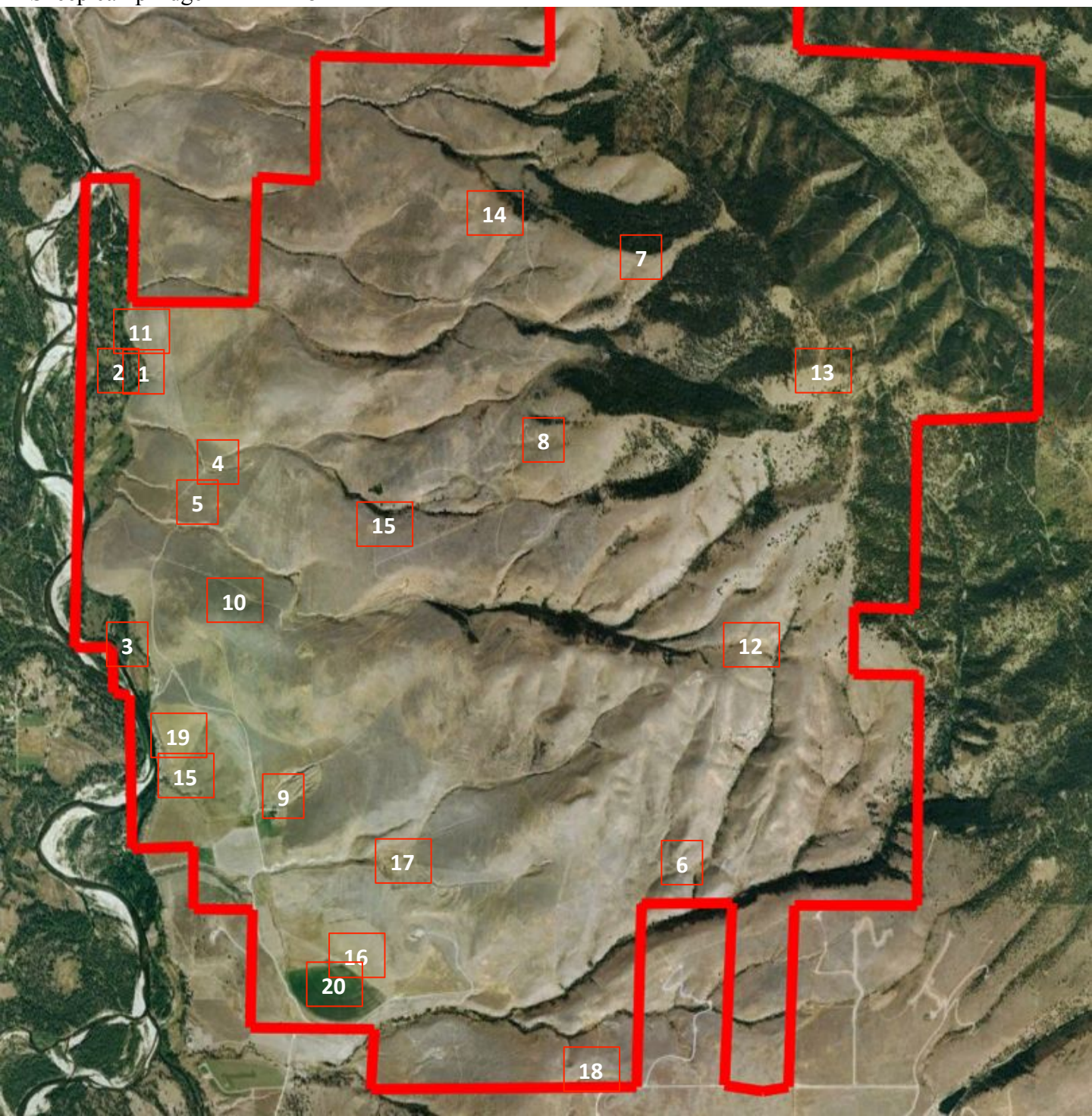
Soil Water Availability on MPG Ranch

Plant responses to precipitation vary with soil properties across the landscape. Soil structure and texture cause variation in site capacity for water uptake and retention over time. This variation alters spatial and temporal availability of water to plants and thus favors different water use strategies. Community composition follows this variation, making soil water availability an important analytical tool in understanding plant community structure.

We placed soil water potential sensors at 20 locations that capture most of the variation in soil properties and topography on the ranch (map on p.2). Weather station and vegetation survey sites were selected to facilitate integration of above and belowground data and to elucidate relationships between phenology and soil moisture, respectively.

Soil Moisture Sensor Locations

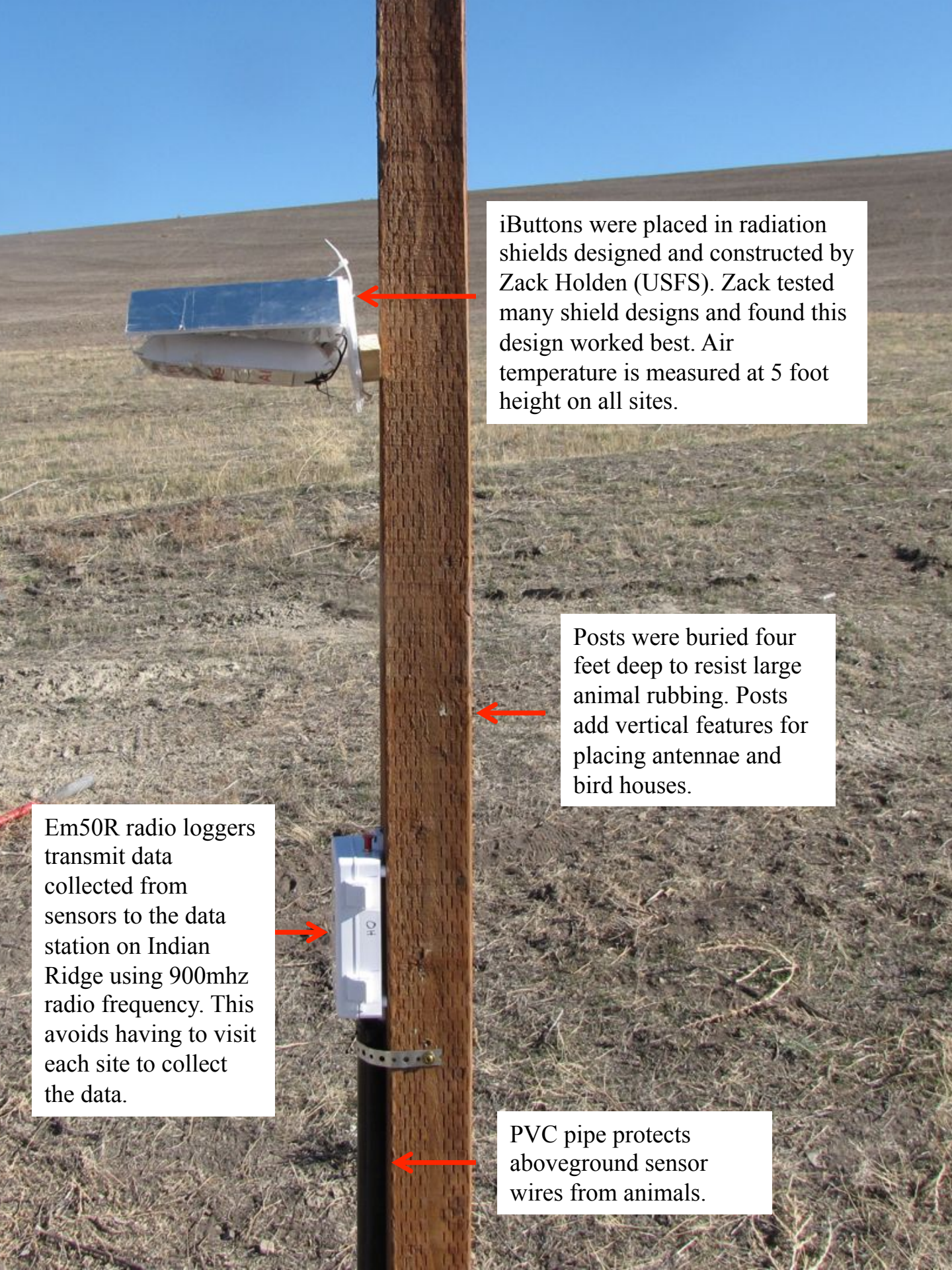
Phenology points		Weather stations		Live cams		Food Plots	
North floodplain swale	1	Orchard house	9	North center pivot	15	North food plot	19
North floodplain dry	2	Indian ridge	10	South center pivot	16	South food plot	20
Wildlife observation deck	3	Sainfoin bench	11	Partridge alley	17		
Lower sheep camp	4	South baldy ridge	12	Snipers roost	18		
Crested	5	Baldy summit	13				
Whaley draw near bees	6	Baldy draw	14				
North ridge	7						
Sheep camp ridge	8						



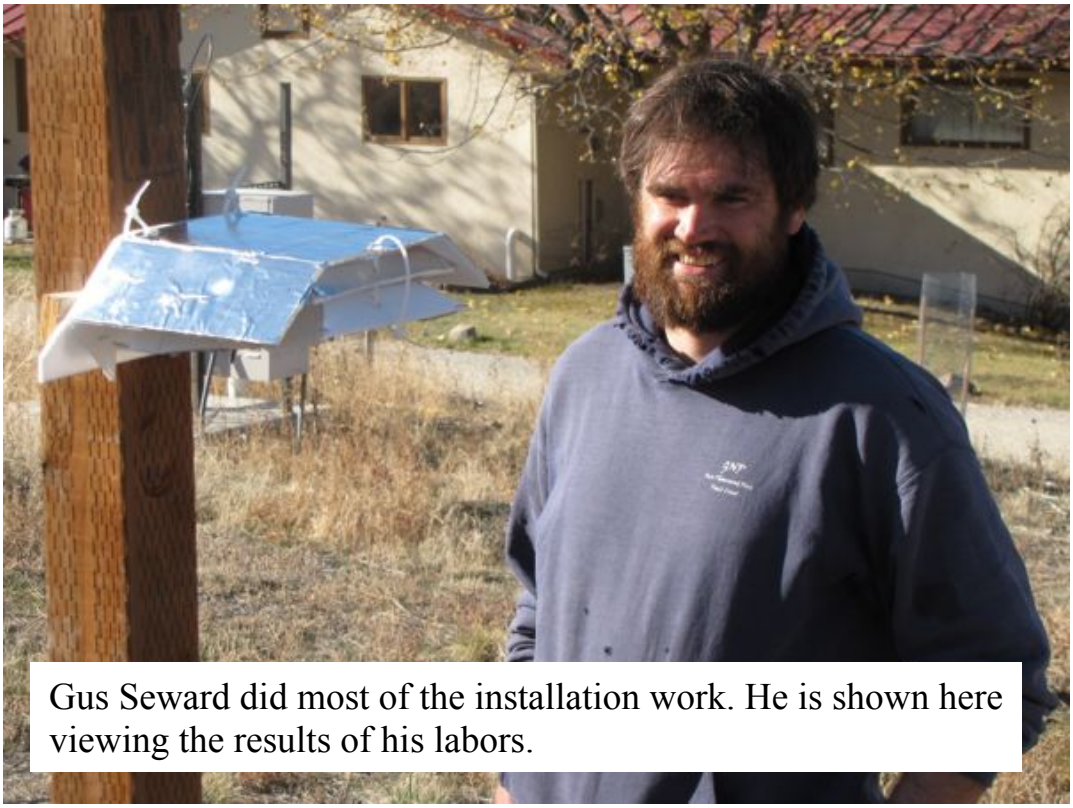
We deployed MPS-2 dielectric water potential sensors (Decagon Devices) at each site. MPS-2 sensors contain ceramic disks that equilibrate with soil water. MPS-2 sensors collect and transmit soil water potential and temperature data in real time. MPS-2 sensors should not require maintenance.

iButton temperature dataloggers measure air temperature every 4 hours at each station.

A crew augered three holes at each location. Sensors were placed at 6 inch and 3 foot depths in two of the holes. The third hole supports a post to mount instrumentation. Sensor wires were buried 6 inches below the soil surface to avoid damage from large animals.


iButtons were placed in radiation shields designed and constructed by Zack Holden (USFS). Zack tested many shield designs and found this design worked best. Air temperature is measured at 5 foot height on all sites.
Posts were buried four feet deep to resist large animal rubbing. Posts add vertical features for placing antennae and bird houses.
Em50R radio loggers transmit data collected from sensors to the data station on Indian Ridge using 900mhz radio frequency. This avoids having to visit each site to collect the data.
PVC pipe protects aboveground sensor wires from animals.

Soil samples were collected from four depths in each hole. Each sample will be analyzed for properties that influence soil hydrology. Information obtained from soils analysis will be integrated with climate and soils data to extrapolate soil water potential data to other areas.



Gus Seward did most of the installation work. He is shown here viewing the results of his labors.

Climate in the Boondocks

Climate information helps delineate plant and animal habitat preferences. Unlike ranch areas west of Mt. Baldy, only coarse climate information is available for the boondocks. We deployed air temperature sensors at locations depicted by red dots on the map below. Sensors and radiation shields were mounted on the north side of trees.

We will use the temperature data to evaluate knapweed root weevil habitat suitability. Is the growing season too short? Or is establishment dispersal-limited? The field crew released weevils across the boondocks in 2012 and 2013. In 2014, weevil establishment and knapweed vigor will be evaluated at each release site. If weevil establishment depends on climate conditions, temperature information will be used to determine future weevil release sites.