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PROPOSAL FOR A PORTABLE AUTOMATED REMOTE WEATHER STATION AT THE TAYLOR RANCH RESEARCH FACILITY

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FOR

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Proposal

To purchase a portable weather station that employs computerized monitor devices to gather data on several climatic elements. It is extremely important that the University of Idaho's Taylor Ranch Research Facility have a transportable, self-contained device to obtain this data.

Justification

A portable, totally automated, weather station at Taylor Ranch would greatly enhance the potential for environmental data aquisition. This would serve a most valuable support function for wildlife, archeological, and recreation research.

Situated in the heart of the Salmon River Mountains in central Idaho the climate typifies that of a montane environment. Differences in elevation, aspect, and slope are abrupt in this region causing a multitude of microclimates. This factor creates the need for researchers to monitor micro-climatological elements at specific geographic locations. The instrumentation most suited to these purposes should have the following characteristics:

1) Be compact enough to be attached to pack saddles for horse transport.
2) Be made of solid-state components which can tolerate the jarring movements of a horse.
3) Be fully automated so the researcher can collect precise data without having to constantly monitor the weather recording devices.
4) Be sturdy enough to endure adverse weather conditions for prolonged periods of time.
5) Be easy to operate so the programmer does not need special training.

Applications

Every research project dealing with some aspect of the physical environment could benefit from a climatic element data base, however, some fields of study are more inherently suited to this type of information. The portable weather station is essential for detailed micro-climatological research. Information must be taken from nearby locations in order to construct local precipitation profiles and maps displaying temperature isolines and microclimatic anomolies.

The wildlife researcher can benefit greatly from the availability of habitat level climatic data. In order to assess how various weather conditions affect animal behavior and location, the researcher needs to conduct studies of favored conditions. As pointed out by Skovlin (1982), and Robinson and Bolen (1984), thermal cover and the capability of animals to thermal regulate, are critical elements of wildlife habitat. Looking at elk as an example, it is evident what role meteorological influences play in elk use of terrain and vegetation habitat features. Choosing appropriate thermal protection is the only way elk can adapt to a wide variety of temperatures and weather conditions encountered on the seasonal ranges. In Skovlin's (1982) discussion on meteorological factors pertaining to habitat requirements he lists those weather features which stimulate a behavioral response from elk. He identifies precipitation (snow depth and condition), temperature (solar radiation and convection), wind (velocity and direction), humidity and barometric pressure as influencial parameters. The fact that these conditions are often interrelated necessitates monitoring them simultaneously.

For vegetation classification it is imperative that the plant ecologist determine what climatic parameters are involved in plant community occurence. Oliver (1973) describes groupings of plants as an expression of a climatic region. The monitoring of solar radiation and moisture

availability are critical for understanding plant distributions. There is a close interrelation between these two factors and many other environmental variables. Not only does the plant ecologist have to know atmospheric conditions, but he has to understand soil, moisture, and temperature characteristics as well as the highly variable interface between soil and air. To handle such complexities it is essential that the plant researcher has access to a mobile, fully instrumented apparatus.

The research fields of archeology and recreation have an application for climatic data as it pertains to human activity. Obviously, the archeologist is concerned with chronology of climatic change over time and can consult the geologic timetable for information from the distant past to recent history. However, to complete the chronology it is essential to understand the current weather conditions. There is little doubt that weather is a primary factor in shaping modern man's recreational habits. Reifsnyder (1980) points out that knowledge of weather is a critically important part of the outdoorsman's skill. Backpacker's will often utilize microclimates in selecting a place to pitch a tent or stop for a meal. Both the archeologist and recreation researcher are concerned with how man responds to his physical environment, and weather is the principle environmental agent affecting man's activity patterns in the outdoors.

Components

It is essential that this remote data aquisition system have a microprocessing unit. Weathertronics Inc., of Sacremento, California offers the latest technology in microprocessors. Their model 11500 analog data processor is equipped with solid-state memories and analog electronics. These features make it one of the most reliable and easy to use units on the market. No prior programming expertise is required to program the 11500. The front panel is comprised of a 16-key pad for entry of instructions and initial

set-up. The front panel also has a 6-digit liquid crystal display. The processor comes equipped with 10 channels, nine function as sensor input and one is for monitoring battery voltage. Once each minute the processor scans the data channels, then the processed data is recorded at specified intervals which may range from 2 minutes to 1 day. For our purpose, the best means of data storage is the play-back cassette tape which can operate on AC or DC power. One side of a 60 minute tape holds 6,000 data points. The following is a list of desired sensors.

1) Micro Response Anemometer, to measure wind.
2) Net Radiometer, to measure solor radiation.
3) Precision Linear Themistors, to measure air and soil temperature.
4) Humidity Probe, to measure relative humidity.
5) Dew Point Sensor, to measure the dew point.
6) Tipping Bucket Rain Gage,to measure precipitation.
7) Recording Evaporation Gage, to record net evaporation.
8) Analog Output Barometer, to record barometric pressure.

In addition to the microprocessor and its sensor components, it is necessary to have a digital translator/printer to convert sonic responses from a cassette tape into a paper tape read-out. Since horses will be the primary mode of transport a telescopic apparatus is desirable for mounting the recording instruments. Light weight metal materials with good tensile strength are essential for this structure. Such a device could be constructed at the ranch or the University Physical Plant.

Benefits

The benefits of a portable weather station to Taylor Ranch, and the University of Idaho, far exceed the cost. As discussed, meteorological data is the foundation of baseline information. Virtually every research project based at Taylor Ranch could benefit from this devise. Field courses could give students the opportunity to analyze detailed

climatological processes with the latest state-of-the-art technology. The weather station would also enhance the University of Idaho's regional services by giving federal and state resource agencies access to this information.

At the present time maximum, minimum temperatures, and precipitation are recorded daily at Taylor Ranch. This information is radioed in to a dispatcher who relays the information to the US Weather Service. The proposed automated station is not intended to replace this facility, but to compliment it by making it a control. By comparing data from the permanent station with the mobile station it is possible to assimilate microclimatic boundaries. The proposed unit is complimentary with the Wilderness Research Centers goal of making Taylor Ranch a self contained headquarters for interdisciplinary studies.

Costs

Based on 1982-83 Weathertronics Catalog.

Item:	Price:
Remote Data Aquisition System	3150.00
Digital Printer	1682.00
Cassette Tape Recorders (2)	390.00
Micro Response Anemometer	330.00
Net Radiometer	510.00
Thermister Probes	176.00
Humidity Probe	560.00
Tipping Bucket Rain Gage	420.00
Dew Point Sensor	415.00
Recording Evaporation Gage	910.00
Analog Output Barometer	695.00
Battery Charger	57.00
Battery Packs (2)	162.00
Tower Material (including cable)	*300.00
	$9,757.00

* Estimate not from catalog.

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