

Trend Study 1-8-06

Study site name: Mud Springs Basin .

Vegetation type: Big Sagebrush-Grass .

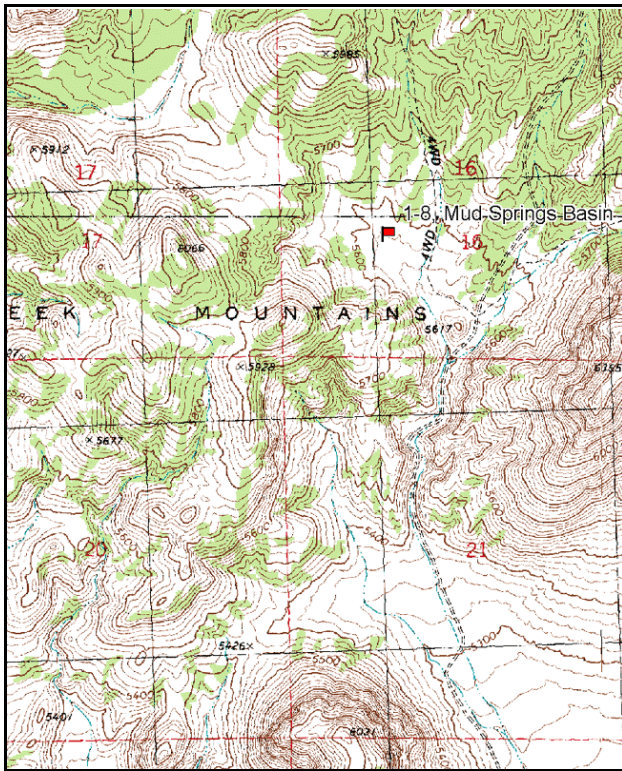
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (71ft), line 4 (59ft).

LOCATION DESCRIPTION

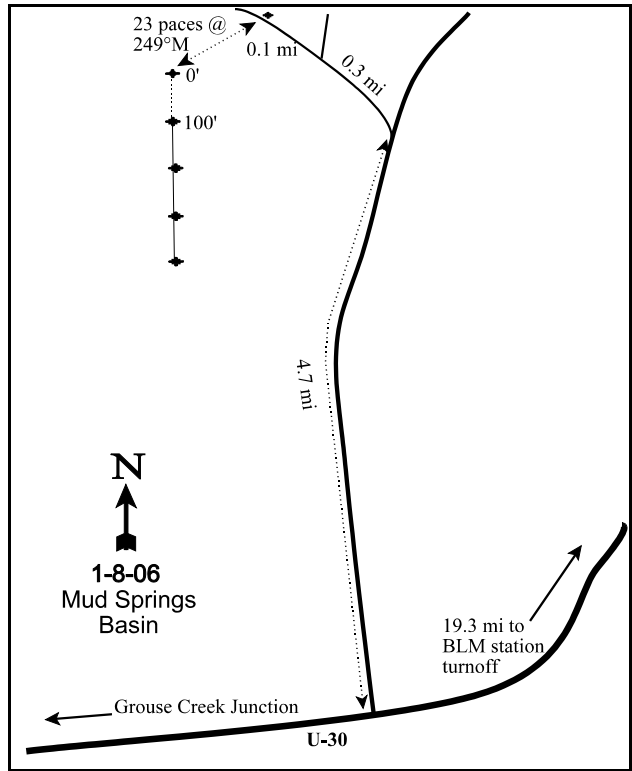
On U-30 proceed 19 miles southwest from the Rosebud BLM station turn-off and turn right (north) onto a gravel road just before mile marker 14. Proceed 4.7 miles and take a fork to the left for 0.3 miles. Take a very faint road to the left for 0.1 miles to a witness post on the right side of the road. From the witness post, walk 17 paces on an azimuth of 182 degrees magnetic to the 0-foot stake of the frequency baseline marked by browse tag #7913. Bearing of the baseline is 180 degrees true.

\* The old faint road is almost nonexistent. New road goes through belt 2.



Map Name: Lucin NE

Township 9N, Range 17W, Section 16



Diagrammatic Sketch

UTM NAD 27, UTM 12T 4597734 N, 266042 E

## DISCUSSION

### Mud Springs Basin - Trend Study No. 1-8

#### Study Information

This study (elevation: 5,580 feet, slope: 5%, aspect: southeast) is located approximately two miles southwest of Mud Springs Basin at the south end of the Grouse Creek Mountains. This area is critical deer winter range, which located on state trust lands. The small basin in which the study is located contains numerous small ridges occupied by fingers of juniper and black sagebrush separated by low areas (swales) occupied by the more deep rooted big sagebrush. The study samples a large sagebrush swale because of the importance of sagebrush during the winter. The pellet group transect in 2001 estimated 29 deer days use/acre (73 deer days use/ha). In 2006, 8 deer and 11 cow days use/acre (20 ddu/ha and 27 cdu/ha) were estimated.

#### Soil

Soil is moderately deep and alluvially deposited with minimal surface rockiness. It is part of the Codquin series (USDA-NRCS 2006). The texture is a loam with a slightly alkaline reaction (7.8 pH). Phosphorus is low at only 6.3 ppm, which may limit plant growth and development (Tiedemann and Lopez 2004). Bare interspaces have pavement covering the surface, but the soil beneath is easily erodible. Ground cover comes principally from sagebrush crowns, native grasses, and cheatgrass. The ratio of bare soil to protective ground cover is fair and the erosion condition class was determined to be moderate in 2001. Most signs of erosion are from pedestalling, flow patterns, and abundant rills. The ample vegetation and litter cover combined with the lack of steep slope prevents more serious soil erosion problems. A number of small drainage channels traverse the area, however none are deep or highly active. Most appear relatively stable. In 2006, the erosion condition class was rated as slight.

#### Browse

The key browse species is Wyoming big sagebrush. Density was estimated at 5,866 plants/acre in 1984. There was a considerable number of rodent damaged plants encountered that year, but decadence was still relatively low at 14%. The surviving mature and decadent plants received heavy deer use on those portions of the crown which protruded above the snow line. The surviving plants looked ragged, but nonetheless exhibited good vigor when examined in June of 1984. Wyoming big sagebrush density has declined with every reading: 3,732 plants/acre (1990), 3,240 (1996), 2,540 (2001), and 1,300 (2006). Between 2001 and 2006 density declined by nearly half. Decadence increased from 19% in 2001 to 35% in 2006. Plants classified as dying was low until 2001 (13%) and increased in 2006 (22%). Decadent and dying plants have not been replaced. Recruitment has declined with each reading. In 2006, no young plants were sampled, but a few seedlings were sampled. Sagebrush cover was 12% in 1996, 14% in 2001, and dropped to 7% in 2006. Utilization has been mostly light since 1984. The decline of this population of sagebrush is likely due to drought and competition with cheatgrass, which can out compete young and seedling sagebrush plants. Young and Evans (1989) showed that sagebrush recruitment was completely stopped in a cheatgrass-dominated community in northwestern Nevada.

Other shrubs sampled include: prickly phlox, narrowleaf low rabbitbrush, black sagebrush, and Nevada ephedra. Black sagebrush was sampled when the sampling design was expanded in 1996. It has increased in density since 1996. Density of narrowleaf rabbitbrush was very high in 1996 (3,300 plants/acre), but has declined since.

#### Herbaceous Understory

Native perennial grasses include: western wheatgrass, bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, and bottlebrush squirreltail. These perennial grasses produced nearly 15% cover in 1996, 11% cover in 2001 and 12% cover in 2006, which was 69% of the total grass cover. Cheatgrass has increased from 5% cover in 1996, to 13% in 2001, to 27% cover in 2006. High abundances of cheatgrass can be a fire hazard as well as compete with other desirable species. Cheatgrass was significantly more abundant in 2001 and

remained similar in 2006, but was more robust in 2006 as cover was much higher.

Forb diversity varies each year based on the timing and amounts of precipitation. Species numbers have varied from a high of 29 species in 1996 to a low of only 9 species in 1990. Forbs are not abundant and do not produce high amounts of forage. Musk-mustard (*Chorispora tenella*) is a weedy species that was sampled. It was noted it grows abundantly along the road.

#### 1990 TREND ASSESSMENT

Trend for big sagebrush is down. The density of mature plants declined from 3,066 to 1,400 plants/acre. Density of seedlings and young plants declined as well, but there appears to be sufficient numbers to maintain the population. Utilization of sagebrush was light but decadence increased from 14% to 29%. Trend for both grasses and forbs is up. Two perennial grasses increased significantly in nested frequency. Perennial forbs are also more abundant.

browse - down (-2)

grass - up (+2)

forb - up (+2)

#### 1996 TREND ASSESSMENT

Trend for the key browse species, Wyoming big sagebrush, is stable. Density of mature plants increased while the number of seedlings and young declined. Some of the differences in shrub densities is likely due to the increased sample size used in 1996. Utilization was mostly light and decadence fell slightly from 29% to 25%. One cause for concern is the increase in density of narrowleaf low rabbitbrush which rose from 199 to 3,300 plants/acre. Trend for grasses is stable. Sum of nested frequency of perennial grasses changed very little. Cheatgrass was sampled, but no prior data was taken on this species to be able to compare changes. The trend for forbs was up once again. Perennial forbs were much more abundant as sum of nested frequency more than doubled. The DCI score rated this site as good-excellent.

winter range condition (DC Index) - good-excellent (63) Lower potential scale

browse - stable (0)

grass - stable (0)

forb - up (+2)

#### 2001 TREND ASSESSMENT

Trend for the key browse species, Wyoming sagebrush, is slightly down with continuing decreases in density. The proportion of young plants has decreased from 12% to only 3%. Plants classified as dying increased to 13%. Utilization was classified as mostly light. Those classified with poor vigor have increased from 7% to 13%. One cause of concern in 1996 was the increase in density of narrowleaf low rabbitbrush which rose from 199 plants/acre in 1990 to 3,300 plants/acre in 1996. Currently it has decreased by 42% to 1,900 plants/acre. Trend for grasses is slightly down. Perennials remained stable, but cheatgrass increased significantly. The forb trend is down. Perennial forbs were much less abundant. The DCI score declined. Perennial grass cover was lower, cheatgrass cover increased, and perennial forb cover declined.

winter range condition (DC Index) - fair-good (47) Lower potential scale

browse - slightly down (-1)

grass - slightly down (-1)

forb - down (-2)

#### 2006 TREND ASSESSMENT

The browse trend is down. Wyoming big sagebrush density and cover declined by nearly half. Decadence increased from 19% to 35% and 22% of the population was classified as dying. There were no young plants sampled. Recruitment may be very poor due to the high competition with cheatgrass. Black sagebrush density has increased slightly, but is still not very abundant. The grass trend is stable. Perennial grasses have only decreased very slightly, while cheatgrass was not significantly more abundant, but was more robust with over 27% cover. The forb trend is slightly down. Perennial forb sum of nested frequency decreased 13% and the weedy, musk-mustard was sampled for the first time. The DCI score declined to poor-fair. Preferred browse cover was down, percent decadence increased, recruitment decreased, and cheatgrass cover was much higher.

winter range condition (DC Index) - poor-fair (27) Lower potential scale  
 browse - down (-2) grass - stable (0) forb - slightly down (-1)

HERBACEOUS TRENDS --  
 Management unit 01 , Study no: 8

T y p e	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron smithii	a <sup>-</sup>	b <sup>16</sup>	a <sup>-</sup>	b <sup>30</sup>	b <sup>12</sup>	-	.58	.08
G	Agropyron spicatum	46	84	78	77	80	3.88	3.45	3.53
G	Bromus tectorum (a)	-	-	a <sup>154</sup>	b <sup>268</sup>	b <sup>295</sup>	5.38	12.92	27.35
G	Oryzopsis hymenoides	24	27	34	35	27	2.56	1.57	1.19
G	Poa secunda	a <sup>51</sup>	b <sup>182</sup>	b <sup>176</sup>	b <sup>179</sup>	b <sup>198</sup>	6.24	4.49	7.14
G	Sitanion hystrix	b <sup>58</sup>	b <sup>63</sup>	b <sup>57</sup>	a <sup>21</sup>	a <sup>13</sup>	1.89	.45	.44
Total for Annual Grasses		0	0	154	268	295	5.38	12.92	27.35
Total for Perennial Grasses		179	372	345	342	330	14.59	10.55	12.40
Total for Grasses		179	372	499	610	625	19.97	23.47	39.75
F	Agoseris glauca	1	-	-	1	2	-	.00	.00
F	Alyssum alyssoides (a)	-	a <sup>-</sup>	a <sup>6</sup>	b <sup>-</sup>	36	.01	-	.17
F	Allium sp.	-	-	-	2	-	-	.00	-
F	Ambrosia artemisifolia	-	2	-	-	-	-	-	-
F	Antennaria rosea	a <sup>-</sup>	a <sup>-</sup>	ab <sup>6</sup>	ab <sup>4</sup>	b <sup>10</sup>	.07	.01	.15
F	Androsace septentrionalis (a)	-	-	-	1	-	-	.00	-
F	Arenaria sp.	-	-	-	1	-	-	.00	-
F	Astragalus beckwithii	8	-	6	3	-	.18	.03	-
F	Astragalus cibarius	a <sup>5</sup>	a <sup>6</sup>	b <sup>32</sup>	ab <sup>18</sup>	b <sup>28</sup>	.47	.22	.32
F	Astragalus newberryi	-	-	10	-	-	.07	-	-
F	Astragalus utahensis	-	8	1	-	1	.00	-	.00
F	Balsamorhiza hookeri	ab <sup>2</sup>	a <sup>-</sup>	b <sup>7</sup>	ab <sup>1</sup>	ab <sup>2</sup>	.30	.00	.06
F	Castilleja chromosa	3	-	-	-	-	-	-	-
F	Calochortus flexuosus	3	-	-	-	-	-	-	-
F	Camelina microcarpa (a)	-	-	c <sup>71</sup>	b <sup>26</sup>	a <sup>6</sup>	.18	.14	.01
F	Chaenactis douglasii	-	-	1	-	-	.00	-	-
F	Chorispora tenella (a)	-	-	4	-	8	.01	-	.07
F	Crepis acuminata	a <sup>1</sup>	b <sup>15</sup>	ab <sup>10</sup>	a <sup>1</sup>	a <sup>2</sup>	.25	.00	.16
F	Cryptantha sp.	a <sup>-</sup>	a <sup>-</sup>	b <sup>32</sup>	a <sup>-</sup>	a <sup>-</sup>	.35	-	-
F	Descurainia pinnata (a)	-	-	b <sup>46</sup>	c <sup>79</sup>	a <sup>6</sup>	.47	.33	.01
F	Eriogonum ovalifolium	-	-	1	-	-	.00	-	-
F	Erigeron pumilus	a <sup>-</sup>	a <sup>-</sup>	b <sup>14</sup>	b <sup>5</sup>	ab <sup>1</sup>	.05	.07	.03
F	Gayophytum ramosissimum(a)	-	-	b <sup>19</sup>	a <sup>-</sup>	a <sup>-</sup>	.04	-	-

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	<i>Gilia</i> sp. (a)	-	-	8	4	-	.02	.01	-
F	<i>Haplopappus</i> acaulis	a-	a-	b20	a-	a-	.46	-	-
F	<i>Halogeton</i> glomeratus (a)	-	10	-	-	-	-	-	-
F	<i>Hackelia</i> patens	a-	b16	c71	a-	a-	.18	-	-
F	<i>Lappula</i> occidentalis (a)	-	-	ab29	b41	a15	.11	.13	.05
F	<i>Mentzelia</i> albicaulis (a)	-	-	ab21	b-	a-	.08	-	-
F	<i>Penstemon</i> cyananthus	-	-	b17	a-	a-	.05	-	-
F	<i>Penstemon</i> sp.	-	-	1	-	-	.00	-	-
F	<i>Phlox</i> hoodii	a3	ab13	d54	cd49	bc31	.72	.45	.24
F	<i>Phlox</i> longifolia	a29	b66	a30	a37	a24	.16	.21	.09
F	<i>Ranunculus</i> testiculatus (a)	-	-	a-	ab7	b20	-	.01	.20
F	<i>Sisymbrium</i> altissimum (a)	-	-	b14	a3	a-	.05	.00	-
F	<i>Sphaeralcea</i> grossulariifolia	3	-	-	-	-	-	-	-
F	<i>Stellaria</i> jamesiana	-	-	-	-	2	-	-	.03
F	<i>Taraxacum</i> officinale	-	-	3	-	-	.00	-	-
F	<i>Tragopogon</i> dubius	-	-	3	-	3	.03	-	.01
F	Unknown forb-perennial	a-	b27	a-	a-	a-	-	-	-
F	<i>Veronica</i> biloba (a)	-	-	3	-	8	.01	-	.04
Total for Annual Forbs		0	10	221	161	99	1.00	0.64	0.57
Total for Perennial Forbs		58	153	319	122	106	3.39	1.03	1.11
Total for Forbs		58	163	540	283	205	4.39	1.68	1.69

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 01 , Study no: 8

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
		B	Artemisia nova	6	15	17	1.54
B	Artemisia tridentata wyomingensis	75	65	39	11.66	13.98	7.30
B	Chrysothamnus viscidiflorus stenophyllus	48	39	24	5.67	1.29	.45
B	Juniperus osteosperma	2	1	1	.15	.15	.15
B	Leptodactylon pungens	5	7	8	.33	.48	.12
B	Opuntia polyacantha	0	2	3	.00	.03	.18
Total for Browse		136	129	92	19.35	17.22	9.65

CANOPY COVER, LINE INTERCEPT --

Management unit 01 , Study no: 8

Species	Percent Cover
	'06
Artemisia nova	1.96
Artemisia tridentata wyomingensis	7.63
Chrysothamnus viscidiflorus stenophyllus	1.41
Juniperus osteosperma	.28
Leptodactylon pungens	.26
Opuntia polyacantha	.15

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 01 , Study no: 8

Species	Average leader growth (in)	
	'01	'06
Artemisia tridentata wyomingensis	1.0	2.1

POINT-QUARTER TREE DATA --

Management unit 01 , Study no: 8

Species	Trees per Acre		Average diameter (in)	
	'01	'06	'01	'06
Juniperus osteosperma	52	29	6.7	9.6

BASIC COVER --

Management unit 01 , Study no: 8

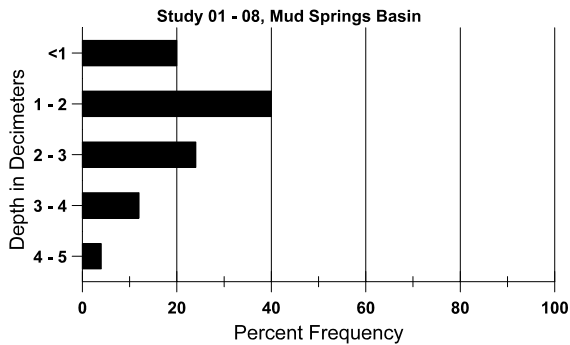
Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	2.25	7.00	47.15	42.79	52.86
Rock	1.75	1.75	3.30	1.93	1.60
Pavement	12.00	21.25	13.01	12.39	10.67
Litter	70.25	39.00	41.55	31.90	32.35
Cryptogams	1.00	1.25	1.82	2.78	.29
Bare Ground	12.75	29.75	12.91	19.01	18.38

SOIL ANALYSIS DATA --

Herd Unit 01, Study no: 08, Mud Springs Basin

Effective rooting depth (in)	Temp °F (depth)	PH	Loam			%OM	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
20.3	56.6 (19.7)	7.8	43.4	32.4	25.3	2.3	6.3	540.8	0.7

### Stoniness Index



PELLET GROUP DATA --

Management unit 01 , Study no: 8

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	10	2	18
Elk	-	1	-
Deer	53	22	3
Cattle	1	-	5
Antelope	-	-	-

Days use per acre (ha)	
'01	'06
-	-
-	-
29 (73)	8 (20)
-	11 (27)
3 (7)	-

BROWSE CHARACTERISTICS --  
Management unit 01 , Study no: 8

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Artemisia nova</b>												
84	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-
90	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-
96	<b>320</b>	-	20	80	220	40	19	69	69	31	31	8/25
01	<b>840</b>	-	40	460	340	80	0	0	40	12	12	7/22
06	<b>940</b>	-	80	780	80	40	0	0	9	9	9	11/23
<b>Artemisia tridentata wyomingensis</b>												
84	<b>5866</b>	25333	2000	3066	800	-	42	31	14	1	7	26/34
90	<b>3732</b>	466	1266	1400	1066	-	0	0	29	4	14	22/22
96	<b>3240</b>	20	380	2060	800	620	3	1	25	7	7	23/37
01	<b>2540</b>	60	80	1980	480	1200	6	.78	19	13	13	22/28
06	<b>1300</b>	200	-	840	460	1740	5	0	35	22	22	24/33
<b>Atriplex canescens</b>												
84	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
90	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
96	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
01	<b>0</b>	-	-	-	-	20	0	0	-	-	0	-/-
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
<b>Chrysothamnus viscidiflorus stenophyllus</b>												
84	<b>266</b>	66	-	266	-	-	100	0	0	-	75	12/14
90	<b>199</b>	-	66	133	-	-	0	0	0	-	0	10/9
96	<b>3300</b>	-	280	2940	80	20	0	0	2	.60	.60	12/20
01	<b>1900</b>	-	180	1140	580	120	0	0	31	11	11	9/14
06	<b>860</b>	20	20	840	-	-	0	0	0	-	0	9/16
<b>Gutierrezia sarothrae</b>												
84	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
90	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
96	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
01	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
06	<b>0</b>	-	-	-	-	-	0	0	-	-	0	9/13

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Juniperus osteosperma</b>												
84	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
90	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
96	<b>40</b>	-	20	20	-	-	0	0	-	-	0	-/-
01	<b>20</b>	-	-	20	-	-	0	0	-	-	0	-/-
06	<b>20</b>	-	20	-	-	-	0	0	-	-	0	-/-
<b>Leptodactylon pungens</b>												
84	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
90	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
96	<b>100</b>	-	20	80	-	-	0	0	-	-	0	5/11
01	<b>280</b>	20	-	280	-	-	0	0	-	-	0	6/7
06	<b>240</b>	20	-	240	-	-	0	0	-	-	0	9/9
<b>Opuntia polyacantha</b>												
84	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
90	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-
96	<b>0</b>	-	-	-	-	-	0	0	-	-	0	5/14
01	<b>40</b>	-	-	40	-	-	0	0	-	-	0	3/6
06	<b>60</b>	-	-	60	-	-	0	0	-	-	0	5/9