MALHEUR RIVER SUBBASIN
Malheur River Wildlife Mitigation Project
Project ID: 200002700
Sponsor: Burns Paiute Tribe
Province: Middle Snake

ISRP Comment #1: *The management plan, with methods, needs to be described in more detail in the proposal's objective, tasks, and methods section, particularly for weed control, native and introduced plantings and seeding, and grazing plans.*

We have included the section of concern and tracked all alterations and additions in red ink.

f. Proposal objectives, tasks and methods

Operation and Maintenance

A. Objective 1: Revive and improve critical habitat for fish and wildlife populations.

1. Tasks and Methods:

a. Restore and maintain vegetative communities.
- ✓ Use controlled disturbance (fire, haying, grazing, herbicide) to remove residual vegetation from meadow communities and stimulate understory production in sagebrush communities.

- Meadows will be hayed following the nesting season to allow for regrowth (see task c, "forage quality") and to stimulate habitat for nesting and species diversity in following seasons.

Cornely et al. (1983) found that the failure to remove residual vegetation on the wet meadows of the Malheur National Wildlife Refuge not only suppressed plant growth but altered plant species composition as well. They observed that decadent vegetation failed to stand erect over time and created a mat of debris that choked out forbs, grasses, and other plant species.

Cornely et al. (1983) were mainly interested in reproductive requirements of upland nesting birds, which prefer to nest in fields of tall, dense vegetation. Therefore, they did not feel that annual manipulation was desirable on any given site. After a period of non-use, however, it was observed that the height of vegetation was reduced until nesting cover no longer existed. Plots that were manipulated by fire, grazing, or haying were noted to show greater biomass production and maximum height of vegetation when compared to non-use plots. Huber et al. (1995) found that the presence of dense litter also slowed the initiation of plant growth in the spring.

- Topographic diversity will be reestablished in the meadows by creating pockets of upland and moist sites through the practice of plowing and reseeding. An introduced mix of grasses and clover

will be used on the moist areas and basin big sagebrush, bluebunch wheatgrass, blue camas, and basin wild rye will be planted on elevated islands. This will occur over a period of eight years. Over time, the introduced species will be phased out and native establishment throughout the meadows will be encouraged.

Historically, the meadows were comprised of a diversity of plant communities hosting various species of sedges, rushes, grasses, forbs, and shrubs. Biotic diversity was dependent on the timing and duration of soil saturation within and above the floodplain. Production was highest in areas that hosted grass species such as tufted hairgrass, which likely facilitated a relatively high fire return interval due to moisture availability and biomass accumulation.

Presently, the meadows are host to a broad array of introduced species as well as remnant natives. As a result, these acres are much more productive than they were during pre-settlement times. Species such as meadow foxtail have proven to be very adaptive to prevailing conditions and have quickly developed a stronghold in these ecosystems. Attempts to reseed areas dominated by this grass have proved largely unsuccessful and extremely expensive. Highly productive species such as this tend to need disturbance to avoid creating a dense mat of residual leaf and stem tissue that can readily choke out other vegetation.

Weed invasion (predominantly perennial pepperweed) is also of grave concern on the meadows and must be considered when creating a management plan for restoring these communities. Introduced species such as various bromes, orchardgrass, and meadow foxtail do tend to germinate earlier, establish quicker, and compete more successfully with noxious weeds than natives do.

It is important to note that as conditions now stand, native seeding would not be successful except in small areas where soils are elevated in island mosaics. Competition with weed and introduced seed in the soil bank would result in a tremendous waste of BPA money ($70-90/lb for natives vs. ~$1.50 for desirable introduced spp). A mix of brome, orchardgrass, and clover will achieve desirable habitat condition on moist sites when combined with native seeding efforts on the upland islands.

- Cattle will be used in the uplands to manipulate plant communities for the benefit of species such as mule deer, elk, and sage grouse. They will be closely monitored and managed to ensure that their presence does not compromise riparian areas and sensitive stands of bitterbrush and other key wildlife vegetation.
- An established rotational grazing plan that incorporates intrapasture use planning will ensure that wildlife will benefit from forage conditioning.

Sage grouse appear to require structural diversity in their habitat. The Tribe believes that cattle can be used effectively in facilitating this diversity by creating areas favorable to high forage value and lek activities through carefully managed grazing. Through reduced stocking rates and intensive management, pockets of undisturbed areas will be maintained that will facilitate nesting requirements.

b. Enhance plant structural diversity.
   - ✓ Alter the structure of habitats by introducing fire or rotational grazing to mimic natural disturbance in creating a variety of plant cover types for various wildlife species.

When managing for various habitat requirements, grazing can be used to achieve heterogeneity on a landscape scale. Because cattle alter plant structure on impacted sites, wildlife biodiversity can be highest at light-moderate grazing intensities due to the facilitation of different growth forms. As grazing levels increase above this, however, diversity tends to decline as short grasses gain a competitive advantage (Laycock 1994).

As discussed earlier, research that has succeeded in demonstrating the usefulness of grazing as a management tool does not grant a license to merely turn cattle out without stringent monitoring and precise objectives in mind. Grazing without a prescription can lead to deterioration even with reduced stocking rates. Even though the Department is reducing the herd size by half on the mitigation site, monitoring and flexibility in our management plan to account for varying environmental conditions or other unpredictable influences on plant vigor must be maintained.

c. Increase forage quality for wildlife.
   - ✓ Use early season grazing/haying to set back plant maturity and increase crude protein and digestibility of late fall native ruminant forage.

As grasses mature, biomass typically increases and quality diminishes.
In a Nebraska study, Worrel et al. (1986) found that crude protein declined from 8.5% in June to 6% in August and 5% in September. Cherney et al. (1986) reported that average differences in neutral detergent fiber (NDF) concentration in five common pasture grasses ranged from less than 40% to more than 65% between early May and late June harvest dates. During this time, acid detergent fiber (ADF) concentrations increased from 20% to greater than 38% across harvest dates.[1]

Researchers have long sought methods to enhance forage quality for livestock. In 1944, Stewart and Clark found that grazing hay meadows 20-35 days longer than usual increased total protein yield per acre 20% over hay grown after early pasturing. Hall

[1] NDF and ADF values represent the percentage of insoluble material found in plant cells. NDF is an indicator of digestibility and ADF indicates intake.

(1998) established forage stands that were cut at intervals of 70, 45, and 35 days. He found forage quality to be greatest when cut at a 35-day interval.

In an upland bluenbunch wheatgrass community complex Pitt (1986) found that plants clipped at boot, emergence, flowering, and seed formation produced significantly higher levels of crude protein and phosphorus and lower levels of ADF than plants of similar phonological stages in "non-disturbed" control treatments. Values of clipped plants exceeded 11% at emergence, flowering, and seed formation stages, which exceed deer and elk maintenance requirements.

B. Control/eradicate weed populations.

1. Tasks and Methods:

    a. Stimulate reestablishment of native species.
        - ✓ Use spring herbicide applications, fire, and/or hand pulling and cutting to control weeds. The focus of this task is to decrease the use of herbicides over time as sites become more weed resistant.

Before the Tribe acquired the mitigation site, a combination of high levels of cattle stocking rates, management strategy, and a disruption of natural disturbance made much of the land susceptible to downy brome (*Bromus tectorum* L.) and medusahead (*Elymus caput-medusae* L.) invasion. Due to the presence of depleted rangeland conditions and resultant exotic annual grass expansion over the last century, the Tribe has an estimated 1,300 acres of medusahead-infested uplands to manage.

The Department is currently finding additional sources of funding to support the research and resultant rehabilitation that will be necessary to reestablish native plant communities on these sites and ensure that they will be fairly resistant to reinfestation. The Agruicultural Research Service, BLM, and the Center for Invasive Plant Management are funding a study that will take place on the project site that will aide us in accomplishing our goals in a cost-effective manner.

Perennial pepperweed and white-top will be sprayed with Escort in the meadows and river corridor over time. It is not certain at this time if native propagule sources have been depleted from the site. If regeneration does not occur on a timely basis, reseeding options will be explored for these areas as well to make the site less susceptible to future invasions. Spot spraying will likely always be a requirement on the site, however.

Weed populations in the uplands will be mapped as plant community boundaries are established (see M&E plan below). Populations will then be placed within the Department's GIS system and monitored over time as hand pulling, spraying, and cutting/ foraging tools are utilized.

C. Improve water quality.

1. Tasks and Methods:

    a. Increase subsurface and decrease overland water flows at the watershed level.
        - ✓ Permit upland vegetation to catch and encourage the infiltration of precipitation in soils by managing toward desirable residual biomass levels.

        -Use fire, late fall herbicide applications (Plateau, etc. against weedy annuals), and selective grazing to regain plant communities that utilize available resources, encourage water infiltration, and secure soils on-site.

    b. Stabilize stream banks.
        - ✓ Retain residual biomass along riparian zones to reduce soil erosion during flooding events.
        - ✓ Initiate burning or grazing treatments only when necessary to stimulate primary production of riparian vegetation.

        -Use fencing, off-site water sources, and intensive cattle management to protect riparian areas from inappropriate levels of grazing disturbance and mass erosion events.

    c. Reestablish woody species when appropriate.
        - ✓ Seek the expertise of riparian specialists to identify soil types and microclimates along associated waterways that may support willow plantings.
        - ✓ Use 35 mm images and image analysis software to determine levels of willow abundance where stands are present.

        Please review the M&E protocol attached below that specifies shrub monitoring strategies.

D. Maintain BLM allotments.

    a. Meet conditions necessary to retain BLM and state grazing allotments to ensure that management of the site will be done at the watershed level.

- ✓ Maintain a close working relationship with pertinent agencies, including the involvement of field personnel in the formation of the project management plan.
- ✓ Coordinate with permitting agencies on focusing pasture and allotment management to benefit fish, wildlife and vegetation

E. Preserve cultural resources.

a. Locate and protect culturally significant plant populations and archeological sites.
   - ✓ Evaluate the possible impact of broader management designs on plant populations to encourage the vigor and natural distribution of these species.
   - ✓ Conduct surveys to ensure that ground-disturbing activities will not diminish culturally important sites.

ISRP Comment #2: *Plans for management and/or improvement of fish resources in the seven miles of river should be emphasized in the overall O&M plan.*

The mitigation site is host to a seven-mile stretch of the Malheur River. The extent of human induced change to the watershed over the last 100 years, including intensive grazing management, weed invasion, and the transformation of the river from a free-flowing system to one that is highly regulated, has had a serious impact on stream dynamics, water quality and fish and wildlife populations.

The overall goal for the river was to restore stream channel morphology and function to Proper Functioning Condition, which is a minimum standard for riparian zones established by the BLM and U.S. Forest Service. Specific vegetative goals and other habitat management practices along the river would then come to play once the system was somewhat stable. Bank stability, a deepening of the river channel, resultant reductions in stream temperature, and increased native riparian vegetation are specific objectives that the Tribe would like to see realized.

To aid in accomplishing these objectives, the Department invited the National Riparian Team to visit the ranch in October 2001. Consisting of professionals with a broad array of backgrounds such as watershed, fisheries, range, and soil management, hydrology, biology, and economics, this Team was qualified to assess our riparian areas and provide management ideas that might lead us toward a stable river system.

After three days on-site, however, the Team concluded the “the Malheur River is functioning at-risk throughout the property and probably will remain so even with

management improvements because of flow regulations from Warm Springs and Beulah Reservoirs and water withdrawals for irrigation upstream." They concluded that "tremendous improvement for some habitat features can be achieved along the lower reaches but fish habitat will likely be severely limited under the best management" (Leonard et al. 2001). Their suggestions included increasing the width of riparian buffers and changing grazing management in the meadows, both of which have already been achieved.

They do believe, however, that tributary streams such as Hunter Creek have "the greatest opportunity for increased fisheries and wildlife habitat." The Team also holds the belief that "although some segments appear to be non-functional, most are at a point of channel evolution that they can begin to recover with proper livestock management." We have been successful in securing a U.S. Fish and Wildlife Service grant that will allow us to build a fence that will exclude livestock from several hundred acres of private and BLM ground for the purpose of facilitating recovery of Hunter Creek over time. An abundance of grass, sedge, and shrub seed sources will likely stimulate vegetative recovery without artificial planting efforts.

ISRP Comment #3: *What water rights are associated with this property and how would they be used?*

The property has 328.25 acres of primary water rights associated with it. This water is currently used to flood irrigate the meadows for the purpose of maintaining wildlife habitat. The Tribe will continue to utilize this practice to meet above-stated goals and objectives.

It is believed that the valley was much different in appearance 150 years ago than it is today. The valley slope and shape suggests that the Malheur River was extremely sinuous as it ran through the site. Beaver activity, an abundance of willow, and higher water tables likely facilitated a mosaic of plant communities varying from wet meadow to upland plant species.

In the last 100 years the river was straightened, the meadows were leveled, and the water table has lowered considerably through ditching in the name of flood control. If water is retained in-stream, the Tribe would lose several plant community types that would have existed historically. Added to this concern is the fact that the river's flows below the dams are manipulated and that it goes dry in the late summer and fall, attempting to create an oasis for fish on the main stem is futile. As discussed earlier, riparian areas will be managed to the best of the tribe's ability through an emphasis on stream bank condition, willow recovery, and other land management-related activities. Fortunately, upland tributaries are another matter and will be actively managed for riparian recovery and aquatic habitat enhancement.

ISRP Comment #4: *Could sponsors purchase and retire the grazing allotment?*

After negotiating with Tribal representatives, the BLM concluded that running livestock was a necessary prerequisite for retaining the allotment. The Tribe was successful, however, in negotiating a 50% reduction in stocking rate. Because of \this compromise, the additional benefit of minimizing impacts on sensitive cultural and wildlife areas can be realized. If the permit is lost, future livestock operators would likely run the maximum allowable AUMs with little to no consideration to fish and wildlife or cultural plants.

To maintain control of associated BLM and state lands (25,698 acres), the Tribe must run 225 head of breeding cattle on federal lands every year from April 1 through October 31. As indicated above, these cattle can be managed to benefit wildlife during this time.

We are pursuing the partial retirement of particular pastures within the allotment to benefit redband trout and sage grouse nesting areas. As mentioned earlier, the Hunter Creek fence is the first of many projects of this type to be implemented on the site.

ISRP Comment #5: *The need for a research program to study interaction of deer, elk, and livestock management in a desert environment is not clear. We suggest that a comprehensive literature review of this issue including work conducted by the ODFW in LaGrande, Oregon, be included in the response.*

It is important to note that this study would be an addition to standard M&E monitoring as described in the protocol found at the end of this document.

Monitor and Evaluation:

Assessing Wild Ungulate Response to Land and Livestock Management on the Malheur River Wildlife Mitigation Project.

Arid environments such as the Mitigation site have not been well studied regarding ungulate responses to livestock. Virtually all elk research has been conducted in forested environments. Notable exceptions include work by Mccorquodale (1987, 1991) at the Hanford nuclear site in Washington. Nor have restoration and enhancement activities been documented on what impacts may occur when habitat management is focused on enhancing habitat to maintain and/or encourage higher standards for herd health among existing wildlife populations.

Currently, the mitigation site lies within the Oregon Department of Fish and Wildlife Malheur River Big Game Management Unit, identified as an elk de-emphasis zone,

indicating they believe local elk populations have reached desired carrying capacities. Although our management is not *exclusively* focused on increasing elk populations, it is inevitable that our enhancement efforts may encourage the expansion of one species at the expense of another.

Although deer and elk have been heavily studied in forested environments, little is known regarding response of deer and elk to habitat improvements in shrub steppe environments. The role of wild ungulates in plant community succession has not been well documented either.

This project is unique in many respects. There are issues that revolve solely around this area that are not commonly found on any other mitigation project. Wild ungulate populations and livestock management is a concern not only to tribal management specialists, but also to local land users, hunters, conservationists, and state and federal wildlife managers.

As suggested in the proposal, there has been high-level wildlife displacement in southeast Oregon for the last two decades. Elk populations have been significantly expanding and can literally be found in every type of habitat in Harney, Malheur and Lake Counties. As a result, elk populations in and around the mitigation site have been of high concern to the local communities. Oregon Department of Fish and Wildlife has spent significant dollars trying to alleviate wildlife damage on neighboring ranches and farms and high levels of deer and elk have compounded the economic struggle of local producers. Although the Tribe's efforts should focus on habitat management, it is not in the best interests of the program to ignore what impacts may occur as a result of the management. The data gathered from this study will be used to justify any actions needed to maintain a healthy balance between wildlife species and remain sensitive to the management objectives of other agencies, interest groups and private stakeholders.

In the last ten years, state and federal management agencies have not been able to maintain detailed information that is useable in the formulation of the management plan. Wildlife populations and habitat characteristics have been determined through very broad assessments. As the Tribe investigates existing data and documentation for the mitigation site, it is apparent that the habitat and wildlife data is outdated and somewhat inaccurate. This places many gaps on accurately forecasting progress with respect to restoration and enhancement strategies.

The interactive studies conducted in LaGrande can be useful and are related to some the management proposed on the mitigation site. Due, however, to the variables controlled by the Tribe and the site specific nature of the project, the relationships between arid land vs. forested environments cannot fully be justified. Studies on the proposed desert environment have been estimated to span over 40,000 acres (larger than any other study in LaGrande). Some of the past censuses by ODFW indicate that wild ungulates have shown to increase their occupancy in desert habitats. Although 80% of the occupied area is publicly owned, only 60% (approximately) of their annual diet is related to public land

utilization. Whereas 40% is dependant on private agricultural lands and harvested products (hay and other crops). As stated in the proposal, the project site will utterly take a 180-degree turn in focus and management. If you consider that this site, from the late 1800's up until last year, has been utilized for livestock production, it is unrealistic to believe that the Tribe's management will not impact the project site in a positive and possibly negative nature. Without justifiable data, the managers will have a very difficult time balancing the pros and cons with limited data and related research.

In the last 9 months, the tribal staff has consulted with many leading researchers in LaGrande (Starkey Experiment Station), Oregon State University and USDA Agricultural Experiment Station, on this proposed study. It was apparent to the researchers and managers that this study is unique and warrants research to identify the differences between past and current studies in Oregon. In the past, much focus was given to forested communities due to the impacts of natural resource harvest and utilization related to wildlife populations in those particular environments. In recent times, other "less desirable" habitats such as deserts and sagebrush steppe habitats have been recognized for their vital role in wildlife life histories and wintering availability. This study would help the Tribe and other partners gather data and information to allow proper management of wildlife and habitat in High Deserts Communities.

Study Outline:

Controlled Variables

1. Habitat management, including restoration and enhancement will occur over a 40,000 acre area (deeded plus permitted).
2. Livestock will only graze on federal and state allotments on scheduled rotations and prescriptions between April 1 thru October 31 as is dictated through the BLM allotment management plan. Stocking rates on the allotments have been reduced indefinitely from 450 pairs to 225 pairs.
3. Livestock rotations, timing and grazing patterns are within Tribal control.
4. Meadow and river bottom habitat will be converted from cultivated crops to a mixture of palatable species that will restock and enhance soil composition, be resilient to week infestations and set the stage for native reintroductions.
5. Access is controlled for 14 miles from the Black Canyon Corridor in Juntura, Oregon to the end of the deeded land on the Malheur River.

Questions to be resolved by this study:

1. Will wild ungulate populations increase and colonize ungrazed pastures due the change in livestock rotations and the reduction in livestock stocking rates?
2. Will deer and elk change their wintering habitat preferences with the improvement of meadow communities to more stable native compositions of grasses, forbs and woody shrubs?

3. Will wild ungulate survival and recruitment increase with the reduction of competition and demands on rangeland forage for livestock production?
4. How will wild ungulates interact with livestock under prescribed rotations and grazing treatments?
5. Will wild ungulates select or utilize pastures that are not grazed by livestock?
6. If elk exceed desired management populations or carrying capacity, will they displace or reduce mule deer herds?
7. Because the Mitigation Project is within an ODFW de-emphasis zone for elk, will the management of the site encourage population growth and expansions and disrupt deer and elk balances?

Goals

1. Evaluate the relationship between wild and domestic ungulates on the Malheur River Wildlife Mitigation Project site.
2. Identify the response of wild ungulates to changes in management practices and land restoration activities on the Malheur River Wildlife Mitigation Project.

Study Objectives

Objective 1. Determine the annual migration patterns of resident elk and mule deer populations within the Malheur Wildlife Mitigation Project site.

Task 1.1 Radio collar 20 elk cows and 20 mule deer does.

Method: *Capture*

Animals will be captured via helicopters net gunning following ODFW protocols. Captured deer and elk will be fitted with GPS radio-collars (Lotek collars and receivers). Blood and fecal samples will also be collected on every captured animal for subsequent blood chemistry and health workups. Ages of captured deer and elk will be estimated by tooth eruption and wear (Quimby and Gaab 1957). Elk and deer will be vaccinated with an antibiotic and selenium-vitamin E compound.

Task 2.1. Track radio collared animals twice weekly to determine location and habitat characteristics.

Method: *Telemetry*
Radio-collars will be programmed to obtain 3 locations/week. Anticipated location accuracy is within 2 meters, and are available in UTM coordinates. Ground checks of radiocollared animals will be conducted bi-monthly to verify transmitter function. Radio-collars will be removed, refurbished, and replaced annually. A satellite function may be

added which will allow immediate downloading of location data, rather than having to wait for jettisoned collars. Periodic aerial tracking will be conducted to supplement telemetry information and for inventory purposes. Additional locations will be measured through triangulation or visual observation by one or more observers (White and Garrott 1990).

Coordinates of aerial and ground relocations will be documented by the use of a Global Positioning System (GPS) receiver. Relocations will also be plotted on 1:24,000 and 1:100,000 quadrangle maps at the time (or shortly after) of observation. Universal transmercator (UTM) coordinates will be used to identify each location point.

Ground travel will be conducted by use of vehicle, horseback or walking~~.~~ Efforts will be made not to disturb collared animals while ground tracking to avoid artificial disruptions, disturbance and/or movements.

Objective 2. Determine changes in seasonal habitat preference and forage utilizations.

Task 1.2. Observe and record collared animal use of seasonal habitat and forage preference.

Method: Habitat relationships will be evaluated using telemetry, GIS systems and 7.5 minute topographic maps. Habitats used in significantly greater proportions than their availability will be considered "preferred." Conversely, habitats used significantly less than available will be considered "avoided." Habitats which are neither preferred nor avoided will be considered to be used in proportion to availability. Because there are a variety of methods used to analyze habitat selection, each with their respective advantages and drawbacks (Alldredge and Ratti 1992), We propose to employ the methods of Neu et al. (1974) because ~~it does not require~~ locations do not need to be analyzed separately (by individual). This method uses a chi-square goodness-of-fit analysis and simultaneous confidence intervals. To address seasonal differences in elk use, locations will be divided according to the following calendar months: spring (March-May), summer (June-August), fall (September-November), and winter (December-February).

Objective 3. Identify elk and deer forage utilization patterns associated with livestock rotations and grazing practices by pasture.

Task 3.1. Identify collared animals (and associated herd) herbivory in rested units.

Method: Compare above ground vegetation of grasses and forbs by clipping vegetation in and outside caged micro-plots (i.e. the paired cage method; Bonham 1989). Relative forage availability (i.e., percent utilization = [caged –uncaged]/caged] X 100] will be used to quantify the degree of deer and elk herbivory (Werner and Urness 1998).

Task 3.2. Document collared animal (and associated herd) utilization of grazed units.

Method: Utilize above methodology in grazed pastures. Relative and cumulative utilization will be recorded and compared.

Objective 4. Determine forage consumed by deer and elk over a ten year period to correlate changes in botanical preference in response to habitat improvements and land management practices.

Task 4.1 Collect fecal samples from deer and elk on selected habitat utilization points three times within each respective season i.e. Summer, Spring, Fall and Winter.

Method: Fecal samples will be collected in accordance to seasonal use of the (listed below) selected areas. Diets will be microscopically analyzed to identify plant cuticle similar to studies performed by Storrs, 1961.

Habitat Utilization Point (1) consists of river bottom lands and meadow habitat on the Mainstem of the Malheur River Basin. Tribal ownership encompasses seven contiguous miles.

Habitat Utilization Point (2) consist of riverine bottom lands in grazed and ungrazed pastures i.e. tributaries within the seven mile ownership of Tribal lands. Nine perennial streams will be annually monitored for use and frequency of use.

Habitat Utilization Point (3) consists of sagebrush steppe habitat within the 34,000 acre grazing allotment permits.

Habitat Utilization Point (4) consists of juniper forested canopies on a North facing slope of the study site. The Tribe controls approximately 5000 acres of state grazing permits on the North end of the Malheur River that runs contiguous with the federal grazing allotments.

Objective 5. Determine herd population trends of mule deer and elk over a 10 year period.

Task 1.5. Conduct aerial and ground counts of populations within the Mitigation Projects.

Method: Population trends will be measured using results of aerial counts and ground observations. Trends will be determined by calculating the observed exponential rate of increase (r_o) and comparing r_o values between years (Caughley 1977, Eberhardt and Simmons 1992, Hatfield et al. 1996).

g. Facilities and equipment

Onsite facilities will be used to administer field assignments and duties. Facilities have been used by participating agencies, and other BPA projects funded in the Malheur River Basin. Minimal repairs are required to maintain these offices and field housing.

h. Cooperators

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-received in June 1998 from Oregon State University.
-*Cum Laude*

WORK EXPERIENCE: **Burns Paiute Tribe**
Rangeland Ecologist, December 2000-current

- ✓ Wrote management plans for Bonneville Power Administration (BPA) mitigation sites.
- ✓ Utilized GPS to conduct weed population analyses.
- ✓ Created public environmental education programs.
- ✓ Participated in Tribal land planning.
- ✓ Fulfilled position of ranch manager for 400 head operation with three full-time employees.
- ✓ Conducted vegetation trend analysis.
- ✓ Initiated a hydrology study in conjunction with Agricultural Research Service (ARS) scientists.
- ✓ Managed BPA wildlife projects for the Burns Paiute Tribe.

Eastern Oregon Agricultural Research Center
Research Assistant/ Graduate Student, June 1998-October 2000

- ✓ Conducted research in fulfillment of the thesis portion of my graduate program. My study examined the effects of early spring grazing on meadow foxtail (*Alopecurus pratensis*) dominated hay meadows in the Harney Basin of southeastern Oregon.
- ✓ Regularly weighed, doctored, and managed 110 replacement heifers during the two summers of my research project (1998-1999).

- ✓ Assisted other research efforts involving the effect of elevated atmospheric carbon dioxide on western rangeland vegetation and the impacts of western juniper competition (*Juniperus occidentalis*) on understory vegetation.
- ✓ Worked cows in the meadows and open range for the station herdsman.

Research Technician, summer of 1997

- ✓ Collected data from transects on a long-term cattle exclosure study at the Northern Great Basin Experimental Range, from a juniper study near Diamond, Oregon, and a burn study on Steens Mountain.

Portland State University
Consultant, spring 1999

- ✓ Investigated and reported on the current status and future risk of various plant community types including the sagebrush steppe, juniper woodlands, and oak woodlands. My reports were used in the writing of the Oregon State of the Environment Report, which was a state environmental assessment mandated by the Oregon legislature.

Malheur National Forest, Burns District
Forest fire-fighter, summer of 1996

- ✓ Manned a heavy engine.
- ✓ Participated in timber thinning and brush disposal projects.

Biological Technician, summers of 1992-1995

- ✓ Range analysis and utilization surveys.
- ✓ Goshawk broadcasting and nest searches, organized and recorded.
- ✓ Raptor counts.
- ✓ Stream surveys.
- ✓ Stream rehabilitation and spring/seep condition evaluations.
- ✓ Stream electroshocking.
- ✓ Elk habitat surveys.

AWARDS AND HONORS: 2000: Outstanding Masters Student, Department of Rangeland Resources, Oregon State University

REFERENCES: Dr. Paul Doescher. Professor of Rangeland Resources. Oregon State University. (541) 737-0504.

Dr. Tony Svejcar, Research Leader. Eastern Oregon Agricultural Research Service. Burns, Oregon. (541) 573-2064.

M & E Protocol for Wildlife Mitigation Projects
Burns Paiute Tribe

Vegetation

Managing land for wildlife habitat requires knowledge of the various species of plants and animals on the site, as well as their special requirements for reproductive success. Unfortunately, gaining the knowledge necessary to manage vegetation toward a targeted habitat condition is more difficult than merely identifying the condition necessary to enhance wildlife.

Any strong habitat restoration plan is dependent on energy flows, nutrient cycles, and plant community dynamics. A combination of the three governs rangeland and meadow ecosystems (National Research Council 1994). Because these communities are dynamic, an intimate familiarity of plant demography (the study of plant population changes and their causes) is critical. Such knowledge can only be gained through careful observation in the field.

Plant Community Mapping.

Because plant communities play such a vital role in the present and future availability of desirable habitat for wildlife, they will serve as a basis for the Burns Paiute Tribe's monitoring and evaluation activities. These aggregations of plant populations will be identified, mapped, and classified in accordance with the Oregon Natural Heritage Program's *Manual of Oregon Actual Vegetation* (Attachment 1). Lines will be drawn along the borders of available topographic maps through the use of GPS technology and numbered with a map code for each specific community type. This information will then be entered into the Department's GIS system. For example, a low sagebrush/ bluebunch wheatgrass site would be classified as ARTARB/AGSP and given the map code 313.

General Vegetation Monitoring for Shrub-Steppe/Grassland Communities.

Four characteristics of vegetation will be observed and recorded for future use in analyses. The first is **frequency**, which is the percentage of a species that is present in a measured area (sample unit). This information is collected mainly for the purposes of monitoring vegetation change over time and comparing differences in adjacent plant communities. **Cover** and **density** data provides insight into demographical and ecological characteristics of the communities being observed. Lastly, **biomass** is used to estimate herbaceous production on the site.

Transect Procedures.

Once all the plant communities on the mitigation sites have been mapped, the Daubenmire method (Daubenmire 1959) will be used to monitor vegetation (Attachment 2). Only a few minor additions and adjustments will be made to this procedure and are listed below.

There will be one macroplot per plant community, three 60 m transects per macroplot spaced 20 meters apart, and 20 quadrats per transect. Each quadrat will be 40 x 50 cm (Attachments 3 and 4). While mapping and monitoring plant community boundaries, Department staff will have the opportunity to locate and record existing and future satellite weed populations in both the meadow and upland sites. Shrub cover/density will also be recorded at this time.

Photo Monitoring.

Three photostations per transect will be established (0 m, 30 m, and 60 m) and photographs will be taken at 0, 90, 180, and 270 degrees at each station. The camera will be elevated exactly one meter above the ground using a tripod and camera type, aperture, date, time of day, transect/location, GPS coordinates, and photographer data will be collected and recorded in a photostation journal and on the data collection sheet for the transect. A one-meter measuring board will be set up 10 meters from the photographer in each picture.

Permanent Placement of Transects.

Rebar will be driven into the ground at 0 m and 60 m and will be spray painted and marked with a metal identification tag bearing the number of the transect.

Shrub Monitoring
(Bitterbrush and Willow spp)

The Tribe has been working closely with the Agricultural Research Service (ARS) on developing monitoring techniques for woody plant abundance. Ground-based photography and image analysis is currently being evaluated for quantifying stand development of riparian willow communities. Field methodology is based on the relationship between visual obstruction and plant production (Attachment 5).

Wildlife and Aquatic Resources

The techniques outlined in the *Monitoring and Evaluation Plan for the Albeni Falls Wildlife Mitigation Project* (Albeni Falls Interagency Work Group 2001) will be used to monitor for land birds, waterfowl, bald eagles, small mammals, and herptofauna. The Tribe will be working closely with the CBFWA Wildlife Committee in establishing standardized M&E strategies for sage grouse and wild ungulates.

A separate M&E project is currently being proposed by the Tribe for monitoring the interactions between deer, elk, and domestic livestock on the Malheur River Wildlife Mitigation Site and will be discussed at the end of this document.

Hydrological features will also be monitored over time. Forest Service Region Six Stream Inventory Level I and II (1999) and Rosgen Level I, II, and III assessments (1998) will be conducted on the mitigation properties every five years in cooperation with the Department's fisheries biologists.

Attachment 1

An Example from the Manual of Oregon Actual Vegetation (Kagan and Caicco 1992)

Mapcode: 303
Mapname: Artemisia tridentate/ Festuca idahoensis

Comnames: big sagebrush/ Idaho fescue

Acroname: ARTTRI/FESIDA
Crosswalk: ARTTRI/FESIDA, ARTTRIW/FESIDA, ARTTRIT/FESIDA

Vegstruct: Tall shrub community in which Wyoming and basin big sagebrush predominate. Patches of a low shrub community in which low sagebrush predominates may occur. Low, early, blooming bunchgrasses predominate between the shrubs.

Ecology: Occurs on deeper soiled flats, plateaus, and slopes. The highest elevation regular sagebrush type, occurring primarily in the mountains of the Basin and Range. In central and eastern Oregon, it occurs on north slopes at lower elevations, and at other moist sites.

Distribut: Common throughout the southern High Lava Plains and Basin and Range, in Lake, Harney, and Malheur Counties, and southern Deschutes and Crook Counties. Occurs as a major type in southeastern Oregon.

Diaggrass: Poa sandbergii dominates the understory, and is often the only grass. Agropyron spicatum, Sitanian hystrix, Stipa occidentalis, and S. thurberiana, and other Poa species (nevadensis, canbyi, or scabrella) can be locally important. Annual grasses are rarely important, but Bromus tectorum increases with cattle grazing.

Diagshrub: Artemisia tridentate dominates. Artemisia arbuscula communities occur in shallow soiled areas typical of this type. Chrysothamnus viscidiflorus, C. nauseosus, and Gutierrezia sarothrae occur in disturbed areas.

Diagtrees: None.

Othtrees: Juniperus occidentalis often occurs as individuals in this type. It also dominates narrow canyons which occur in this type, along with Cercocarpus ledifolius.

Elevation: 4000-6000 feet.

Attachment 2

Daubenmire Method

1. *General Description*. The Daubenmire method consists of systematically placing a 20- x 50-cm quadrat frame along a tape on permanently lovated transects. The following vegetation attributes are monitored using the Daubenmire method:

    - Canopy cover
    - Frequency
    - Composition by canopy cover

    It is important to establish a photo plat and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use.* This method is applicable to a wide variety of vegetation types as long as the plants do not exceed waist height.

3. *Advantages and Limitations*. This method is relatively simple and rapid to use. A limitation is that there can be large changes in canopy cover of herbaceous species between years because of climatic conditions, with no relationship to the effects of management. In general, quadrats are not recommended for estimating cover. This method cannot be used to calculate rooted frequency.

4. *Equipment.* The following equipment is needed:
    - Study Location and Documentation Data form
    - Daubenmire forms
    - Hammer
    - Permanent yellow or orange spray paint
    - Two stakes: ¾- or 1-inch angle iron not less than 16 inches long
    - Tape: 100- or 200-foot, delineated in tenths and hundredths, or a metric tape of the desired length
    - Steel pins for marking zero, mid and end points of the transect
    - Frame to delineate the 20- x 50-cm quadrats
    - Compass
    - Steel post and driver

5. *Training.* The accuracy of data depends on the training and ability of the examiners. Examiners must be able to identify the plant species. They must receive adequate and consistent training in laying out transects and making canopy coverage estimates using the frame.

6. *Establishing Studies.* Careful establishment of studies is a critical element in obtaining meaningful data.

a. **Site Selection.** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to runthe study. Study sites should be located within a single plant community within a single ecological site. Transects and sampling points need to be randomly located within the critical or key areas.

b. **Pilot Studies.** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample.

c. **Number of Studies.** Establish a minimum of one study on each study site; establish more if needed.

d. **Study Layout.** Data can be collected using the baseline, macroplot, or linear study designs. The linear technique is the one most often used.

(1) Align a tape (100- or 200-foot, or metric equivalent) in a straight line by stretching the transect location and the transect bearing stakes. Do not allow vegetation to deflect the alignment of the tape. A spring and pulley may be useful to maintain a straight line. The tape should be aligned as close to the ground as possible.

(2) Drive steel pins almost to the ground surface at the zero point on the tape and at the end of the transect. A pin may also be driven into the ground at the midpoint of the transect.

e. **Reference Post or Point.** Permanently mark the location of each study with a reference post and a study location stake.

f. **Study Identification.** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground.

g. **Study Documentation.** Document pertinent information concerning the study on the Study Location and Document Data form.

7. *Taking Photographs.* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process.* In addition to collecting the specific studies data, general observations should be made of the study sites.

a. **Cover Classes.** This method uses six separate cover classes:

Cover Class	Range of Coverage	Midpoint of Range
1	0 – 5%	2.5%
2	5 – 25%	15.0%
3	26 – 50%	37.5%
4	51 – 75%	62.5%
5	76 – 95%	85.0%
6	96 – 100%	97.5%

b. **Collecting Cover Data.** As the quadrat frame is placed along the tape at the specified intervals, estimate the canopy coverage of each plant species. Record the data by quadrat, by species, and by cover class on the Daubenmire form. Coanopy coverage estimates can be made for both perennial and annual plant species.

(1) Observe the quadrat frame from directly above and estimate the cover class for all individuals of a plant species in the quadrat as a unit. All other kinds of plants are ignored as each plant species is considered separately.
(2) Imagine a line drawn about the leaf tips of the undisturbed canopies (ignoring inflorescence) and project these polygonal images onto the ground. This projection is considered "canopy coverage." Decide which of the classes the canopy coverage of the species falls into and record on the form.
(3) Canopies extending over the quadrat are estimated even if the plants are not rooted in the quadrat.
(4) Collect the data at a time of maximum growth for key species.
(5) For tiny individuals, it is helpful to estimate the number of individuals that would be required to fill 5% of the frame. A quick estimate of the numbers of individuals in each frame will then provide an estimate as to whether the aggregate coverage falls in Class 1 or 2, etc.
(6) Overlapping canopy cover is included in the cover estimates by species; therefore, total cover may exceed 100 percent. Total cover may not reflect actual ground cover.

9. *Calculations.* Make the calculations and record the results in the appropriate columns on the Daubenmire form.

a. **Canopy Cover.** Calculate the percent canopy cover by species as follows:

(1) On the Daubenmire form count the number of quadrats in each of the six cover classes (by species) and record in the Number column on the Daubenmire Summary form.
(2) Multiply this value times the midpoint of the appropriate cover class.
(3) Total the products for all cover classes by species.

(4) Divide the sum by the total number of quadrats sampled in the transect.
(5) Record the percent cover by species on the form.

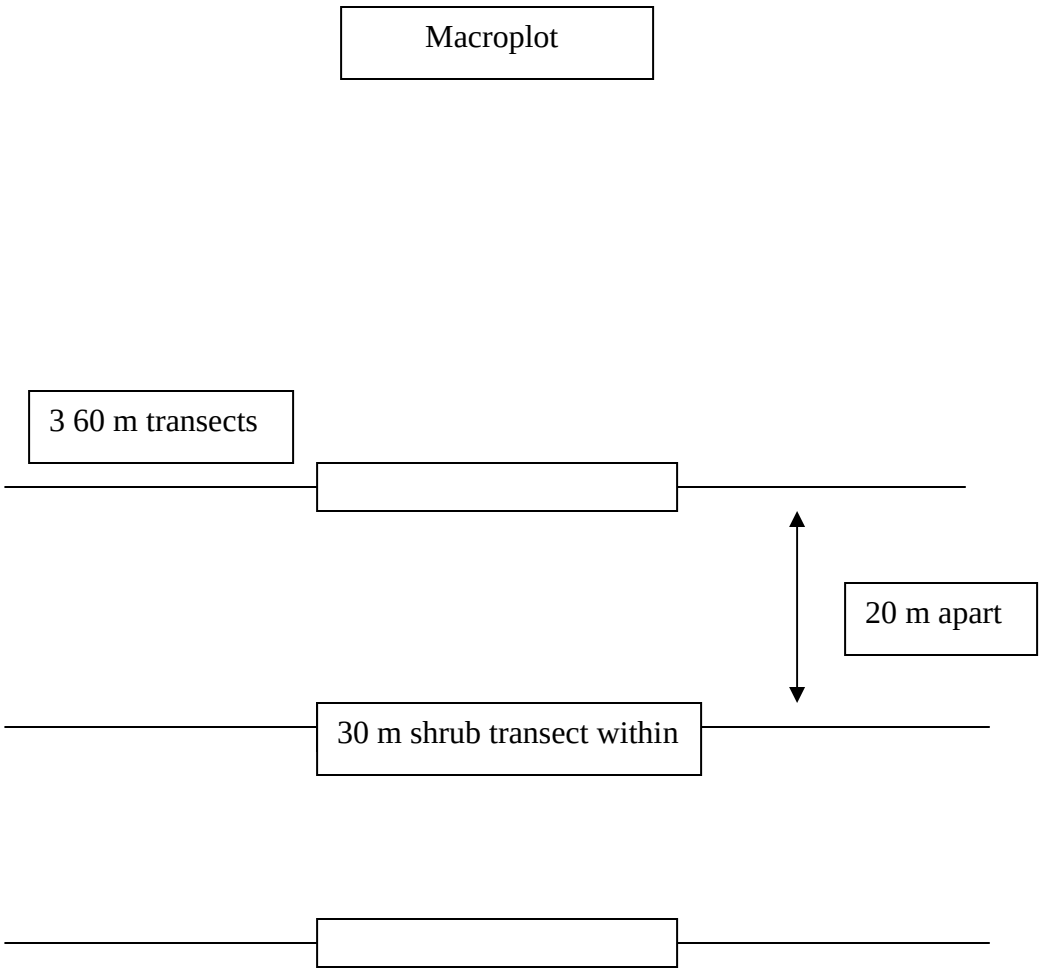
b. **Frequency.** Calculate the percent frequency for each plant species by dividing the number of occurrences of a plant species (the number of quadrats in which a plant species was observed) by the total number of quadrats sampled along the transect. Multiply the resulting value by 100. Record the percent frequency on the form.

c. **Species Composition.** With this method, species composition is based on canopy cover of the various species. It is determined by dividing the percent canopy cover of each plant species by the total canopy cover of all plant species. Record the percent composition on the form.

10. *Data Analysis.* Tests should be directed at detecting changes in cover of the species and/or in major ground cover classes. Tests for changes in minor species will have low power to detect change. If quadrats are spaced far enough apart on each transect so as to be considered independent, the quadrat can be analyzed as the sampling unit. Otherwise, the transects should be considered the sampling units. If the transects are treated as the sampling unit, and given that the transects are permanent, either the paired t-test or the nonparametric Wilcoxon signed rank test should be used to test for differences between 3 or more years. If the quadrats are treated as the sampling units, care must be taken to ensure they are positioned the same along each transect in each year of measurement. A paired t-test, Wilcoxon signed rank test, or ANOVA is then used as described above for transects.

Attachment 3

Macroplot Illustration



20 quadrats per transect.
Each quadrat is 40 x 50 cm in size.

Attachment 4

Field Vegetation Data Sheet

☐ cover/density

Page ___ of ____

Study Number:	Date:	Examiner:	Allotment Name and No:	Pasture:
Transect No. and Location:			Number of Quadrants:	

Plant Species	Quadrant 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Shrub Spp	Density S	J	M	D	Hits																		

Photostation # _____

Slope: _____

Aspect:_____

Production estimate (#/acre):_____

Soil Notes:

General Notes (Population structure, boundary dynar stratification):

Attachment 5

Willow Monitoring Techniques

The following willow assessment techniques were developed by ARS scientists Dr. Chad Boyd and Dr. Tony Svejcar, who are stationed out of the Eastern Oregon Agricultural Research Center in Burns, OR.

Willow abundance will be assessed during the growing season. Monitoring stations will chosen to be representative (plant age and site conditions) of the willow communities present in targeted drainages. Monitoring will take place at both the community and individual clump levels.

For community monitoring, we will identify clumps of willow to be monitored and place permanent PVC markers at the outer boundaries of the clumps. A photopoint that would allow for photographing the area of interest will then chosen and marked, as will a location for a 1m tall photoboard. Communities are to be photographed in August with a 35mm camera. Camera height and lens focal length are recorded at each station and will remain the same for all repeat photographs. Images are then scanned to digital form and a minimum convex polygon was digitized around the boundaries of the clump using SigmaScan 5.0 software. Using the same software we will calculate maximum and minimum (largest diameter perpendicular to the maximum diameter) diameters and area of the polygons. Multiple polygon values at a site are summed together and the results in total.

Visual obstruction (VO) will be measured for 1 willow clump at each monitoring station. VO provides an index to the mass of photosynthetically active tissue on a given willow clump. VO stations are located within the community photograph seen and placement of the visual obstruction board and camera are permanently marked with PVC stakes. Photographs are taken at a height of 117cm (equal to the center of the standing, fully assembled board), with a 50mm lens, and at a distance of 440cm from the photoboard. The photoboard itself is 150 x 180cm in size and is constructed of an aluminum frame overlain with white sheet plastic painted fluorescent orange. The photoboard is photographed fully assembled or disassembled to one half size for smaller plants. Film images are scanned to digital format, and the number of visible pixels determined using Adobe Photoshop 4.0 software.

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