Trend Study 19A-1-07

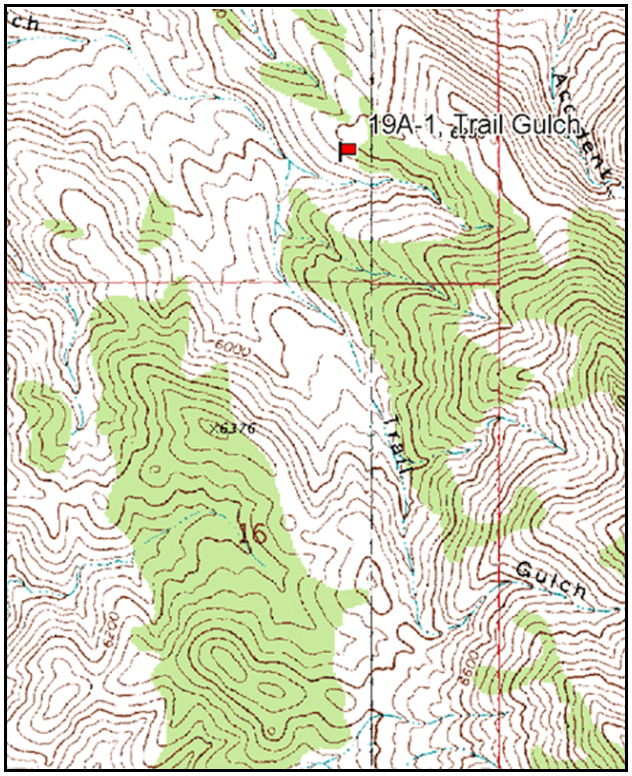
Study site name: Trail Gulch . Vegetation type: Stansbury Cliffrose .

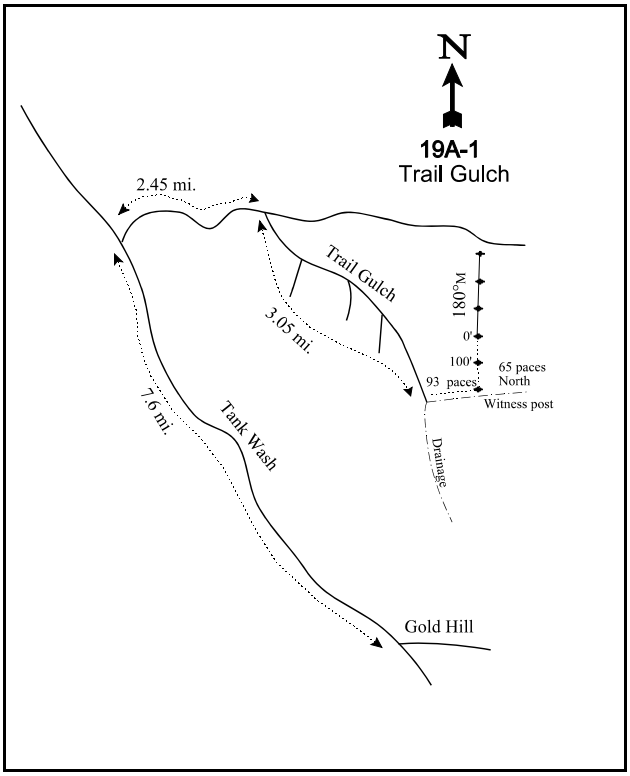
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). Rebar: none on site, too rocky.

LOCATION DESCRIPTION

Beginning at Gold Hill, proceed northwesterly toward Gold Hill Pass and Tank Wash for 7.60 miles to a road to the north. Turn right and proceed northerly for 2.45 miles to a dirt road to the southeast up Trail Gulch. Proceed up Trail Gulch for 3.05 miles staying to the left (straight) at all intersections. Stop where the road ends and two drainages come together. From the intersection of the streambeds, walk 93 paces easternly, along the left drainage to a green steel "T" fencepost on the north side of the streambed. From the fencepost, walk 65 paces north to the 0-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake has a red browse tag, number 3970, attached.





Map Name: Ochre Mountain

Diagrammatic Sketch

Township 7S , Range 18W , Section 9

GPS: NAD 83, UTM 12T 255223 E 4457093 N

DISCUSSION

Trail Gulch - Trend Study No. 19A-1

Study Information

This study monitors winter range on the north end of the Deep Creek Mountains. It is dry, rocky, and occupied by a sparse stand of Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*) and black sagebrush (*Artemisia nova*) in association with scattered Utah juniper (*Juniperus osteosperma*) [elevation: 5,900 feet (1,790 m), slope: 30-45%, aspect: south]. In 1983, utilization was reportedly intense, although relatively few deer pellet groups were observed. Several broods of chukars were observed in the area in 1983. In 1989 and 1997, utilization by livestock and wildlife was noted as infrequent. From the pellet group transect, deer use was estimated at 22 days use/acre (55 ddu/ha) in 2002 and 5 days use/acre (13 ddu/ha) in 2007. Elk use was estimated at 1 elk day use/acre (3 edu/ha) in 2007.

Soil

The soil is in the Amtoft series. These soils are shallow and well-drained, and formed in material weathered from calcareous sedimentary rocks (USDA-NRCS 2007). Rocks are angular shaped and uniformly dark grey in color. The soil texture is clay loam with a neutral reaction (pH 7.1). Relative bare ground cover has been low to moderately low at 3%-11% in all years, and combined vegetation and litter cover has been high at 46%-57%. The combined relative rock and pavement cover have also been high at 38%-45%. The erosion condition was classified as slight in 2002 and 2007. The soil showed recent surface litter and soil movement as well as flow patterns.

Browse

The key browse species are Stansbury cliffrose, Nevada ephedra (*Ephedra nevadensis*), and black sagebrush. On average, black sagebrush has provided more cover than any other preferred browse. Stansbury cliffrose density was estimated at 340 plants/acre (840 plants/ha) in 1997, 380 plants/acre (939 plants/ha) in 2002, and 360 plants/acre (642 plants/ha) in 2007. The population has been composed predominantly of mature plants and few young. Decadence has ranged from 0%-40% of the population. Vigor has been generally good. Utilization of cliffrose was moderate-heavy in 2002, but lighter in other sample years. Even with drought in 2002, cliffrose had an abundance of flowers and annual leaders. The average annual growth was 1.8 inches (4.6 cm) in 2002, and increased to 2.3 inches (5.8 cm) in 2007.

Nevada ephedra had an estimated density of 820 plants/acre (2,025 plants/ha) in 1997, 660 plants/acre (1,630 plants/ha) in 2002, and 720 plants/acre (1,778 plants/ha) in 2007. Decadence has ranged from 7-69%. Vigor was good in 1989 and 1997, but poor in 1983, 2002, and 2007. Use was heavy in 1983, light-moderate in 1989 and 1997, and moderate-heavy in 2002 and 2007.

The population of black sagebrush was estimated at 840 plants/acre (2,075 plants/ha) in 1997, 1,400 plants/acre (3,458 plants/ha) in 2002, and 980 plants/acre (2,421 plants/ha) in 2007. Decadence has ranged from 11%-53%. Use on black sagebrush has been moderate overall and vigor has generally been good. Annual leaders averaged less than 1 inch (2.5 cm) of growth in 2002 and 2007.

Other browse sampled include shadscale (*Atriplex confertifolia*), California brickellia (*Brickellia californica*), broom snakeweed (*Gutierrizia sarothrae*), narrowleaf low rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*), and littleleaf horsebrush (*Tetradymia glabrata*). Broom snakeweed was the most abundant in 1983 and 1989, but decreased to 20 plants/acre (49 plants/ha) by 2007. Single-leaf pinyon (*Pinus monophylla)* and Utah juniper are scattered across the landscape. Point-center quarter data estimates were 14 pinyon/acre (35 pinyon/ha) in 1997 and 34 pinyon/acre (84 pinyon/ha) in 2007. Juniper estimates were 53 juniper/acre (131 juniper/ha) in 1997, and 76 juniper/acre (188 juniper/ha) in 2007. The average trunk diameter for juniper was 8.7 inches (22.1 cm) in 1997 and 7.7 inches (19.6 cm) in 2007. The average trunk diameter for pinyon

was 4.1 inches (10.4 cm) in 1997 and 3 inches (7.6 cm) in 2007.

Herbaceous Understory

The dominant grass is cheatgrass (*Bromus tectorum*). It provided 64% of the grass cover in 1997, 52% in 2002, and 48% in 2007. Cheatgrass nested frequency significantly decreased in 2002, and remained stable in 2007. Its cover decreased from 7% in 1997, to 4% in 2007. Bluebunch wheatgrass (*Agropyron spicatum*) is the most abundant perennial grass. It has maintained a stable nested frequency and cover since 1997. Other less abundant grasses that have been sampled include galleta (*Hilaria jamesii*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), bottlebrush squirreltail (*Sitanion hystrix*), and sand dropseed (*Sporobolus cryptandrus*).

The forb component, including annual species, is neither abundant nor diverse. Longleaf phlox (*Phlox longifolia*) is the most abundant species but was sampled in less than five quadrats every year. No annual species were sampled in 1997, but five were sampled in 2002 and 2007.

1989 TREND ASSESSMENT

The browse trend is up. The key species, black sagebrush, Stansbury cliffrose, and Nevada ephedra, increased in density. The recruitment of young was stable at 0%for black sagebrush, increased to 50% for Stansbury cliffrose, and increased to 31% for Nevada ephedra. However, they also have increased in percent decadence, which may be due to drought conditions. The grass trend is slightly up. The sum of nested frequency of perennial grasses increased, mostly due to the first sampling of sand dropseed. The forb trend is stable. There was very little change in perennial forbs.

browse - up (+2) grass - slightly up - (+1) forb - stable - (0)

1997 TREND ASSESSMENT

The trend for browse is stable. Stansbury cliffrose density was changed little. The recruitment of young decreased to 18% of the population and decadence also decreased from 40% to 18%. The density of black sagebrush increased 68%. The recruitment of young increased slightly to 2% of the population and decadence decreased from 53% to 19%. The density of Nevada ephedra increased 54%. The recruitment of young decreased to 20% of the population, and decadence decreased from 44% to 7%. Browse utilization was lower than reported in past years, which coincided with the lack of pellet groups sampled. The grass trend is stable. Bluebunch wheatgrass nested frequency significantly increased while galleta grass was not sampled. Annual grasses were measured in the study for the first time. Cheatgrass was the dominant grass, with an average cover of 7%. The forb trend is stable. Very little change occurred in perennial forbs. The Desirable Components Index (DCI) rated this study as fair due to moderate browse cover with relatively low decadence, and a low perennial grass and forb cover.

winter range condition (DCI) - fair (31) Low potential scale
browse - stable (0) grass - stable (0) forb - stable (0)

2002 TREND ASSESSMENT

The browse trend is slightly up, but the key species showed obvious negative signs of drought, specifically minimal annual leader growth and increased decadence. Black sagebrush density increased 67%. The recruitment of young changed little to 1% of the population and decadence increased to 29%. Utilization also increased. Cliffrose density increased 12%. The recruitment of young decreased to 5% of the population and decadence decreased slightly to 16%. Browse use increased to mostly moderate and heavy. The density of nevada ephedra decreased 20%. The recruitment of young decreased to 3%, and decadence increased to 42%. Browse use increased from mostly light to moderate-heavy. The grass trend is slightly up due to a significant decrease in the nested frequency of cheatgrass. Trend for forbs is stable. The nested frequency of perennial forbs changed little. Storksbill (*Erodium cicutarium*) and stickseed (*Lappula occidentalis*) were sampled for

the first time. The DCI rating remained fair, though there was a slight decrease in the recruitment of young browse.

winter range condition (DCI) - fair (27) Low potential scale
browse - slightly up (+1) grass - slightly up (+1) forb - stable (0)

2007 TREND ASSESSMENT

The trend for browse is slightly down. Black sagebrush density declined 30% The recruitment of young increased slightly to 2% of the population, and decadence remained stable. Browse use increased, with 57% of the population showing heavy use. Cliffrose density decreased 5%. The recruitment of young decreased to 0% of the population and decadence increased to 33%. The Nevada ephedra population decreased 9%. The recruitment of young decreased to 0% of the population and decadence increased to 69%. Browse use increased to mostly heavy, with 75% of the population showing heavy use. The trend for grasses is stable. The nested frequencies for perennial and annual grasses changed little. The trend for forbs is stable. The nested frequencies of perennial and annual forbs changed little. However, the nested frequency of storksbill increased slightly. The DCI rating declined to poor-fair due to relatively high decadence and nearly no recruitment of young browse.

winter range condition (DCI) - poor-fair (22) Low potential scale
browse - slightly down (-1) grass - stable (0) forb - stable (0)

HERBACEOUS TRENDS --
Management unit 19A, Study no: 1

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
G	Agropyron spicatum	a43	a47	b97	b82	b112	3.09	4.33	3.88
G	Bromus tectorum (a)	-	-	b248	a196	a195	7.17	5.39	3.75
G	Hilaria jamesii	c37	bc33	ab13	a5	a2	.36	.09	.06
G	Oryzopsis hymenoides	a5	a6	a6	a1	a2	.21	.15	.06
G	Poa secunda	a3	a14	a15	a19	a13	.40	.29	.08
G	Sitanion hystrix	-	-	a6	a7	-	.03	.07	-
G	Sporobolus cryptandrus	-	b20	-	a4	-	-	.00	-
Total for Annual Grasses		0	0	248	196	195	7.17	5.39	3.75
Total for Perennial Grasses		88	120	137	118	129	4.11	4.95	4.08
Total for Grasses		88	120	385	314	324	11.29	10.35	7.83
F	Astragalus utahensis	-	-	3	-	-	.00	-	-
F	Cirsium neomexicanum	a6	b19	a1	a1	a2	.00	.00	.15
F	Collinsia parviflora (a)	-	-	-	-	4	-	-	.01
F	Cymopterus sp.	-	-	-	-	1	-	-	.03
F	Descurainia pinnata (a)	-	-	-	a4	a5	-	.01	.01
F	Draba sp. (a)	-	-	-	1	-	-	.00	-
F	Erodium cicutarium (a)	-	-	-	a3	b18	-	.00	.16
F	Lappula occidentalis (a)	-	-	-	a1	a3	-	.00	.01

Type	Species	Nested Frequency					Average Cover %		
		'83	'89	'97	'02	'07	'97	'02	'07
F	Lomatium sp.	-	-	$_{a}$1	$_{a}$3	-	.00	.00	-
F	Lygodesmia grandiflora	3	-	-	-	-	-	-	-
F	Machaeranthera spp	1	-	-	-	-	-	-	-
F	Phlox longifolia	-	$_{a}$3	$_{a}$10	$_{a}$6	$_{a}$6	.04	.01	.01
F	Sphaeralcea coccinea	$_{a}$2	$_{a}$10	-	$_{a}$3	$_{a}$5	-	.00	.06
F	Streptanthus cordatus	-	-	-	2	-	-	.00	-
F	Unknown forb-perennial	-	-	$_{a}$8	-	$_{a}$3	.06	-	.00
F	Zigadenus paniculatus	-	-	-	4	-	-	.01	-
Total for Annual Forbs		0	0	0	9	30	0	0.02	0.19
Total for Perennial Forbs		12	32	23	19	17	0.12	0.04	0.25
Total for Forbs		12	32	23	28	47	0.12	0.06	0.44

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

BROWSE TRENDS --
Management unit 19A, Study no: 1

Type	Species	Strip Frequency			Average Cover %		
		'97	'02	'07	'97	'02	'07
B	Artemisia nova	21	25	21	5.40	3.59	3.61
B	Atriplex confertifolia	5	3	4	.53	.03	.21
B	Brickellia californica	5	2	4	.03	-	.00
B	Chrysothamnus viscidiflorus stenophyllus	10	5	6	.15	.38	.38
B	Cowania mexicana stansburiana	15	15	14	2.54	4.02	3.59
B	Echinocereus sp.	0	1	0	-	-	-
B	Ephedra nevadensis	12	17	12	1.78	.97	.59
B	Gutierrezia sarothrae	19	7	1	.60	.00	-
B	Juniperus osteosperma	8	5	8	11.46	10.00	8.23
B	Opuntia sp.	2	3	1	-	.00	-
B	Pinus monophylla	1	3	2	-	.15	.56
B	Tetradymia glabrata	12	4	9	1.09	-	.30
Total for Browse		110	90	82	23.60	19.16	17.50

CANOPY COVER, LINE INTERCEPT --
Management unit 19A, Study no: 1

Species	Percent Cover		
	'97	'02	'07
Artemisia nova	-	4.16	3.33
Brickellia californica	-	.08	.21
Chrysothamnus viscidiflorus stenophyllus	-	.65	.08
Cowania mexicana stansburiana	-	7.38	7.76
Ephedra nevadensis	-	2.26	.56
Juniperus osteosperma	14.60	13.10	15.23
Pinus monophylla	-	2.11	2.04
Tetradymia glabrata	-	.10	.75

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 19A, Study no: 1

Species	Average leader growth (in)	
	'02	'07
Artemisia nova	0.9	1.0
Cowania mexicana stansburiana	1.8	2.3

POINT-QUARTER TREE DATA --
Management unit 19A, Study no: 1

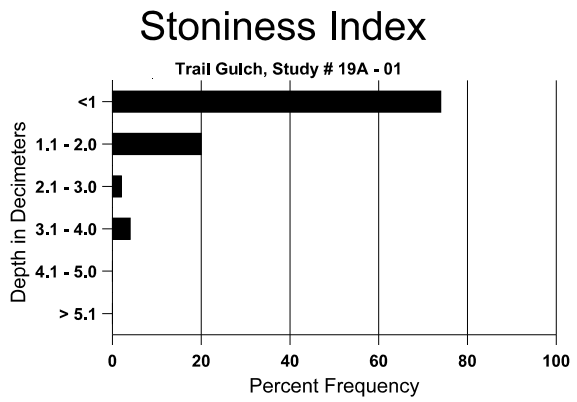
Species	Trees per Acre		Average diameter (in)	
	'97	'07	'97	'07
Juniperus osteosperma	53	76	8.7	7.7
Pinus monophylla	14	34	4.1	3.0

BASIC COVER --
Management unit 19A, Study no: 1

Cover Type	Average Cover %				
	'83	'89	'97	'02	'07
Vegetation	.25	4.00	35.30	28.60	25.70
Rock	27.00	30.00	27.53	32.42	31.78
Pavement	20.25	21.50	16.47	18.55	19.24
Litter	39.50	33.50	30.37	27.46	30.22
Cryptogams	.25	1.50	1.66	2.11	.71
Bare Ground	12.75	9.50	3.34	13.38	6.87

SOIL ANALYSIS DATA --
Herd Unit 19A, Study no: 1, Trail Gulch

Effective rooting depth (in)	Temp °F (depth)	pH	Clay loam			%0M	ppm P	ppm K	dS/m
			%sand	%silt	%clay				
8.9	64.4 (12.6)	7.1	38.0	32.4	29.6	2.4	7.7	76.8	.7



PELLET GROUP DATA --
Management unit 19A, Study no: 1

Type	Quadrat Frequency		
	'97	'02	'07
Rabbit	8	9	25
Elk	-	-	-
Deer	-	2	6

Days use per acre (ha)	
'02	'07
-	-
-	1 (3)
22 (55)	5 (13)

BROWSE CHARACTERISTICS --
Management unit 19A, Study no: 1

		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 nova												
83	**332**	-	33	266	33	-	60	30	10	-	20	13/25
89	**499**	33	-	233	266	-	53	0	53	-	0	12/29
97	**840**	-	20	660	160	140	19	0	19	7	7	13/29
02	**1400**	-	20	980	400	140	51	13	29	6	6	10/21
07	**980**	-	20	680	280	160	29	57	29	22	22	14/28

		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)
Atriplex confertifolia												
83	**0**	-	-	-	-	-	0	0	0	-	0	-/-
89	**0**	-	-	-	-	-	0	0	0	-	0	-/-
97	**120**	20	-	80	40	-	0	0	33	-	0	8/11
02	**60**	-	-	20	40	-	0	0	67	33	33	6/12
07	**80**	-	-	60	20	-	0	25	25	25	25	12/22
Brickellia californica												
83	**0**	-	-	-	-	-	0	0	-	-	0	-/-
89	**0**	-	-	-	-	-	0	0	-	-	0	-/-
97	**160**	60	20	140	-	-	0	0	-	-	0	12/14
02	**40**	-	-	40	-	-	0	0	-	-	0	10/15
07	**160**	-	-	160	-	-	38	0	-	-	0	9/19
Chrysothamnus viscidiflorus stenophyllus												
83	**133**	-	-	133	-	-	0	0	0	-	0	8/10
89	**166**	-	-	66	100	-	0	0	60	-	0	4/6
97	**220**	-	-	180	40	-	0	0	18	9	9	10/16
02	**100**	-	-	80	20	-	0	0	20	-	0	11/24
07	**120**	-	-	120	-	-	0	0	0	-	0	13/21
Cowania mexicana stansburiana												
83	**199**	-	33	166	-	-	33	17	0	-	0	44/67
89	**332**	-	166	33	133	-	10	0	40	-	0	55/71
97	**340**	20	60	220	60	-	12	0	18	6	6	38/60
02	**380**	-	20	300	60	-	42	37	16	11	11	44/63
07	**360**	-	-	240	120	20	17	28	33	17	17	45/64
Echinocereus sp.												
83	**33**	-	-	33	-	-	0	0	-	-	0	3/5
89	**33**	-	33	-	-	-	0	0	-	-	0	-/-
97	**0**	-	-	-	-	-	0	0	-	-	0	-/-
02	**20**	-	-	20	-	-	0	0	-	-	0	4/5
07	**0**	-	-	-	-	-	0	0	-	-	0	3/8
Ephedra nevadensis												
83	**300**	-	-	200	100	-	0	100	33	-	100	18/33
89	**532**	-	166	133	233	-	56	0	44	-	0	15/24
97	**820**	-	160	600	60	20	34	0	7	-	0	20/29
02	**660**	-	20	360	280	80	27	39	42	27	45	18/32
07	**720**	-	-	220	500	60	11	75	69	39	39	17/33

		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)
Gutierrezia sarothrae												
83	**2533**	-	200	2333	-	-	0	0	0	-	0	8/8
89	**2699**	166	300	1566	833	-	0	0	31	-	0	5/7
97	**640**	20	40	600	-	20	0	0	0	-	0	7/12
02	**180**	-	-	40	140	100	0	0	78	67	67	8/12
07	**20**	-	-	20	-	-	0	0	0	-	0	6/12
Juniperus osteosperma												
83	**0**	-	-	-	-	-	0	0	0	-	0	-/-
89	**99**	-	66	33	-	-	0	0	0	-	0	118/197
97	**160**	-	40	100	20	-	0	0	13	-	0	-/-
02	**100**	-	-	100	-	20	0	0	0	-	0	-/-
07	**160**	20	60	80	20	20	0	0	13	-	0	-/-
Opuntia sp.												
83	**33**	-	-	33	-	-	0	0	0	-	100	4/18
89	**66**	-	33	-	33	-	0	0	50	-	50	-/-
97	**40**	-	-	40	-	-	0	0	0	-	0	7/13
02	**80**	-	-	80	-	-	0	0	0	-	0	4/12
07	**20**	-	-	-	20	-	0	0	100	100	100	4/8
Pinus monophylla												
83	**33**	-	33	-	-	-	0	0	-	-	0	-/-
89	**66**	-	66	-	-	-	0	0	-	-	0	-/-
97	**20**	-	-	20	-	-	0	0	-	-	0	-/-
02	**60**	20	40	20	-	-	0	0	-	-	0	-/-
07	**40**	20	20	20	-	-	0	0	-	-	0	-/-
Tetradymia glabrata												
83	**66**	-	-	66	-	-	0	0	0	-	0	26/38
89	**199**	-	66	-	133	-	0	0	67	-	33	-/-
97	**340**	-	20	180	140	80	0	0	41	12	12	23/21
02	**120**	-	-	-	120	220	0	0	100	83	100	22/14
07	**220**	-	-	60	160	100	18	9	73	45	73	11/20