all nodes that have their GPS enabled and are sharing their position.
- **Node Information:** Tapping on a node on the map shows you its name, distance from you, battery level, and when it was last heard from.
- **Offline Maps:** You can download maps for your area ahead of time, so you don't need an internet connection in the field. This is crucial for off-grid use.



Questions?



APRS vs Meshtastic – Comparison Overview

Category	APRS	Meshtastic
Text Messaging	✓	✓
Group Chat		✓
Position Reporting	✓	✓
Telemetry	✓	✓
Requires FCC License	✓	
Map Display	✓	✓
Worldwide Reach	✓	
Encryption		✓
Obscured Position		✓



Text Messaging

APRS

- Radio to Radio over the air
- Radio to SMS (requires gateway)
- Radio to Email (requires gateway)

APRS messages are sent as “unnumbered Information” and delivery is not guaranteed

The automatic ACK process is subject to collisions and often not delivered

Meshtastic

- Send to all nodes in the mesh
- Send to specific node in the mesh
 - Encrypted with receivers PSK
 - Subject to maximum hops
- Limited characters per message



Position Reporting

APRS

- Well developed capability
- Configuration somewhat complex
- If an IGate is within range, position reports are sent via the Internet to APRS.fi
 - Other options are also available
- APRS.fi maintains a database of position reports

Meshtastic

- Configuration straight forward
- Position can be sent to all nodes on the mesh or only to “subscribing” nodes
- The actual position can be obscured if desired
- No generally available Internet capability



Telemetry

APRS

- Weather reporting is most common
- Protocol is well defined and adaptable to other data needs
- APRS.fi maintains an extensive database of telemetry information

Meshtastic

- A node's Telemetry Module reads the telemetry info (for example, its battery voltage)
- The node broadcasts this telemetry data as a LoRa packet over your mesh channel
- A Gateway Node hears this LoRa packet
- The gateway connects to the specified MQTT* broker and publishes the telemetry data, converted to JSON
- Subscribers to that telemetry topic receives the JSON data packet. It can then parse the data and do something with it (for example, display "Battery: 95%")

*MQTT: (Message Queuing Telemetry Transport)



Map Display

APRS

- APRS.fi has built-in map display
- Alternative maps are available from other services
- Time frame for data to be displayed easily set

Meshtastic

- Uses Google Maps as the map platform
- Limited configuration capability
- Data persists for long periods of time



Using Meshtastic to Track Participants

Device selection criteria

Device configuration considerations

Mesh considerations

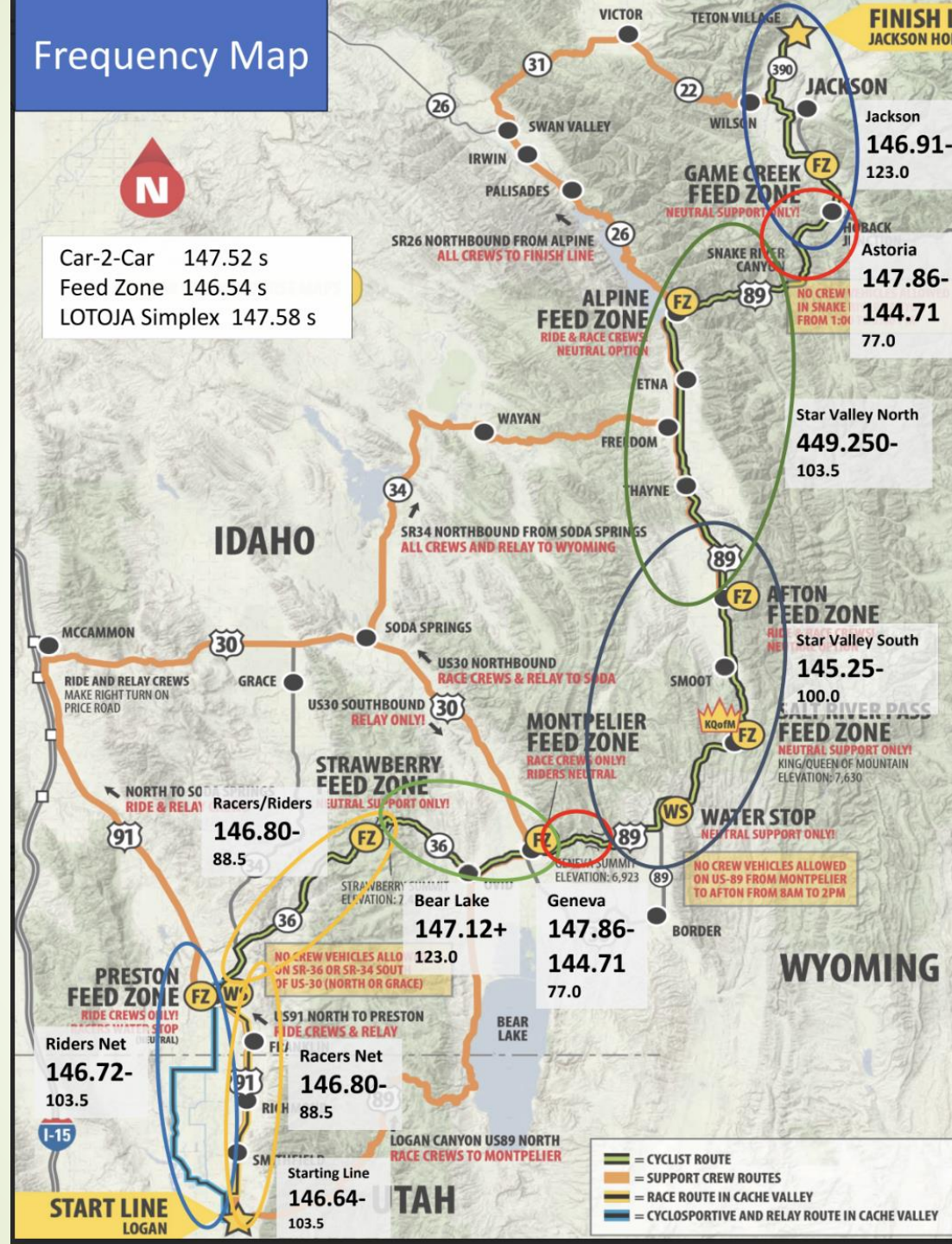
Mapping considerations

Overall evaluation

Frequency Map



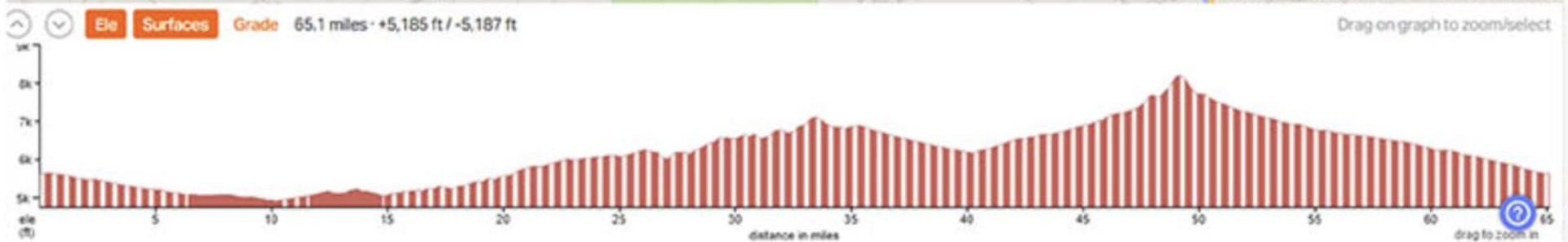
Car-2-Car 147.52 s
Feed Zone 146.54 s
LOTOJA Simplex 147.58 s



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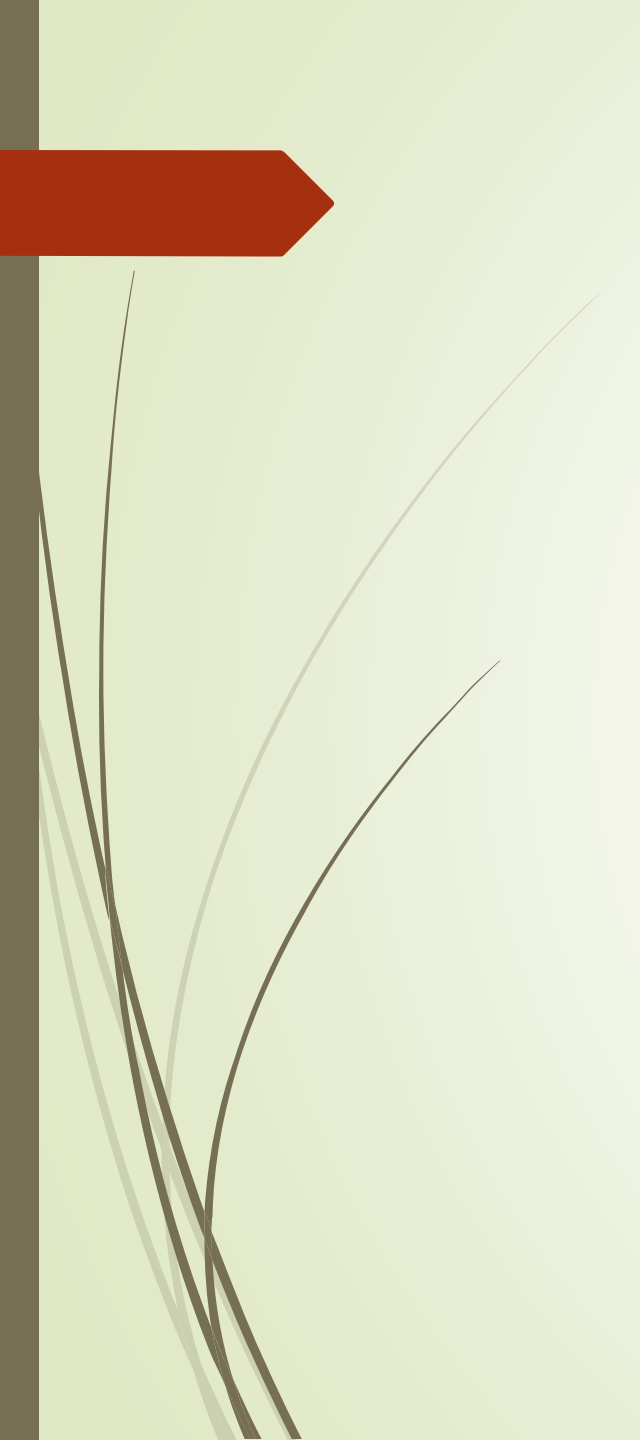
(65 MILE)

Wild Horse Gravel



Aid Stations

South Aid Station: 25 miles
Ranch Aid Station: 40 miles
North Aid Station: 49 miles



Questions?