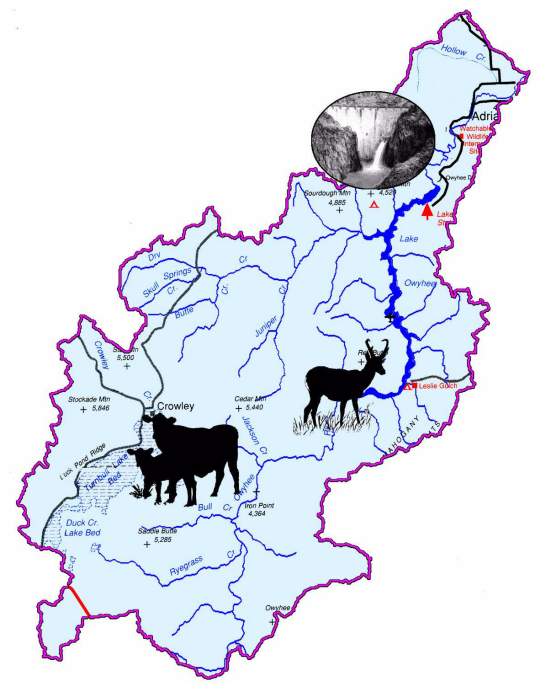

Lower Owyhee Watershed Assessment

Appendix J. Data Gaps and Unknowns

Appendix J. Data gaps and unknowns

Many of the currently identified unknowns, or data gaps, have been enumerated in the other sections of this assessment. Some of them are reiterated or summarized below.

A. Hydrology

There is data missing for the lower Owyhee subbasin which is available for most of the United States. There are no soil studies except for the irrigated lowlands, no mapping of groundwater aquifers, and no data for water infiltration rates, key variables for hydrology.

The mapping of vegetative coverage is basic: it is mixed sagebrush shrubland and grass.

There has been no ground verification of which streams are ephemeral, intermittent or perennial. The three types can not be looked at in the same fashion when considering if any remediation is feasible.

What were the natural patterns of flows in the lower Owyhee River before construction of the dam?

The specific figures for the percentages that evapotranspiration, runoff, groundwater recharge, and change in soil water contribute to the fate of precipitation in the lower Owyhee subbasin are not available.

There is no data for the lower Owyhee subbasin on how much runoff will occur with rain events of different intensities and on the different soil types.

Although figures for the percentage of precipitation intercepted by different types of canopy covers are available for other areas, interception data has not been developed for the local region.

The soils for most of Malheur county have not been mapped. Without knowing the types of soils in the lower Owyhee subbasin, it is difficult to estimate the maximum infiltration rate and the percentage of rain that could be infiltrated.

There has been no mapping of groundwater reserves or calculation of groundwater recharge for the lower Owyhee subbasin.

How do different land uses in the lower Owyhee subbasin affect spring flows, runoff, and aquifer recharge? The mapping of vegetative coverage is basic: it is mixed sagebrush shrubland and grass.

How does juniper expansion impact watershed function and water resources? How does it affect the water balance? Does it increase surface runoff and erosion? Are stream flow and spring flow affected? Does water extraction by juniper reduce aquifer recharge and stream flow?

What are the real flood risks in the lower Owyhee subbasin? How often will the Owyhee River upstream from the dam scour the banks of all vegetation including trees?

What are potential peak flows and low flows in the Owyhee River? What have they been over the last 1000 years? The typical condition for this ecoregion is that the maximum peak flow in each drainage is vastly greater than the average flows and average flows are much larger than the minimum flows.

What is the frequency of large rainfall or rainfall on snow events which would fill Owyhee Reservoir and then exceed the capacity of the Owyhee Dam glory hole?

Rainfall estimates only model rainfall between one point in the subbasin and stations surrounding it. These models are probably only somewhat accurate and give no idea of any local conditions that differ.

Are there locations within the lower Owyhee subbasin where precipitation exceeds or is much lower than that predicted by models?

B. Irrigated Agriculture

1. Future uncertainties

a. Water availability and competition for water

Water is the grower's second most important resource behind the land itself. Some years there is a serious irrigation water shortage due to nature's unpredictable ways. However, the growers in the lower Owyhee subbasin also face increasing pressure to restrict their water use so that it can be used for other purposes.

With the current power crises, there may be more and more pressure applied to use the water for power generation. Increased demands for water in the cities of the deserts of Nevada may place pressure upstream to divert water from the upper reaches

of the Owyhee to uses in Nevada. There may be pressure to release water for endangered species such as salmon.

A Bureau of Reclamation (BOR) study concluded that "based on the historical period of record (1939-1992), the Owyhee River basin above Owyhee Reservoir would yield no additional water for storage in over 50 percent of the years." Although the study was conducted to see if increased storage in Owyhee Reservoir would be a potential source of water for flow augmentation in the lower Snake River for salmon, the conclusion that extra "water would be available . . . only in good water years," means that any allocation for other purposes would remove water from that available to irrigated agriculture in the lower Owyhee subbasin and other areas benefiting from this irrigation water.

Growers have made and are making many changes to conserve water. These changes will help cushion the effect on irrigated agriculture from drought years. These changes can not generate a reliable source of water for allocation to other uses. Any allocation for other purposes would be detrimental to the health of irrigated agriculture in Malheur County.

b. Population growth

Reallocation of land in Malheur County to residential and industrial purposes will have a concomitant reallocation of water away from agriculture.

c. Regulations

Since the water which growers use contains more nutrients and has a higher temperature than is allowed by the Total Maximum Daily Load (TMDL) to return to the Snake River, once this water is used of farms it will continue to exceed TMDL parameters for the Snake River. To reduce or eliminate water run off from farm ground, vast capital investments in irrigation are being required by the Oregon Department of Environmental Quality and the Environmental Protection Agency.

d. World economy

US policy is global free trade without consideration of whether trade ferms are fair. Other trading partners often establish non-tariff barriers that greatly restrict the movement of US products to other countries. It is not known if the US will continue these practices that are unfair to US producers.

The US allows the importation of goods produced with low standards of environmental protection, of labor protection and benefits, of permitted pesticide use, etc. to compete freely with US goods conforming to all US regulations. It is not known if the US will continue these practices which place US producers at an unfair disadvantage.

C. Recreation

The real costs of recreational use of the lower Owyhee subbasin to local governmental bodies is unknown. What are the costs associated with recreational use by individuals from outside the county to the Malheur County sheriff's office? To the Nyssa Road District?

How will the increasing population of the Boise metropolitan area affect the level of use of the lower Owyhee subbasin?

Is there adequate monitoring of the wild and scenic river corridor to ensure that improper use of some areas will not result in those areas becoming off limits to rafters?

Are there adequate resources and administrative concern to ensure that weeds that are introduced and expanding in the area do not end up compromising the values of the area?

Are private float parties bringing all their refuse out of the canyon?

How will the continued encroachment of tamarisk along the lower Owyhee River interfere with the vegetation needed for the insect life which provides food for the fish in the cold water fishery below the dam. The disturbance in the food chain could affect the availability of fish for fly fishing.

How would the potential wild and scenic river designation of the lower Owyhee River for recreational purposes affect the ability to maintain access through the river corridor to the recreational activities at Owyhee Reservoir?

How would the potential wild and scenic river designation of the lower Owyhee River affect the ability to quickly gain access for maintenance or repairs on Owyhee Dam by enlarging the roadway to support heavy construction equipment and supplies?

Is better collection of trash and garbage needed along the lower Owyhee River below the dam.

Will the designated camping facilities at Leslie Gulch be adequate to accommodate increased recreational use?

How can operators of OHVs be made aware of which routes are acceptable for use of OHVs?

Do recreational uses of the lower Owyhee subbasin contribute to the spread of noxious weeds?

D. Wildlife

What are the forage preferences of different wildlife species? How do forage preferences for each specie differ by time of year. What forage is used by bighorn sheep, by deer, by pronghorn?

Do wild horses compete with bighorn sheep forage preferences?

Are wild horses competing with cattle for forage? What are the effects of wild horse populations being maintained within the BLM targets? What are the effects of wild horse populations exceeding BLM targets?

What specific ranching practices will improve rangeland forage production? How can cattle grazing improve forage for wildlife? When will grazing of grasses encourage the growth of forbs? How can cattle grazing be used to stimulate the growth of winter forage? Can cattle grazing be used to control invasive species that out-compete the forbs necessary in wildlife diets?

What types of shelter do different types of wildlife need? Bands of shrub vegetation, rocky areas?

Is competition for natural resources limiting the reproductive capabilities of rangeland species?

We know little about the ecology of free ranging horses. Is the BLM managing to keep horse stocking rates within the parameters they have set? How often should wild horses be gathered?

How many cougar are actually in the lower Owyhee subbasin?

At what level does the cougar population significantly affect wildlife populations? Ranching?

What levels of coyotes pose a problem? What types of control programs might be necessary?

Are enough of the range fences adapted for the passage of pronghorn?

Do fences interfere with the movement of bighorn sheep?

Ground studies are needed to verify the GAP program database.

What, if any, is the magnitude and nature of grazing's influence on Columbia spotted frogs?

What is the occurrence of nonnative animal species within the lower Owyhee subbasin?

How are wildlife populations being influenced by the expansion of weeds? Are restrictions on weed control placed on BLM past lawsuits having unintended negative effects on the native food supplies required by native wildlife?

E. Riparian / Wetlands and Channel Habitat Type

How will the expansion of tamarisk into many of the riparian areas of the lower Owyhee subbasin affect the hydrology of the area. How does the hydrology impact native riparian vegetation?

Where are the true riparian areas in the lower Owyhee subbasin? What are their characteristics?

What is the potential of riparian areas in the lower Owyhee subbasin based on physical, biological, and chemical conditions? The site specific physical, biological, and chemical condition of riparian areas has not been surveyed.

No study has identified the riparian areas on private lands.

The relative impact of different uses of riparian areas in the lower Owyhee subbasin is not known. What impact do river rafters have on riparian areas? There are limited camping areas along the Owyhee River corridor and these tend to be in riparian areas.

What are the actual impacts of livestock on riparian areas?

What are the affects on the riparian vegetation and functioning of increased traffic and fishing on the Owyhee River below the dam?

How can grazing systems be used to accomplish such goals as maintenance of woody streambank vegetation and the prevention of bank crumbling and soil compaction? What management will result in maintaining, restoring, improving, or expanding riparian areas in the lower Owyhee subbasin?

No channel habitat studies have been conducted in the lower Owyhee subbasin.

1. Channel Modification Assessment

Would the removal of the old railroad bridge between Owyhee corner and the Snake River decrease flooding upstream?

Did removing water access to the old Owyhee slough increase flooding upstream?

2. Sediment Sources Assessment

The sources of water entering the rivers in the lower Owyhee subbasin have not been delineated. In addition, the amount of sediment carried by runoff and streams varies based upon the source. This is a data gap.

Erosion on rangeland has not been scientifically studied in the lower Owyhee subbasin.

a. Questions that need to be answered about soil losses

How much vegetation is needed on the rangeland to avoid erosion related to thunderstorm events? Do different types of vegetation have different amounts of sediment losses?

What is the difference in sediment loss between rangeland on a flat plain and that on the slope of a hill? How does grazing affect sediment losses?

How is the amount of soil erosion changing with the invasive species? With juniper cover?

How much vegetation is needed along a stream bank for stabilization? What species of vegetation that are adapted to local environmental conditions would grow in these places?

What types soils in the Lower Owyhee subbasin are most susceptible to erosion?

To what extent are soil losses following wildfires and controlled rangeland burning problems?

There is no survey of locations within the lower Owyhee subbasin with erosion or any idea whether the erosion occurs naturally or is caused by anthropomorphic activities. Only the latter would be amenable to remediation. Naturally occurring erosion has been responsible for much of the beauty and incredible landscape of the lower Owyhee subbasin.

F. Fish and Fish Habitat Assessment

Most of the habitat data for fish species is from generalized data for the United States since specific information on adaptations within the lower Owyhee subbasin is not available.

What types of interactions are there between species of fish in the lower Owyhee subbasin? What is the distribution of each specie within the lower Owyhee subbasin?

What are the populations and fluctuations of populations of non-game fish in the subbasin?

How do the native non-game fish fit ecologically into the food webs in the lower Owyhee subbasin?

How do introduced fish compete for food and habitat with the native fish?

The nonnative European brown trout was originally introduced partially as a predator on nongame fish populations below the Owyhee Dam. What would be the effect of eliminating non-game fish in this area?

What effects are the hatchery trout stocked into ponds in the lower Owyhee subbasin having on the native redband trout populations? What effects are the nonnative trout stocked into the upper basin in Idaho and Nevada having on the population of native redband trout in the Owyhee basin including the lower Owyhee subbasin area? Is the genetic composition of native redband trout changing?

What are the effects of introduced warmwater game fish on native redband trout in the lower Owyhee subbasin?

What habitat restrictions on the abundance of redband trout are due to natural causes? What is the native thermal potential of streams? How does this affect the distribution of inland redband trout populations?

Have there been increases in riparian vegetation due to impoundment decreases of flows? Has there been removal of riparian vegetation which has allowed water temperatures to increase? Does the addition or elimination of riparian vegetation affect redband trout?

Are stream banks where riparian vegetation has been removed less stable and apt to flush more sediment into streams during high water events? Are stream banks where riparian vegetation has been added more stable and less apt to flush sediment into streams during high water events? How would more or less sediment in the streams affect the redband population?

Do mountain whitefish exist in the lower Owyhee subbasin? Just about everything is unknown about this species.

Are smallmouth bass and channel catfish in the Owyhee River upstream of the reservoir having an adverse impact on this population of native fish by predation or competition for food?

What effect does the reputation that the fishery below the dam is gaining outside the local area have on the local area? What are the potential impacts of increased use of this artificial recreational fishery? What are the peripheral social impacts of the fishery as the population in the Boise metropolitan area grows? What percentage of the anglers are from Idaho?

How do recreational fishermen affect the presence of different species of fish?

What impacts will very large (24 inches or 5 pound) brown trout have on the recruitment of rainbow trout?

What impacts are brown trout having on the native populations of amphibians?

What would the impacts be on other salmonid species if brown trout were flushed downstream by a major flood event? Could they pass downstream over the Hells Canyon complex of dams? Would the brown trout go upstream on the Boise and Payette Rivers?

What is the effect of Lahontan tui chubs in the Owyhee Reservoir? They may favor bass populations.

What would be the effect on fish species both in the Owyhee Reservoir and in the Owyhee River below the dam of future potential demands for salmon flush flows. How would it affect spawning and populations?

Why is there a high mortality of smallmouth bass in some years?

What are the interactions between different warm water fish? How does an increase in the catfish population affect the native warmwater fishes? What effect does it have on the other warmwater game fish? What fish do catfish compete with for food and habitat?

G. Water Quality Assessment

1. Mercury

No comprehensive survey has been done to locate possible sources of mercury in the lower Owyhee subbasin. There are large areas of the basin have not been sampled. There is virtually no information on mercury in the groundwater. Although geothermal wells and springs have been documented, there is a scarcity of data to indicate the possible influence of mercury in the hydrologic system of the basin. Similarly, the data is inadequate to characterize the effect of the hydrologic system on mercury.

Likewise, a comprehensive survey would be needed to identify geologic locations in the lower Owyhee subbasin that have mercury concentrations which might contribute to mercury in the river system if they were disturbed naturally or by human activities. There are localized geologic sources of mercury and elevated mercury concentrations have been observed in volcanic rock located near Lake Owyhee. Some of the richest mercury deposits in the US are located just south of the Owyhee watershed at McDermitt, NV.

Past studies have positively identified the Silver City area as a source of mercury. Follow up studies are needed to characterize mercury sources, concentrations and distribution in the Silver City area. Delineating the distribution and concentration of mercury is essential if action to remediate at these sites is to be taken. Site characterization would establish a baseline for comparison with future monitoring efforts, both in the Silver City area and in downstream areas.

We do not know how long it would take for the mercury from Silver City that is already in the river system of the basin to dissipate if the Silver City site were cleaned.

To better understand mercury in the Owyhee River ecosystem, there need to be studies of the mixing and transport hydrodynamics of Lake Owyhee, and stratification of the reservoir during autumn, winter, and mid-summer. Remobilization of mercury to water from lake bottom sediment has not been studied

2. Temperature

The physics involved in stream heating are not utilized in ODEQ's water temperature standards.

In the lower Owyhee subbasin, the relative contribution to stream heating from solar radiation, from the air and from the ground have not been described . The cooling effects of the existing shading of the streams from the canyon walls has not been estimated. The effect of evaporative cooling from the surface of the river on the water temperature has not been estimated. None of these parameters have been measured in the lower Owyhee subbasin. There is a lack of good stream temperature science to realistically consider the thermal potential of the Owyhee River and tributaries.

Thermal refugia (places to hide and hang out) have not been mapped in the lower Owyhee subbasin. Refugia might allow fish species to survive where the general temperature of the stream waters is above the specie's preferred habitat.

3. Baseline data

In the lower Owyhee subbasin below the dam there have been significant changes in agricultural practices, covered in the section on agriculture, which have led to less sediment and nutrients returning to the stream system from agricultural land. There is a need to analyze stream data and return flow data collected in the past to establish baseline conditions. Data was collected from 1978 to 1980 when the Malheur County Court recognized a possible problem with non-point source pollution and evaluated water quality. However, changes in agricultural techniques began before this with laser leveling and concrete ditches decades ago. Innovations continue being made today with the adoption of many advanced practices. Accurate current data needs to be generated to provide a snapshot of the results of changes which have already taken place. Current data needs to provide an accurate mid-point baseline for evaluating changes in the future.

4. Generalizing from other situations

It is inappropriate to generalize water quality criteria with sweeping prescriptions for all sites. The complexity of the natural world requires site-specific criteria based on

the nature of each site and the uses appropriate and economically feasible at that site. The continual variation of geology, soil, slope, plant and animal communities, and other environmental features impose fiscal, biological, and practical constraints on potential beneficial uses.

H. Rangeland

There is no good mapping of current vegetative coverage in the lower Owyhee subbasin.

1. Plant composition

a. Juniper

Much of what is unknown about western juniper expansion impacts on rangelands is basic science. How does juniper expansion impact watershed function and water resources? How does it affect the water balance? Does it increase surface runoff and erosion? Is stream flow and spring flow affected? Does water extraction by juniper reduce aquifer recharge and stream flow?

There has been no work on snowfall accumulation dynamics. How does the hydrology change if juniper is removed?

What are the nutrient dynamics of western juniper in rangelands? How is the expansion of juniper distributed across landscapes? What is the interrelationship between juniper and elk?

b. Invasive plants and noxious weeds

An integral part of any control program is first mapping where weeds exist in the lower Owyhee subbasin.

What are the effects of conversion to invasive annuals on watershed function and water resources?

What are the factors that make sagebrush ecosystems susceptible/resistant to invasion by nonnative species? What are the rates of expansion of invasive plant species, the types of activities that increase invasion rates, and the types of ecosystems where expansion is occurring most rapidly? Can changes in current management activities be used to decrease the rates of invasion?

What are the most appropriate scales and stages of invasion of noxious weeds to target control activities? What are the longer-term impacts of using herbicides to control invasive species? What are the long term impacts of failing to use herbicide to control invasive weeds, especially when they first appear?

c. Cheatgrass

The interaction effects between cheatgrass and crested wheatgrass are unknown. Cheatgrass doesn't seem to expand in areas of crested wheatgrass. Relatively low densities of cheatgrass affect the establishment of seedlings of crested wheatgrass.[67] Native grasses generally have poorer seedling vigor than the introduced grasses so what affect does cheatgrass have of native grass establishment?

A major problem in the management of cheatgrass infested rangelands is using livestock grazing management practices to improve the vigor and quantity of native perennial vegetation by reducing the competition of cheatgrass.

Is there an acceptable ratio of cheatgrass to native plants where the ecological processes still function?

What treatments can restore perennial vegetation in cheatgrass infested rangelands. How do the treatments change depending on the degree of cheatgrass dominance?

Experience indicates cheatgrass seed production is limited by early spring cattle grazing.[103]

Does the removal of livestock accelerate conversion of rangeland to cheatgrass because of increased fuel accumulations and more frequent wildfires?

What happens to plant communities with the removal of livestock for rangeland dominated by cheatgrass? From rangeland dominated by crested wheatgrass? From rangeland dominated by native grasses? From rangeland dominated by sagebrush? There are long term exclosure studies at Squaw Butte.[103]

Dominance by cheatgrass varies depending on the elevation. At higher elevations it is closely related to temperature. At lower elevations it is related to soil water.[87] Can we use these relationships to anticipate which areas are most subject to cheatgrass dominance?

Do wildfires favor cheatgrass? Could early grazing following wildfires be used to favor native vegetation?

d. Ecosystem factors

There are currently researchers studying some of the following questions. The problem is then to apply the knowledge to day to day operations and decisions.

How will climate change influence water resources in sagebrush ecosystems? How will climate change influence fire regimes and expansion of invasive species? Tony Svejcar at Burns ARS has been studying this for a long time.

What fire regimes are required to maintain the diverse sagebrush ecosystems? What are the effects of fire and prescribed fire on vegetation, soils, animals and hydrology of sagebrush ecosystems? Rick Miller has written a number of publications.

What are the factors, abiotic and biotic, that determine the capacity of the diverse sagebrush ecosystems to recover following disturbance or management treatments? How can we discover and define these factors? Tamzen Stringham has worked on this.

What are the habitat requirements, spatial structures of populations, and population biology of the endemic plant and animal species?

What are the cause and effect relationships between and uses and population responses of species at risk? Are threatened species actually favored by grazing? Will

the exclusion of grazing in ACECs place them at risk by the uncontrolled growth of other vegetation?

How will ACECs impact other species?

How does crested wheatgrass affect native perennial vegetation? Is there a density of crested wheatgrass that maintains perennial vegetation? One study showed three crested wheatgrass plants in ten square feet maintained perennial vegetation.[67]

2. Methodology

Effective management of sagebrush ecosystems requires basic resource information for developing effective management strategies. This information needs to be collected at appropriate scales. GIS and local measurements can be supplemented with remote sensing if there are ground-based observations to verify the validity of the conclusions.

• Methods are needed for assessing current ecological conditions and species status across the region. Information on the current ecological status (intact, at risk, threshold crossed) of sagebrush ecosystems and on the status of individual species is necessary for developing strategic plans and implementing management and restoration programs.[11]

• Methods are needed for monitoring the types and rates of change occurring in sagebrush ecosystems. Information on the changes in vegetation, soils, and animals, as well as in climate, fire regimes, and invasive species is needed for effective adaptive management.[11]

• Methods/tools are needed for predicting future effects of ecosystem stressors on sagebrush ecosystems. Predictive information is needed on the future effects of increases in human populations, climate change, fire and invasives that can be used to develop alternative futures and guide research and management programs.[11]

• Methods/tools are needed for prioritizing management activities and restoration treatments at site, watershed and landscape scales. Prioritization requires information not only on the ecological status of sagebrush ecosystems and individual species, but also on the habitat and range requirements for species of concern, and the abiotic and biotic conditions that cause threshold crossings for both plants and animals.[11]

• Methods/tools are needed for maintaining intact ecosystems and restoring ecosystems at risk or that have crossed thresholds. Although many studies have been conducted on managing and restoring sagebrush ecosystems, information/tools are still lacking in several areas including: 1) economic analysis tools to compare the current situation to the restored site and assess the benefits to local communities that participate in restoration activities; 2) seed supplies and establishment methods for native species; 3) methods for controlling invasive species while reestablishing sagebrush communities.[11]

• Education programs are needed that can be used to build consensus for implementing necessary changes in management.[11]

3. Research and Management Questions

There are numerous research and management questions that remain to be answered.

“What are the consequences of doing nothing? That's just as much of a management decision as doing something. What will the site look like in 20 years if we don't treat it?” Managers can greatly increase their success rate by asking the right questions: What is the goal? What is the problem? What plants or soils are on the site now? What course of treatment will be both affordable and effective? What follow-up will be needed?[96]

There is still little data on the results of prescribed burning on many important invasive species. The impact of prescribed burning on native vegetation has only been studied for a few perennial grasses and legume species. What is the seedbank longevity of target and non-target species. How do differences in timing, topography, fire extent or size, community structure, fuel loads and properties, or intensity affect native plants?

The effectiveness of establishing green strips for controlling fire in cheatgrass invested rangelands should be tested.

There have only been a few burning trials of forage kochia and there is a lack of published data on its fire suppressant qualities. The most efficient greenstrip width, best establishment practices, and potential combinations with other greenstrip species are unknown.[28]

There have been promising initial studies that show that squirreltail can invade both cheatgrass and medusahead stands.[39] Is it a more promising native plant to seed in cheatgrass infested areas?[39]

We don't really know what happens to plant communities with the removal of livestock. Will the removal of grazing place special status plants at risk by increasing competition?

There are no systematic allotment monitoring studies (trend, actual use, utilization and weather). These could be made and kept current with summaries posted in each allotment file for use by range staff.

There could be follow up studies on the same area that was well surveyed in 1979-80 in the Owyhee Breaks to see what obvious changes have occurred.