

ESTABLISHMENT REPORT

Thompson Clover Research Natural Area

Wenatchee National Forest

Chelan County

Washington

DESIGNATION ORDER

By virtue of the authority vested in me by the Secretary of Agriculture under Regulation 36 CFR 251.23, I hereby designate as the Thompson Clover Research Natural Area, the lands described in the preceding report by Joseph O. Gjertson, Phillip D. McColley and Arthur R. Tiedemann, dated 8/28/74: Said lands shall hereafter be administered as research natural area subject to said regulations and instructions thereunder.

Date

Chief

PRINCIPAL DISTINGUISHING FEATURES

The Thompson Clover Research Natural Area is a steep, 80-ha (200-acre), southwest-facing tract lying at midelevations of Swakane Canyon near Wenatchee, Washington.

Thompson clover (*Trifolium thompsonii* Morton)^{1/}, (*Agropyron spicatum* (Pursh) Scribn. and Smith, and *A. spicatum* var. *inerme*), stiff sagebrush (*Artemisia rigida* (Nutt.) Gray), big sagebrush (*A. tridentata* Nutt.) and false buckwheat (*Eriogonum* spp.) provide the dominant vegetative aspect with a scattering of old-growth ponderosa pine (*Pinus ponderosa* Dougl.) trees throughout the area.

Justification

Thompson clover is an endangered plant species known only from the type locality in Swakane Canyon. The Research Natural Area encompasses the only known Thompson Clover stand except for 20 acres located on private and Department of Game lands at lower elevations in Swakane Canyon.

Virtually nothing is known of the autecology or synecology of Thompson clover. Classification of the site as a Research Natural Area will serve to protect the species for educational and research purposes, and still allow for manipulations that may be necessary to maintain an environment suitable for continued vigor and perpetuation of the clover.

Location, Access, and Administration

The area is located between 609 m (2,000 ft) and 1,097 m (3,600 ft) elevation on Wenatchee National Forest lands in the SW $\frac{1}{4}$ and the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 15, T. 24 N., R. 20 E., W.M. Latitude and longitude are 47°35' N and 120°19' W, respectively. The Swakane winter game range completely surrounds the stand of Thompson clover.

Access is via State Route 97, 13.7 km (8 $\frac{1}{2}$ miles) north of Wenatchee. Turn west on the Swakane Canyon Road (County Road 252) and follow for 2.4 km (1 $\frac{1}{2}$ miles). Turn north on Forest Road 1458 (Rattlesnake Spring Road) and follow for 6.4 km (4 miles) until crossing the National Forest boundary (see attached map). The Research Natural Area lies above the road at a sharp switchback about 0.4 km ($\frac{1}{4}$ mile) after the road enters the National Forest.

^{1/} Plant nomenclature follows Hitchcock and Cronquist (1973).

The Research Natural Area will be administered by the District Ranger, Entiat District of the Wenatchee National Forest located at Entiat, Washington. Those wishing to use the Research Natural Area for research purposes will obtain permission from the Director of the Pacific Northwest Forest and Range Experiment Station. The Entiat District Ranger will also be informed of any research use of the area. Educators wishing to use the area for observational visits will obtain permission from the Entiat District Ranger.

Topography, Geology and Soils

Swakane Canyon runs in a northwest to southeast direction. It is a deep, steep to very steep, nonglaciaded canyon with a narrow valley bottom filled with fan and stream alluvium.

This area has been mapped as preupper Jurassic gneiss on the geologic map of Washington, which also includes some schist. Bedrock is highly fractured but is not deeply weathered; therefore, it is fairly compact. Loose rock fragments have a wide range of sizes, but most are less than 30 cm (one foot) in diameter, and are characteristically angular in shape.

Soil descriptions of six soil profiles described in the study area are:

Soil profile #1 - Classification: coarse-loamy, mixed, messic Typic Haploxeroll, slope--35%; aspect--west; elevation--774 m (2,540 ft).

<u>Depth - cm</u>		
A ₁₁	0-3	Very dark grayish brown (10YR3/2) loam; moderate fine granular structure; slightly sticky and slightly plastic; abundant roots.
A ₁₂	3-23	Dark brown (10YR3/3 moist) loam; moderate fine subangular blocky structure; slightly sticky and slightly plastic; abundant roots.
A ₃	23-41	Dark brown (10YR3/3) loam; strong fine and medium subangular blocky structure; slightly sticky and slightly plastic; abundant roots.
B ₁	41-58	Brown (10YR4/3) loam; moderate medium subangular blocky structure; slightly sticky and slightly plastic; plentiful roots.

B ₂	58-102	Brown (10YR4/3) loam; moderate medium subangular blocky structure; slightly sticky and slightly plastic; few roots.
C ₁	102 +	Brown (10YR4/3) loam; massive; nonsticky and nonplastic; very few roots.

Soil Profile #2 - Classification: Coarse-loamy, mixed, messic Lithic Haploxeroll. Slope--27%; aspect--west-southwest; elevation--853 m (2,800 ft).

<u>Depth - cm</u>		
A	0-8	Dark brown (10YR3/3) coarse sandy loam; moderate fine subangular blocky structure; nonsticky and slightly plastic; 10 percent gravel; abundant roots.
B	8-33	Dark brown (10YR3/3) coarse sandy loam; moderate fine and medium subangular blocky structure; nonsticky and slightly plastic; 10 percent gravel; few roots.
R	33 +	Gneissic bedrock.

Soil Profile #3 - Classification: Coarse-loamy, mixed, messic Lithic Haploxeroll. Slope--27%; aspect--west; elevation--914 m (3,000 ft).

<u>Depth - cm</u>		
00	3-1	Duff--pineneedles.
A ₁	0-13	Very dark gray (10YR3/1) sandy loam; moderate fine and medium subangular blocky structure; nonsticky and nonplastic; 3% gravel; abundant roots.
A ₁₂	13-20	Very dark grayish brown (10YR3/2) sandy loam; moderate fine and medium subangular blocky structure; nonsticky and nonplastic; 3% gravel; abundant roots.
B	20-25	Dark brown (10YR3/3) sandy loam; moderate medium subangular blocky structure; slightly sticky and nonplastic; 5% gravel; few roots.
R	25 +	Weathered gneissic bedrock.

Soil Profile #4 - Classification: Coarse-loamy, mixed, messic Typic Haploxerolls.

<u>Depth - cm</u>		
A ₁₁	0-23	Very dark grayish brown (10YR3/2) sandy loam; moderate fine subangular blocky structure; slightly sticky and slightly plastic; abundant roots.
A ₁₂	23-41	Dark brown (10YR3/3) sandy loam; moderate fine and medium subangular blocky structure; slightly sticky and slightly plastic; plentiful roots.
B ₂₁	41-94	Brown (10YR4/3) sandy loam; moderate medium subangular blocky structure; slightly sticky and slightly plastic; few roots.
B ₂₂	94-102	Dark brown (10YR3/3) sandy clay loam; moderate medium subangular blocky structure; sticky and plastic; few roots; 10% gravel; clay bridging in pores and on ped faces.
R	102 +	Weathered gneissic bedrock.

Soil Profile #5 - Classification: Coarse-loamy, mixed, messic Lithic Haploxerolls. Slope--33%; aspect--west; elevation--914 m (3,000 ft).

<u>Depth - cm</u>		
A	0-10	Dark brown (10YR3/3) sandy loam; moderate medium subangular blocky structure; nonsticky and nonplastic; abundant roots; 15% gravel.
C	10-23	Dark brown (10YR4/3) sandy loam; moderate medium and weak coarse subangular blocky structure; nonsticky and nonplastic; plentiful roots; 20% gravel.
R	23 +	Weathered schist bedrock.

Soil Profile #6 - Classification: Sandy, mixed, messic Lithic Haploxeroll. Slope--42%, aspect--south; elevation--762 m (2,500 ft).

<u>Depth - cm</u>		
A	0-15	Dark brown (10YR3/3) coarse sandy loam; weak medium subangular blocky structure; nonsticky and nonplastic plentiful roots; 10% gravel.
B	15-25	Brown (10YR4/3) loamy sand; massive; nonsticky and nonplastic; few roots; 20% gravel.
R	25 +	Weathered gneissic bedrock.

Some soil temperatures recorded at the different sites on October 12, 1973, are:

Soil Profile #1 - 15 cm depth - 5.6⁰ C (42⁰ F)
 Soil Profile #4 - 15 cm depth - 7.8⁰ C (46⁰ F)
 Soil Profile #4 - 51 cm depth - 11.1⁰ C (52⁰ F)

Physical analyses were determined for selected horizons on each of the six soil profiles described. These data are:

<u>Soil Profile #</u>	<u>Horizon</u>	<u>Depth - cm</u>	<u>Percent</u>		
			<u>Silt</u>	<u>Sand</u>	<u>Clay</u>
1	A ₁₂	3-23	37.0	50.0	12.6
1	B ₂	58-101	39.4	48.0	12.6
2	A	0-8	18.0	74.4	7.6
3	A ₁	0-13	23.0	67.0	10.0
4	A ₁₂	23-41	31.0	56.0	13.0
4	B ₂₁	41-94	32.6	54.4	13.0
4	B ₂₂	94-102	23.0	57.0	20.0
5	A	0-10	22.0	69.0	9.0
6	A	0-15	19.0	75.0	6.0

Soil profiles #1 and #4 have over 30 percent silt in the upper part, and in the case of profile #4 the silt content drops markedly below 94 cm. This suggests the possibility of loessial material overlying residuum (lithologic discontinuity). (Note: The field textural determinations also suggested the possibility of a loess cap on part of the study area.)

The samples from soil profile #1 show a very close resemblance and are, therefore; considered to be of the same origin. Samples from soil profile #4 do show a marked difference in particle sizes between the B₂₁ and B₂₂ horizons. To see if this difference was really significant, the particle size values for silt and sand were recalculated on a clay-free base. These data then appear as:

	<u>Horizon</u>	<u>Depth - cm</u>	<u>% Silt</u>	<u>% Sand</u>
Soil Profile #4	A ₁₂	23-41	35.6	64.4
Soil Profile #4	B ₂₁	41-94	37.5	62.5
Soil Profile #4	B ₂₂	94-102	28.8	71.3

The relative change for the silt fraction was not significant, but the difference for sand was approximately three times. It changed from a difference of 3 percent between the B₂₁ and B₂₂ horizons to almost 9 percent. This difference suggests that the upper 94 cm is loessial and that below is residual.

Chemical analyses for the samples are:

<u>Profile #</u>	<u>%N</u>	<u>%S</u>	<u>%C</u>	<u>%O.M.</u>
1	.075	.006	1.27	2.18
2	.046	.0188	1.06	1.82
3	.078	.0072	2.20	3.78
4	.085	.0138	1.84	3.16
5	.061	.0103	1.38	2.37
6	.049	.0085	1.27	2.18

These data indicate a very low content of nitrogen and sulfur, but do show that the organic matter content is high enough to designate these soils as Mollisols.

There appears to be a soil pattern relating to the occurrence of Thompson clover. The soils growing Thompson clover all seem to have been influenced by loess. If it is true that Thompson clover is selective to soils containing loessial material; then the plant selectivity is probably related to mineralogy and nutrient availability. The wide range in soil depths and resultant variability in available water capacities pretty well eliminates soil water as a factor.

Climate

Climate is representative of the east Cascades with moderately cold winters, and warm, dry summers. Most of the precipitation occurs as snow between November and April from moisture-laden Pacific storms that cross the area. Wenatchee, Washington, the nearest climatic station, receives 22 cm (8.5 inches) of precipitation and has mean temperatures of 22° C (71.5° F) in July and August, and -3° C (6° F) in January. Mean annual temperature is 11° C (52° F). The Natural Area undoubtedly receives more precipitation and is probably somewhat cooler in summer and colder in winter than Wenatchee.

Biota

Two paced transects were taken through the area in June 1973 using a 929-cm² (1-ft²) frame to reference vegetation cover measurements by species. Cover and frequency for the species encountered are shown in Table 1. Species that were present in the area but were not encountered on the transects include: shooting star (Dodecatheon spp.), rock rose (Lewisia rediviva Pursh), bitter cherry (Prunus emarginata (Dougl.) Walp.), bottlebrush squirreltail (Sitanion hystrix (Nutt.) Smith), serviceberry (Amelanchier alnifolia Nutt.), sunflower (Helianthus spp.), mountain dandelion (Agoseris spp.), fritillary (Fritillaria pudica (Pursh) Spreng.), rose (Rosa spp.), and death camas (Zigadenus spp.).

Those portions of the Research Natural Area with tree cover can probably be assigned SAF forest cover type 237, Interior ponderosa pine and Kuchler's Type 10, Ponderosa-shrub forest. Shrub-grass associations are similar to the Artemisia rigida/Poa sandbergii habitat type or association described by Daubenmire (1970) and Franklin and Dyrness (1973).

Fauna

Thompson Clover Research Natural Area lies within the Swakane key winter range for mule deer (Odocoileus hemionus). Late fall migrations cause heavy concentrations of deer along the Columbia River breaks below 900 m (3,000 ft) elevation. During severe winters, deer tend to use wind-swept and south-facing slopes within the midelevation, or thermal zone. The Natural Area could be considered within "critical" winter range during severe weather conditions.

Large predators such as the coyote (Canis latrans) and bobcat (Lynx rufus), follow the migrating deer herds to Swakane winter range. In rare instances, cougar (Felis concolor) visit the lower Swakane for easy prey. Resident coyote families and an occasional bobcat may be found throughout the year within Swakane Canyon. Although the black bear (Ursus americanus) prefers more wooded areas on the Forest, stragglers could visit the natural area in search of rodents or carrion.

In 1969, nine California Bighorn Sheep (Ovis canadensis) were transplanted to Swakane Canyon by Washington State Department of Game. This trial herd increased to 24 head and expanded its range to the Entiat River. Survival success of this release will depend upon how well the animal copes with disease and predators. There has been some decline in numbers since 1971. The natural area contributes a small portion of range for the introduced bighorn.

Although elk (Cervus canadensis) are not yet located within the Swakane, indications are they will be soon. Small, pioneering groups from the main Colockum herd have become well entrenched below Wenatchee River, 8 air-miles to the south. What effect this grazing animal will have upon Thompson clover is unknown at present. We know the plant has survived other ungulates.

Small mammals indigenous to the Swakane include the porcupine (Erethizon dorsatum), snowshoe hare (Lepus americanus), cottontail (probably Sylvilagus nuttalli), golden mantled ground squirrel (Spermophilus lateralis), pocket gopher (Thomomys talpoides or mazama), yellow-bellied marmot (Marmota flaviventris), chipmunks (Eutamias spp.), deer mice (Peromyscus maniculatus), pack or bushytail woodrat (Neotoma cinerea), meadow vole (Microtus pennsylvanicus), the longtail weasel (Mustela frenata), badger (Taxidea taxus), and striped skunk (Mephitis mephitis).

Below the Natural Area, furbearers such as the beaver (Castor canadensis), mink (Mustela vison), muskrat (Ondatra zibethica), and racoon (Procyon lotor) find habitat tolerable. The marten (Martea americana) would rarely visit the Swakane.

Native game birds common to the Swakane include Richardson's blue grouse (Dendragapus obscurus), valley quail (Lophortyx californicus), ruffed grouse (Bonasa umbellus), and infrequently the Hudsonian spruce grouse (Canachites canadensis). The introduced chukar partridge (Alectoris graeca) has found the rugged terrain to its liking and is now most abundant among the gallinaceous birds present.

The Chinese ring-necked pheasant (Phasianus colchicus) is released into Swakane Canyon during open season as a put-and-take sport-hunting venture. The habitat is unsuited for wintering this bird.

Common birds which visit the Natural Area are the raven (Corvus corax), crow (Corvus brachyrhynchos), meadow lark (Sturnella neglecta), magpie (Pica pica), robin (Turdus migratorius), Steller's jay (Cyanocitta stelleri), Clark's nutcracker (Nucifraga columbiana), woodpeckers (Dendrocopos sp.), sapsuckers (Sphyrapicus sp.), chickadees (Parus sp.), and juncos (Junco sp.). The evening grosbeak (Hesperiphona vespertina) and Alaska robin (varied thrush) (Ixoreus naevius) may visit the area during seasonal migrations.

The turkey vulture (Cathartes aura) is not uncommon to Swakane. Bald eagles (Haliaeetus leucocephalus) are sighted frequently during winter migrations, feeding upon winter dieback of deer. Five bald eagles were sighted on one snag at the mouth of Swakane during the winter of 1971.

No known rare or endangered species nest within the Natural Area.

The western rattlesnake (Crotalus viridis) is found within the Natural Area during spring months. The bullsnake or blowsnake (Pituophis melanoleucus) may be found throughout the summer. The rubber boa (Charina bottae) and common garter snake (Thamnophis sirtalis fitchi) may be found along the canyon bottom. The sagebrush lizard (Sceloporus graciosus) and western fence lizard (Sceloporus occidentalis) may be common during peak of summer.

Avian Species List

This list is presented in two parts. The first section includes species actually observed on the Natural Area. The second section lists hypothetical species which may be found on or around the Natural Area during some season of the year. Because of the transitory nature of birds, not all will be in the area at one time nor may some show up in this small area for several seasons.

Observed Species List

<u>Pica pica</u>	Magpie
<u>Sturnella neglecta</u>	Meadowlark
<u>Cyanocitta stelleri</u>	Steller's jay
<u>Nucifraga columbiana</u>	Clark's nutcracker
<u>Haliaeetus leucocephalus alascanus</u>	Bald eagle
<u>Aquila chrysaetos canadensis</u>	Golden eagle
<u>Cathartes aura</u>	Turkey vulture
<u>Colaptes auratus</u>	Flicker
<u>Parus atricapillus</u>	Black capped chickadee
<u>Corvus corax</u>	Raven
<u>Dendroica coronata</u>	Yellow-rumped warbler
<u>Junco hyemalis</u>	Dark-eyed junco
<u>Turdus migratorius</u>	Robin
<u>Zenaidura macroura marginella</u>	Mourning dove
<u>Zonotrichia leucophrys</u>	White-crowned sparrow

Hypothetical Species List

<u>Accipiter gentilis</u>	Goshawk
<u>Accipiter striatus</u>	Sharp-shinned hawk
<u>Accipiter cooperii</u>	Cooper hawk
<u>Buteo jamaicensis</u>	Red-tailed hawk
<u>Buteo lagopus sanctijohannis</u>	Rough-legged hawk
<u>Circus cyaneus hudsonius</u>	Marsh hawk
<u>Falco mexicanus</u>	Prairie falcon
<u>Falco columbarius</u>	Pigeon hawk or merlin
<u>Falco sparverius</u>	Kestrel
<u>Lophortyx californicus</u>	California quail
<u>Columbia livia</u>	Rock dove or domestic pigeon
<u>Otus asio</u>	Screech owl
<u>Bubo virginianus</u>	Great horned owl
<u>Glaucidium gnoma</u>	Pygmy owl
<u>Asio otus</u>	Long-eared owl
<u>Aegolius acadicus</u>	Saw-whet owl
<u>Chordeiles minor</u>	Common nighthawk
<u>Chaetura vauxi</u>	Vaux's swift
<u>Salasphorus rufus</u>	Rufous hummingbird
<u>Stellula calliope</u>	Calliope hummingbird
<u>Sphyrapicus varius</u>	Yellow-bellied sapsucker
<u>Dendrocopos villosus</u>	Hairy woodpecker
<u>Dendrocopos pubescens</u>	Downy woodpecker
<u>Empidonax spp.</u>	Flycatchers
<u>Contopus sordidulus</u>	Western wood pewee
<u>Nuttallornis borealis</u>	Olive-sided flycatcher
<u>Tachycineta thalassina</u>	Violet-green swallow
<u>Iridoprocne bicolor</u>	Tree swallow
<u>Petrochelidon pyrrhonota</u>	Cliff swallow
<u>Corvus brachyrhynchos</u>	Common crow
<u>Parus gambeli</u>	Mountain chickadee
<u>Sitta carolinensis</u>	White-breasted nuthatch
<u>Sitta canadensis</u>	Red-breasted nuthatch
<u>Ixoreus naevius</u>	Varied thrush
<u>Sialia mexicana occidentalis</u>	Western bluebird
<u>Sialia currucoides</u>	Mountain bluebird
<u>Myadestes townsendi</u>	Townsend's solitaire
<u>Regulus satrapa</u>	Golden-crowned kinglet
<u>Regulus calendula</u>	Ruby-crowned kinglet
<u>Bombycilla cedrorum</u>	Cedar waxwing
<u>Lanius excubitor</u>	Northern shrike
<u>Lanius ludovicianus</u>	Loggerhead shrike
<u>Sturnus vulgaris</u>	Starling

<u>Vireo olivaceus</u>	Red-eyed vireo
<u>Vermivora ruficapilla</u>	Nashville warbler
<u>Vermivora petechia</u>	Yellow warbler
<u>Dendroica nigrescens</u>	Black-throated gray warbler
<u>Dendroica townsendi</u>	Townsend's warbler
<u>Oporornis tolmiei</u>	MacGillivray's warbler
<u>Wilsonia pusilla</u>	Wilson's warbler
<u>Icterus galbula bullockii</u>	Northern oriole
<u>Molothrus ater</u>	Brown-headed cowbird
<u>Piranga ludoviciana</u>	Western tanager
<u>Hesperiphona vespertina</u>	Evening grosbeak
<u>Carpodacus cassinii</u>	Cassin's finch
<u>Pinicola enucleator</u>	Pine grosbeak
<u>Leucosticte tephrocotis</u>	Gray-crowned rosy finch
<u>Spinus pinus</u>	Pine siskin
<u>Spinus tristis</u>	American goldfinch
<u>Loxia curvirostra</u>	Red crossbill
<u>Pipilo erythrophthalmus</u>	Rufous-side towhee
<u>Spizella passerina</u>	Chipping sparrow
<u>Zonotrichia atricapilla</u>	Golden-crowned sparrow

Impact on Other Resource Values

Timber

The Research Natural Area lies on the very outer edge of tree-growing sites. Tree development is poor, trees are scattered and short, and reproduction is very sparse. Approximately 307 m³ (130 M bd ft) of merchantable timber occurs within the Natural Area. Timber yield is less than 1.4 m³/ha/yr (20 cu ft per acre per yr) and the area is thus classified as noncommercial forest land. This, plus the extreme difficulty of successfully regenerating trees after cutting, indicates that this area should not be managed for the production of timber. Following establishment, the area will be removed from any plans involving harvest of timber.

Range

Carl Edwards operated a small cattle ranch in Swakane from 1954 to 1965. Thirty to 40 head were grazed for three months on the slopes of the Swakane. Native bunchgrasses offered fair to good early forage. It is very likely that bands of sheep grazed the area prior to documented records. During this time, Thompson clover has survived.

No range developments exist within the 80-ha Natural Area. No known permanent water source has been located.

Entiat District has discontinued commercial use of livestock on the Swakane C&H Allotment which includes the Natural Area. The area will be withdrawn from any considerations of domestic livestock use after establishment.

That portion of the drainage now owned by the Department of Game has been designated a Wildlife Recreation Area by the State. Wildlife is considered to have priority use over State as well as Federal lands within the area.

Recreation

Few people visit the area except during hunting seasons for upland birds and deer. Little effect upon the clover is anticipated.

Minerals

A mineral examination (Exhibit A) indicates that lands in the proposed Research Natural Area are non-mineral in character for both leasing act and locatable minerals. The Wenatchee National Forest will proceed with action to withdraw the area from mineral entry upon establishment.

Water

Protection of the site should have a positive effect on water quality as the site continues to improve. The area is substantially below primary water yielding areas of the Wenatchee National Forest. Protection will likely have little effect on yields of water from the area.

Roads and Trails

Primitive road No. 1458 traverses the lower part of the Research Natural Area. There is, however, little threat of motorized vehicle use on the natural area proper because of the steep slopes.

A scenic trail has been proposed that would cross the Research Natural Area. Following establishment as a Research Natural Area, alternate routing will be sought for the trail. In the event no alternative route is feasible and the trail is built across the Research Natural Area, the trail will be restricted to foot and horse traffic. Grazing use of the area by horses will be prohibited.

References

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Hitchcock, C. Leo, and Arthur Cronquist. 1973. Flora of the Pacific Northwest. Univ. of Wash. Press, Seattle, Wa. 730 p., illus.

Kuchler, A. W. 1964. Manual to accompany the map of potential natural vegetation of the conterminous United States. Am. Geogr. Soc. Spec. Publ. 36, various paging, illus.

Society of American Foresters. 1954. Forest cover types of North America (exclusive of Mexico). 67 p., illus. Washington, D.C.

Table TC-1. Cover and frequency of understory plants of the Thompson Clover Research Natural Area.

	<u>Cover %</u>	<u>Frequency %</u>
<u>Trifolium thompsonii</u>	3.4	38
<u>Artemisia tridentata</u>	4.1	12
<u>Artemisia rigida</u>	3.2	20
<u>Eriogonum spp.</u>	3.1	24
<u>Balsamorhiza sagittata</u>	4.6	20
<u>Festuca viridula</u>	1.8	18
<u>Agropyron spicatum</u>	5.3	24
<u>Agropyron spicatum var. inerme</u>	8.6	32
<u>Bromus tectorum</u>	2.2	44
<u>Koeleria cristata</u>	1.1	14
<u>Poa sandbergii</u>	2.8	46
<u>Stipa occidentalis</u>	0.1	2
<u>Lomatium spp.</u>	0.1	6
<u>Collomia grandiflora</u>	0.3	16
<u>Aster spp.</u>	1.2	10
<u>Crepis spp.</u>	1.0	20
<u>Achillea millefolium</u>	0.8	7
<u>Antennaria spp.</u>	0.6	6
<u>Chaenactis douglasii</u>	0.1	2
<u>Lupinus sulphureus</u>	2.8	14
<u>Astragalus spp.</u>	0.3	4
<u>Silene spp.</u>	0.6	6
<u>Erigeron spp.</u>	1.0	4
<u>Phlox spp.</u>	3.1	8
<u>Brodiaea spp.</u>	0.1	3
<u>Aplopappus spp.</u>	0.7	10
<u>Lithospermum spp.</u>	0.3	2
Total cover	53.3	

RECOMMENDATIONS

I recommend that the Thompson Clover Research Natural Area be established on the lands described in this report.

SIGNATURE

Date 8-28-74

Submitted: Joseph O. Gjertson
Range & Wildlife Staff

Date 8-28-74

Submitted: William D. McCally
Soils Scientist

Date 8-27-74

Submitted: Arthur R. Lederman
Project Leader, Forest Hydrology Laboratory

Date 9/16/74

Recommended: Robert C. Benson
District Ranger, Entiat

Date 9/23/74

Recommended: Dee W. Hughes
Supervisor, Wenatchee National Forest

Date 10/15/74

Recommended: Robert E. Bucher
Director, PNW Exp. Station

Date 1/16/75

Recommended: T. A. Schlepfer
Regional Forester, R-6

Date _____

Approved: _____
Director, Division of Recreation and Land Use

Date _____

Approved: _____
Deputy Chief, Research

Date _____

Approved: _____
Chief

REPORT OF GEOLOGIC INVESTIGATION

Job No. M-152

Reason for examination: Withdrawal, proposed Thompson Clover
Research Natural Area

Subject: Mineral Classification

Lands involved: Approximately 200 acres in the SW $\frac{1}{4}$ and
the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 15,
T. 24 N., R. 20 E., W.M., Wenatchee N.F.,
Chelan County, Washington

Examined by: Daniel Y. Meschter, Mining Engineer

Date of examination: July 25, 1974

Introduction

Examination of the Thompson Clover Research Natural Area was requested by the Wenatchee National Forest on March 11, 1974, in support of proposed withdrawal of the lands. The land was examined on July 25, 1974. The examiner was unaccompanied.

Physical Features

The subject lands are located about 3 airline miles north-northwest from Rocky Reach Dam on the Columbia River on the north side of Swakane Canyon.

The lands are reached from U.S. Highway 97 just north of Rocky Reach Dam over Forest Service Road No. 252, 2.9 miles to a point at the southwest end of the area, and thence 1.9 miles up hill over a dirt trail to a switchback in the south central part of the area.

The terrain is mountainous at an average elevation of about 1,000 feet. The relief is moderate to steep. The slopes are mostly smoothly sculptured. The vegetation is chiefly grasses and low plants with scattered ponderosa pine and a little brush. Terrain visibility is good.

The lands were identified by reference to an aerial photograph on which the lands had been plotted and furnished with the request.

Geology

The Geologic Map of Washington (Washington Division of Mines and Geology map, 1:500,000, 1961) shows that the general area is underlain by Pre-Upper Jurassic metamorphic rocks. The Metamorphic rocks are intruded by plutons of diabase and peridotite just north of the subject lands and the tops of a few of the highest hills are capped by basaltic volcanics.

The rock types exposed on the land are dominantly quartz-mica schist, subordinate quartz-diorite gneiss, and rare amphibolite. Massive white quartz commonly is found as float and local concentrations indicate the presence of thin beds or veins in the subsurface.

Mineral Deposits

Review of the standard literature shows there are no reports of known mineral deposits on the subject lands. The ultrabasic rocks further to the north are reported to contain asbestiform minerals which have not been developed. The white quartz is essentially pure, except for very minor iron staining, but represent bodies too small to be of economic interest.

No evidence of mining activity in the way of prospect holes or claim staking was seen on the land.

Valuation and Conclusions

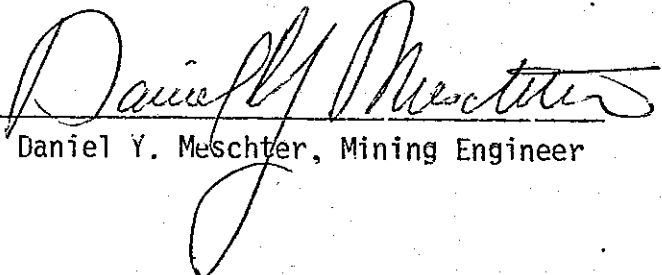
Evidence sufficient to impress land with classification as mineral-in-character with respect to leasing act minerals (coal, oil, etc.) must be such as to engender the belief that these minerals exist in the lands in workable quantities. The evidence with respect to locatable minerals under the General Mining Law must consist of an actual physical showing of the minerals such as would justify a bona fide effort to explore for them and give the land value for the mineral estate separate from the value of the surface estate; U.S. v. Northern Pacific Railway Co., 1 Fed 2nd. 53, (1924).

The geology of the area precludes the possibility of leasing act minerals in the subject lands.

Based upon my examination on the ground, there is no evidence of the presence of valuable minerals subject to the General Mining Law.

Accordingly, I conclude that the lands in the proposed Thompson Clover Research Natural Area are non-mineral in character for both leasing act and locatable minerals.

Date: December 6, 1976.


Daniel Y. Meschter, Mining Engineer