

**HIGHLAND GLEN NATURE PRESERVE  
LAND MANAGEMENT PLAN**

Prepared for:  
Bozeman Health  
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Prepared by:  
Jeff Mosley, PhD  
Extension Range Management Specialist  
Department of Animal and Range Sciences  
Montana State University  
Bozeman, MT 59717-2900  
Office: 406-994-5601  
Cell: 406-579-8177  
FAX: 406-994-5589  
Email: [jmosley@montana.edu](mailto:jmosley@montana.edu)

Reviewed and referenced annually for ongoing operations:  
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Reviewed by:  
Brienne Rogers, Consultant  
Bird Dog Strategies, LLC  
Email: [briannerogers@gmail.com](mailto:briannerogers@gmail.com)  
Cell: 406-579-2921

## **1.0 EXECUTIVE SUMMARY**

This plan describes how Bozeman Health (BH) will manage about 430 acres of undeveloped land near Bozeman Health Deaconess Hospital in Bozeman, Montana. BH desires to sustain the land's ecological health and ecosystem services, and BH desires to be a good neighbor to adjacent landowners. If compatible with these goals, BH also wishes to: 1) provide year-round public recreational opportunities, and 2) generate income for BH and support the Gallatin Valley economy by leasing cropland to a local farmer and leasing livestock grazing to a local rancher. Current land health is generally good to excellent, with the notable exception of a large infestation of the noxious weed common tansy and much smaller infestations of the noxious weeds Canada thistle, hound's tongue, musk thistle, and spotted knapweed. The cropland lessee will be responsible for weed control on the cropland, and a licensed contractor will be responsible for weed control within the cropland field buffers and throughout the remainder of the property. Light to moderate-intensity cattle grazing from July 15-October 15 each year will be used to suppress the noxious weed Canada thistle, enhance wildlife habitat and biological diversity, and reduce the threat of wildfire. Motorized machinery is permitted for operational purposes for the farmer and rancher lessees. Motorized scooters for handicapped trail users are permitted; pedal-powered bicycles are also permitted. No other motorized recreation will be permitted. Working with Gallatin Valley Land Trust (GVLT), BH will update and add to existing signage at trailheads to interpret the land's ecology and significant history for recreational users. Signs will be installed at all trailheads to inform recreational users about farming and cattle grazing on the property and to advise people about how to safely coexist with the farming and cattle grazing as they recreate. Any trail changes or additions will be coordinated between BH and GVLT.

## **2.0 INTRODUCTION**

Bozeman Health (BH) owns about 430 acres of undeveloped land near Bozeman Health Deaconess Hospital inside the city limits of Bozeman, Montana (Figure 1). The undeveloped land is located in Township 2 South, Range 6 East, Section 17. About 295 acres are cropland and leased for farming. About 135 acres are rangeland, with about 119 acres of the rangeland leased for cattle grazing. In addition to the undeveloped cropland and rangeland owned by BH, Bozeman Deaconess Real Estate Development Corporation owns undeveloped residential lots within The Knolls subdivision. The weed management plan outlined below applies to the 430 acres of undeveloped cropland and rangeland, plus the unsold residential lots within The Knolls subdivision. This plan revises and replaces the BH Bozeman Trail Coulee Land Management Plan dated January 24, 2012. This revision has been prepared with input and assistance from the Gallatin Valley Land Trust, Gallatin County Weed District, and faculty and students from the Department of Land Resources and Environmental Sciences at Montana State University. The MSU ENSC 443 (Weed Ecology and Management) Fall 2014 students put together a project paper analyzing weed management alternatives that have been considered in the creation of this comprehensive plan. The BH Subarea Plan completed in April 2006 describes the long-term vision for the 430 acres. Most of this land will eventually be developed to include commercial and residential uses, with about 100 of the rangeland acres dedicated to remain undeveloped in a linear park (Highland Glen Nature Preserve). The purpose of this plan is to guide land management actions until commercial and residential development occurs. BH will review and possibly update this plan at least once every 5 years.

## **3.0 LAND MANAGEMENT GOALS**

BH desires to sustain the land's ecological health and ecosystem services, and BH desires to be a good neighbor to adjacent landowners. If compatible with these goals, BH also wishes to: 1) provide year-round public recreational opportunities, and 2) generate income for BH and support the Gallatin Valley economy by leasing cropland to a local farmer and leasing livestock grazing to a local rancher.

## **4.0 WATER, VEGETATION, WILDLIFE, AND HISTORICAL/CULTURAL RESOURCES**

### **4.1 Water**

One unnamed watercourse extends from south to north through Highland Glen Nature Preserve. The stream channel begins where groundwater surfaces near a spring about 1000 feet north of the southern property boundary. The watercourse does not contain fish. One old, unmaintained, excavated stock water pond exists near the northern end of the coulee and is surrounded by tall willow trees. Beavers have constructed several dams along the stream in the northern half of the coulee, and these dams have created small ponds adjoined by aspen, cottonwoods, and other wetland vegetation. The number and size of beaver ponds declined appreciably in 2014 compared with 2011-2013. During years with abundant precipitation, groundwater surfaces in small pools dispersed along the bottom of the coulee's southern third. The watercourse is generally in good ecological health. Cattle trampling is not excessive along the watercourse. Immediately prior to cattle grazing in summer 2012, woody debris was placed along streambanks at a few small, localized sites to mitigate previous trampling impacts and to prevent cattle from accessing these sites. This action was successful. Similar action is now needed at one site near the north-south center of the coulee where shrubs were removed during recreational trail construction in 2012. Shrub removal allowed cattle to access the streambank in places where they could not do so prior to trail construction. Streambank cattle trampling also needs addressed at one localized site near the northern end of the coulee where decreased beaver activity has lowered the water depth in the stream and lowered the water table, thereby enabling cattle greater access to the streambank and enabling cattle to congregate where they could not previously when beaver activity was greater.

## 4.2 Vegetation

Common plant species present are listed in Table 1. The plant species composition indicates good to excellent ecological health with a few notable exceptions. Five perennial forbs (i.e., broadleaf weeds) require suppression: common tansy, Canada thistle, musk thistle, hound's tongue, and spotted knapweed. All five of these forbs are officially listed as noxious by the state of Montana or Gallatin County. Consequently, BH is required by law to control these weeds. Common tansy is abundant along the watercourse; Canada thistle is common; hound's tongue is common along the recreational trails, especially wherever trail construction significantly disturbed the soil; and musk thistle and spotted knapweed are limited to one or two small sites.

Gallatin County Weed District personnel treated the infestation of common tansy in spring/early summer 2011 and 2012. These herbicide treatments were very successful and effectively controlled common tansy in the treated sites, but additional sites require treatment. Hound's tongue and Canada thistle, and common tansy in some places, have increased within the cropland field buffers that were created to provide cross-country ski trails. The BH cropland is leased to Vaughn Kraft, whose family began farming the BH cropland in 1962. The Kraft Family has worked for decades to eradicate weeds on these cropland fields so that the Kraft's could grow certified (i.e., weed-free) grain seed. Better weed control in the ski-trail field buffer is needed to protect the weed-free status of the Kraft's grain crop.

Another noteworthy vegetation concern is the large amount of wildfire fuel provided by the productive rangeland. Light to moderate-intensity cattle grazing currently reduces the wildfire threat. Mowing could be used as an alternative to cattle grazing in some portions of the rangeland, but steep topography in other portions of the rangeland make mowing unfeasible.

## 4.3 Wildlife

The undeveloped rangeland provides valuable habitat for numerous wildlife species. Mule deer, white-tailed deer, fox, beaver, raccoons and other small mammals, coyotes, raptors, songbirds, and waterfowl are common. Black bears and moose are present infrequently. The area also provides important winter-early spring range for elk. Residential development (e.g., Arrowleaf Hills Subdivision, Eagle Rock Reserve, Triple Tree Subdivision, Trooper Trail area, and Painted Hills Subdivision) eliminated considerable elk winter-spring range to the south of the BH property during the past 20-30 years. Elk grazing distributions and travel patterns also were dramatically altered. However, adjacent land immediately to the south of Highland Glen Nature Preserve owned by the Burkhart-Behring Family has remained agricultural since the beginning of pioneer settlement in the Gallatin Valley, thus providing a travel corridor that enables wintering elk to access Highland Glen Nature Preserve from the foothills of the Gallatin Range. The Burkhart-Behring Family property is anticipated to remain agricultural for the foreseeable future, which may maintain Highland Glen Nature Preserve as valuable winter elk range for the next several years. Elk use of Highland Glen Nature Preserve during spring, however, declined in 2013-2015 because of increased recreational trail use, and it is unlikely Highland Glen Nature Preserve will provide significant spring elk habitat in the future.

## 4.4 Historical and Cultural Resources

Archeological sites are probably present in the coulee, as acknowledged in the BH Subarea Plan (page 2-22). Prior to urban development, the developer will be required to coordinate with the State of Montana's State Historic Preservation Office to determine whether mitigation is needed, but to date an archaeological survey has not been completed.

There is little doubt that the coulee is an important historical site. For centuries, Native American tribes inhabiting lands west and north of present-day Bozeman, including Shoshone, Bannock, Nez Perce, Salish, and Blackfeet, likely traversed the coulee while traveling between the Gallatin Valley and the Paradise Valley via Bear Canyon or Bozeman Pass. In 1806, William Clark of the Corps of Discovery established a survey benchmark on a knoll on the coulee's edge. Members of the Crow Tribe regularly

camped in the coulee while interacting with the US military at Fort Ellis during the late 1800s, and an old wagon road that extends the length of the coulee was used by pioneer settlers when travelling to/from the southeast corner of the Gallatin Valley to/from the town of Bozeman. Speculation also exists that this wagon road was an alternative route for Bozeman Trail pioneers to reach Bozeman after entering the Gallatin Valley from the east via either Moffett Gulch or the current route of Interstate 90.

The undeveloped rangeland has been grazed by livestock for 140+ years. Current cattle grazing lessee Darrell Kurk, a descendant of pioneer settlers in the Gallatin Valley, was raised on the family ranch located near the mouth of Bear Canyon, and the Kurk Family has been grazing cattle on nearby lands for more than 100 years. Darrell Kurk and Vaughn Kraft, the cropland lessee, are good ambassadors for BH in the course of operating their agricultural leases.

Few cultural resources exist on the property. A City of Bozeman sanitary main line sewer is buried in the bottom of the coulee, entering the coulee near the New Hyalite View Subdivision and extending northward the length of the watercourse to Haggerty Lane. This sanitary sewer serves most of the New Hyalite View Subdivision, Highwood Estates, and portions of Graf's 1<sup>st</sup> Subdivision. Northwestern Energy maintains an overhead electric power transmission line that crosses the property from east to west, located immediately north of New Hyalite View Subdivision. No permanent buildings exist on the property. The principal recreational resources on the property are the cross-country ski trails and hiking/equine trails. Bridger Ski Foundation created winter recreational trails in fall 2010, and Gallatin Valley Land Trust added summer trails in 2012. Human recreation on the BH property increased dramatically from 2012-2015.

## **5.0 LAND MANAGEMENT OBJECTIVES**

### **5.1 Water**

1. Improve streambank stability.
2. Maintain or improve functioning condition of stream.

### **5.2 Vegetation**

1. Suppress noxious weeds.
2. Maintain or enhance vigor and productivity of desirable vegetation.
3. Maintain or reduce the threat of wildfire.

### **5.3 Wildlife**

1. Maintain or enhance wildlife habitat values.

### **5.4 Historical/Cultural**

1. Maintain sewer and power transmission infrastructure.
2. Maintain winter and summer recreation trails.
3. Construct display panels/signs to inform recreational users.
4. Generate farming and cattle grazing lease income to BH.

## **6.0 LAND MANAGEMENT ACTIONS**

### **6.1 Cattle Grazing Management**

- Estimated livestock grazing capacity at a light-moderate grazing intensity is 90 AUMs (refer to Forage Availability and Use Chart; an AUM = Animal Unit Month, defined as the amount of forage required to support the equivalent of one 1,000-lb cow for one month). Cattle grazing at a light-moderate stocking rate during summer will enhance forage quality for wildlife, increase biological diversity, suppress Canada thistle, and reduce the threat of wildfire.
- Grazing season will be July 15 to October 15. Delaying grazing until mid-July will: 1) allow riparian soils to be drier and less susceptible to trampling damage, and 2) limit plant regrowth after grazing, thereby providing more effective wildfire protection. This grazing season also coordinates well with the Kurk Ranch's US Forest Service grazing permit that has the same grazing season, and this grazing season is coordinated with the Kurk Ranch's brucellosis management plan that has been approved by the Montana Department of Livestock. Delaying cattle grazing until after the elk calving season (May to mid-June) decreases potential brucellosis transmission from elk to cattle.
- Stocking rate will be one mature bull plus 12-20 cow/calf pairs (6-10 mature cows and 6-10 young cows; Total = 55 to 89 AUMs; refer to Livestock Inventory Chart). Calves will average about 4 months old when they enter the property.
- Kurk Ranch will purposely select docile cattle to graze on the property.
- Kurk Ranch will carry liability insurance coverage on their cattle that graze on the property.
- Kurk Ranch will move salt/mineral supplemental feeding sites during the grazing season, as needed, to achieve proper grazing distribution. Beginning about 3 weeks before the end of the grazing season (i.e., beginning on or about Sept. 23), Kurk Ranch will begin feeding Bloat Guard blocks to prepare the cattle for exiting the property and transitioning to graze alfalfa aftermath. Feeding Bloat Guard blocks also will make the cattle easier to gather and transport at the end of the grazing season.
- Kurk Ranch will place woody debris along streambanks at selected sites to mitigate previous trampling impacts and to prevent cattle from accessing these sites. Existing downed woody debris in the coulee will be used. In the event more woody debris is needed, hawthorn shrubs/trees  $\leq 6$ -inch dbh (diameter at breast height) will be cut. Cutting hawthorns will reduce the abundance of this undesirable shrub and enhance the regeneration of desirable willows and cottonwoods.

### **6.2 Weed Control**

- Five noxious weed species will be suppressed: 1) common tansy, 2) Canada thistle, 3) hound's tongue, 4) musk thistle, and 5) spotted knapweed.
- Adaptive, integrated weed management will be used, incorporating mowing, hand-pulling, targeted cattle grazing, biological control insects, herbicides, tillage, and other tools as needed.
- The cropland lessee will be responsible for weed control on the cropland.

- Gallatin Valley Land Trust will coordinate with BH to provide funding to hire a licensed contractor who will be responsible for weed control within: 1) the cropland field buffer, 2) the rangeland in Highland Glen Nature Preserve, and 3) the undeveloped lots within The Knolls subdivision. Only the licensed contractor will be allowed to apply herbicide in these three areas. A plan for full funding of the licensed weed control contractor can be found in addendum 1.0.
- All herbicide applications will adhere to Gallatin County Weed District recommendations.
- Herbicide applications will be limited to spot-spraying. Boom spraying will not be allowed.
- The licensed contractor will post signs to inform the public whenever herbicide is being applied. In addition, the licensed contractor will inform Gallatin Valley Land Trust when herbicide application is planned to enable Gallatin Valley Land Trust to use its website and e-newsletter to inform the public of upcoming herbicide applications.
- To limit weed spread from Highland Glen Nature Preserve into the adjacent cropland, the rotary mower used for ski trails will be cleaned of weed seeds each time before entering Section 17, and the ski trails in the crop field boundary will always be cut before cutting the trails within Highland Glen Nature Preserve.

### **6.3 Recreation Management**

- Motorized machinery is permitted for operational purposes for the farmer and rancher lessees. Motorized scooters for handicapped trail users are permitted; pedal-powered bicycles are also permitted. No other motorized recreation will be permitted.
- Any trail changes or additions will be coordinated between BH and GVLTL.
- One display panel will be constructed at each trailhead to interpret the land's ecology and history for recreational users.
- Signs will be installed at all trailheads to inform recreational users that they are entering an area where cattle graze from July 15-October 15. Signs will educate people how grazing by cattle is being purposely applied to enhance wildlife habitat, enhance biological diversity, suppress Canada thistle, and suppress the threat of wildfire. Signs will also advise people to not approach the cattle or attempt to feed them, and remind pet owners to keep their pets under control and not allow them to chase or harass the cattle.
- Signs will be installed at all trailheads entering the adjacent cropland fields to inform recreational users that they are entering an area where farming activities occur such as plowing, seeding, and harvesting. Signs will advise people to avoid the area during those few times a year when farming activities are in progress, and remind pet owners to keep their pets under control and safely away from farm machinery while it is operating.

## 6.4 Ecological Monitoring

- Dr. Jeff Mosley, Montana State University Extension Range Management Specialist, will inspect the ecological health of Highland Glen Nature Preserve two or three times annually and provide a brief annual report each year to BH, Vaughn Kraft, and Darrell Kurk.

## 6.5 Written Lease Agreements

- The cattle grazing lessee (Darrell Kurk) and the farming lessee (Vaughn Kraft) each want to develop separate 5- to 10-year written leases with BH. Only verbal agreements currently exist. When drafted, leases will stipulate weed control objectives and responsibilities.
- Darrell Kurk and Vaughn Kraft each want to continue their agricultural leases with BH for the foreseeable future.

## 7.0 FUTURE ISSUES

The proposed urban development will eliminate the cropland and present several challenges to continued cattle grazing and recreational trail use. Identifying and anticipating these potential challenges now may help all concerned to address them more proactively as urban development approaches. It is anticipated that cattle grazing and recreation can continue to coexist when urban development begins and continue to coexist after urban development has been completed.

1. Sanitary sewer: The proposed development will require replacement of deficient sections of the existing sanitary sewer as well as installation of additional main lines (pages 2-13 and 5-3 BH Subarea Plan).

2. Storm water utilities: Storm water utilities, including additional catch basins, inlets and subsurface piping will deliver runoff to retention areas and ultimately to the watercourse in the bottom of the coulee. Storm water retention areas also will likely be constructed throughout the bottom of the coulee and existing wetlands may become larger (page 2-14, BH Subarea Plan).

3. Electric Power Transmission Line: The existing 50 KV electric power transmission line may be relocated and possibly buried (page 2-22 BH Subarea Plan), potentially impacting fences or creating a need to construct protection around electrical boxes to prevent disturbance by cattle.

### 4. Roads:

- a. Anticipated improvements/widening to Kagy Boulevard and Bozeman Trail Road (page 2-17 BH Subarea Plan) will likely alter existing fence locations.
- b. It is anticipated that only one roadway will cross the coulee and this will be a bridge (page 2-7 BH Subarea Plan) or pre-cast crossing over the drainage channel (page 2-10 BH Subarea Plan). The roadway crossing will include an elevated road surface to lessen detrimental impacts and allow free migration of animals and pedestrians under the road (page 2-11, BH Subarea Plan). A crossing that allows free migration of deer, elk or other wildlife should also allow free migration of livestock and perhaps horseback riders, too.
- c. Collector roads planned to connect Kagy Blvd to Highland Blvd and connect Haggerty Lane, across the coulee, to the Kagy/Highland Blvds collector (page 2-18 BH Subarea Plan) will impact fences. Cattle guards will need to be installed if cattle grazing is planned to continue after road construction.



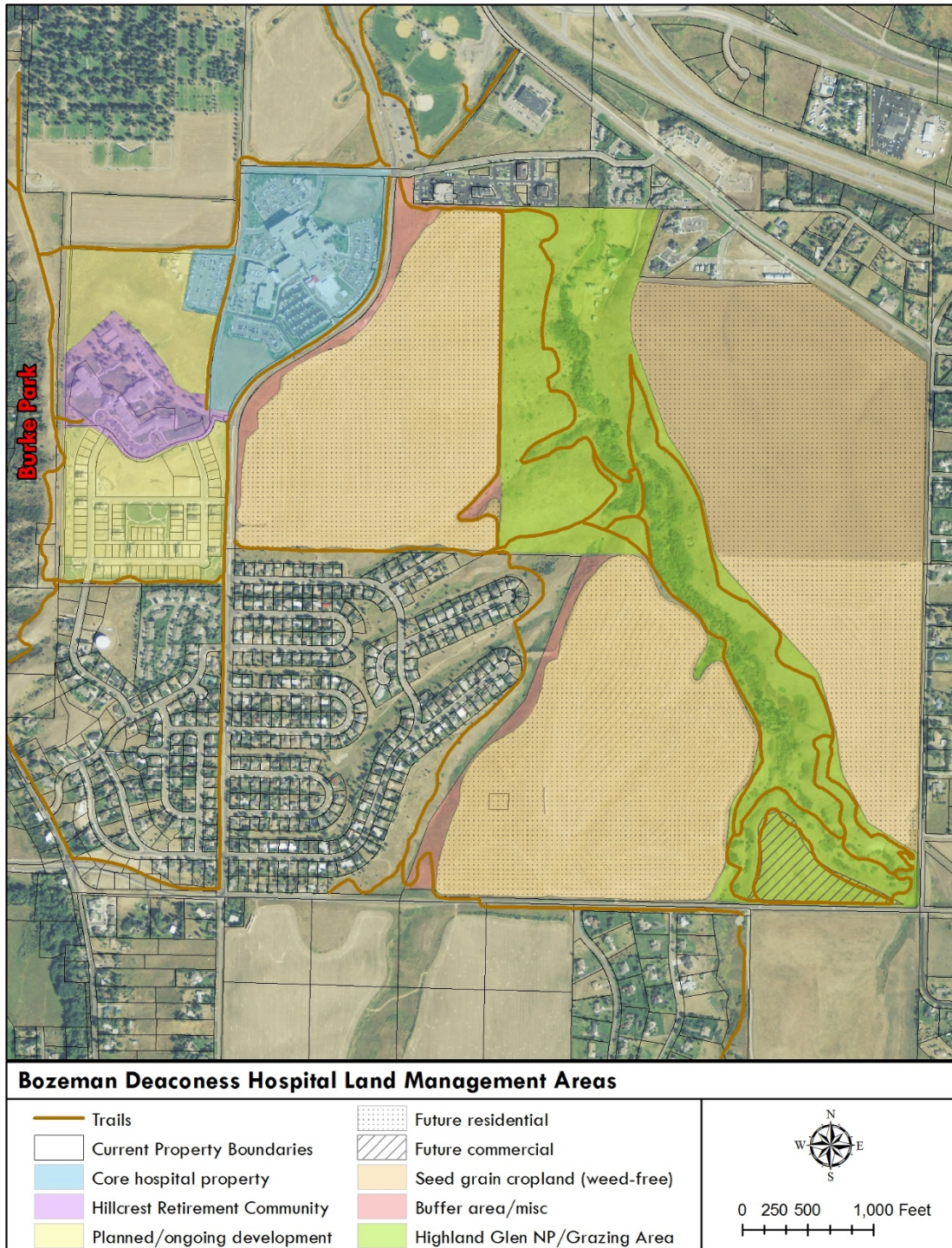


Figure 1. BH property including current and future land uses.

Addendum 1. Funding breakdown for weed contractor. To be added after consultation with GVL.



Table 1. Common plant species present in Highland Glen Nature Preserve.

Common Name	Scientific Name
<b>Noxious Weeds</b>	
Canada thistle	<i>Cirsium arvense</i>
Common tansy	<i>Tanacetum vulgare</i>
Hound's tongue	<i>Cynoglossum officinale</i>
Musk thistle	<i>Carduus nutans</i>
Spotted knapweed	<i>Centaurea stoebe</i>
<b>Grasses and Sedges</b>	
Beaked sedge	<i>Carex rostrata</i>
Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>
Creeping meadow foxtail	<i>Alopecurus arundinaceus</i>
Idaho fescue	<i>Festuca idahoensis</i>
Indian ricegrass	<i>Achnatherum hymenoides</i>
Kentucky bluegrass	<i>Poa pratensis</i>
Nebraska sedge	<i>Carex nebrascensis</i>
Orchardgrass	<i>Dactylis glomerata</i>
Plains reedgrass	<i>Calamagrostis montanensis</i>
Redtop	<i>Agrostis gigantea</i>
Rough fescue	<i>Festuca campestris</i>
Smooth brome	<i>Bromus inermis</i>
Timothy	<i>Phleum pratense</i>
<b>Forbs</b>	
American licorice	<i>Glycyrrhiza lepidota</i>
Arrowleaf balsamroot	<i>Balsamorhiza sagittata</i>
Aster	<i>Aster</i> spp.
Camas	<i>Camassia</i> sp.
Canada goldenrod	<i>Solidago Canadensis</i>
Common cattail	<i>Typha latifolia</i>
Cudweed sagewort	<i>Artemisia ludoviciana</i>
Dotted blazing star	<i>Liatris punctata</i>
Northern bedstraw	<i>Galium boreale</i>
Old man's whiskers	<i>Geum triflorum</i>
Silky lupine	<i>Lupinus sericeus</i>
Slender cinquefoil	<i>Potentilla gracilis</i>
Sticky purple geranium	<i>Geranium viscosissimum</i>
Wavyleaf thistle	<i>Cirsium undulatum</i>
Western yarrow	<i>Achillea millefolium</i>
Whitepoint locoweed	<i>Oxytropis sericea</i>
Yellow salsify	<i>Tragopogon dubius</i>
<b>Shrubs/Trees</b>	
Black cottonwood	<i>Populus trichocarpa</i>
Mountain big sagebrush	<i>Artemisia tridentata</i> spp. <i>vaseyana</i>
Quaking aspen	<i>Populus tremuloides</i>
Red-osier dogwood	<i>Cornus stolonifera</i>
Rocky Mountain juniper	<i>Juniperus scopulorum</i>
Succulent hawthorn	<i>Crataegus succulent</i>
Western snowberry	<i>Symphoricarpos occidentalis</i>
Willow	<i>Salix</i> spp.
Wood's rose	<i>Rosa woodsii</i>

Highland Glen  
Nature Preserve  
Livestock Inventory

Livestock Count/Forage Demand														
Kind/Class of Livestock	Animal Unit Value	#	Month											
		AUs	J	F	M	A	M	J	J	A	S	O	N	D
Mature cows (non-lactating)	0.9	#												
		AUs												
Mature cows (lactating)	1.2	#							5.0	10.0	10.0	5.0		
		AUs							6.0	12.0	12.0	6.0		
Young cows (lactating)	1	#							5.0	10.0	10.0	5.0		
		AUs							5.0	10.0	10.0	5.0		
Replacement bred heifers (18-24 months)	0.8	#												
		AUs												
Replacement yearling heifers (12-17 months)	0.7	#												
		AUs												
Replacement heifer calves (6-12 months)	0.5	#												
		AUs												
Calves (4 months through weaning)	0.3	#							10.0	20.0	20.0	10.0		
		AUs							3.0	6.0	6.0	3.0		
Weaned steer/heifer calves (6-12 months)	0.5	#												
		AUs												
Yearling steers/heifers (12-17 months)	0.7	#												
		AUs												
Young bulls (12-24 months)	1.2	#												
		AUs												
Mature bulls (2-5 years)	1.5	#							0.5	1.0	1.0	0.5		
		AUs							0.8	1.5	1.5	0.8		
Horses	1.2	#												
		AUs												
Mature ewes (non-lactating, 150 lbs.)	0.18	#												
		AUs												
Mature ewes (lactating, 150 lbs.)	0.2	#												
		AUs												
Lambs (2 months to weaning)	0.06	#												
		AUs												
Lambs (weaned to yearling)	0.12	#												
		AUs												
Yearling lambs	0.15	#												
		AUs												
Rams	0.25	#												
		AUs												
Mature goats	0.15	#												
		AUs												
Yearling goats	0.1	#												
		AUs												
Total		#	0.0	0.0	0.0	0.0	0.0	0.0	20.5	41.0	41.0	20.5	0.0	0.0
		AUs	0.0	0.0	0.0	0.0	0.0	0.0	14.8	29.5	29.5	14.8	0.0	0.0

Forage Availability and Use Chart															
Soil Mapping Unit	Acres	Acre/ AUM	AUMs	Month											
				J	F	M	A	M	J	J	A	S	O	N	D
Anceny Cobbly Loam, 15-60% slopes	26.1	2.3	11.3							1.8	3.8	3.8	1.9		
Blackmore Silt Loam, 4-8 % slopes	14.3	1.3	11.0							1.8	3.7	3.7	1.8		
Blackmore Silt Loam, 8-15% slopes	37.6	1.3	28.9							4.9	9.6	9.6	4.8		
Enbar-Nythar Loams, 0-4% slopes	37.1	1.0	37.1							6.1	12.4	12.4	6.2		
Enbar-Nythar Loams, cool, 0-4% slopes	0.2	0.8	0.2							0.0	0.1	0.1	0.0		
Meagher-Shawmut-Bowery Complex, 15-45% slopes	4.0	2.0	2.0							0.3	0.7	0.7	0.3		
Total	119.3		90.5												
Total Forage AUMs Available			90.5							14.9	30.3	30.3	15.0		
Total AUMs Required			88.6							14.8	29.5	29.5	14.8		
Total AUMs Excess/Deficiency			1.9							0.1	0.8	0.8	0.2		