



GRAYSON COUNTY AMATEUR RADIO CLUB



GCARC
GRAYSON CO. TEXAS USA



Basic Fox Hunting



Agenda

- What is a “Fox Hunt”?
- What is a Fox Hunting Equipment
- The Hunt
- Additional Information

What is a Fox Hunt?

Simple Answer:

Find a hidden transmitter



Why do a Fox Hunt?

- Social – a chance to spend time with fellow HAMs
 - Can be competitive: both for the hunt and for the equipment construction
- Skill building – Learning more about radios, antennas, propagation, kit building, micro-controllers, etc.
- An important skill for emergencies
 - Stuck PTT (Push to Talk) – usually headset
 - Injured, trapped, or lost person
 - Locate distractors (intentional or panic)
 - Hunters do not broadcast – no license needed
 - Can be simple or complex – you choose



Examples of a ham radio “Fox”?





Can buy ready built Foxes

There are numerous designs for home-built Foxes

All you needs is to send a signal and an FCC ID

Most “foxes” are 2 m or 80 cm

**You can also be a person with a radio
simulating a lost, injured, trapped individual**



Fox Placements

- Foxes are usually hidden (fixed)
This is what we will do for our hunt.
- Could be mobile
- Reflections might “hide” the Fox
- Fox with Yagi to bounce off buildings
- Placed next to metal structures
- Time varying radiation/reflection patterns



Hunting Equipment



KB8TAD

- “Pointing” HT antennas
- Pringles® can or shielded paper towel tube
- Yagi antenna – “Tape Measure Yagi” is VERY popular!
- Loop antennas
- Attenuators
- TDOA – Time Difference of Arrival
- Doppler
- Automatic Direction Finders, etc.

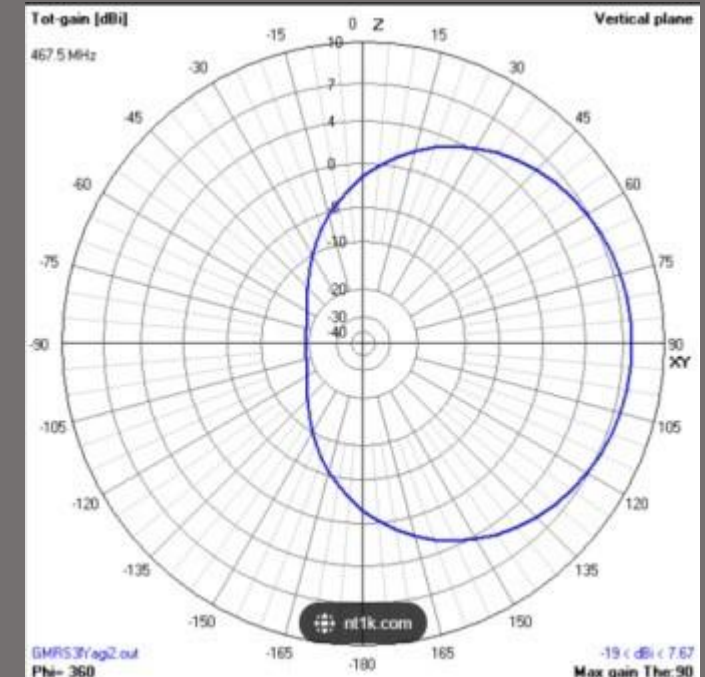
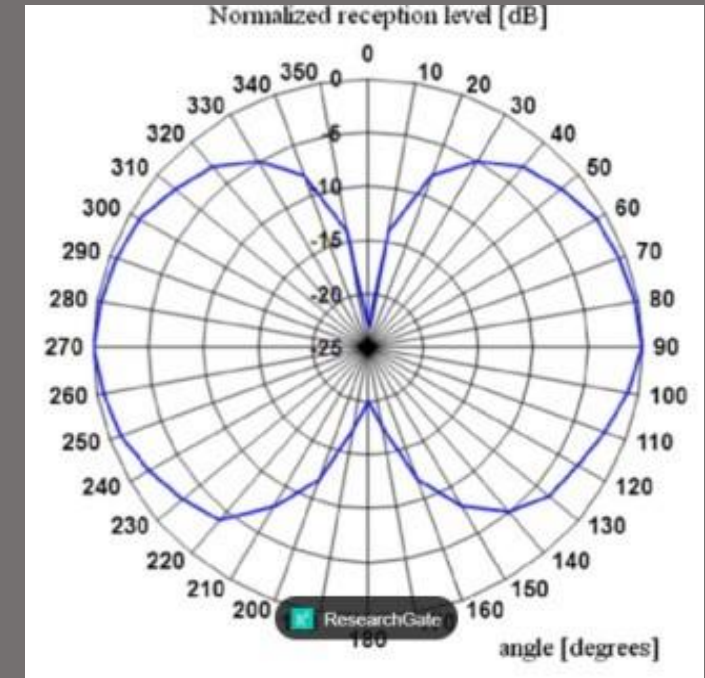
Peak versus Null Hunting

Null Hunting -- look for weakest signal

- Tends to be much more precise: ~1-2 degrees
- Typically has a “false null” at 180 degrees
- Reflections/strong signal can prevent deep nulls
- Can have “fly over” problem
- Typical choice: loop antenna or TDOA antenna

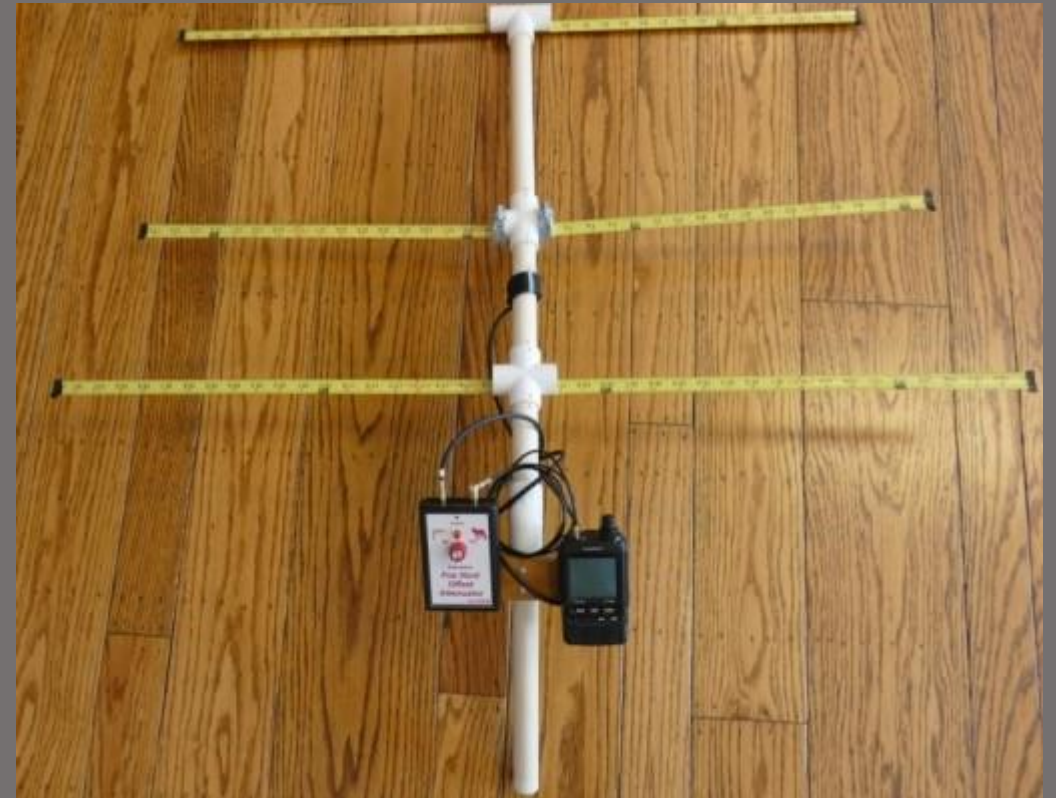
Doppler

- 4+ antennas and expensive equipment required



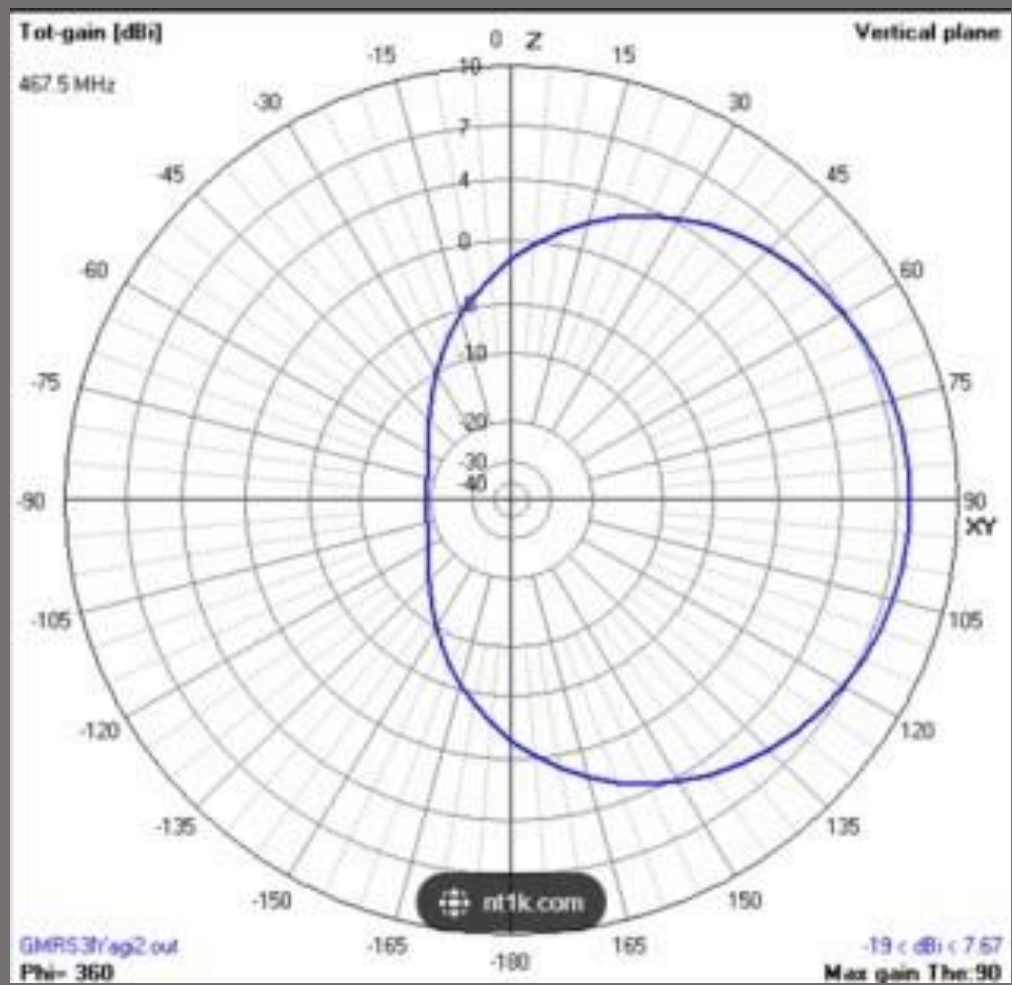
“Peak” Reading Antennas

- Yagi “Tape Measure Yagi” very popular
- Large Loop
- Pringles® antenna
- Elaborate antennas

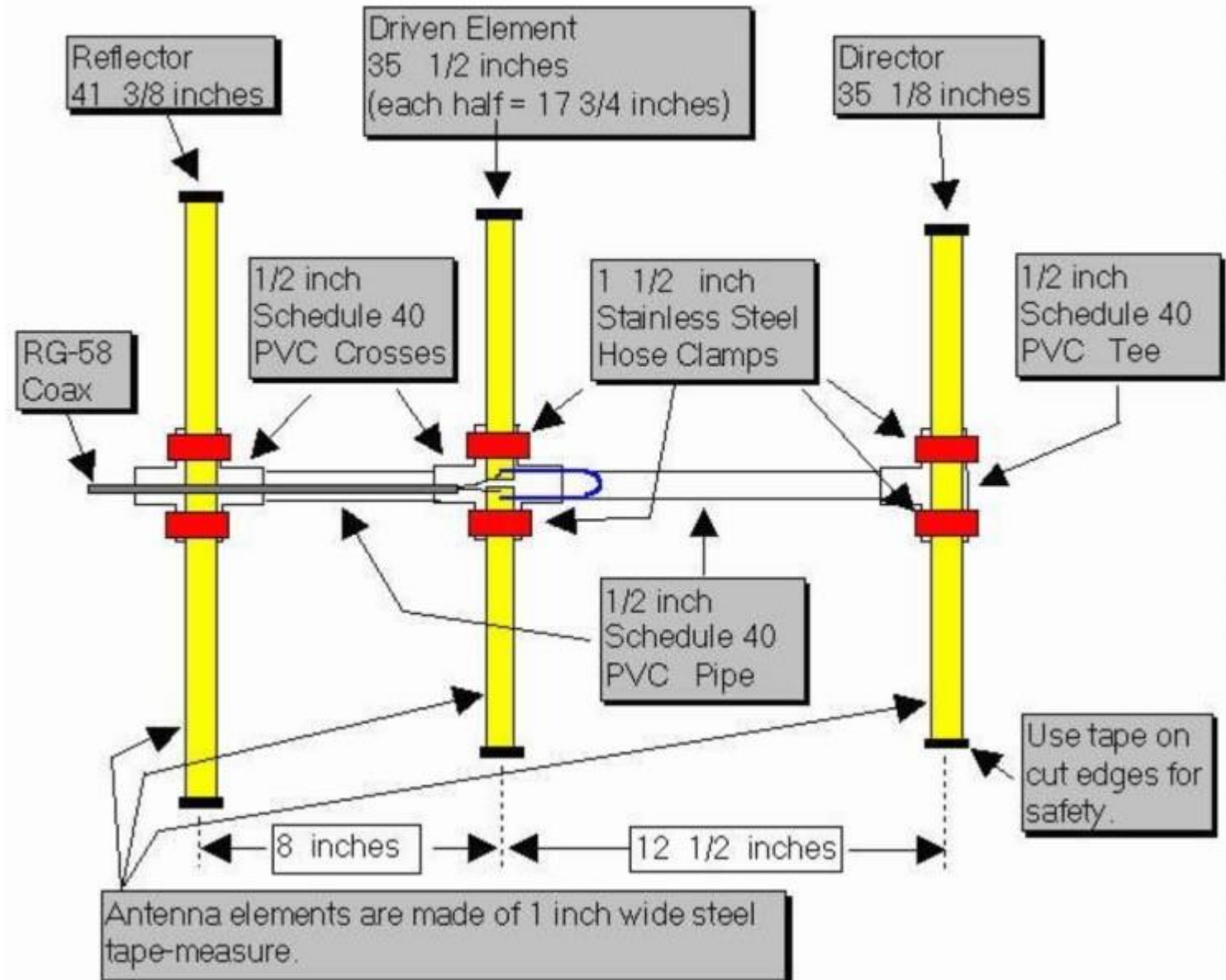


Yagi Antenna Pro/Cons

- Single directivity, no false directions
- Not very sharp directivity. ± 20 degrees hard to resolve • Angle error not important once close to FOX
- “Tape Measure Yagi” easy to build

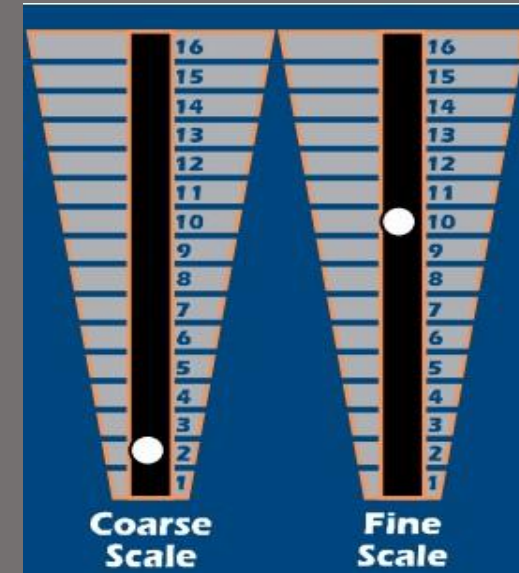


Tape Measure Yagi



Elaborate Peak Reading Antennas

- Vecta₂ a peak reading TDOA antenna
- ~\$2,000
- 121.5 MHz

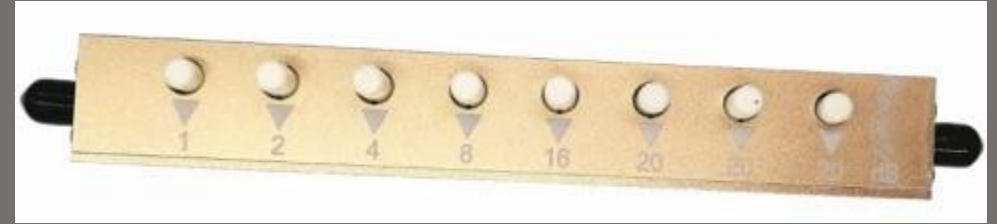


Fox Hunting Antennas can get Serious



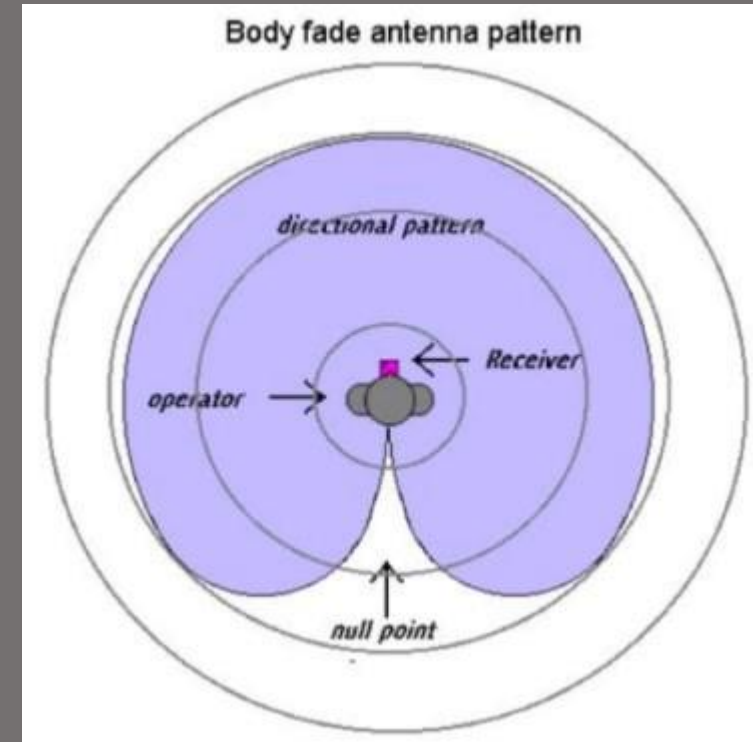
Attenuation – Signal too Strong

- Use radio attenuators



Remove antenna or install a less efficient one

- Body blocking
- Tune to harmonics (2X, 3X, etc.)
- “Pringles®” container
- Attenuators (screw-in, switch sets)
- Offset attenuator (typ. +/- 4, 8, 12 ... MHz)

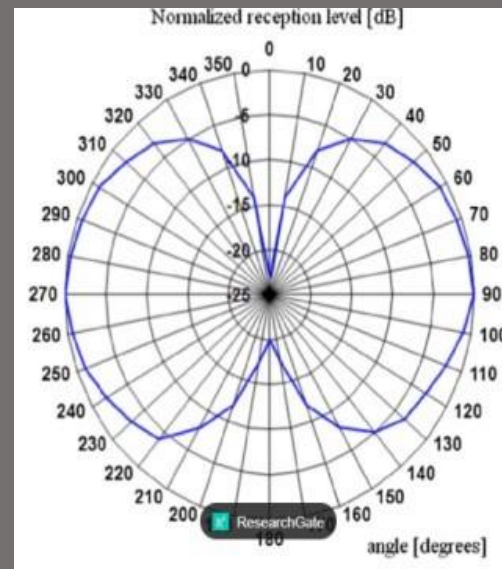
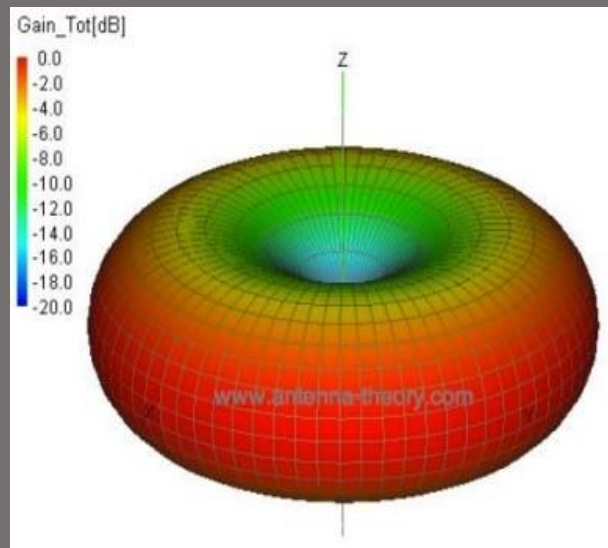


“Null” Antennas



Straight Antenna Pro/Con

- Point antenna at FOX. Looking for null in signal
- Very precise null – within about 1 degree
- However, can have “false nulls” at 90, 180 and 270 from FOX
- More difficult to use once close to FOX, e.g., reflections



Source: antenna-theory.com

Loop Antenna

- Fairly inexpensive.
- Very precise null – within a few degrees
- However, has a “false null” at 180 degrees from FOX
- More difficult to use once close to FOX, e.g., reflections



TDOA – Time Difference of Arrival

- Lots of choices available
- Some available as kits
- Many are “DIY projects”
- Very precise null – within a few degrees
- However, has a “false null” at 180 degrees from FOX
- More difficult to use once close to FOX, e.g., reflections



Specialized Hunting Equipment

VK3YNG “Sniffer”

- A semi-automated search tool
- Uses a peak antenna, e.g., Yagi
- Has its own receiver: 120-123 or 143-150 MHz
- Audio tone frequency increases as signal strength increases
- Automatically adds attenuation – up to 135 dB
- Cost of a few hundred dollars



Doppler System

- Usually, 4 or more antennas
- Processor needed to compute target direction
- These are based upon phase difference of signals, not frequency shifting due to relative velocity (i.e., Doppler shift)
- Others are “Doppler” by electrically “rotating” the antennas
- Only suitable for car-based hunts.



Equipment Comparison

	Search		Needed Equipment			180 degree	"Flyover"	
Equipment	Method	Precision	Radio	S-Meter?	Atten.	Error	Error	Freq.
HT antenna	Null	1–2°	Yes	Optional	No	Yes	Yes	Any
Yagi	Peak	10–20°	Yes	Yes	Yes	No	No	2m/70cm
Loop antenna	Null	2–5°	Yes	Optional	Optional	Yes	Yes	2m/70cm
VK3YNG Sniffer	Peak	10–20°	Built-in	No	Built-in	No	No	120/144
TDOA	Null	2–5°	Yes	Optional	No	Yes	Yes	100-500

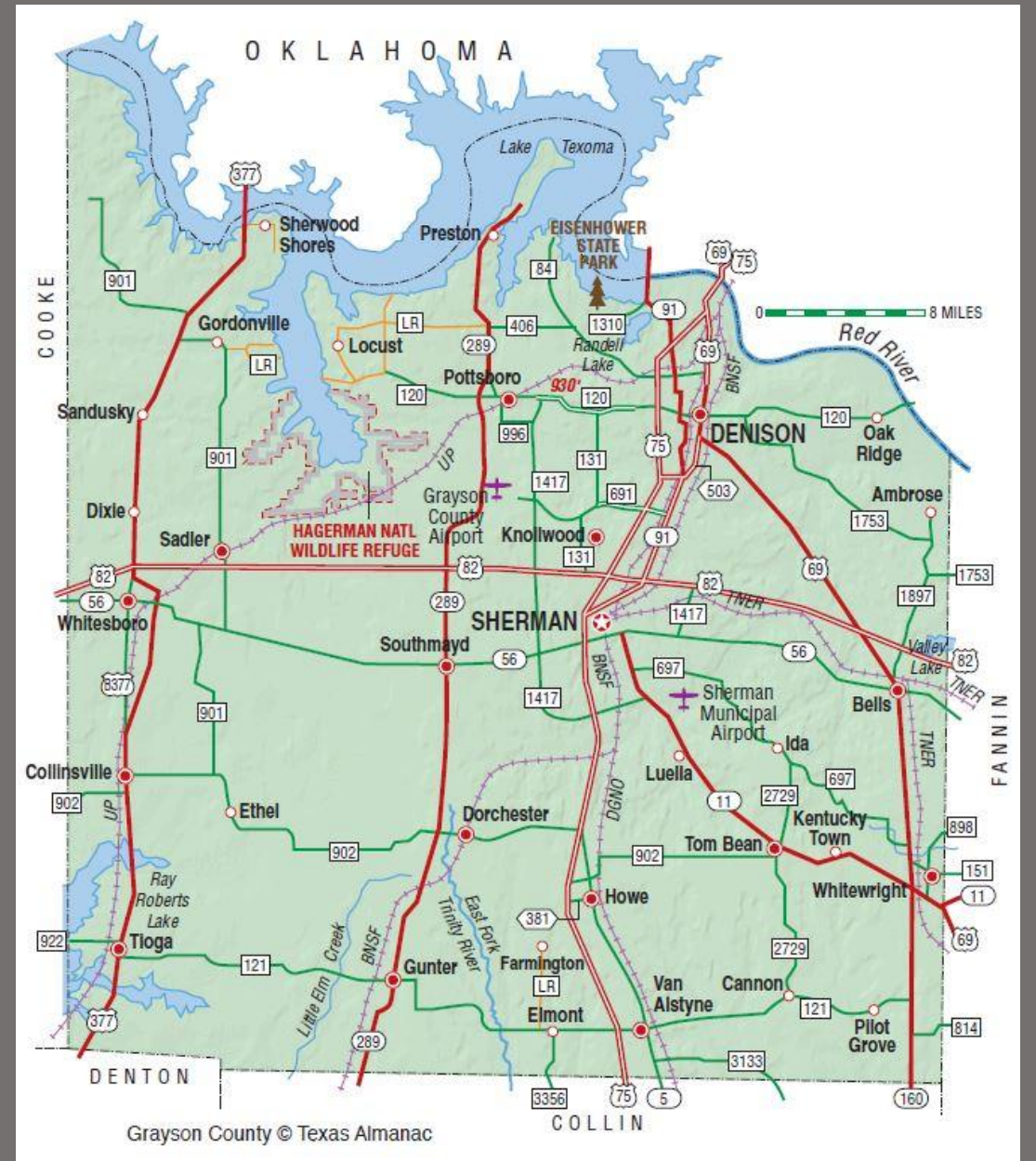
There is no “perfect” solution

- Combinations (e.g., HT antenna and Yagi) can be very effective

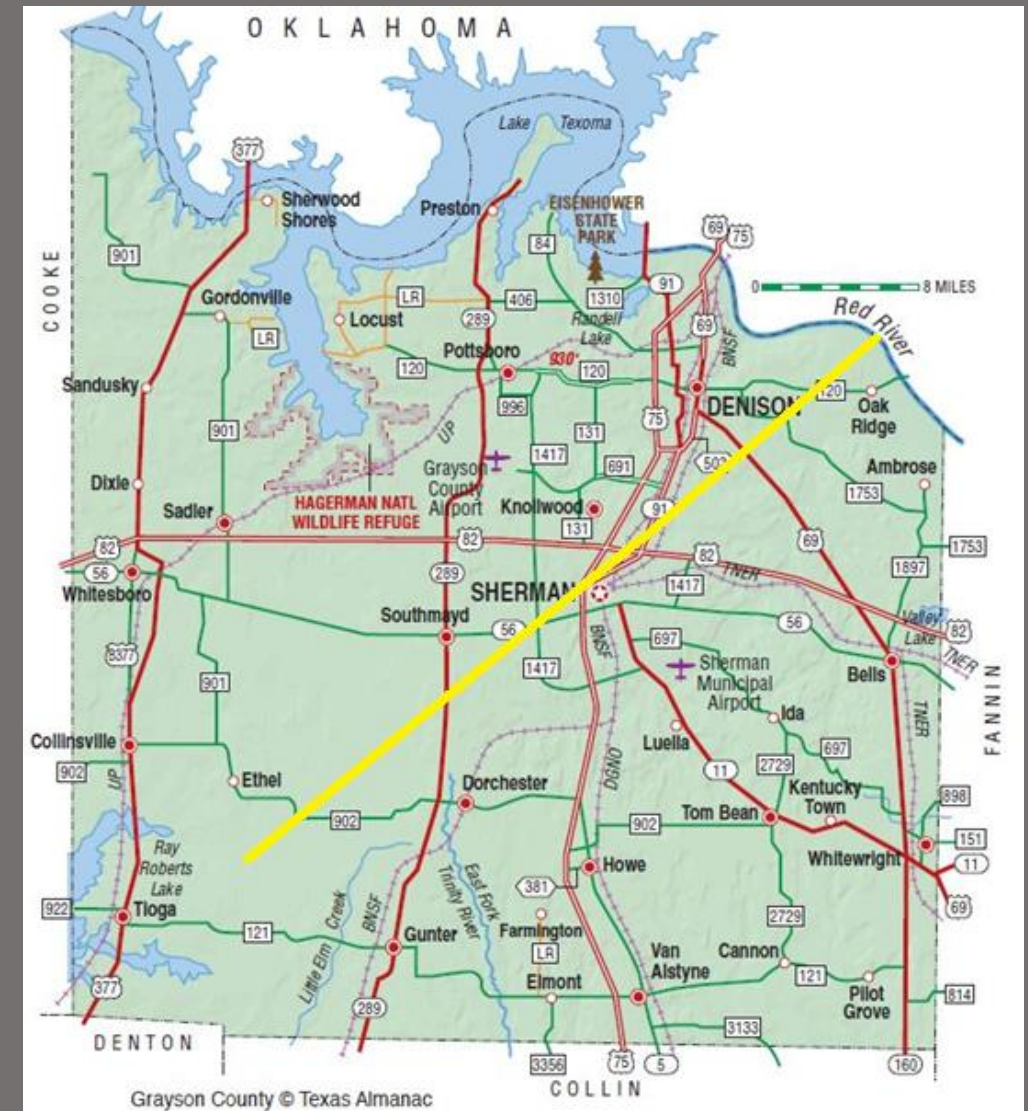
Hunting a Fox

- Search Methods
- Straight search
- Triangulation
- Team triangulation
- Common issues
- Signal strength overload • Add attenuation
- Imprecise angles
- Reflections -> wrong direction
- False nulls
- “Moving” Fox

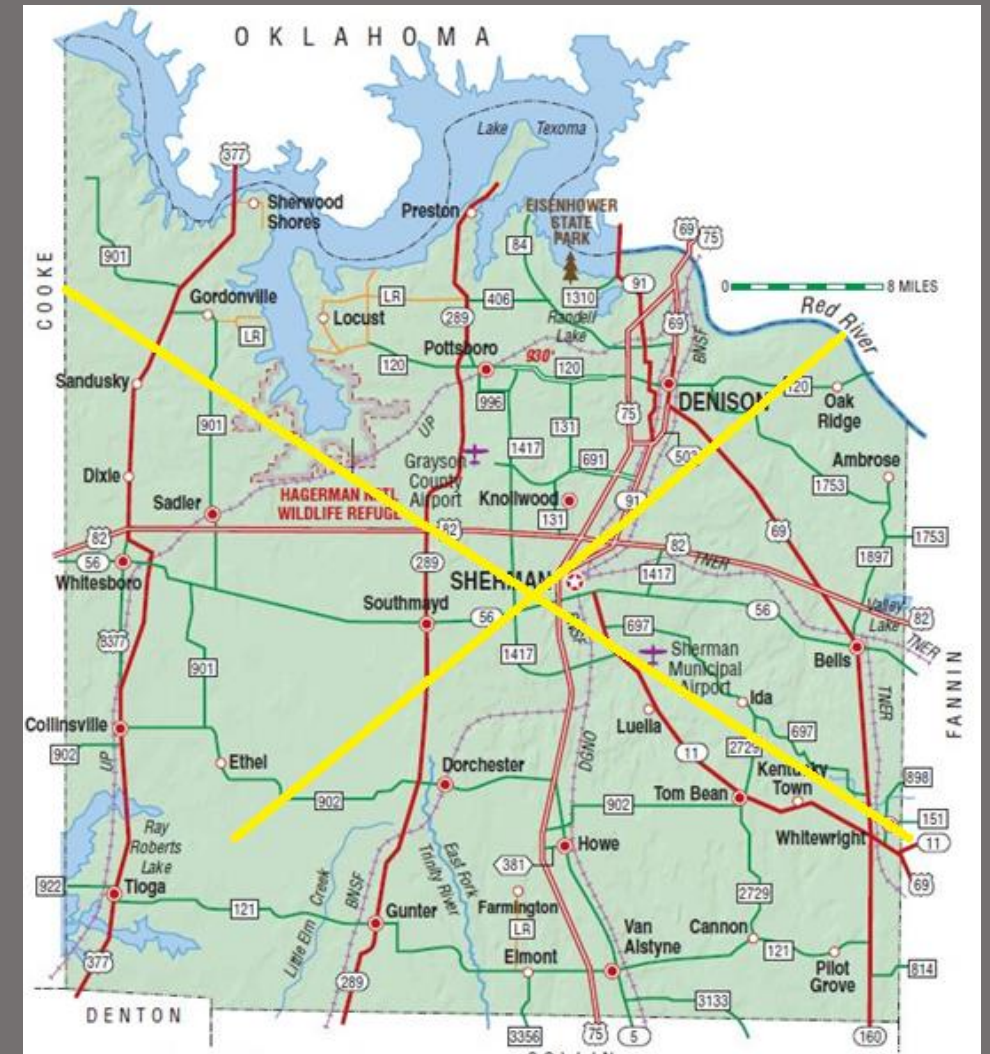




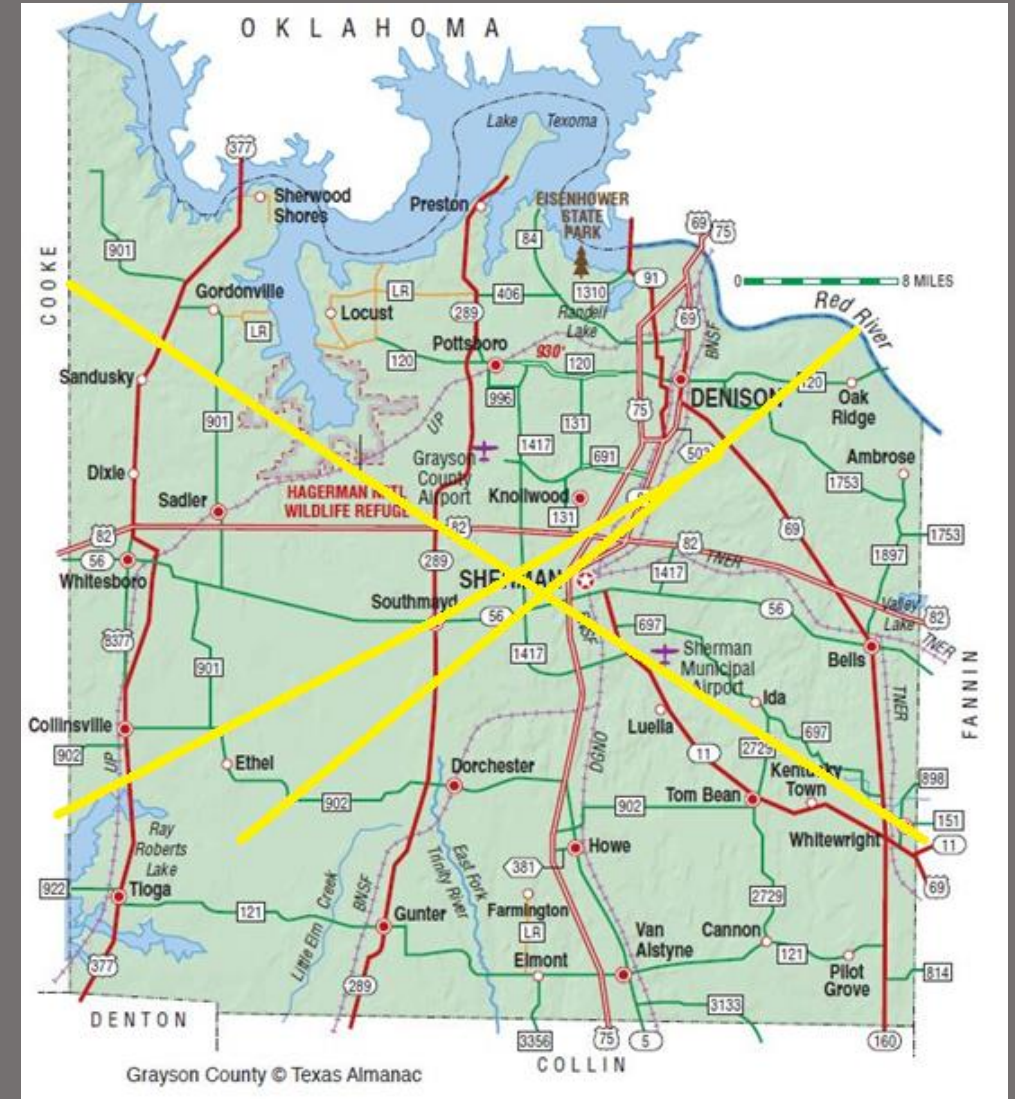
Take a compass bearing from here and it is 50/230 degrees



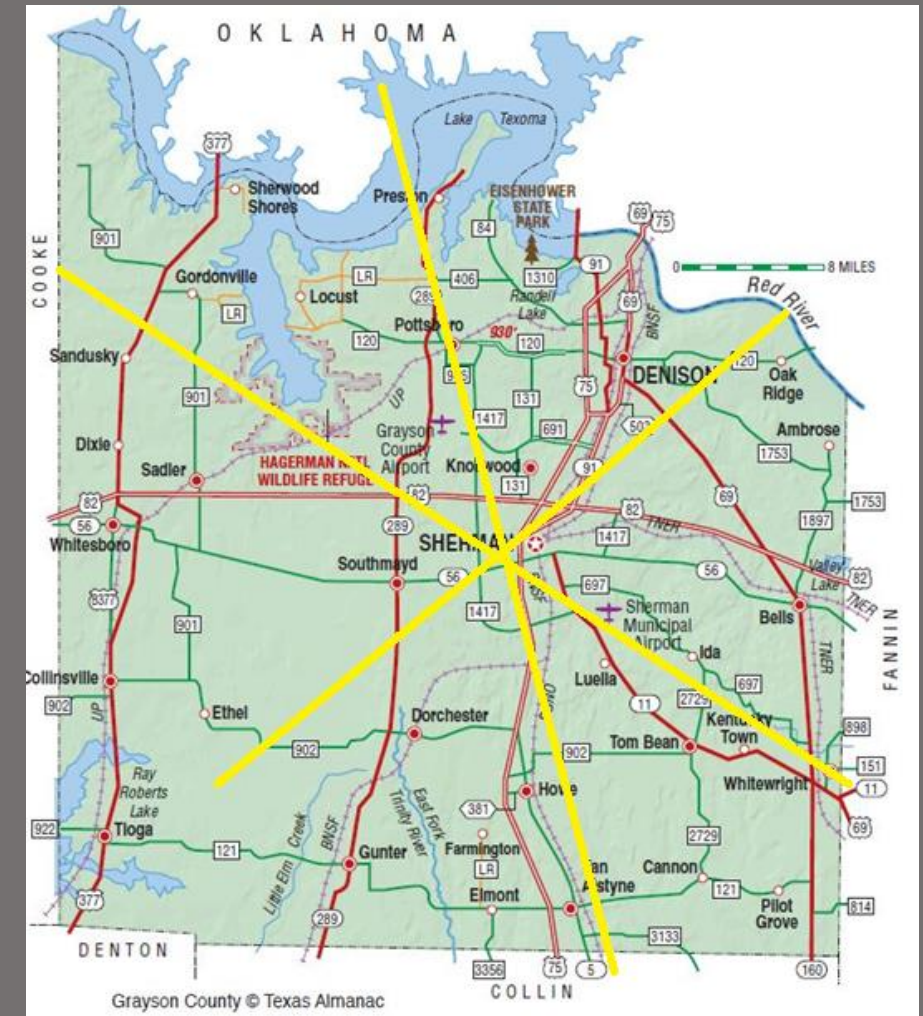
Take HWY 82 to 289 and shoot another bearing, 120/300 degrees



This time you drive south on Preston and shoot your bearing from Southmayd.



Angles are too close, so maybe a bearing for Howe, or Potttsboro....



- **Do rough scan with Yagi antenna –Determine rough direction for the Fox**
- **Do precise scan with “Null” antenna • Get very precise angle to the Fox. Plot lines on map.**
- **Move to new location**
- **Repeat rough/fine scans (maybe 3-4 times) • Determine very precise location of Fox on map**
- **Approach Fox, use Yagi w/attenuator to do final hunt down**
- **Signal will noticeably increase as one approaches Fox**

When Can We All Try This?

- GCARC will hold an informal Fox Hunt
- October 29, 2022, after the Hungry Hams Breakfast & Swap Meet
- The Hunt will start at 9 AM, finish by Noon
- No previous experience necessary
- No special equipment is necessary
- No Ham license is required for the hunt – family can join in • Come have fun!
- Sign up so we have a count, sheet on desk at back of room and we will take signups the morning of the event.

Additional Information

There are Entire Books and YouTube channels dedicated on this topic

References

- www.homingin.com -- Excellent overall source
- [FoxHunting101-ARDF-KI4ASK-April-2019.pdf](#)
- [ARDF_Presentation_11-5-2020.pdf](#)
- [Byonics.com](#) – Source of micro-foxes
- [kc9on.com](#) (3rd Planet Solar) – Source for offset attenuators
- <http://www.dhawke.com/kq1lweb/documents/rdf.pdf> -- many misc. DIY RDF projects
- Arrow Antennas – manufacturer of “fox” hunting antennas and gear
- CQ Amateur Radio magazine – regularly has fox hunting articles and ARDF info

