

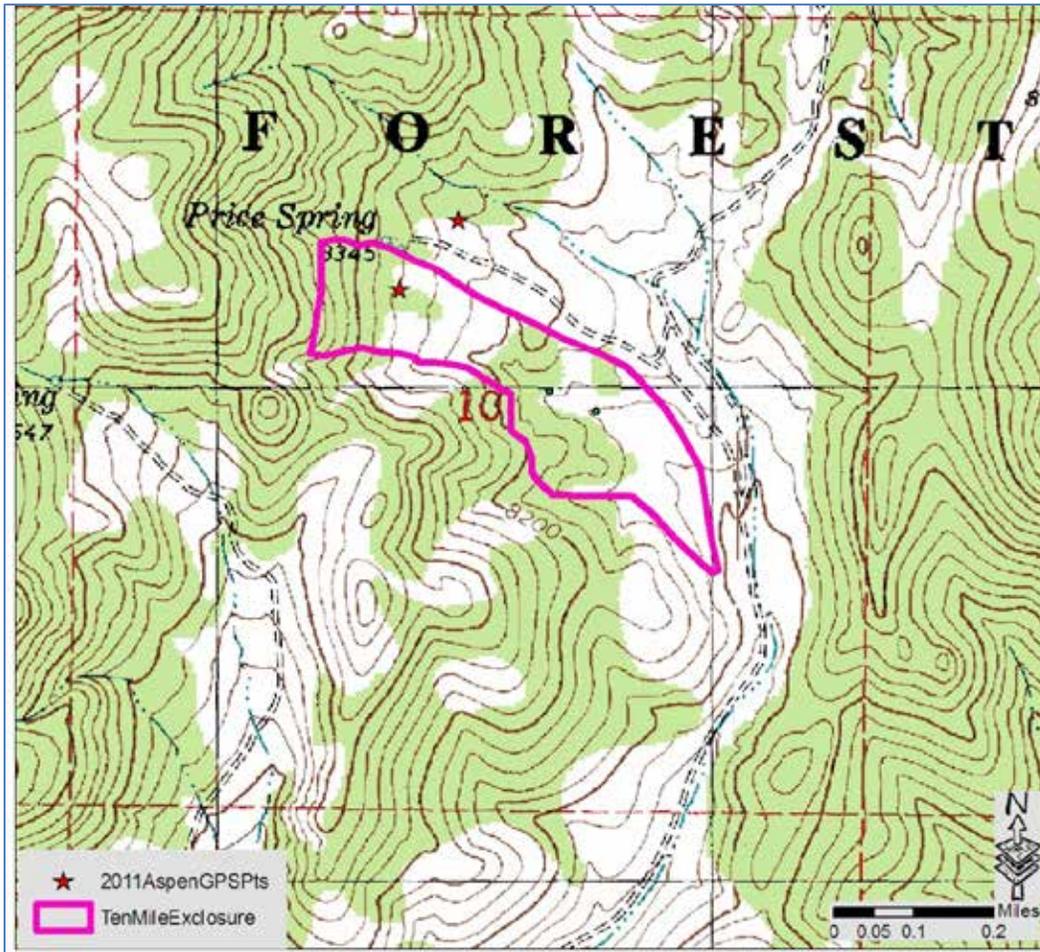
Ten Mile Allotment Aspen Permanent Range Cage

Established May 20, 2009

(1) October 14, 2011

(2) September 29, 2010

(3) September 9, 2011



Ten Mile Allotment Aspen Permanent Range Cage	Established May 20, 2009
Fishlake NF/Beaver RD	Allotment: Ten Mile Pasture: Price/Cougar
Aspect: East	Elevation: ~8320 ft
Range Cage Location: (NAD CONUS 83) 12N 0386309 E 4240400 N	Outside Transect Location Begins 12N 386443E 4240189N (2009- NAD27 Begins 12N 386427 E 4240540 N (2010& 2011) NAD 83
Inside Transects Two transects run E-W from within 6" of cage fence. Data as to exact cage wire from which	Outside Transect 2009 - The 100' transect was downslope 130° from the SE corner of the range cage.

<p>the transects extend across the cage were unfortunately not recorded</p> <p>A: 16' length</p> <p>B: 15' length</p>	<p>2010 – The 100' transect runs at a 120° from the starting point which is about 50 meters NNE from the end of the road up to the spring</p>
<p>Transect readings: (1) October 14, 2009 surveyors: Hoskisson/O'Brien</p> <p>(2) Sept 29, 2010: Hoskisson/ Wheeler</p> <p>(3) Sept 9, 2011 Hoskisson/Young/Ratcliff</p>	

The Ten Mile Allotment aspen permanent range cage is in Price/Cougar Pasture. This 16' X 16' permanent range cage (Fig. 1) is adjacent to FS 614 on a sagebrush toe slope with aspen, oak, and pinyon-juniper, downslope from Price Spring. A small brook flows from Price Spring along the northern edge of the 100' transect. The drainage joins Order Canyon and eventually flows into City Creek, which continues north of Junction, and enters Piute Reservoir. City Creek Peak is the dominant peak above Price Spring. A low pass separates the Price Spring drainage from the Ten Mile Creek drainage just to the north.

On May 20, 2009, Grand Canyon Trust photographed each aspen within the enclosure for a record (e.g., Figs. 2-3). No detailed survey of all species within and outside the enclosure has been made.

On October 14, 2009, Grand Canyon Trust read two point-intercept transects running N-S within the transect (starting 6" from inside the cage fence). The height of all plants intercepted and the ground cover were recorded every 6". In addition, the height and location of each aspen within the range cage were recorded.

In 2009, the outside comparison to this permanent aspen range cage is a 100' point-intercept transect located 37' and 180' from the SE corner of the range cage. On October 14, 2009 Grand Canyon Trust read the outside transect as within the range cage, but at 2' intervals rather than 6". The height of all mountain mahogany within 3' of either side of the transect was recorded.

By October 14, a larger enclosure had been partially built to encompass the aspen stand immediately below Price Spring, but an aspen had fallen on one side, breaking the fence (Fig. 10); another side is inadequately supported (Fig. 13), and it is not clear whether the enclosure had even been completed. Wild ungulates will have access inside this larger enclosure until the fence is repaired in 2010.

In 2010, an enclosure fence was built that encompasses approximately 45 acres around Price Spring to protect the resources at and around the spring. The range cage is located within this new 45 acre enclosure. The transect outside the range cage thus had to be relocated to adequately compare grazing and browsing levels inside and outside the enclosure.



Fig. 1 (05/20/09) The aspen range cage is located on a sagebrush toeslope



Fig. 2 (05/20/09) Ground cover within the range cage on the day of construction.



Fig. 3 (05/20/09) Each aspen within the enclosure was photographed on the day of cage construction.

Transect Readings

(1) October 14, 2009

(2) September 29, 2010

(3) September 9, 2011

The first transect reading was made just four months after the aspen range cage was established, but it encompassed the mid- and later portions of the growing season. The range cage encompasses similar numbers of aspen as were encountered within the 6-foot wide, 100' belt transect.

(2009) Both inside and outside the range cage, aspen heights of 3.1'-4' predominate, with one 4.1'-5' stem present. The outside transect includes a broader range of heights, from 1.1'->6'. By October 14, 33% of leaders on aspen <6' were browsed; 100% outside. The 33% browse inside the cage likely reflects browse that had occurred by wild ungulates prior to the May 20 construction of the aspen range cage. Given that both current and past browsing of leaders and subleaders within 6 vertical inches of the leaders are recorded, past year browsing may account for the 71% browse of subleaders inside (compared with 98% outside). Future years of monitoring will be informative.

Inside range cage bare ground is 7%; 25% outside. Columbia needlegrass (*Achnatherum nelsonii*) averaged 9" tall within (Fig. 4) and 4" tall outside the range cage.

The average number of subleaders by height class is higher outside (e.g., 9 versus 3.5 for the 3.1'-4' height class).

The banks of the waterway flowing from Price Spring riparian banks are sheared (Fig. 8), hummocked (Fig. 9), and grazed beyond Forest standard.

(2010): The Ten Mile Pasture was rested in 2010. The transect outside the range cage (comparison with inside) had to be moved as the new large exclosure built around the Price Spring waterway also enclosed the "outside" transect. The new "outside" transect is located NNE of the exclosure about 50 meters northeast of the road (see Map, first page of this report).

Aspen in the range cage are $\leq 5'$ and outside transect aspen are all $\leq 4'$ in height. For reasons not apparent, trees inside the range cage are not in good health (Figs 12,13), but aspen outside the range cage appear to be in relatively good health (Fig 13). There was no apparent browsing of the aspen inside the range cage, but 80% of the tall leaders in the range cage were dead, although none of the subleaders were dead. Browsing outside the exclosure was about 17% on the tall leaders and 65% on the subleaders. It will be important to determine if the aspen in the range cage rebound in 2011. The aspen in the large exclosure appear to be a mixture of trees and saplings in relatively good health and some in poor health.

Inside the range cage, total vegetation cover was 82%, litter was 15% of total ground cover, and bare ground was only 3%, Native perennial grasses accounted for 16% of the vegetation cover and averaged 11.5" in height, whereas sagebrush (*Artemisia tridentata* var *vaseyana*) was 54% cover and 34" in height. A second layer of vegetation was intercepted 8 times, signifying very little layering of vegetation in the area (Figs 12 and 13).

The average number of subleaders within 6" of the leaders was much greater outside the range cage, indicating more browsing and greater bushiness.

Outside the range cage, total vegetation cover (36%), was much less than half that inside the range cage; bare ground was almost twice as high at 28%; and litter cover (36%) more than double that inside the range cage. Here, native perennial

grasses and grasslike species accounted for only 11% of the cover (at an average height of about 3"), while sagebrush accounted for 18% of the cover at an average height of 28". Perennial forbs (chiefly lupine) contributed 5% cover at an average height of 23". There were only 6 second hits on vegetation along this transect, meaning a predominance of a single layer of vegetation (Figs 15-18).

(2011) Ten Mile pasture was scheduled to be grazed between August 21 and October 10 of 2011 at no more than 30% utilization. The transects inside and outside the permanent range cage read in 2010 were repeated in 2011.

Most of the aspen inside the range cage remain in poor health (see figs 12 and 20). However it also appears that one aspen moved from 2.1-3' to 3.1-4'; a second from 3.1-4' to 4.1-5' and a third from 4.1-5 to 5.1-6'. It will be interesting to see in 2012 whether any aspen outside the enclosure exceed 4'.

There continues to be a higher amount of bare ground outside enclosure (16% outside enclosure compared to 6% inside enclosure when no overhead plants were included. When overhead plants were included, bare ground increased to 10% inside the enclosure as compared to 25% outside the enclosure.

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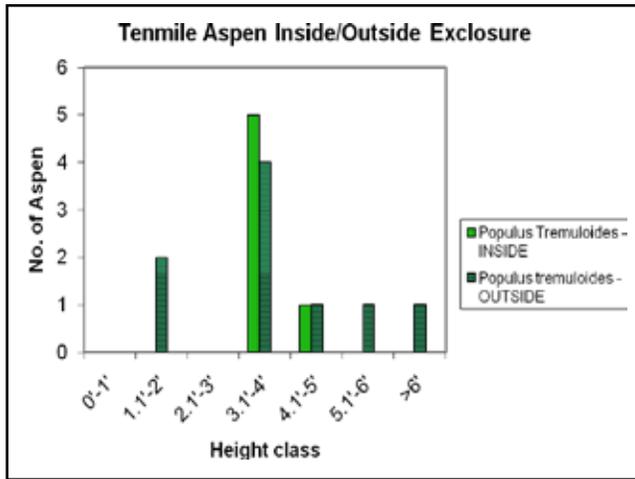
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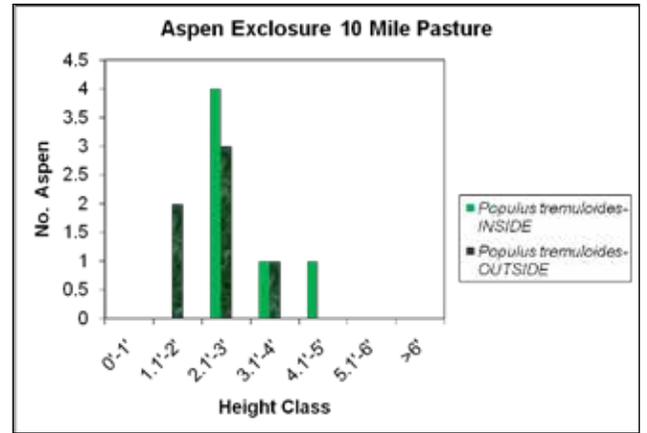
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Aspen Height Distribution

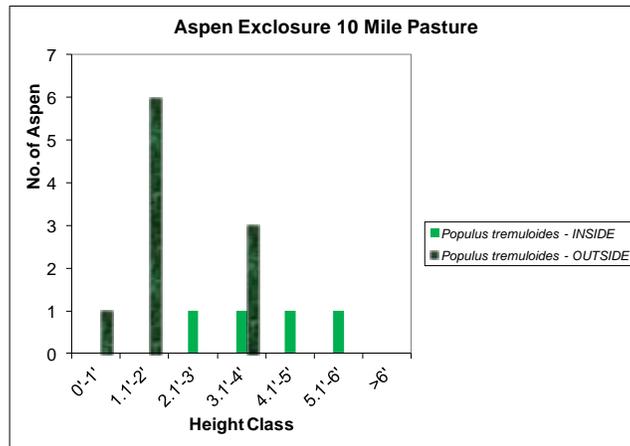
2009



September 29, 2010 (Different transect than 2009 because the 2009 transect was enclosed by a larger exclosure)



September 9, 2011



**Browse
2009**

Tenmile Aspen Exclosure inside/outside exclosure Inside: 6 Populus tremuloides <6' Outside: Populus tremuloides <6'		
		<i>Populus tremuloides</i>
% tall leaders browsed	Inside	33.3
	Outside	100.0
% tall leaders browsed or dead	Inside	33.3
	Outside	100.0
% subleaders browsed	Inside	71.4
	Outside	97.9
% subleaders browsed or dead	Inside	71.4
	Outside	97.9

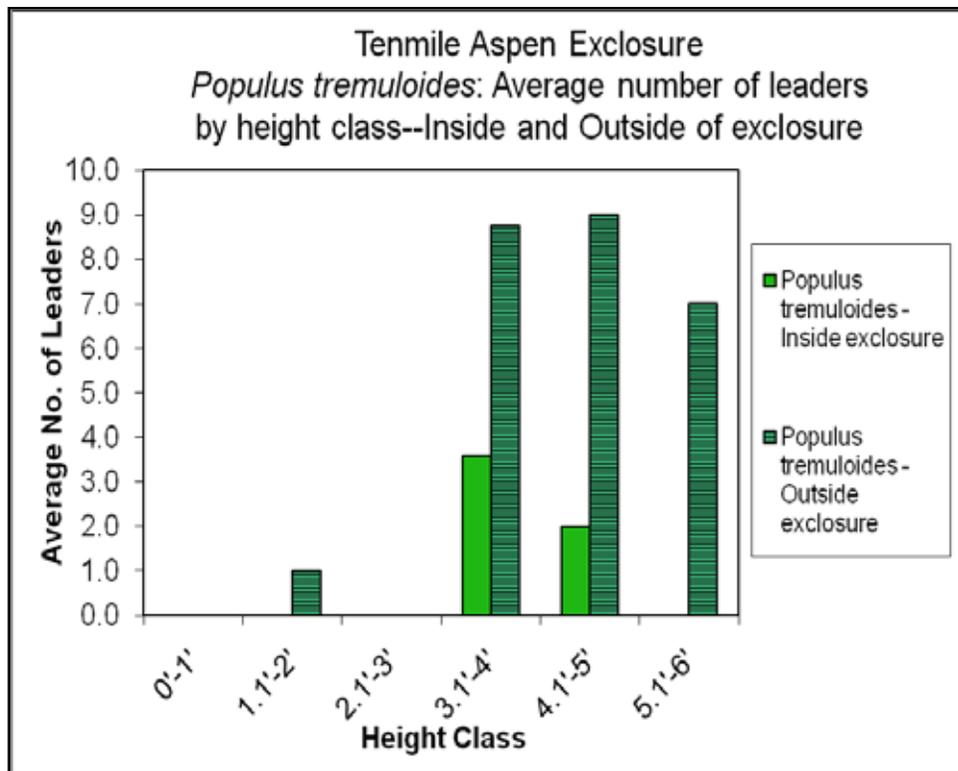
2010

Tenmile Aspen Exclosure inside/outside exclosure Inside: 6 Populus tremuloides <6' Outside: 6 Populus tremuloides <6'		
		<i>Populus tremuloides</i>
% tall leaders browsed	Inside	0
	Outside	16.7
% tall leaders browsed or dead	Inside	80
	Outside	16.7
% subleaders browsed	Inside	0
	Outside	64.7
% subleaders browsed or dead	Inside	0
	Outside	64.7

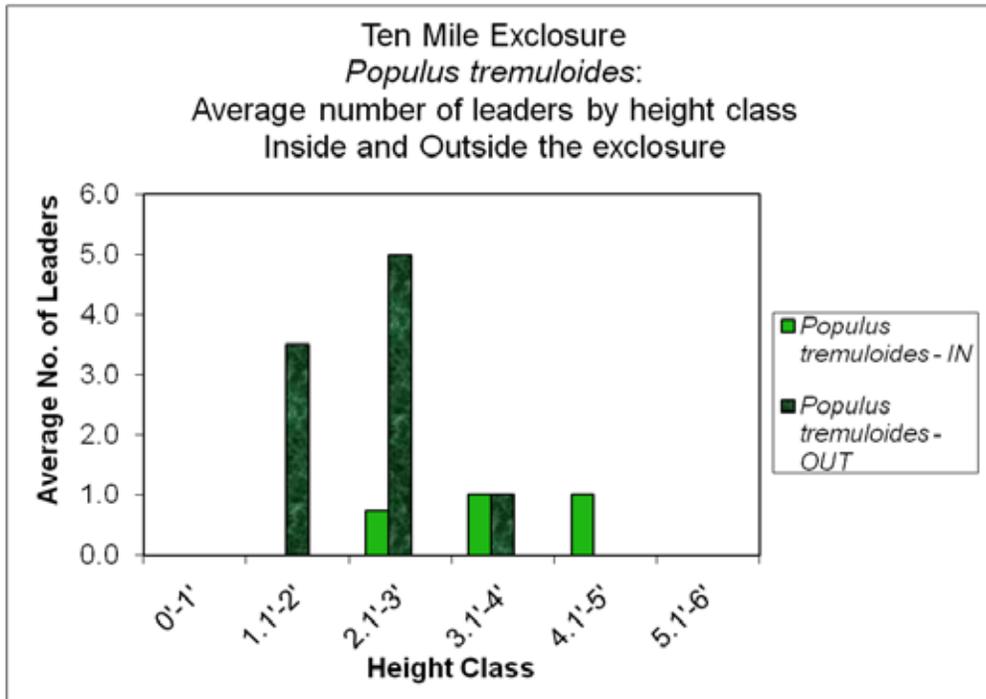
September 7, 2011

Tenmile Aspen Exclosure inside/outside exclosure Inside: 3 Populus tremuloides <6' Outside: 10 Populus tremuloides <6'		
		<i>Populus tremuloides</i>
% tall leaders browsed	Inside	0
	Outside	90.0
% tall leaders browsed or dead	Inside	33.3
	Outside	90.0
% subleaders browsed	Inside	No subleaders
	Outside	97.4
% subleaders browsed or dead	Inside	No subleaders
	Outside	97.4

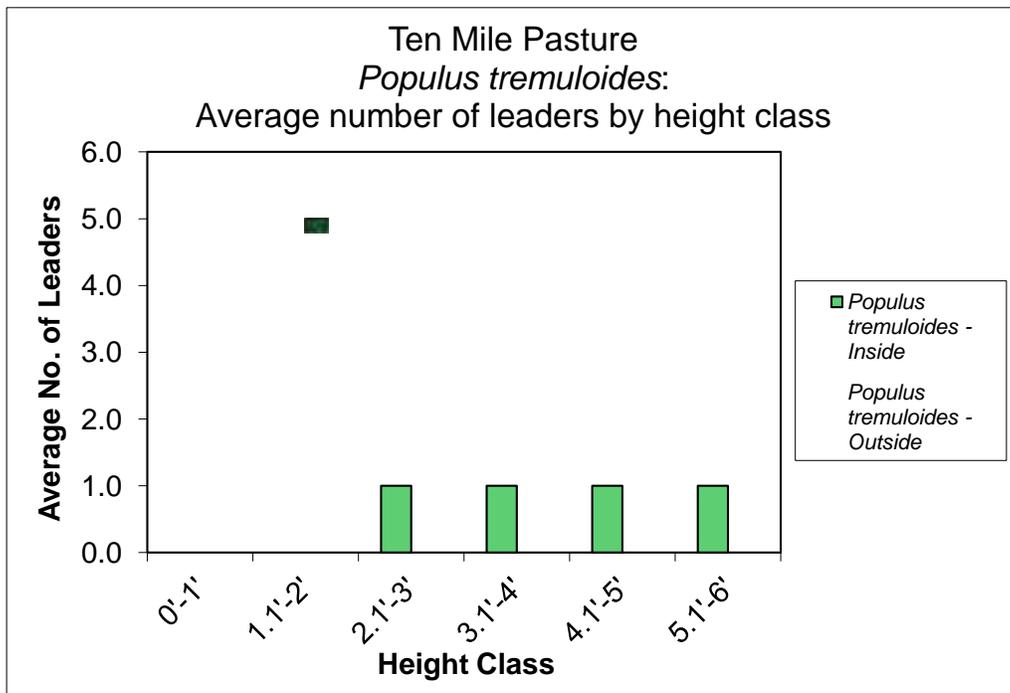
Number of Leaders by Height Class 2009



2010



2011



Understory/Ground Cover

Inside Exclosure - 2009

Plants	Cover (%)	# Species	Height (in.) (average)	Two most common species
Aspen	2	1	40	<i>Populus tremuloides</i>
Shrub	21	1	31	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
<i>Poa pratensis</i>	25	1	11	<i>Poa pratensis</i>
Other Grass	31	2	9	<i>Achnatherum nelsonii</i> ssp. <i>nelsonii</i> , one unidentified species
Grass-like Plant	0	0		
Forb	21	1	25	<i>Lupinus</i> sp.
All Veg Types	67	7		<i>Poa pratensis</i> , <i>Achnatherum nelsonii</i>
Non-plant Cover %:	Bare	Rock	Litter	Lichen, moss, biological crust
	7	0	93	0

Plants intercepted on transect inside exclosure, in order of frequency

<i>Achnatherum nelsonii</i>	15
<i>Poa pratensis</i>	15
<i>Artemisia tridentata</i> subsp. <i>vaseyana</i>	13
<i>Lupinus</i> sp.	13
Grass	5

Inside Exclosure - 2010

Plants	Cover (%)	# Species	Height (in.) (average)	Two most common species
Aspen	0	0	0	0
Shrub	54	1	34	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
<i>Poa pratensis</i>	0	0	0	<i>Poa pratensis</i>
Other Grass	16	5	11.5	<i>Achnatherum lettermanii</i> , <i>Poa sp.</i> , <i>Pascopyrum smithii</i>
Forb	5	1	13	<i>Lupinus sericeus</i>
Total Cover	82	6		<i>Achnatherum nelsonii</i>
Ground cover(%)	Bare	Rock	Litter	Lichen, moss, biological crust
Ground Cover (no overhead plants)	3		15	
Ground Cover (includes beneath plants)	6		94	

**Plants intercepted on transect inside exclosure,
in order of frequency (2010)**

Mountain big sagebrush	<i>Artemisia tridentata</i> subsp. <i>vaseyana</i>	54%
Letterman's needlegrass	<i>Achnatherum lettermanii</i>	9%
Silky lupine	<i>Lupinus sericeus</i>	5%
Bluegrass	<i>Poa sp</i>	4%
Nelson's needlegrass	<i>Achnatherum nelsonii</i> var <i>nelsonii</i>	2 %
Western wheatgrass	<i>Pascopyrum smithii</i>	2%

Inside Exclosure 2011

Plants	Cover (%)	# Species	Height (in.) (average)	Two most common species
Aspen	0	0	0	0
Shrub	54.3	1	39	<i>Artemisia tridentata</i> <i>ssp. vaseyana</i>
<i>Poa sp</i>	5.7	1	8.6	<i>Poa sp</i>
Other Grass	8.6	1	9.7	<i>Achnatherum lettermanii</i> ,
Forb	14.3	1	27	<i>Lupinus sp</i>
Total Cover	82.8			
Ground cover(%)	Bare	Rock	Litter	Lichen, moss, biological crust
Ground Cover (no overhead plants)	5.7		11.4	
Ground Cover (includes beneath plants)	9.6		90.3	

**Plants intercepted on transect inside exclosure,
in order of frequency (2011)**

Mountain big sagebrush	<i>Artemisia tridentata</i> subsp. <i>vaseyana</i>	54%
Silky lupine	<i>Lupinus sericeus</i>	14%
Letterman's needlegrass	<i>Achnatherum lettermanii</i>	9%
Bluegrass	<i>Poa sp</i>	7%

Outside Exclosure 2009

Plants	Cover (%)	# Species	Height (in.) (average)	Two most common species
Aspen	14	1	55	<i>Populus tremuloides</i>
Aspen (dead)	4	1	36	<i>Populus tremuloides</i>
Shrub	33	1	39	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ,
<i>Poa pratensis</i>	8	1	9	<i>Poa pratensis</i>
Other Grass	12	1	4	<i>Achnatherum nelsonii</i> ,
Grasslike plants	0	0	0	
Forb	2	1	20	<i>Lupinus</i> sp
Total Cover	47	6		
Ground cover	Bare	Rock	Litter	Lichen, moss, biological crust
No overhead plants	25		75	

**Plants intercepted on transect outside exclosure,
in order of frequency**

Artemisia tridentata subsp. *vaseyana* 17
Achnatherum nelsonii 6
Poa pratensis 4
Lupinus sp. 1

Outside Exclosure - 2010

Plants	Cover (%)	# Species	Height (in.) (average)	Two most common species
Aspen	2	0	27	<i>Populus tremuloides</i>
Shrub	18	2	34	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> , <i>Symphoricarpos oreophilus</i>
<i>Poa pratensis</i>	0	0	0	<i>Poa pratensis</i>
Other Grass	4	2	5.5	<i>Bouteloua gracilis</i> , <i>Poa sp.</i>
Grasslike plants	7	1	3	<i>Carex stenophylla</i>
Forb	5	2	13	<i>Lupinus sericeus</i> , <i>Eriogonum racemosum</i>
Total Cover	36	6		
Ground cover	Bare	Rock	Litter	Lichen, moss, biological crust
No overhead plants	28		36	
Includes beneath vegetation	35		65	

**Plants intercepted on transect outside exclosure,
in order of frequency (2010)**

Mountain big sagebrush	<i>Artemisia tridentata</i> var <i>vaseyana</i>	16%
Sedge	<i>Carex stenophylla</i>	7%
Silky lupine	<i>Lupinus sericeus</i>	4%
Blue grama	<i>Bouteloua gracilis</i>	3%
Bluegrass	<i>Poa sp.</i>	1%
Red root buckwheat	<i>Eriogonum racemosum</i>	1%

Outside Exclosure - 2011

Plants	Cover (%)	# Species	Height (in.) (average)	Two most common species
Aspen	1.9	1	25	<i>Populus tremuloides</i>
Shrub	31.3	2	27	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> , <i>Symphoricarpos oreophilus</i>
<i>Poa</i> sp	1.9	1	2.5	<i>Poa</i> sp
Other Grass	3.9	1	6.5	Unknown,
Grasslike plants	11.7	1	3.4	<i>Carex</i> sp
Forb	9.7	2	16	<i>Lupinus sericeus</i> , <i>Eriogonum racemosum</i>
Total Cover	61.0			
Ground cover	Bare	Rock	Litter	Lichen, moss, biological crust
No overhead plants	15.6		23.5	
Includes beneath vegetation	25.4		74.5	

**Plants intercepted on transect outside exclosure,
in order of frequency (2011)**

Mountain big sagebrush	<i>Artemisia tridentata</i> var <i>vaseyana</i>	29%
Sedge	<i>Carex</i> sp	12%
Silky lupine	<i>Lupinus sericeus</i>	8%
Unkown Grass		4%
Aspen	<i>Populus tremuloides</i>	2%
Red root buckwheat	<i>Eriogonum racemosum</i>	2%
Snowberry	<i>Symphoricarpos oreophilus</i>	2%
Bluegrass	<i>Poa</i> sp	2%



Fig. 4 (10/13/09) Tall grasses, lupine, litter in range cage.



Fig. 5 (10/13/09) 5' aspen with unbrowsed leader, but may be accessible for browsing from outside, at edge of range cage

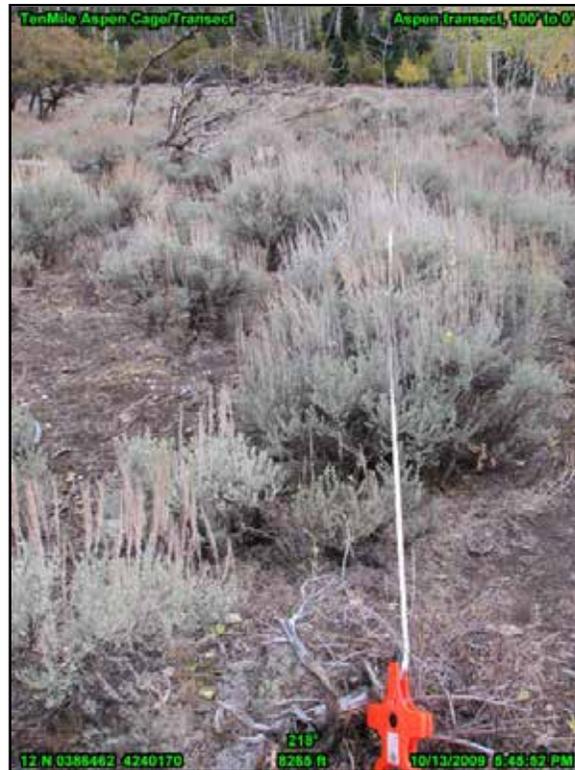


Fig. 6 (10/13/09) Outside transect at 100' looking toward 0°



Fig. 7 (10/13/09). Outside transect at 46': aspen with one dead leader >6'; others browsed



Fig. 8 (10/13/09) Riparian banks sheared; riparian vegetation grazed beyond Standard below enclosure



Fig. 9 (10/14/09) Riparian banks hummocked; riparian vegetation grazed beyond standard below enclosure



Fig. 10 (10/13/09) Large aspen enclosure surrounding permanent aspen range cage; fence broken by fallen log.



Fig. 11 (10/13/09) Western side of large aspen enclosure inadequately supported.



Fig 12 (9/29/2010) Bushy (and dying) aspen within the range cage UTM NAD 27 386373 E 4240196N



Fig 13 (8/31/2010) Aspen, sagebrush and perennial grasses inside aspen range cage



Fig 14 (8/31/2010) Photo inside large (~45 acres) enclosure



Fig 15 (9/28/2010) New 'outside' aspen transect in Ten Mile Pasture.



Fig 16 (9/28/2010) New 'outside' aspen transect from beginning of transect



Fig 17 (9/28/2010) Bare ground and browsed aspen along outside aspen transect



Fig 18 (9/28/2010) Typical browsed aspen along outside aspen transect



Fig 19 (9/9/2011) Aspen exclosure within larger Price Spring exclosure



Fig 20 (9/9/2011) Bushy and unhealthy aspen inside the enclosure.



Fig 21 (9/9/2011) Browsed aspen outside enclosure



Fig 22(9/9/2011) Aspen transect outside exclosure

Appendix A – Cover data in table format

Inside aspen permanent range cage Ten Mile Pasture

	Aspen In 10 mile		Cover		Avg height
Total Vegetation Cover			82.4		
Litter			14.7		
Bare Soil			2.9		
Total Ground Cover			97.1		
	Scientific Name	Common name	Cover	Rel Cover	
Cool season perennial grasses					
	Agropyron smithii	Western Wheatgrass	1.5	1.8	
	Agropyron trachycaulum	Slender Wheatgrass	P	P	
	Poa spp	Blugrass	4.4	5.5	7.8"
	Stipa columbiana	Nelson's Needle grass	1.5	1.8	
	Stipa lettermanii	Letterman's stipa	8.8	10.9	14.8"
		<i>Subtotal</i>	16.2	20.0	
Grasslike plants					
	Carex sp.	Sedge	P	P	
Introduced perennial grasses					
	Poa pratensis	Kentucky Bluegrass	P	P	
Perennial forbs					
	Lupinus sericeus	Silky lupine	5.1	12.7	
	Taraxacum officinale	Common Dandelion	P	P	
		<i>Subtotal</i>	5.1	12.7	
Shrubs					
	Artemisia tridentata	Big Sagebrush	54.4	67.3	34.3"
		<i>Subtotal</i>	54.4	67.3	

Aspen In Ten Mile 2011	n=35				
	Scientific Name	Common Name	Cover	Relative Cover	Avg ht (in)
Total Vegetation Cover			82.8		
Litter			11.4		
Bare Soil			5.7		
Total Ground Cover			94.2		
Cool season perennial grasses					
	<i>Poa sp</i>	Blugrass	5.7	6.9	8.6"
	<i>Stipa lettermanii</i>	Letterman's stipa	8.6	10.3	9.7"
Perennial forbs					
	<i>Lupinus argenteus</i>	Silvery Lupine	14.3	17.2	27"
Shrubs					
	<i>Artemisia tridentata</i>	Big Sagebrush	54.3	65.5	39"

Outside Permanent Range Cage Ten Mile Pasutre2010

	Aspen Outside 10 Mile		Cover		Avg Height
Total Vegetation Cover			36.0		
Litter			36.0		
Bare Soil			28.0		
Total Ground Cover			72.0		
	Scientific name	Common name	Cover	Rel Cover	
Cool season perennial grasses					
	Poa spp	Blugrass	1.0	2.8	
	Stipa lettermanii	Letterman's stipa	P	P	
		<i>Subtotal</i>	1.0	2.8	
Warm season perennial grasses					
	Bouteloua gracilis	Blue Grama	3.0	8.3	
		<i>Subtotal</i>	3.0	8.3	
Grasslike plants					
	Carex stenophylla	Sedge	7.0	19.4	2.8"
		<i>Subtotal</i>	7.0	19.4	
Perennial forbs					
	Astragalus convallarius	Lesser rushy milkvetch	P	P	
	Boechera sp	Rockcress	P	P	
	Erigeron divergens	Spreading fleabane	P	P	
	Eriogonum racemosum	Red root buckwheat	1.0	2.8	
	Lotus utahensis	Utah trefoil	P	P	
	Lupinus sericeus	Silky lupine	4.0	11.1	22.5"
	Penstemon sp	Penstemon	P	P	
		<i>Subtotal</i>	5.0	13.9	
Shrubs					
	Artemisia tridentata	Big Sagebrush	16.0	44.4	27.5"
	Quercus gambelli	Gambel's oak	P	P	
	Symphoricarpos oreophilus	Snowberry	2.0	5.6	
		<i>Subtotal</i>	18.0	50.0	
Trees					
	Cercocarpus ledifolius	Mountain Mahogany	P	P	
	Populus tremuloides	Aspen	2.0	5.6	27.3"
		<i>Subtotal</i>	2.0	5.6	

Aspen Out Ten Mile 2011	n=51				
	Scientific Name	Common Name	Cover	Relative Cover	Avg ht (in)
Total Vegetation Cover	Total Vegetation Cover		61.0		
Litter	Litter		23.5		
Bare Soil	Bare Soil		15.6		
Total Ground Cover	Total Cover		84.3		
Cool season perennial grasses					
	Unkonwn Graminae		3.9	6.5	
	<i>Poa sp</i>	Blugrass	1.9	3.2	2.5"
		Sub-total		9.7	
Grasslike plants					
	<i>Carex sp</i>	Sedge	11.7	19.4	3.4"
Perennial forbs					
	<i>Eriogonum racemosum</i>	Red root buckwheat	1.9	3.2	2"
	<i>Lupinus argenteus</i>	Silvery Lupine	7.8	12.9	18"
		Sub-total		16.1	
Shrubs					
	<i>Artemisia tridentata</i>	Big Sagebrush	29.4	48.4	27.9"
	<i>Symphoricarpos oreophilus</i>	Snowberry	1.9	3.2	9"
		Sub-total		56.1	
Trees					
	<i>Populus tremuloides</i>	Aspen	1.9	3.2	25"