Trend Study 6-7-06

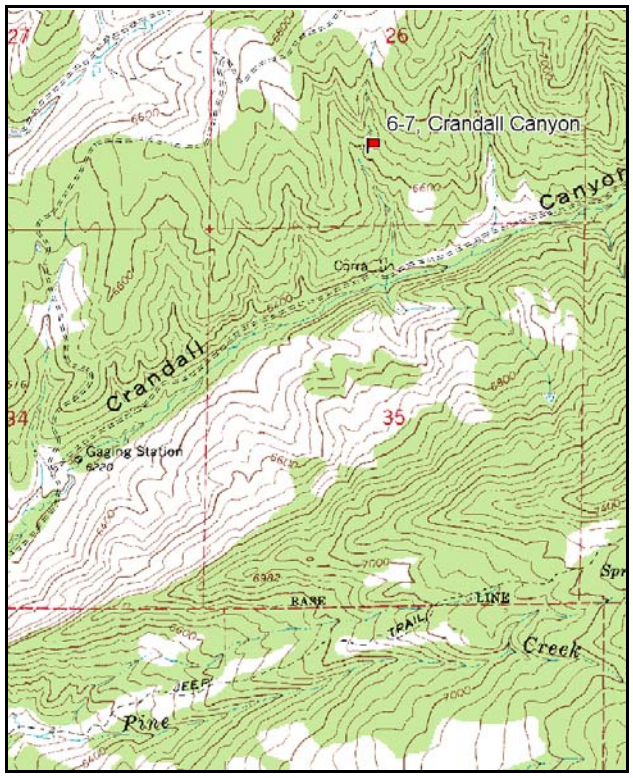
Study site name: Crandall Canyon . Vegetation type: Mountain Brush .

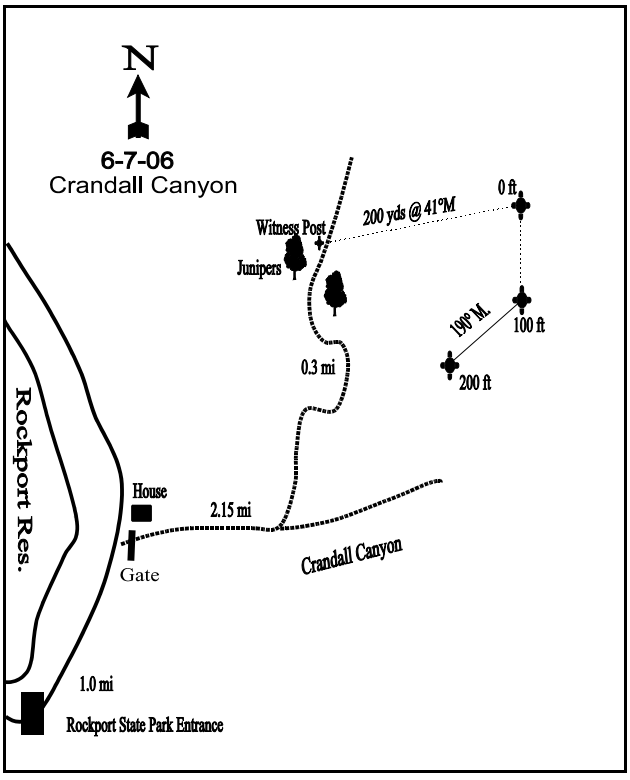
Compass bearing: frequency baseline 165 degrees magnetic.

Frequency belt placement: Line 1 (11, 31, & 71ft), line 2 (59 & 95ft).

LOCATION DESCRIPTION

From the guard house at Rockport State Park, proceed north and east on the paved road for 1.0 mile. Turn right, proceed up though the gate and up Crandall Canyon (dirt road) for 2.15 miles, and turn left at the fork. Travel 0.3 miles north on this road to a pair of junipers on either side of the road. Just past the junipers on the left hand side of the road is a witness post. From the witness post walk approximately 200 yards at 41 degrees magnetic to the 0-foot stake of the baseline. The 0-foot stake is marked by browse tag #7956. The 200-foot baseline doglegs and runs 190 degrees magnetic.





Map Name: Crandall Canyon Diagrammatic Sketch

Township 1N , Range 5E , Section 26 UTM NAD 27, UTM 12T 4514925 N 470499 E

DISCUSSION

Crandall Canyon - Trend Study No. 6-7

Study Information

This study is located on critical deer and elk winter range east of Rockport Lake (elevation: 6,600 feet, slope: 28%, aspect: southwest). The plant community is best described as mixed mountain brush with patches of mountain big sagebrush-grass and Gambel oak. The result is a mosaic vegetation pattern that provides excellent big game habitat. Crandall Canyon is privately owned and is grazed by sheep and cattle. Big game use is heavy and animals are usually seen here at all times of the year. All types of vegetation have been impacted by grazing or browsing since the establishment of this study. The pellet group transect in 2001 estimated 50 deer days use/acre (122 ddu/ha), 2 elk days use/acre (5 edu/ha), and 7 cow days use/acre (16 cdu/ha). The 2006 pellet group data estimates were only 15 deer and 1 elk days use/acre (36 ddu/ha and 3 edu/ha).

Soil

The soil is in the Yeates Hollow-Henefer series complex, which consists of deep to very deep, well drained and moderately well drained, slowly permeable soils that formed in alluvium, colluvium, and residuum from conglomerate, sandstone, and quartzite. They are found on fan remnants, hills, mountain toeslopes, and mountain slopes (USDA-NRCS 2006). The soil texture is classified as sandy clay loam and the soil reaction is moderately alkaline (8.0 pH). Phosphorus is low at 5.1 ppm; values less than 6 ppm may limit normal plant growth and development (Tiedemann and Lopez 2004). The soil profile is moderately rocky throughout. Some erosion is apparent with pedestalling around some of the plants. The relative bare ground cover was 27% in 1996, 36% in 2001, and 38% in 2006. The erosion condition class assessment estimated slight soil erosion in 2001 and moderate erosion in 2006. Gullies are evident, but many of them show signs of healing. Most of the area has been utilized heavily enough to adversely effect plant and litter cover, especially when associated with periods of drought. Sheet and gully erosion have been high in the past, but appear to have been stabilizing in recent years.

Browse

The majority of the vegetation is composed of a diverse mixture of mountain brush species. Twelve species have been sampled. The abundant species are true mountain mahogany, mountain snowberry, Gambel oak, serviceberry, mountain big sagebrush, and bitterbrush. The estimated density of two species, serviceberry and mountain big sagebrush, decreased substantially after the 1990 sampling. Both of these species have discontinuous, clumped distributions, and much of the change in density is due to the larger sample size implemented during 1996 reading. Sagebrush density has decreased from 340 plants/acre in 1996 to 200 plants/acre in 2006 and serviceberry has decreased from 580 plants/acre in 1996 to 320 plants/acre in 2006. In 1990, percent decadence and poor vigor were high in the populations of serviceberry, mountain big sagebrush, mountain mahogany, and snowberry. Beginning in 1996, percent decadence and vigor have shown considerable improvement for all of these species. The key browse species receive moderate to heavy use and have stable populations. In 2001 and 2006, the highest use was observed on mountain mahogany, but mahogany densities have remained relatively stable. Mahogany densities have remained between 1,060 and 1,200 plants/acre since 1996. Consistent heavy browsing on mahogany has resulted in a population of short-statured plants. Pocket gopher and badger diggings around plants were noted in the past. A moderate rust infestation on serviceberry plants has also been sampled in past readings, which does not usually kill plants, but can effect vigor.

Juniper has been invading the study area. Juniper line intercept cover has increased from 7% in 2001 to 13% in 2006. Juniper density estimated from the point-centered-quarter method was 40 trees/acre in 2006.

Herbaceous Understory

The herbaceous understory is quite sparse for a mountain brush community. Forbs are insignificant and only

provided 2-3% average cover from 1996 to 2006. Grasses have contributed an average of 11% cover in 1996 and 2001, and 17% cover in 2006. Thickspike wheatgrass, bluebunch wheatgrass, and Indian ricegrass are the most abundant perennial grasses. Two annuals, cheatgrass and Japanese brome, are present, but not abundant. Both of these annual bromes have remained at low nested frequencies since 1996.

1990 TREND ASSESSMENT

The mixed mountain brush community on this privately-owned winter range still provides good big game habitat, although conditions have deteriorated for some species. Photo-point comparisons depict a loss of sagebrush cover and production. Sagebrush density is slightly higher, however. Sagebrush canopy cover averages only 5%. True mountain mahogany density decreased and a loss of mature plants occurred, resulting in 88% decadence. Vigor is poor on these heavily hedged shrubs. Oakbrush, low rabbitbrush, and snakeweed increased in several, but not all measured parameters. Thickspike wheatgrass nested frequency increased significantly. The nested frequency of Indian ricegrass is unchanged, while that of bluebunch wheatgrass was significantly lower. Forbs are relatively insignificant.

browse - stable (0) grass - stable (0) forb - stable (0)

1996 TREND ASSESSMENT

Since the drought from 1987 to 1990, there have been some signs of recovery. The browse trend is stable. Browse densities for sagebrush and serviceberry have decreased because of the change in sample size and location in 1996. Mountain mahogany density remained unchanged. Decadence and the percentage of plants classified as dying has decreased for all key browse species. The grass trend is stable. The nested frequency of perennial grasses is unchanged. The forb trend is stable. The nested frequency of perennial forbs increased, but some of the increase is due to a change in sample area and none of the species increases are beneficial to big game. The Desirable Components Index score is fair due to low preferred browse cover, low browse decadence, good perennial grass cover, and moderate perennial forb cover.

winter range condition (DC Index) - fair (60) High potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2001 TREND ASSESSMENT

Trend for browse is stable. The preferrred species remained at stable densities. Percent decadence increased in mountain big sagebrush and mountain mahogany, but current levels are within acceptable limits for these species. Use remains moderate to heavy on true mountain mahogany, serviceberry, and mountain big sagebrush. Recruitment from young plants is low for big sagebrush and mahogany, but moderately high for serviceberry. The grass trend is slightly down. The nested frequency of perennial grasses decreased 16%, but the nested frequencies of individuals species did not change. The forb trend is stable. The nested frequency of perennial forbs is unchanged and forb composition did not change. The DCI score declined to poor due to decreases in browse cover and percent young and an increase in decadence.

winter range condition (DC Index) - poor (51) High potential scale
browse - stable (0) grass - slightly down (-1) forb - stable (0)

2006 TREND ASSESSMENT

The browse trend is slightly down. The densities of serviceberry, sagebrush, and mahogany all decreased slightly. Mahogany cover decreased slightly and the strip frequency of serviceberry and sagebrush decreased. Juniper line intercept cover nearly doubled. The grass trend is stable. The nested frequency of perennial grasses is unchanged. The nested frequency of thickspike wheatgrass increased significantly and the nested frequency of bluebunch wheatgrass decreased significantly. The forb trend is stable. The nested frequency of perennial forbs decreased, but forb composition remained poor for big game forage. The DCI score returned to fair due to a decrease in decadence and an increase in perennial grass cover.

winter range condition (DC Index) - fair (60) High potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 06 , Study no: 7

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
G	Agropyron dasystachyum	a26	c268	b126	b100	c219	3.48	2.92	9.85
G	Agropyron spicatum	b244	a21	b147	b133	a44	4.57	5.35	2.71
G	Bromus japonicus (a)	-	-	a-	ab10	b19	-	.04	.09
G	Bromus tectorum (a)	-	-	b57	b40	a20	.22	.15	.05
G	Carex sp.	b19	ab12	ab8	ab6	a1	.16	.08	.03
G	Elymus cinereus	-	-	-	1	-	-	.03	-
G	Oryzopsis hymenoides	53	53	72	49	55	1.62	1.81	3.05
G	Poa pratensis	-	-	1	5	3	.00	.06	.03
G	Poa secunda	4	6	20	13	17	.18	.03	.09
G	Sitanion hystrix	-	3	4	3	-	.00	.03	-
G	Stipa comata	a1	ab10	ab8	b15	b12	.45	.64	1.08
Total for Annual Grasses		0	0	57	50	39	0.21	0.20	0.14
Total for Perennial Grasses		347	373	386	325	351	10.48	10.97	16.87
Total for Grasses		347	373	443	375	390	10.70	11.17	17.01
F	Achillea millefolium	-	-	4	1	-	.03	.03	-
F	Agoseris glauca	-	-	-	-	3	-	-	.00
F	Alyssum alyssoides (a)	-	-	b215	ab182	a177	1.00	.84	.43
F	Arabis sp.	-	-	-	1	-	-	.00	-
F	Aster chilensis	a-	a-	b32	b36	b14	.52	.48	.11
F	Astragalus convallarius	-	-	-	-	1	-	-	.03
F	Astragalus sp.	-	3	-	-	-	-	-	-
F	Balsamorhiza sagittata	3	3	5	2	-	.06	.03	.03
F	Camelina microcarpa (a)	-	-	a-	a1	b29	-	.00	.06
F	Calochortus nuttallii	-	-	-	5	-	-	.18	-
F	Chaenactis douglasii	4	11	13	5	1	.08	.04	.00
F	Cirsium sp.	-	-	-	-	1	-	-	.03
F	Cirsium undulatum	9	5	22	27	16	.63	.90	.61
F	Collomia linearis (a)	-	-	-	3	-	-	.00	-
F	Comandra pallida	28	12	28	25	23	.19	.22	.14
F	Cryptantha sp.	a19	b34	a22	ab30	a12	.27	.50	.37
F	Descurainia pinnata (a)	-	-	1	-	1	.00	-	.00
F	Epilobium brachycarpum (a)	-	-	1	-	1	.00	-	.00

Type	Species	Nested Frequency					Average Cover %		
		'84	'90	'96	'01	'06	'96	'01	'06
F	Eriogonum umbellatum	-	3	-	-	3	-	-	.03
F	Hackelia patens	$_{c}$32	$_{ab}$10	$_{bc}$21	$_{ab}$8	$_{a}$4	.20	.04	.18
F	Lactuca serriola	-	-	1	-	-	.00	-	-
F	Oenothera caespitosa	-	-	-	1	-	-	.03	-
F	Penstemon humilis	11	6	9	15	10	.09	.18	.07
F	Phlox longifolia	-	-	-	-	1	-	-	.00
F	Ranunculus testiculatus (a)	-	-	$_{a}$-	$_{b}$14	$_{a}$-	-	.02	-
F	Smilacina racemosa amplexicaulis	$_{a}$-	$_{a}$-	$_{b}$6	$_{a}$3	$_{a}$-	.07	.03	-
F	Tragopogon dubius	2	-	4	-	6	.06	-	.06
F	Unknown forb-perennial	3	-	-	-	-	-	-	-
Total for Annual Forbs		0	0	217	200	208	1.01	0.88	0.50
Total for Perennial Forbs		111	87	167	159	95	2.24	2.71	1.68
Total for Forbs		111	87	384	359	303	3.25	3.59	2.19

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

BROWSE TRENDS --
Management unit 06 , Study no: 7

Type	Species	Strip Frequency			Average Cover %		
		'96	'01	'06	'96	'01	'06
B	Amelanchier alnifolia	22	25	16	1.68	1.17	2.56
B	Artemisia tridentata vaseyana	13	11	8	.94	.56	.63
B	Cercocarpus montanus	38	38	40	5.02	4.66	2.92
B	Chrysothamnus viscidiflorus viscidiflorus	20	23	19	.74	1.50	1.55
B	Gutierrezia sarothrae	82	77	36	4.02	3.67	.44
B	Juniperus osteosperma	2	6	7	2.39	3.37	5.87
B	Opuntia sp.	10	7	11	.51	.45	.18
B	Purshia tridentata	1	1	1	.63	.38	.38
B	Quercus gambelii	6	8	9	2.65	1.66	2.16
B	Rosa woodsii	0	1	0	.15	-	-
B	Symphoricarpos oreophilus	19	19	21	2.75	3.59	1.97
B	Tetradymia canescens	4	3	0	.18	.38	-
Total for Browse		217	219	168	21.69	21.43	18.69

CANOPY COVER, LINE INTERCEPT --
Management unit 06 , Study no: 7

Species	Percent Cover	
	'01	'06
Amelanchier alnifolia	-	3.48
Artemisia tridentata vaseyana	-	.30
Cercocarpus montanus	-	2.59
Chrysothamnus viscidiflorus viscidiflorus	-	1.01
Gutierrezia sarothrae	-	.98
Juniperus osteosperma	6.80	13.14
Opuntia sp.	-	.08
Purshia tridentata	-	1.01
Quercus gambelii	3.40	4.31
Symphoricarpos oreophilus	-	3.45

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 06 , Study no: 7

Species	Average leader growth (in)	
	'01	'06
Amelanchier alnifolia	-	2.7
Artemisia tridentata vaseyana	-	2.2
Cercocarpus montanus	1.9	2.3

POINT-QUARTER TREE DATA --
Management unit 06 , Study no: 7

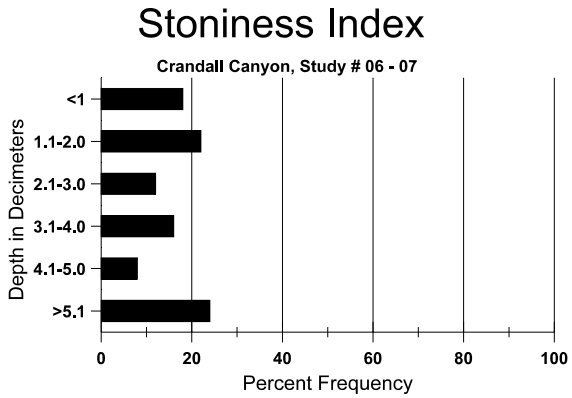
Species	Trees per Acre		Average diameter (in)	
	'01	'06	'01	'06
Juniperus osteosperma	-	40	-	8.5

BASIC COVER --
Management unit 06 , Study no: 7

Cover Type	Average Cover %				
	'84	'90	'96	'01	'06
Vegetation	4.50	9.50	34.75	37.41	38.00
Rock	2.75	4.75	3.69	3.95	4.17
Pavement	11.25	7.25	5.34	4.38	4.35
Litter	46.50	37.00	38.81	26.92	26.64
Cryptogams	.25	0	.03	0	0
Bare Ground	34.75	41.50	31.27	41.62	45.29

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 07, Crandall Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	Sandy clay loam			%0M	PPM P	PPM K	dS/m
			%sand	%silt	%clay				
15.8	68.0 (14.8)	8.0	58.7	12.0	29.3	1.7	5.1	32.0	0.5



PELLET GROUP DATA --
Management unit 06 , Study no: 7

Type	Quadrat Frequency		
	'96	'01	'06
Rabbit	-	11	3
Elk	5	2	2
Deer	15	22	7
Cattle	-	1	-

Days use per acre (ha)	
'01	'06
-	-
2 (5)	1 (3)
50 (122)	15 (36)
7 (16)	-

BROWSE CHARACTERISTICS --
Management unit 06 , Study no: 7

		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)
Amelanchier alnifolia												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**1133**	-	533	-	600	-	24	18	53	9	29	-/-
96	**580**	20	120	400	60	40	21	21	10	-	14	21/22
01	**640**	-	160	400	80	-	28	34	13	6	9	22/27
06	**320**	-	80	200	40	20	19	44	13	-	19	25/30

		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)
Artemisia tridentata vaseyana												
84	**866**	-	66	400	400	-	62	31	46	-	0	20/23
90	**1133**	66	-	333	800	-	12	59	71	7	41	19/23
96	**340**	-	80	240	20	140	24	41	6	-	0	14/25
01	**280**	-	20	180	80	40	36	43	29	-	0	16/26
06	**200**	60	-	160	40	100	50	20	20	20	20	23/31
Cercocarpus montanus												
84	**1333**	-	133	600	600	-	15	85	45	-	0	17/18
90	**1065**	-	66	66	933	-	13	81	88	8	31	6/10
96	**1120**	20	220	860	40	40	27	43	4	-	2	21/29
01	**1200**	-	40	940	220	20	7	80	18	13	13	26/35
06	**1060**	-	100	740	220	60	9	66	21	4	6	20/34
Chrysothamnus viscidiflorus viscidiflorus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**6266**	-	1400	3133	1733	-	16	0	28	4	43	9/7
96	**1020**	-	20	960	40	-	2	2	4	-	0	10/12
01	**1640**	-	60	1580	-	20	0	0	0	-	0	8/11
06	**1120**	-	100	1000	20	-	5	0	2	-	0	9/16
Gutierrezia sarothrae												
84	**4599**	-	-	4466	133	-	1	0	3	-	0	11/13
90	**7999**	2333	2866	4333	800	-	0	0	10	.50	3	8/7
96	**7640**	620	820	6820	-	-	0	0	0	-	0	9/11
01	**10680**	20	180	9760	740	520	0	0	7	4	4	6/8
06	**1360**	40	220	1120	20	-	0	0	1	-	0	7/10
Juniperus osteosperma												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**40**	-	40	-	-	20	0	0	-	-	0	-/-
01	**120**	-	-	120	-	-	0	0	-	-	0	-/-
06	**140**	-	20	120	-	-	0	0	-	-	0	-/-
Opuntia sp.												
84	**399**	-	133	200	66	-	0	0	17	-	0	10/7
90	**199**	-	66	133	-	-	0	0	0	-	0	6/6
96	**380**	-	60	320	-	-	0	0	0	-	0	5/15
01	**300**	20	-	180	120	-	0	0	40	27	27	4/9
06	**440**	-	60	380	-	20	0	0	0	-	0	4/13

		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)
Purshia tridentata												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**0**	-	-	-	-	-	0	0	0	-	0	-/-
96	**40**	-	-	20	20	-	50	0	50	-	0	-/-
01	**60**	-	-	60	-	-	0	0	0	-	0	14/51
06	**20**	-	-	20	-	-	100	0	0	-	0	12/54
Quercus gambelii												
84	**1999**	-	733	1266	-	-	27	47	0	-	0	30/19
90	**4400**	666	3200	-	1200	-	26	6	27	.45	18	-/-
96	**720**	60	120	600	-	-	0	0	0	-	0	28/18
01	**1320**	-	340	980	-	80	0	0	0	-	0	47/24
06	**1460**	-	340	1120	-	40	0	0	0	-	0	40/19
Rosa woodsii												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**0**	-	-	-	-	-	0	0	-	-	0	16/10
01	**40**	-	-	40	-	-	0	0	-	-	0	9/6
06	**0**	-	-	-	-	-	0	0	-	-	0	19/12
Symphoricarpos oreophilus												
84	**0**	-	-	-	-	-	0	0	0	-	0	-/-
90	**866**	-	133	-	733	-	54	8	85	18	62	-/-
96	**940**	20	340	520	80	20	32	2	9	2	2	16/26
01	**560**	-	120	440	-	-	0	0	0	-	0	18/29
06	**1000**	-	80	640	280	-	0	4	28	14	16	16/22
Tetradymia canescens												
84	**0**	-	-	-	-	-	0	0	-	-	0	-/-
90	**0**	-	-	-	-	-	0	0	-	-	0	-/-
96	**200**	-	20	180	-	-	90	0	-	-	0	15/18
01	**100**	-	20	80	-	-	0	0	-	-	0	10/15
06	**0**	-	-	-	-	-	0	0	-	-	0	6/15