CHAPTER 2 PHYSICAL CHARACTERISTICS

A. General Location

Wasco County lies east of the Cascade Range along the Columbia River. It is bounded on the west by the forests of Mt. Hood National Forest, on the north by the Columbia River, and on the east by the Deschutes and John Day Rivers. A large portion of the southern half of the county lies within the Warm Springs Indian Reservation. The line between Township 8 and 9 South forms the southern boundary of the county.

B. Topography

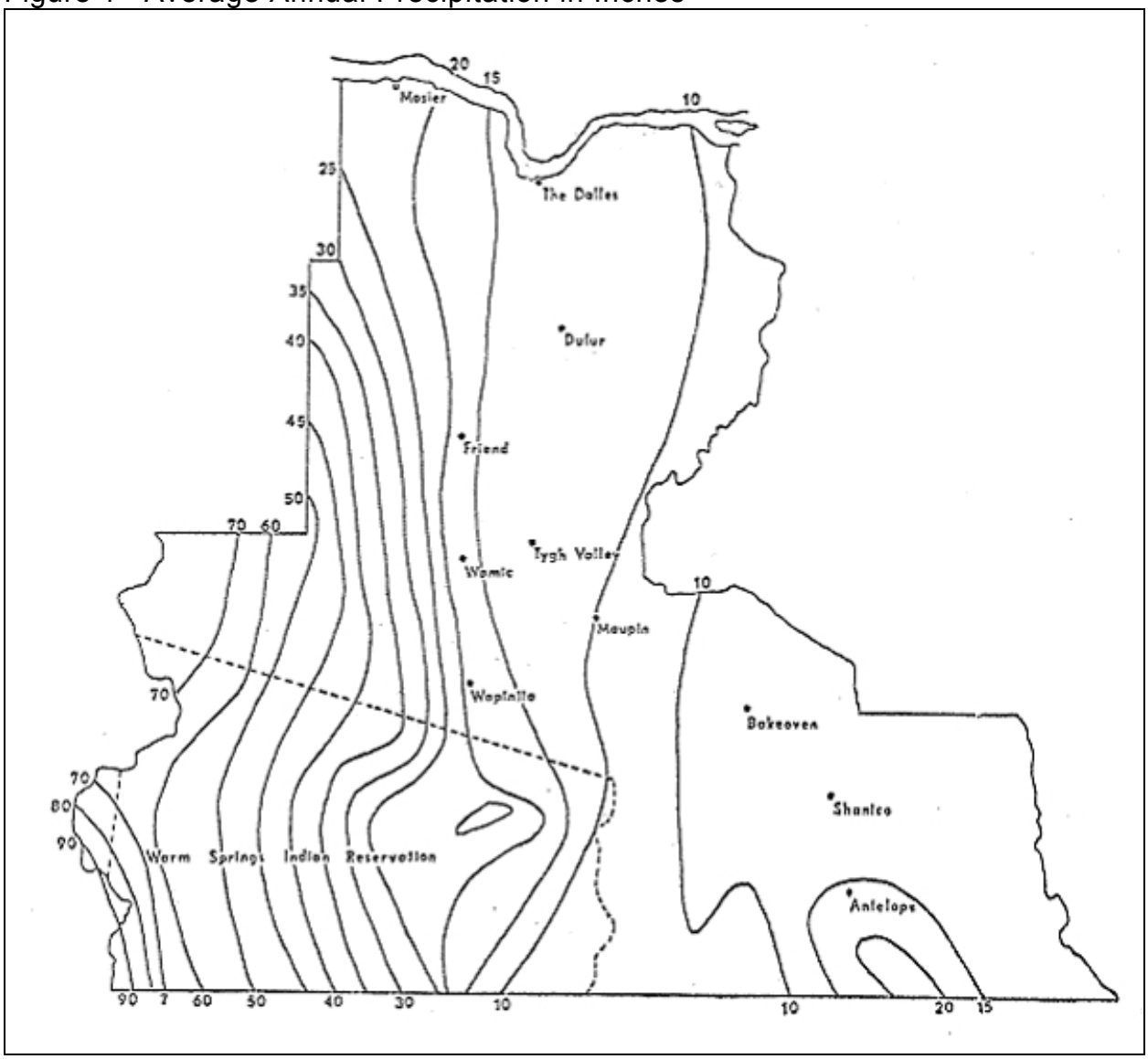
Steep rolling hills and sharp cliffs and canyons are characteristic landforms in Wasco County. Elevations vary from 5,700 feet at Flag Point in the western part of the county to 150 feet on the Columbia River. A general slope occurs to the north and east from the higher elevations of the Cascade range. Tributary streams dissect steep canyons as they make their way to the Columbia, Deschutes and John Day Rivers.

C. Climate

Wasco County lies in a transitional zone between western and eastern Oregon climates. Maritime air patterns are characteristic of western Oregon, while the drier continental air patterns dominate eastern Oregon. The Cascade Mountain Range forms a barrier which creates the climatic difference. The transition between these two major climates can be evidenced within the county.

The western portions of the county have higher amounts of precipitation with lower temperatures. Snowfalls as great as 14 to 20 feet can be found at the higher elevations near the Cascade Mountains. Rainfall amounts are also higher in the western portions of the county. The Cascade Mountains create this "rain shadow" effect, making the climate drier progressively to the east. (See Figure 1). The growing season in the western elevations is only thirty days. Temperatures are cooler, with a 43 degree Fahrenheit annual average at Friend.

Figure 1 - Average Annual Precipitation in Inches



Warmer temperature averages can be found at lower elevations.

A drier, warmer climate is found in the eastern portions of the county. Precipitation amounts average less than fourteen inches per year. Average annual temperatures are greater than 50 degrees Fahrenheit. Precipitation decreases and temperatures increase at the lower elevations near the Columbia River and other river valleys. Table 1 shows the annual temperature and precipitation ranges and growing season for several areas in Wasco County.

The eastern and lower portions of the county have a longer growing season. The average number of days without killing frost in Antelope is approximately 130 days. The normal frost-free season is from early May to late September.

Highly unstable climatic conditions are found in the Columbia Gorge and nearby areas. The contact between continental and maritime air masses produces strong wind patterns. The Dalles receives wind over fifty percent of the time. Sustained westerly winds above 65 miles per hour have been recorded. Prevailing winds are north-westerly in summer and northeasterly in winter. Winds are less dominant away from the Columbia Gorge. Western Wasco County is generally protected from winds by mountains in the west. The rolling topography makes local differences in wind patterns. Wind patterns are shown

The topography of the county forms microclimates. The higher portions of rolling hills have higher soil temperatures because they are exposed to the sun and drying winds. The creek bottoms and canyons have lower soil temperatures and retain a greater amount of moisture. Differences in microclimates can be seen in the changes of vegetation. Trees and bushes are found in the canyons, while bunchgrass dominates the tops of rolling hills.

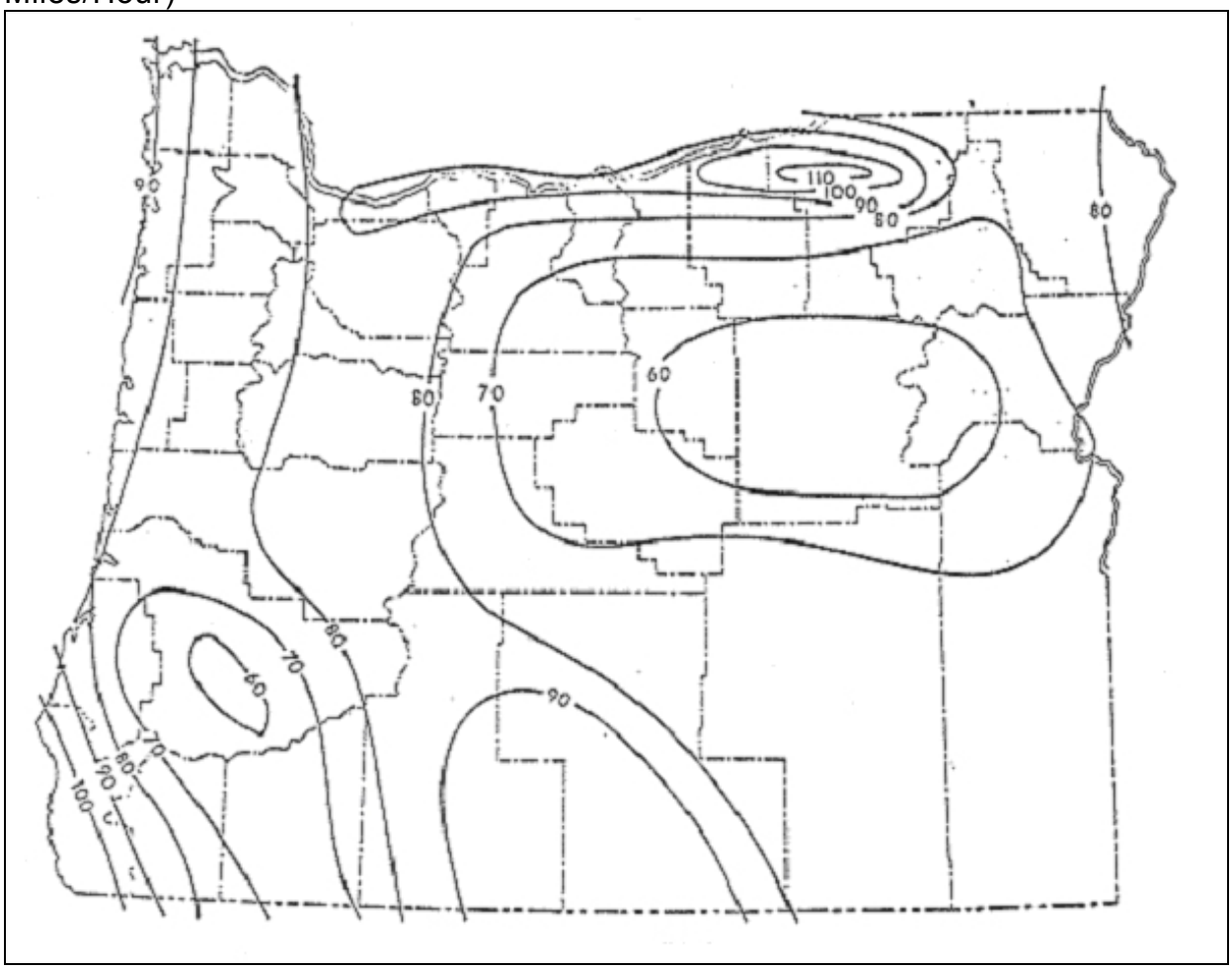
Overall, the climate in Wasco County is temperate and semi-arid. Low annual precipitation, low winter temperatures, and high summer temperatures are typical. Seasonal differences in temperature are greater than daily changes. However, daily differences are usually greater than those in western Oregon. Extremes of temperature most often occur when a continental air mass dominates the area with an east wind.

Table 1 – Annual Temperatures, Precipitations & Growing Seasons

Annual Temperature					
	The Dalles	Friend	Dufur	Big Eddy	Antelope
Avg. Max	64	58	63	64	63
Avg. Min	43	33	37	43	35
Mean	54	43	50	54	48
Highest	115	109	110	115	109
Lowest	-30	-28	-28	-26	-27
Annual Precipitation					
Least	6	9	5	7	7
Greatest	44	23	19	24	18
Mean	14	17	12	14	13

Growing Season	
Location	Average Number of Days without Killing Frost
Wasco Co. overall	100 to 217 (depending upon location and elevation)
Western Wasco Co. (higher elevations)	30
The Dalles	180
Wamic	110
Antelope	130

Figure 2 – Extreme Winds – 100 Year Mean Recurrence Interval (Wind Speed in Miles/Hour)



Source: "Distribution of Extreme Winds In the BPA Service Area" (Portland, U.S. Department of the Interior, Bonneville Power Administration). (Mimeographed)

D. Water Resources

1. Surface Water

Surface water resources are important in Wasco County. The county does not have an over abundance of these resources. Therefore, they must be utilized properly.

Wasco County lies within three major drainage basins, the Hood, Deschutes River and John Day River Basins. These are shown in Figure 3. The major rivers which drain these areas include the Columbia, Deschutes and John Day Rivers.

Table 2 lists surface water resources within Wasco County and give their yearly average quantity. In addition to those named, there are many unnamed seasonal streams and small reservoirs.

Table 2 – Surface Water Resources in Wasco County

Lakes	Average Quantity
Tooley Lake *	35 surface acres
Hog Lake (McClure) *	60 surface acres
Lake Camp Baldwin	4 surface acres
Salisbury Slough *	120 surface acres
Pullens Pond	---
Wassen Pond	---
Ketchum Pond	---
Badger Lake	45 surface acres
Boulder Lake	2 surface acres
Cearl Lake	555 surface acres
Cody Ponds	10 surface acres
Frog Lake	20 surface acres
Green Lake	2 surface acres
Little Boulder Lake	7 surface acres
Twin Lakes (2)	63 surface acres
Reservoirs (over three acres in size)	**Average Quantity**
Evans Reservoir	25 surface acres
Wicks Reservoir	The Dalles City Water Supply
Dufur City Reservoir	Dufur City Water Supply
Ketchum Reservoir	14 surface acres
Crow Creek Reservoir	31 surface acres-Municipal Water Supply
Gray Reservoir	3 surface acres
Merrel Reservoir	12 surface acres
Miller Reservoir	11 surface acres
Pine Hollow Reservoir	235 surface acres
Robert Reservoir No. 1-3	9 surface acres
Rock Creek Reservoir	105 surface acres
Smarts Reservoir	1 surface acre
Tygh Valley Log Pond	16 surface acres

Chase Reservoir	4 surface acres
<u>Streams</u>	<u>Average Quantity</u>
Mosier Creek and Tributaries	16,000 acre feet/year
Mill Creek and Tributaries	20,000 acre feet/year
Threemile Creek	3,000 acre feet/year
Fivemile Creek	12,000 acre feet/year
Eightmile Creek	12,800 acre feet/year - near Boyd
Fifteenmile Creek	20,900 acre feet/year - near Dufur
Dry Creek	1,000 acre feet/year - estimated
Currant Creek	3,000 acre feet, year - estimated
Muddy Creek	17,000 acre feet/year – estimated
Rock Creek	**Annual Stream
Chenowith Creek	Annual Stream
Brown Creek	Annual Stream
Rowena Dell	Annual Stream
Rowena Creek	Annual Stream
Japanese Hollow	Annual Stream
Ramsey Creek	Annual Stream
Larch Creek	Annual Stream
Barlow Creek	Annual Stream
Frog Creek	Annual Stream
Clear Creek	Annual Stream
Crane Creek	Annual Stream
Badger Creek	Annual Stream
Tygh Creek	Annual Stream
Gate Creek	Annual Stream
Wapinitia Creek	Annual Stream
Nena Creek	Annual Stream
<u>Rivers</u>	<u>Average Quantity</u>
Columbia River	Average discharge of 194,600 cubic feet per second--141,000,000 acre feet/year
Deschutes River	Average discharge 4,213,000 acre feet/year
John Day River	Average discharge 1,410,000 acre feet/year
White River	Average discharge 315,230 acre feet/year

* These are actually parts of the Columbia River.

**Annual streams flow during periods of high runoff, normally in the Spring and Fall. Measurement on these streams is difficult because of flow differences.

Table 3 shows the annual run-off in the Hood Basin. It is interesting to compare the amounts of run-off in the Hood and Wasco County portions of this basin.

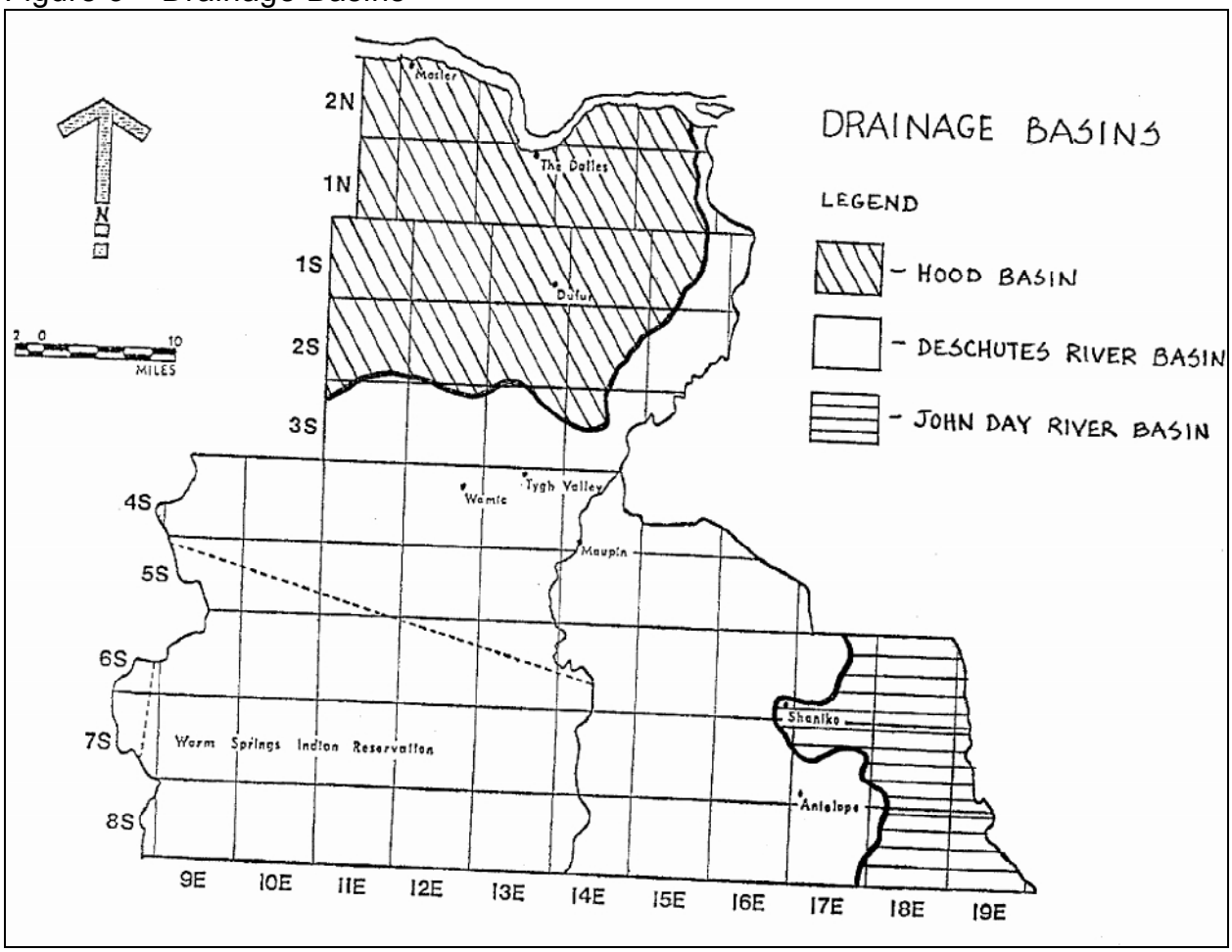
Table 3 – Estimate Average Annual Surface Outflows by Areas, 1932 - 1961

AREA	AVERAGE ANNUAL OUTFLOW		
	Square Miles	Acre Feet	Inches Per Acre
Hood	482	1,250,000	48.6
Wasco	540	130,000	4.5
Total or Average	1,022	1,380,000	26.6

Data Source: USGS records and SWRB correlations

Many of the streams in Wasco County (those in the Hood and Deschutes River Basins), begin in the Cascades and run northeasterly with relatively steep profiles. Mosier Creek, for example, descends 3,000 feet in approximately eleven miles. Drainage patterns in these areas are characteristic of a youthful stage or early mature stage of stream development, with large, flat erosion surfaces incised by narrow stream channels. Topographic relief is quite pronounced.

Figure 3 – Drainage Basins



Source: State Water Resources Board

Stream flows are rapid during early winter rain-storms, before the heavy snowfall and freezing conditions prevail. This is the case with all streams in the county. Spring run-off due to snow melt greatly increases stream flow. Again, Mosier Creek can be used as an example. The maximum discharge on this creek has varied from a maximum of 4,790 cubic feet per second (cfs) in 1964, to a minimum of 0.60 cfs in the summer of 1968.

There are several gauging stations on rivers in Wasco County. Stations on the John Day River are maintained by the United States Geological Survey at Service Creek, Wheeler County, at river mile 156.7, approximately thirty-six miles upstream from the county border, and at McDonald Ferry, Sherman County, at river mile 20.9, approximately 125 miles downstream from Maupin.

The average discharge recorded at Service Creek for forty-six years was 1,327,000 acre/feet per year (Geological Survey, 1974). The estimated average discharge of the John Day River at its mouth for thirty-three years was 1,410,000 acre/feet per year (State Water Resources Board, 1962).

Gauging stations on the Deschutes River are maintained by the United States Geological Survey near Madras, Jefferson County, at river mile 100.1, approximately ninety miles upstream of Wasco/Jefferson County line; and at Moody, Sherman County, at mile 1.4, approximately eighty-five miles downstream of Maupin.

The average discharge recorded near Madras for fifty-one years was 3,225,000 acre/feet per year. The average discharge recorded at Moody for seventy years was 4,218,000 acre/feet per year (Geological Survey, 1974).

The Deschutes and John Day Rivers, as with most streams that drain arid basins, are subject to extreme flow variations. The John Day River has had periods when no flow was recorded. Seasonal variations are quite pronounced. The high water months normally are March, April, May, and June during snow melt.

A partial record station has been maintained within Wasco County on a small tributary stream of the John Day since 1969. The station is located approximately five miles west of Clarno along State Highway 218. In 1970, the gauge recorded an annual maximum discharge of thirty-seven cubic feet per second. In 1971, an annual maximum discharge of sixty-five cubic feet per second was recorded. In 1972, the recorded annual maximum discharge was fifty-four cubic feet per second. No flow was observed in 1973 (Geological Survey, 1970, 1971, 1972, 1973).

The White River is a major watershed in Wasco County. It is a tributary of the Deschutes River and has a drainage area of 238,080 acres in Wasco and Hood River Counties. It drops 830 feet per mile in its upper four miles, 96 feet per mile between miles 45 and 20, and averages 48 feet per mile between river mile 20 and its mouth. The White River originates at the White River Glacier on the east side of Mt. Hood and flows in an easterly direction through Tygh Valley to the

Deschutes River. The river often carries heavy loads of glacial silt, making the water a chalky, white color. This material is emptied into the Deschutes as the White River joins it just north of Maupin.

2. Ground Water

   a. Hood Basin:
   The Dalles Ground Water Reservoir, or "The Dalles Pool", extends slightly beyond The Dalles Urban Area. This reservoir has been declared a Critical Ground Water Area by the State Engineer, because of declining water levels. It has been shown; however, that artificial recharge of this ground water source is practical by diverting surface water. Artificial re-charge means that a stream was diverted into the ground water reservoir to raise its level. A secondary ground water reservoir exists in lower Three-mile Creek Valley and is also a Critical Ground Water Area. There are no other Critical Ground Water Areas in Wasco County. Declines have been so severe in these areas that it is estimated the water supplies are near exhaustion. Fault impounded ground water reservoirs also exist in upper Mosier Creek Valley and along the North Fork of Mill Creek. Figure 4 shows the generalized ground water geology and the groundwater yield capabilities of each geologic unit.

   Well depths in the Hood Basin vary from 50 to 1,000 feet. The average well depth for all completed wells is approximately 270 feet. The yield of these wells is highly variable. Some produce enough water for irrigation, while others barely supply water for domestic uses. Minimum well spacing of approximately', 1,500 feet has been found advisable for deep wells tapping the aquifer in the Columbia River basalt under steady pumping conditions. Five to ten million gallons per day is the maximum depletion recommended for a two square mile area. Large industrial users like Martin Marietta Aluminum in The Dalles use twenty million gallons of water per day. Average use users Dalles City residents equals 233 gallons per household.

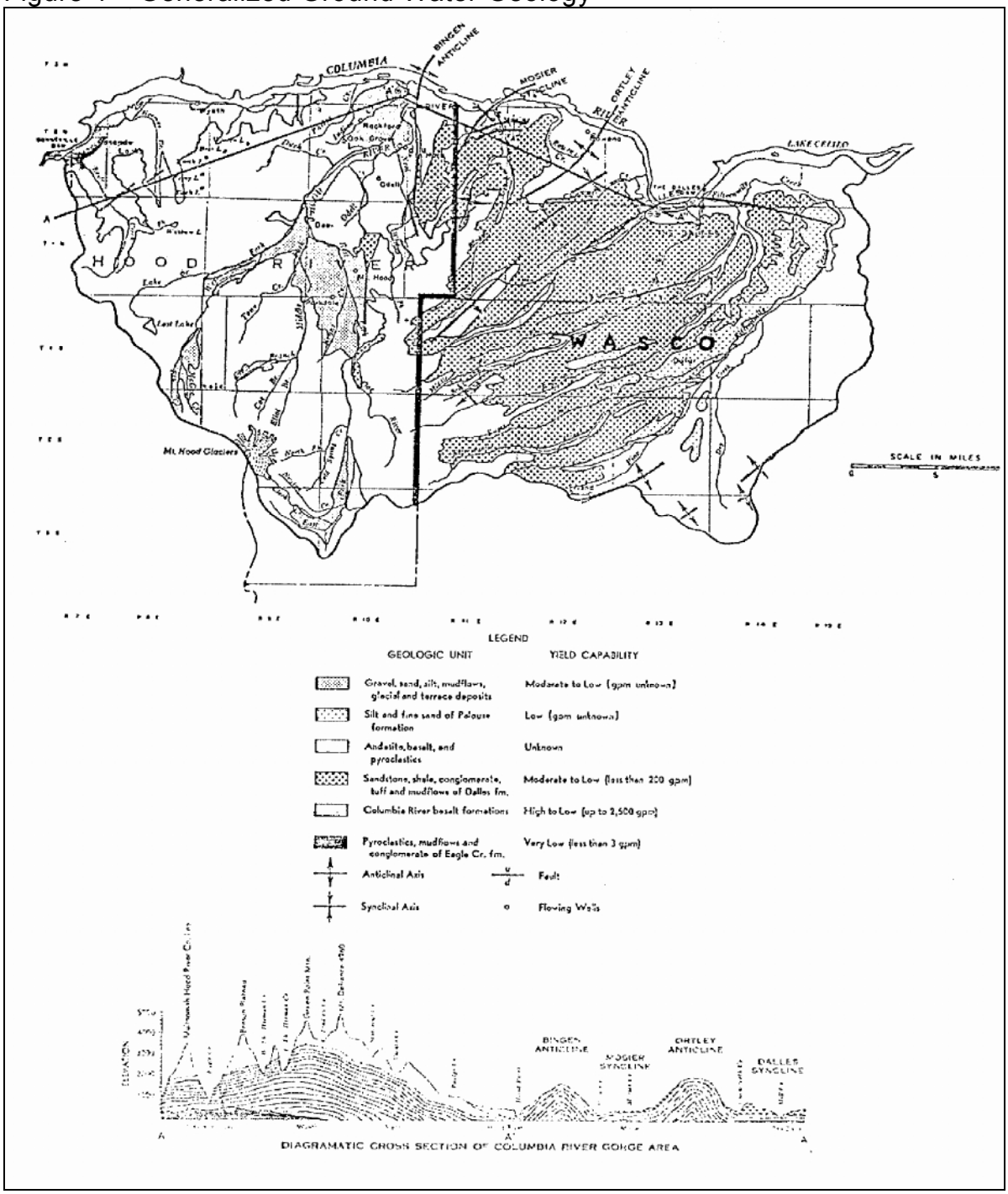
   Tests indicate that a range of flows between 1½ and 300 gallons per minute are derived from these wells that are not artesian. Average well flows are approximately 100 gallons per minute, with artesian wells to 300 gallons per minute and greater.

   Ground water is used in varying amounts to supplement surface irrigation supplies along parts of Mosier, Chenowith, Mill, Threemile, Fivemile, and Fifteenmile Creeks. Around Friend, ground water is insufficient to supply even domestic needs. Most wells drilled in this area are dry.

   The Dalles geologic formation, overlying much of this area, has low permeability and is a source of domestic water only. Moderate supplies of ground water are furnished along Chenowith Creek by gravel zones at the base of this formation. Wells show no indication of declining water levels.

Analysis of the quality of the ground water of selected wells of the area has been studied in Geological Survey Water-Supply Paper 1999-N (see Literature Cited). This publication reveals that ground water of the basalt is satisfactory without treatment for most ordinary uses of water. The water varies from moderately hard to hard, and has a slightly basic pH composition. Other chemical factors do not greatly affect the quality of the water.

Figure 4 – Generalized Ground Water Geology



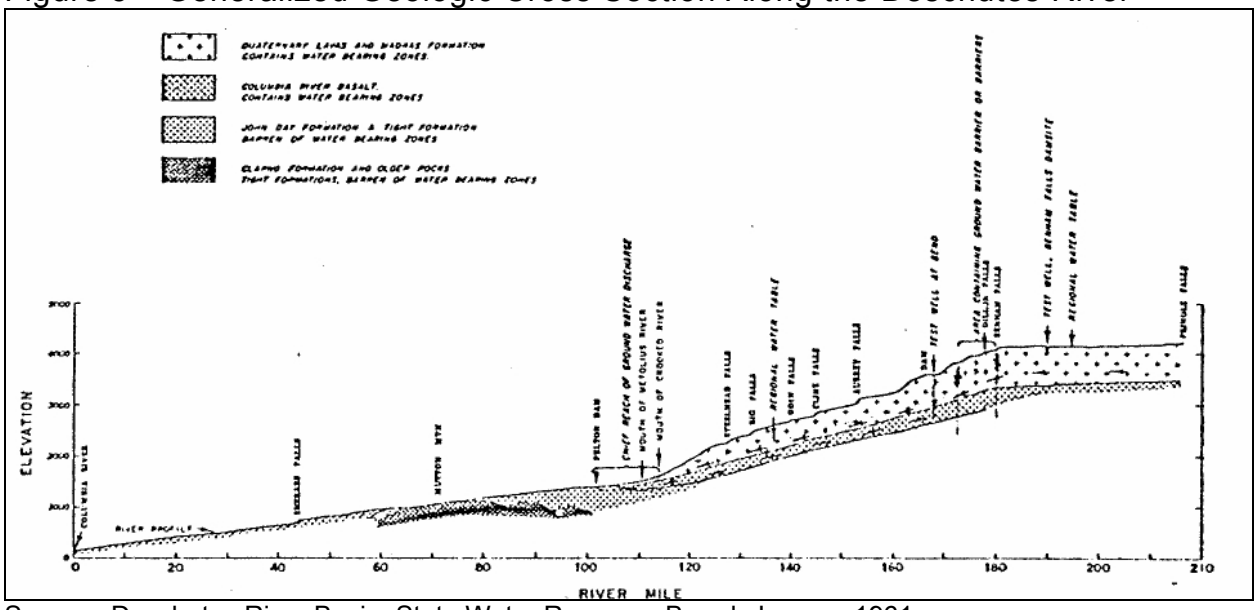
One of the principal ground water problems is that much of the plateau land in the northwestern part of the county lies above the regional water table and necessitates high pumping lifts. Wells over 1,000 feet in depth have been drilled in this area. In the upper areas of Threemile, Fivemile, and Eight-mile Creeks, however, geologic fault barriers in the basalt cause ground water to accumulate at higher elevations than it would otherwise.

b. Deschutes Basin:
According to the report titled, Deschutes River Basin, (State Water Resources Board, 1961), very little is known about ground water resources in the northern part of the Deschutes Basin. Existing well logs are inadequate in number and coverage to determine ground water characteristics or occurrence. Figure 6 gives a general overview of ground water supplies for this portion of Wasco County.

Based on the location of springs identified by the U.S. Geological Survey on topographic quadrangles, it would appear that most springs occur between the elevation of 3,400 feet and 3,700 feet. Many springs are located at the contact between the John Day Formation and the Basalts of the Columbia River Group.

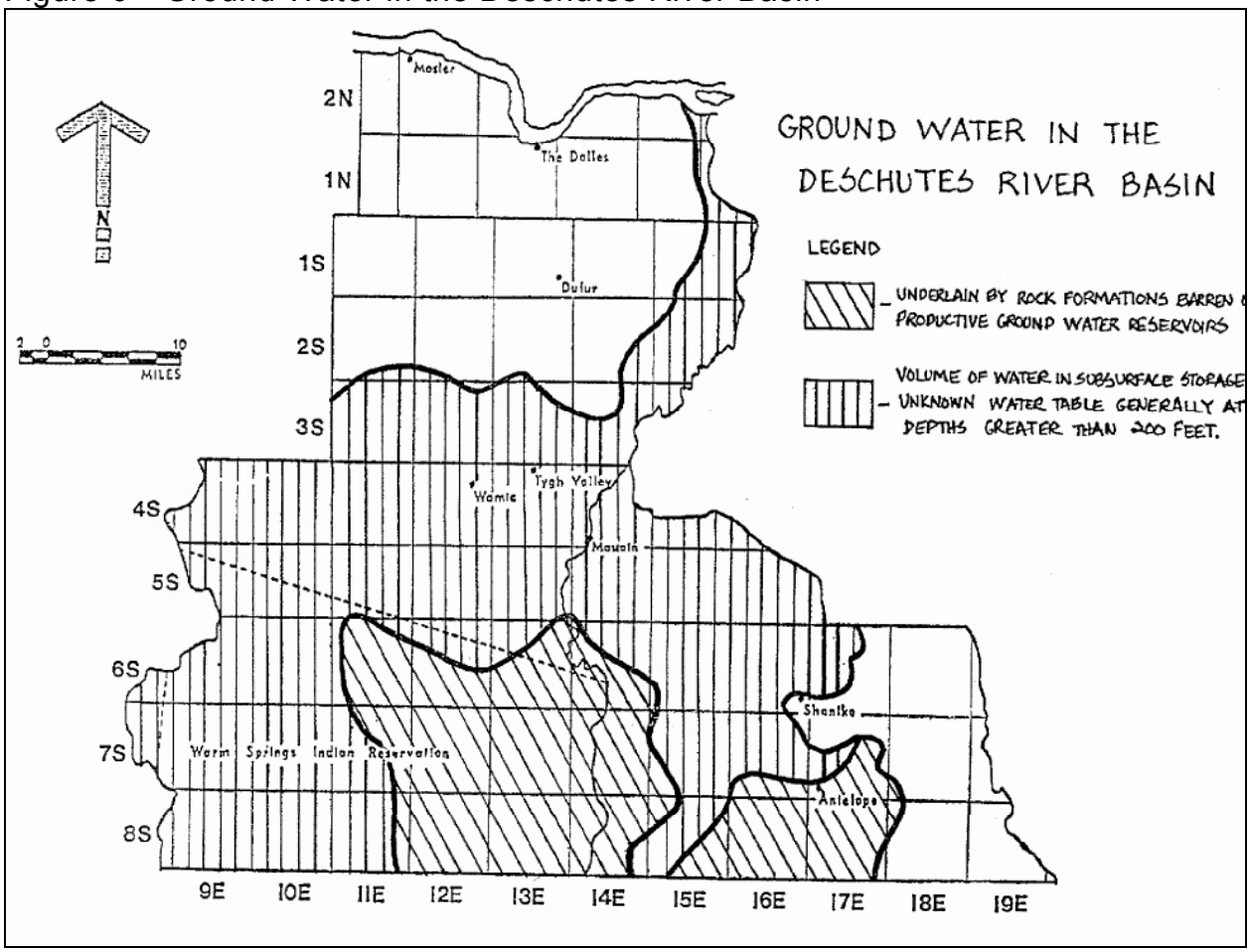
Figure 6 shows a cross section of the Deschutes River from Pringle Falls to the Columbia. The river cuts through layers of Columbia River basalt, which is generally a good water-bearing formation.

Figure 5 – Generalized Geologic Cross Section Along the Deschutes River



Source: Deschutes River Basin, State Water Resource Board, January 1961.

Figure 6 – Ground Water in the Deschutes River Basin



Source: State Water Resources Board

c. John Day River Basin:
No general ground water studies have been made in the John Day River Basin. Figure 7 shows generalized ground water geology and corresponding yield capabilities.

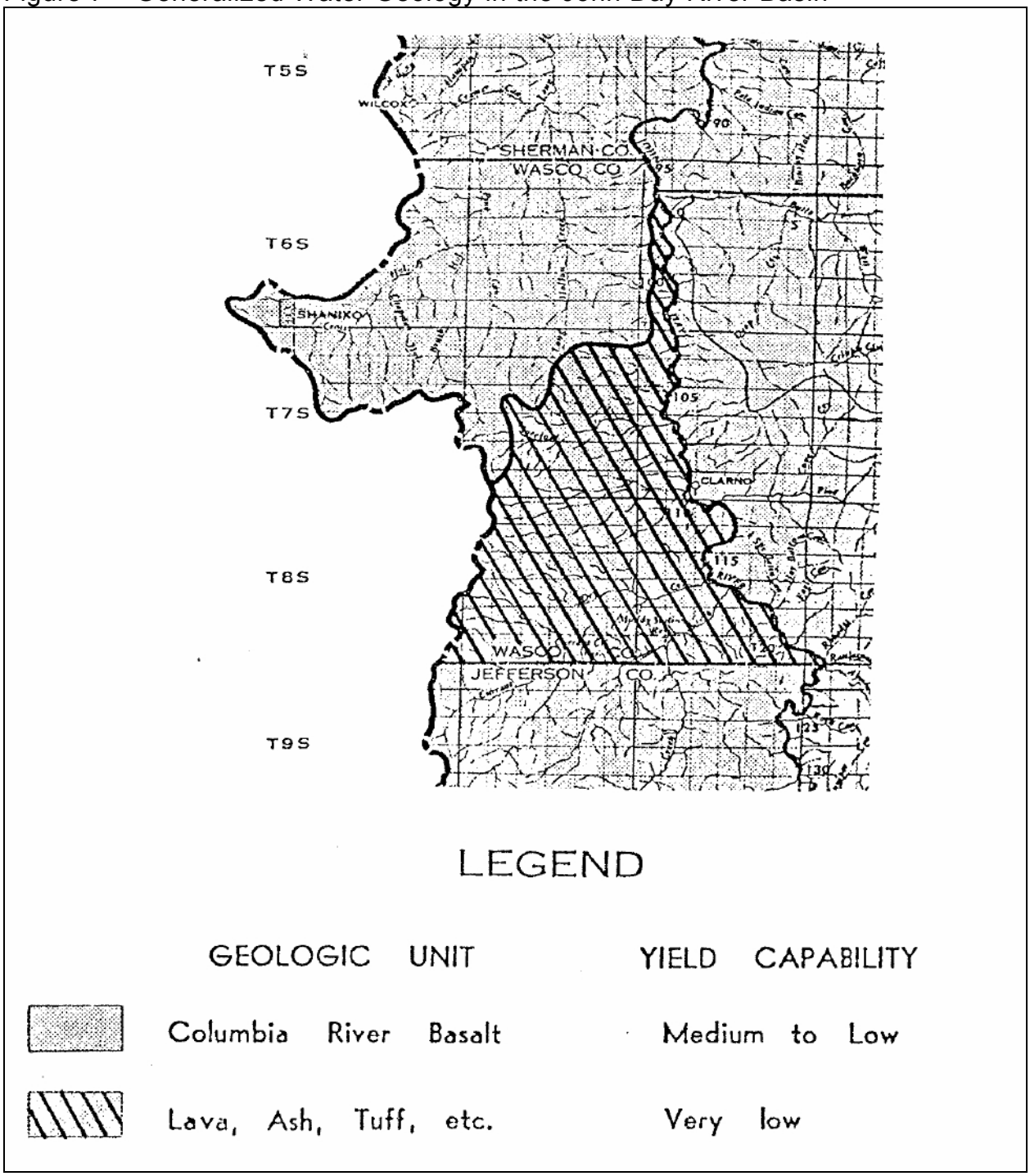
3. Water Rights and Usage
The following Tables (4-6) show water rights for the Wasco County portions of the Hood and Deschutes River Basins. This information could not be extracted for the small portion of the county that lies within the John Day River Basin.

Table 4 – Surface Water Rights Summary, Sub-Basin 3 – Lower Deschutes River

USE	STREAM	CFS	TOTAL RIGHTS
Domestic	Antelope Creek	0.2	
	Badger Creek	0.4	
	Clear Creek	1.0	
	Deschutes River	1.2	
	Hay Creek	0.6	
	Rock Creek	0.1	
	Threemile Creek	0.2	
	Trout Creek	0.3	
	Tygh Creek	0.1	
	Wapinitia Creek	0.1	
	Warm Spring River	0.1	
	White River	0.3	
	TOTAL		4.6
Irrigation	Antelope Creek	6.2	
	Badger Creek	55.8	
	Buck Hollow Creek	1.6	
	Clear Creek	52.7	
	Columbia River	1.0	
	Deschutes River	8.1	
	Hay Creek	43.7	
	Rock Creek	12.0	
	Threemile Creek	26.6	
	Trout Creek	50.6	
	Tygh Creek	36.8	
	Wapinitia Creek	0.5	
	White River	42.6	
	TOTAL		338.2
Municipal	Antelope Creek	0.2	
	Badger Creek	1.0	
	Deschutes River	6.5	
	Threemile Creek	1.0	
	TOTAL		8.7
Industrial	Columbia River	0.1	
	Deschutes River	3.5	
	Tygh Creek	1.0	
	White River	0.2	
	TOTAL		4.8
Recreation	Warm Springs River	0.5	
	TOTAL		0.5
Power	Badger Creek	1.3	
	Clear Creek	0.1	
	Deschutes River	20.0	
	White River	262.0	
	TOTAL		283.4
Mining	Deschutes River	51.0	
	TOTAL		51.0
Fish	Deschutes River	71.4	
	TOTAL		71.4
	GRAND TOTAL		762.6

Source: State Water Resources Board

Figure 7 – Generalized Water Geology in the John Day River Basin



Source: John Day River Basin State Water Resources Board, 1962

Table 5 – Surface Water Rights Summary for Hood Basin As of January 1, 1964

AREA & STREAM	CONSUMPTIVE						NONCONSUMPTIVE				Total Rights Cfs
	Domestic Cfs	Municipal Cfs	Irrigation Cfs	Irrigation Acres	Industrial Cfs	Total Cfs	Power Cfs	Fish Cfs	Recreation Cfs	Total Cfs	
Wasco Area											
-Fifteen Mile Area											
Fifteen Mile Creek	2.09	1.58	47.32	3,813		50.99	16.69			16.69	67.68
Ramsey Creek	0.01		2.76	220		2.77					2.77
-Eightmile Area											
Eightmile Creek	1.45		13.95	1,112	0.28	15.68			0.10	0.10	15.78
Fivemile Creek	0.19		2.47	205	0.50	3.16					3.16
-The Dalles Area											
Threemile Creek & Misc.	1.04		11.29	854		12.33	0.10			0.10	15.78
Mill Creek & Misc.	3.78	2.00**	13.47	1,074		19.25**					19.25**
Chenoweth Creek & Misc.	1.37		2.72	170		4.09					4.09
Columbia River Misc.	0.43		42.49	3,393	13.50	56.42					56.42
Mosier Area											
Mosier Creek & Misc.	4.43	*	5.62	383		10.05	1.88	0.10		1.98	12.03
TOTAL	14.79	3.58*	142.09	11,224	14.28	174.24**	18.67	0.10	0.10	18.87	193.61**
GRAND TOTAL	25.25	51.68*	710.50	53,534	60.08	847.49**	215.62	193.15	0.16	408.93	1,256.42**

Note: *Excludes two springs for municipal to the City of Mosier with no amount given.
**Excludes 4.55 Cfs for ground water recharge of The Dalles Ground Water Pool
Data Source: Oregon State Engineer & USGS

Table 6 – Ground Water Rights Summary – Hood Basin As of January 1 1964

Area	Use	Claimed Cfs	Inchoate Cfs	Perfected Cfs	Area Total Cfs
Wasco	Domestic	1.77	0.28	0	2.05
	Municipal	5.10	34.41	2.68	42.19
	Industrial	0.37	14.38	0.53	15.28
	Irrigation (acres)	1.89 (170)	15.58 (1277)	25.30 (2350)	42.77 (3797)
Subtotal		9.13	64.65	28.51	102.29
Basin Total		9.13	64.65	29.00	102.78

Note: Cfs for irrigation is based on a rate of 1/80 Cfs per acre and 3 acre-feet per acre per irrigation season.
Data Source: Oregon State Engineer

Table 7 Shows the estimated use of water in the Hood Basin (in 1964). This information was not available for other basins.

Table 7 – Estimated Water Consumption

Area	Surface Water Acre Feet	Ground Water Acre Feet	Total Consumed Acre Feet
Hood	46,000	0	46,000
Wasco	10,000	8,000	18,000
Total	56,000		64,000

Further information on water and its uses in Wasco County can be found in the following publications: Hood Basin, (1965); Deschutes River Basin, (1961); and, John Day River Basin, (1962), (State Water Resources Board).

4. Municipal Watersheds

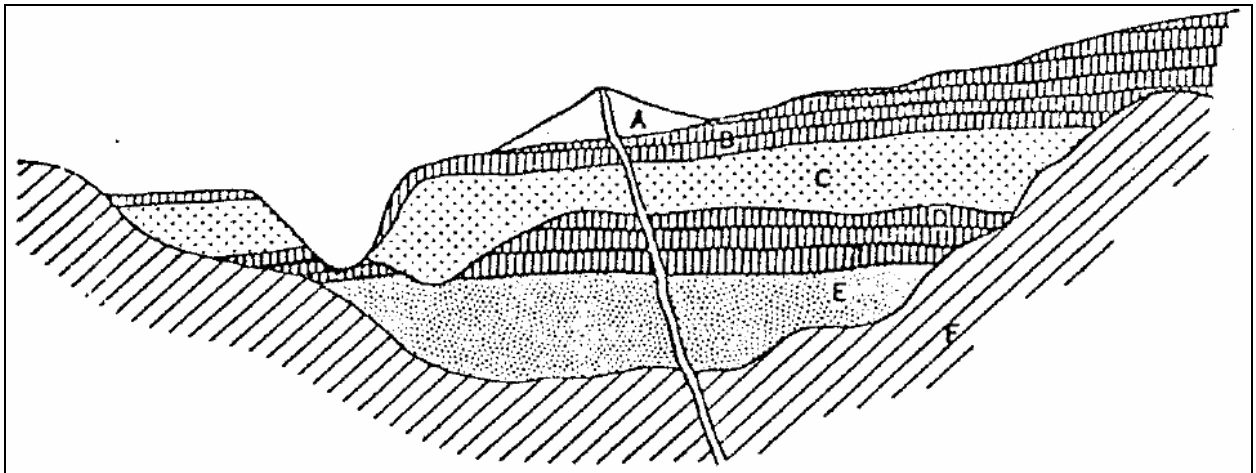
The Dalles Watershed: "The Comprehensive Management Plan for The 'Danes Municipal Watershed", December, 1972, is the guiding document for planning in this area. This document will be considered as the inventories, analysis, and policies for this watershed.

Dufur Watershed: This watershed supplies domestic water for the city of Dufur. This water from Fifteenmile Creek is the main source of domestic water, supplemented by two wells located inside the city limits. The wells producing approximately 350 and 1080 gallons per minute, respectively, supplement low summer flows in Fifteenmile Creek. The watershed is utilized at approximately 300 to 900 g.p.m. depending on the season. Turbidity is the major water quality problem, with occasional fecal coliform contamination due to grazing.

E. Geology

Figures 4, 5, and 7 have shown the basic geologic formations in the Wasco County portions of the Hood, Deschutes River and John Day River Basins. Figure 8 (below) shows the major rock units in the Deschutes River Basin.

Figure 8 - Diagrammatic section showing the major rock units of the Deschutes River Basin



Designation in Figure	Unit Name	Character	Water Bearing Characteristics
A	Quaternary Pyroclastic Deposits	Chiefly cinders associated with cinder cones.	Rocks of this unit are generally well drained and not sources of good ground water. Where saturated they are capable of yielding large supplies of ground water.
B	Quaternary Lavas	Chiefly basaltic lava flows associated with Newberry Crater, and volcanic eruptions in the Cascade Range.	Contains numerous porous lava flows. At most places are well drained and are unproductive. Where they are saturated, they are capable of yielding moderate to large supplies of ground water.
C	Madras Formation	Chiefly stratified layers of sand, silt, ash, pumice with some gravel with some lenses. Contains some interbedded lava flows.	This formation is in large part fine grained and not a productive aquifer. At places it contains permeable lenses of gravel that are capable of yielding moderate supplies of ground water. Some of the interbedded volcanic rocks are permeable and are capable of yielding large supplies of ground water.
D	Columbia River Basalt	Series of basaltic lava flows.	Contact zones between individual lava flows serve as aquifers. This formation is generally capable of yielding moderate to large supplies of ground water.
E	John Day Formation	A sedimentary formation composed of silt, sand, and volcanic ash.	The fine grained character of this formation precludes it from being a productive source of ground water.
F	Clarno Formation & Older Rocks Unidentified	Chiefly consolidated sedimentary rocks, volcanic rocks and associated pyroclastics.	All of these rocks are believed to be of low permeability and not capable of furnishing more than meager supplies of ground water

Generally, the county is underlain with expansive flows of Columbia River Basalt. Layers of ash, tuff, and other volcanic material have been deposited in many areas as have erosional materials from the Cascades, such as sand and silt. The flows of Columbia River Basalt are very obvious in the cliffs along the Columbia River Gorge and other parts of the county.

F. Natural Hazards

Natural hazards include phenomena such as floods, earth-quakes, high winds, erosion, etc., which may be detrimental to human health and/or property values. There has only been a limited amount of study of natural hazards within Wasco County.

1. Geologic Hazards: Slopes, slide and slump areas, erosion areas, fault lines, and geologic units have been identified by the Oregon Department of Geology and Mineral Industries. Reference is made to Geologic Hazards of Parts of Northern Hood River, Wasco and Sherman Counties, Oregon, 1977. A complete explanation and maps showing the natural hazards and geologic units can be found in this document; however, this document should not be mistaken as a site-specific study. It shows generalized first approximations of actual conditions as they occur on specific parcels of land. Engineering solutions to problems should be considered in any of the identified hazard areas.

   Following is a list of the specific types of areas identified as geologic hazards. Figure 9 shows the slide and slump areas that have been identified in the county.

   a. Average regional slopes - slopes of varying degrees are identified; hazards increase with slope.

   b. Deep bedrock slides - possible hazards include continued sliding, variable foundation strength, variable cutbank stability, poor drainage, and others; potential for development variable.

   c. Earthflow and slump topography - (areas greater than ten to twenty acres) possible hazards may include continued movement, low cutbank stability, poor drainage, and others; development possible locally, but generally may reactivate or accelerate sliding.

   d. Steep slope mass movement - areas subject to localized debris flow, rock fall or rockslide.

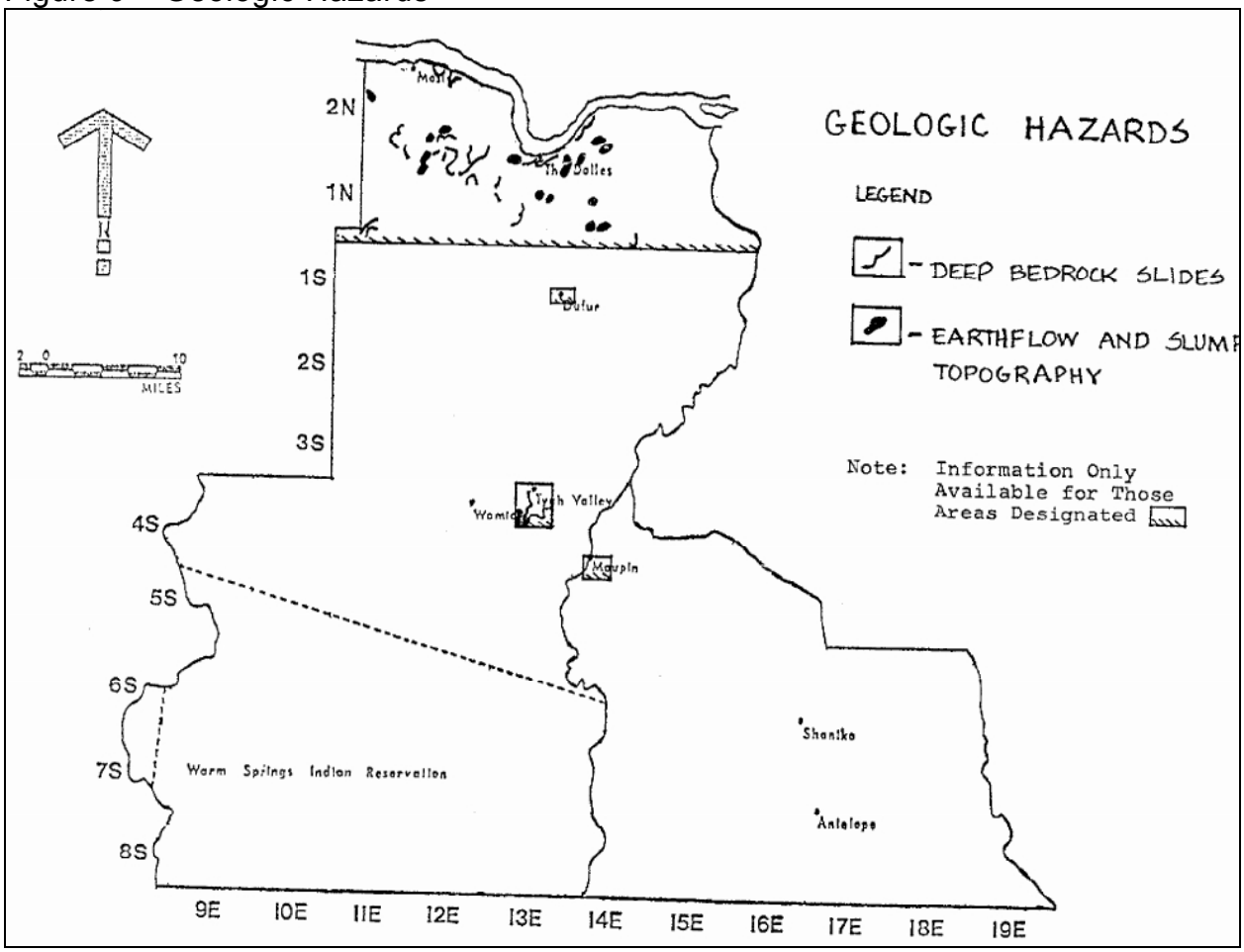
   e. Thick talus - associated hazards include shallow sub-surface run-off, low cutbank stability especially in wet season, and debris flows either in talus or emanating from upslope canyons; deep cuts and development generally not recommended.

   f. Critical stream-bank erosion - (not including torrential flood channels) - mitigation may include riprap, channel modification, and land use restriction depending on local hydraulics, desired land use, and erosion rates.

   g. Lowland and torrential flooding - areas of historic or probable flooding shown in a generalized manner.

   h. Potential future mass movement - certain areas have potential for future hazards based on known occurrences; delineation requires detailed mapping.

Figure 9 – Geologic Hazards



Source: Department of Geology and Mineral Industries

i. Faults - There appear to be no active faults in the Study area. It must be remembered that these geologic hazards have been identified in a general manner and boundaries are approximate. Evaluations of development require on-site investigation by a geologist.

j. Slope erosion - loss of soil material by moving water on slopes.

2. Flood Hazards: The Flood Insurance Rate Maps covering most of the unincorporated portions of Wasco County was published by the Federal Emergency Management Agency and became effective on September 24, 1984 The maps are on a scale of one inch equals 2,000 feet (1:24,000), and are revised and/or modified as needed. Figure 10 indicates areas within Wasco County that are designated as "Areas of Special Flood Hazard". The detailed maps are available at the Wasco County Planning Office. They are referred to when decisions are made concerning development near creeks, streams or rivers.

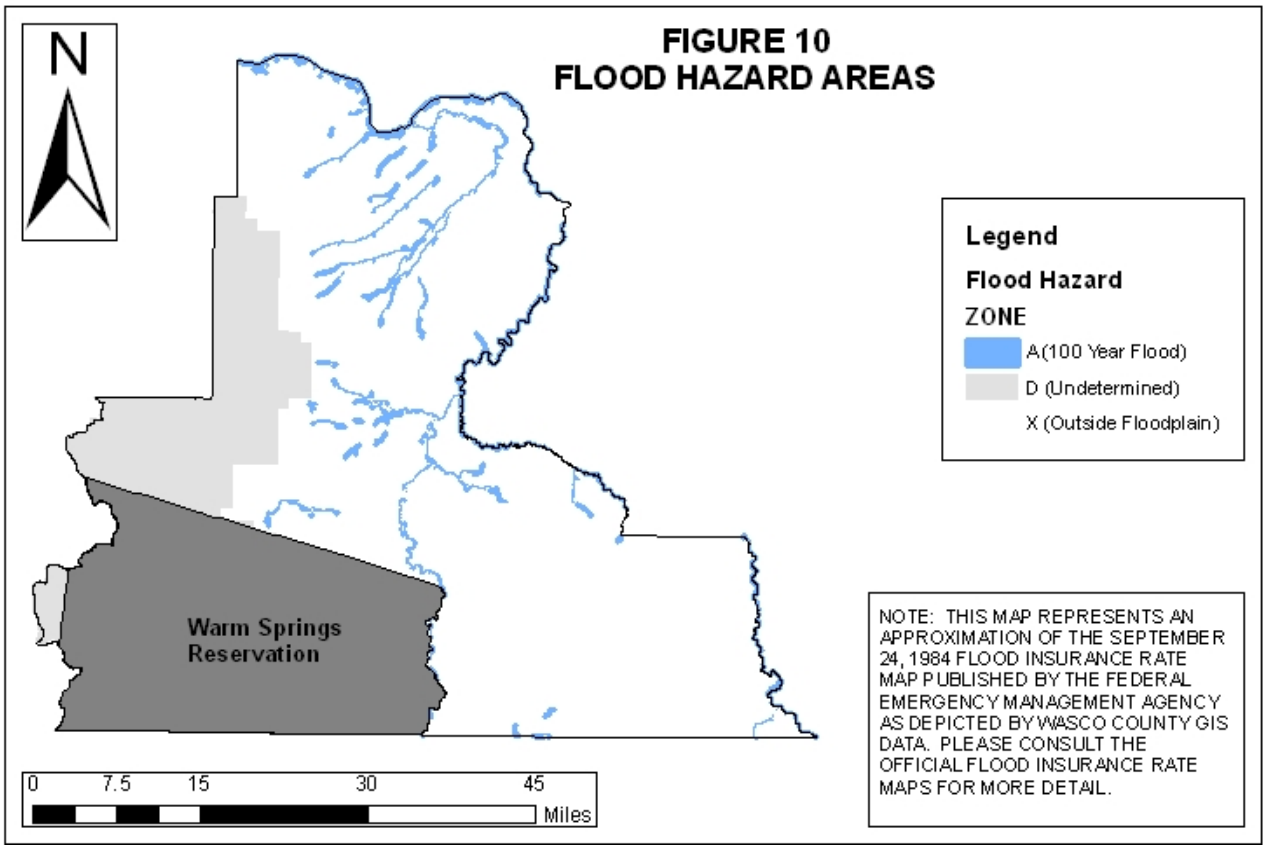
   No slope studies have been initiated for the entire county. However, "71/2 - minute" (1:24,000) topographic maps are avail-able from the United States Geologic Survey. These maps can be used to determine areas of excessive

slope which may have high erosion potential or other geologic hazards. A map showing areas of excessive slope, (20% and over), should be prepared and included in the Plan during the updating process.

Neither of the above sources of natural hazard information should be mistaken as site-specific proof of incidence or non-incidence of a natural hazard. They only indicate generalized first approximations of actual conditions on specific parcels of land.

The summer of 1980 has brought another type of natural hazard sharply into focus; volcanic eruption and the resulting ash fall-out, flooding, debris flows and fires.

Figure 10 – Flood Hazard Areas



3. Volcanic Hazards: Although ash fall-out in Wasco County from the eruptions of Mount St. Helens has been minor, an eruption of Mount Jefferson or Mount Hood could cause vast destruction. The County Sheriff's Department would cooperate with state and local police, the National Guard and the Civil Defense (A Commission in case of national or widespread local emergency.

   Local radio stations test the National Warning System frequently. In case of an actual emergency, these stations would broadcast pertinent information and instructions.

G. Mineral & Aggregate Resources

1. General Information: Wasco County has few economically important mineral deposits. Some limited mining activity has occurred in the past. There are no active mineral mines in Wasco County.

   Most of the county is underlain with recent basalt flows which precludes the possibility of extensive mineral resources. The highest potential for minerals would be in the older geologic formations, found in other parts of Oregon or bordering counties. The primary minerals found in Wasco County are discussed below.

   a. Bauxite: Evidence suggests that there may be some potential low grade bauxite found in the Columbia River basalt group but no investigations have been undertaken in the County.

   b. Copper and Lead: These minerals have been mined in the Ashwood-Oregon King Mine located in Jefferson County to the south. Some deposits may occur in the County.

   c. Mercury and Molybdenum: No economically important deposits are located within the County.

   d. Semi-precious Gems: These are attractive to "rock hounds", rather than for their mineral value. The highest concentrations of these stones are indicated on Figure 11.

   e. Perlite: Mining was undertaken south of Maupin near the Deschutes River between 1945 and 1950. High quality acoustic and insulating tile was produced for a number of years from this perlite. It became unprofitable to mine at this location and the operation was discontinued. A large deposit still exists in the area and may become important in the future.

   f. Volcanic Tuffs: The Rainbow Rock Quarry, about five miles south of Pine Grove, has produced brightly colored and banded tuff since 1949. Rock of similar appearance has been uncovered but not developed on a nearby flat east of the quarry. Tuffs are utilized for decorative building stone and ceramic art.

   g. Peat: According to the U.S. Geological Survey, Mineral and Water Resources of Oregon, 1969, there are widely scattered minor deposits of peat in the Cascade region of the County and coal in the southeastern region. They have never been mined commercially.

   h. The Ka-Nee-Ta Stone Quarry: On the Warm Springs Indian Reservation. This quarry produces rough pieces of rhyolite. The stone is multi-colored and valuable for decoration. Other stone quarries include the Indian Candy, and Sorenson Quarry.

i. Quarry Rock: Quarry rock increases in importance as the more desirable deposits become depleted. Transportation costs are high so that quarries must be located within ample reserves of good quality crushing rock, those reserves are not always located conveniently with respect to present markets or proposed projects. The best rock for crushing generally is Columbia River basalt.

2. Inventory: Wasco County's cumulative demand projection for all aggregate material by the year 1995 was between four and six million tons (Wasco County Aggregate Site and Aggregate Demand Analysis (1976) Montagne and Associates). Total resources as inventoried in that document are 6.3 million tons. The demand projection was based on a per capita average.

Available information was sufficient to identify 135 resources sites in Wasco County. A study done in 1976 by Montagne and Associates, Wasco County Aggregate Sites and Aggregate Demand Analysis (1976), provided the basis for this information. However additional information requested by and received by the County for these sites seldom revealed site-specific location and never indicated quality of the material. Location and quality information should be augmented whenever a use is proposed within the proximity of a mapped site. Reclamation permits issued through the Oregon Department of Geology and Mineral Industries (DOGAMI) provided an additional source of information for mineral sites. During 1990-1991 additional information, to supplement the 1976 survey information, was gathered from individual owner/operators and from the DOGAMI Mined Information Layer (MLR) database to provide the County a more thorough and accurate record of sites in the County (Appendix A).

Available information was not sufficient to determine the specific location, quality and quantity for the majority of the 135 mineral sites identified. Most every source contained only general locational information. Quantity information was sometimes available, quality information was nearly always lacking. All Wasco County sites listed in the County Inventory and DOGAMI Mined Information Layer (MLR) database shall be incorporated into the County inventory and designated "Potential Sites" until further information is available to determine whether or not the site is significant. See Table 7B below for current inventory.

3. Application of the Goal 5 Process for Mineral Resources

a. Potential Conflicting Use in Zone Categories Applicable to Mineral Resource Sites: All except one currently inventoried resource site fall into three resource zones employed by the County: A-1, Agriculture; FF, Farm - Forest; F-2, Forest. One site is in an Industrial zone (Sun Pit). Conflicting uses are generally those which, if allowed to locate within the specific site identified, would render the resource unrecoverable and those activities on surrounding lands which affects or is affected by aggregate operation. Most of the conflicting uses are structural improvements which commit the site to another use. Other less intensive uses such as recreation facilities, public parks and playgrounds, and golf courses which are conditional uses in some zones may conflict because, once established, they tend to diminish the value of the resource. Some

competing uses, such as water impoundments or power generation facilities, may be determined to be of sufficient importance as to preempt the mineral resource value.

Specific potentially conflicting uses contained within the A-1, FF, and F-2 zones are;

Zone	Permitted Uses	Conditional uses
A-1	Farm dwelling	Additional Farm Dwelling
	Utility facility (public)	Nonfarm dwelling
		Commercial activities in conjunction
		Private recreation facilities
		Churches
		Schools
		Public parks and playgrounds
		Golf courses
		Utility facilities (commercial)
		Personal use airport
		Home occupations
		Solid waste disposal site
F-F	Same as A-1 Zone except boarding of horses for profit.	Same as A-1 zone except for kennels
F-2	Utility Facilities (public)	Forest Farm Dwelling

b. Economic, Social, Environmental and Energy Consequences of Conserving Mineral Resources

(1) Economic Consequences: Aggregate is a crucial resource for nearly all types of structural development. As a basic building material, its relative abundance can exert either a positive or negative influence on the development of a local economy. It provides the building blocks for development, and the removal, transport and use provides jobs upon which a substantial part of the economy depends.

To protect mineral resource sites through the resolution of conflicts between mineral extraction and other competing uses (as identified) will help ensure a strong economic future. The economic consequences of not protecting mineral sites could be costly to the local economy through increased costs for basic building materials.

(2) Social Consequences: The consequence of protecting mineral resource sites is necessary in order for public and private construction projects. The characteristics of sand and gravel operations may be a nuisance in that they do contribute to noise, dust, and visual blight.

The negative social consequence of applying regulations is similar to the negative economic consequences in that the same individuals may be inconvenienced in their building plans.

(3) Environmental Consequences: The importance of any mining activity lies within its economic value and the relative scarcity of the resource. State agencies regulate mining activities and require that reclamation plans be submitted prior to permit approval. Reclamation plans provide for productive uses of property following a mining operation and can include recreational features such as lakes and wildlife habitats.

Because the natural environment will, of necessity, be disturbed by mining, the protection of mineral resource sites may not result in positive environmental consequences (mineral extraction is temporary in nature). Farming, forestry and recreation can and do occur before and after a mining operation. In case of important mineral resource sites, the positive economic and social benefits must be weighed against the environmental consequences.

(4) Energy Consequence: Because of transportation costs, the deposits nearest to developing areas are, of necessity, the best ones in order to remain economically viable. As a result, the energy consequence of protecting the best mineral resource site (those close to construction areas) is entirely positive.

(5) Conclusion: In Wasco County decisions to protect aggregate sites for Goal 5 will be on a site by site basis. The consequences of establishing requirements which limit conflicting uses in identified mineral resource sites should prove to be of substantial benefit to the economic, social, and energy systems within which we live. As long as provision for reviewing extenuating circumstances is included, the limitation of conflicting uses within identified mineral resources sites is warranted.

c. A Program to Conserve Mineral Resource Sites: The program to conserve significant mineral resource sites is designed to limit some conflicting uses and prohibit others through the use of an overlay zone. The overlay will ensure that most structural development will not preempt the use of a needed mineral resource.

Based on a site specific ESEE analysis, the County shall make a determination on the level of protection to be afforded each significant site. The County shall make one of the following determinations:

(1) Protect the site fully and allow mining. To implement this decision the county shall apply the Mineral and Aggregate Overlay zone. Development of the significant site shall be governed by the standards in Section 3.835 of the Wasco County Land Use and Development Ordinance. As part of the final decision, the County shall adopt site-specific policies prohibiting the establishment of conflicting uses within the Impact Area.

(2) Allow conflicting uses, do not allow surface mining. To implement this decision the county shall not apply the Mineral and Aggregate Overlay zone.

The significant site will not be afforded protection from conflicting uses, and surface mining shall not be permitted.

(3) Balance protection of the significant site and conflicting uses, allow surface mining. To implement this decision the county shall apply the Mineral and Aggregate Overlay zone, and identify which uses in the underlying zone will be allowed, allowed conditionally, or prohibited. Development of the significant site shall be governed by the standards in Section 3.835 of the Wasco County Land Use and Development Ordinance and any other site-specific requirements designed to avoid or mitigate the consequences of conflicting uses and adopted as part of the final decision. Development of conflicting uses within the Impact Area shall be regulated by Section 3.845 of the Wasco County Land Use and Development Ordinance and any other site-specific requirements designed to avoid or mitigate impacts on the resource site and adopted as part of the final decision.

Any uses not mentioned below will be allowed as specified in the Land Use and Development Ordinance.

Under the Mineral Resource Overlay, the following uses, by zone, will be prohibited:

Zone	Prohibited Use
F-2	Single Family Dwelling
A-1	Churches
	Second farm dwelling
	Schools
	Additional farm dwellings
	Nonfarm dwellings
F-F	Churches
	Second farm dwelling
	Schools
	Additional farm dwellings
	Nonfarm dwellings

The following uses by zone, will require a conditional use permit.

Zone	Conditional Use
F-2	Public recreational facilities
	Water impoundments
	Private recreation facilities
A-1	Public utility facilities
	Solid waste disposal site
	Water impoundments
	Commercial activities in conjunction with farm use
	Private recreation facilities
	Public parks and playgrounds

	Golf courses
	Commercial utility facilities
	Personal use airport
	Boarding horses for profit
	Farm Dwellings
F-F	Placement of power generation facilities
	Kennels
	Public utility facilities
	water impoundments
	Commercial activities in conjunction with farm use
	Public parks and playgrounds
	Golf courses
	Commercial utility facilities
	Personal use airport
	Boarding horses for profit
	Private recreation facilities
	Solid waste disposal sites
	Farm Dwelling

Table 8 - Wasco County Aggregate Inventory

Inv. #	Current Map/Tax Lot	Former Map & Tax Lot	Owner Name & Address	Application #'s	DOGAMI #	Goal 5	Zone
1	2N 11E 2 D 200	2N 11E 0 1400	Hood River Sand & Gravel 2630 Columbia River Dr. HR OR 97031	CUP 92-110	33-0055	No	Mosier UGA
2	2N 11E 11 900	2N 11E 11 2800	ODOT – Bend Region 4 63034 O.B. Riley Road Bend OR 97701		33-0060	No	NSA A-2(80)
3	2N 11E 2 D 300	2N 11E 11 200	ODOT – Bend Region 4 63034 O.B. Riley Road Bend OR 97701		33-0057		Mosier UGA
4	2N 11E 1 D 200	2N 11E 1 D 200	Hood River Sand & Gravel 2630 Columbia River Dr. HR OR 97031	CUP 92-136	33-0076	No	NSA A-1(40)
5	2N 11E 13 600	2N 11E 3500	Ken & Joan Hudson 1020 Mosier Creek Rd. Mosier, OR 97040			No	F-2(80)
6	2N 11E 24 500	2N 11E 6001	Ken Thomas PO Box 156 Dufur, OR 97021			No	F-2(80)
7	2N 12E 19 1200	2N 12E 19 600	Tony Heldstab 2175 Mosier Creek Road Mosier OR 97040	CUP 92-126 94-111	33-0088	No	F-2(80)
8	2N 12E 29 1801	2N 12E 29 1800	Ken Thomas PO Box 156 Dufur, OR 97021			No	F-2(80)
9	2N 11E 11 800	2N 11E 11 2700	Jayson & Julie Sprague (Weisfield Pit) 195 Hood River Rd Mosier, OR 97040	CUP 92-101 - Exp. 1997	33-0079	No	NSA A-2(80)
10	2N 12E 0 4300		Ardyce Edling Chenoweth Air Park			No	F-F(10) & R-R(10)

			6200 Chenowith Rd. The Dalles, OR 97058				
11	2N 13E 19 1600	2N 13E 19 100	Ulrich Wingens 1525 Norland Dr. Sunnyvale, CA 94087			No	NSA A-1(160)
12	2N 13E 19 600	2N 13E 19 800	Yvonne Walton 4900 Seven Mile Hill Rd The Dalles, OR 97058		33-0009	No	NSA A-1(160)
13	2N 12E 0 1300	2N 12E 24 12500	Jim Ellett 5693 Chenoweth Road The Dalles OR 97058	CUP 90-124 & C90-0249	33-0056	Yes	NSA A-1(160)
14	2N 12E 16 D 1900	2N 12E 16 D 1700	William Ringllbauer 2244 Dell Vista Drive The Dalles OR 97058			No	F-F(10)
15	2N 12E 0 100		Mayer State Park (Rowena Loops)			No	NSA SMA Open Space
16	2N 13E 17 B 200	2N 13E 17 1801	US Forest Service 902 Wasco Ave Ste 200 Hood River OR 97031			No	NSA SMA Open Space
17	2N 13E 20 300	2N 13E 20 1000	Wayne & Jana Webb P O Box 692 The Dalles OR 97058	CUP-98-122 Exp. 1-2000	33-0064	No	NSA A-1(160)
18	2N 12E 13 20 ROW Site Not Identified		ODOT Gooseberry Springs			No	NSA A-1(160)
19	2N 12E 13 20 ROW Site Not Identified		ODOT Gooseberry Springs			No	NSA A-1(160)
20	2N 14E 0 500 & 2N 14E 0 2300		Dalles Dam - State of Oregon Gard Fulton			No	NSA A-1(160)

			3775 Fifteen Mile Road The Dalles, OR 97058				
21	2N 13E 0 20 700, 600	2N 13E 20 600	(Sun Pit) - Munsen Paving & Excavating 1022 W 9th Street The Dalles OR 97058	CUP 91-101 SPR 91-103	33-0011 33-0083	No	NSA A-1(160)
22	2N 15E 0 500	2N 15E0 700	Celilo - State of Oregon Sandra Richard 7240 SW Benz Park Ct Portland, OR 97225			No	NSA A-1(160)
23	Fifteen Mile Road ROW Site Not Identified		Wasco County 511 Washington St. The Dalles, OR 97058			No	
24	2N 14E 25 ROW	2N 14E 0 25	Wasco County 511 Washington St. The Dalles, OR 97058			No	A-1(160)
25	2N 14E 0 1100	2N 14E 0 1000	Jacob Kaser 4550 Fifteen Mile Road The Dalles OR 97058			No	A-1(160)
26	2N 14E 0 2200	2N 14E 28 2700	Donna E. Ashbrook et al 75 Heimrich St. Dufur OR 97021		33-0014	No	A-1
27	2N 14E 33 500	2N 14E 33 400	Judith F. Bayley et al 6331 SW Radcliff St Portland OR 97219			No	A-1
28	2N 14E 0 2400	2N 14E 33 3000	C Gard Fulton 3775 Fifteen Mile Rd. The Dalles OR 97058		33-0023	No	A-1(160)
29	1N 14E 0 300	1N 14E 0 400	William Johnson 4800 McCoy Rd The Dalles OR 97058			No	A-1(160)
30	1N 14E 2000	1N 14E 0 3500	Sylvia Weimer			Yes	A-1(160)

			2230 Five Mile Road The Dalles, OR 97058				
31	1N 14E 0 2300	1N 14E 0 3300	William & Sheli Markman/Wasco County 4800 Eight Mile Road The Dalles OR 97058			No	A-1(160)
32	1N 15E 0 3700	1N 15E 3700	William & Carmen Eddins 1312 W 10th St Unit 17 The Dalles OR 97058			No	A-1(160)
33	1N 14E 0 500	1N 14E 0 6700	Mike Byers 3693 Fifteen Mile Rd, The Dalles, OR 97058			No	A-1(160)
34	1S 13E 0 100	1S 13E 0 100	Tom May 5650 Eight Mile Rd. The Dalles, OR 97058		33-0013		A-1(160)
35	1S 14E 17 300	1S 14E 3100	Miller Ranch Co. 110 NE Greenwood Ave. Bend OR 97701			No	A-1(160)
36	1S 14E 0 3000	1S 14E 0 3401	Paul & Velma Limmeroth 2520 Ward Road The Dalles OR 97058			No	A-1(160)
37	1S 14E 18 100	1S 14E 18 100	Miller Ranch Co. 110 NE Greenwood Ave. Bend OR 97701			No	A-1(160)
38	1S 14E 0 3200	1S 14E 0 3600	Mary Sylvester 3813 Faith Home Road Ceres CA 95307			No	A-1(160
39	1S 14E 20 Site Not Identified	1S 14E 20	Dufur			No	
40	2S 13E 0 100	2S 13E 35 100	Richard Neil 4820 Davis Cut-Off The Dalles, OR 97058		33-0050	No	A-1(160)

41	2S 13E 0 5000	2S 13E 35 5200	ODOT - 33-025-4 Tygh Ridge Quarry		33-0071	Yes	A-1(160)
42	3S 13E 0 100	3S 13E 0 100	William Hulse 61906 Dufur Gap Rd. Dufur OR 97021			No	A-1(160)
43	3S 13E 0 2300	3S 13E 0 2500	Frances Limmeroth Trust 63439 Dufur Gap R. The Dalles OR 97058			No	A-1(160)
44	3S 13E 0 2300	3S 13E 0 2500	Frances Limmeroth Trust 63439 Dufur Gap R. The Dalles OR 97058			No	A-1(160)
45	3S 13E 0 2700	3S 13E 0 3200	Tygh Ridge Ranch 82859 Hwy 216 Tygh Valley OR 97063	CUP 96-101	33-0054	No	A-1(160)
46	3S 13E 33 100	3S 13E 33 3500	Tygh Ridge Ranch 82859 Hwy 216 Tygh Valley OR 97063		33-0047	No	A-1(160)
47	2N 11E 36 100	2N 11E 7600	Hattie Schmidt 2050 State Rd. Mosier OR 97040		33-0081	No	F-2(80)
48	2N 12E 30 1100	2N 12E 9139	David McKinney PO Box 291 Georgetown, ME 04548		33-0088	No	F-2(80)
49	2N 13E 31 B 600	2N 13 31 600	Leroy Greenway 3323 Sandlin Rd. The Dalles OR 97058			No	R-R(5)
50	1N 11E 25 100	1N 11E 0 900	Ketchum Ranch Inc 6282 Chenowith Road W The Dalles OR 97058			No	F-2(80)
51	1N 13E 0 1300	1N 13 0 4490	John Skirving Trust 809 W. 9th St The Dalles OR 97058			No	A-1(160)
52	1N 13E 32 200	1N 13E 0 5300	Orchard Meadow LLC			No	A-1(160)

			3573 Olney Rd. The Dalles OR 97058				
53	1N 13E 0 700	1N 13E 25 700	Munsen Paving LLC 1022 W. 9th St. The Dalles OR 97058	CUP 90-113	33-0082	No	A-1(160)
54	1N 15E 0 3500	1N 15E 0 2900	Joanne Brewer Et Al 5854 Robert Mkts Road The Dalles OR 97058			No	A-1(160)
55	1S 15E 0 700	1S 15E 0 402	James Q Johnson 6352 Roberts Market Road The Dalles OR 97058			No	A-1(160)
56	1S 15E 0 2000	1S 15E 0 1400	Julia Testa Living Trust 8604 Buckboard Dr. Alexandria, VA 22308			No	A-1(160)
57	1S 15E 0 2601	1S 15E 0 2600	Carleton & Pam Clausen 85681 Adkisson Rd. Dufur OR 97021			No	A-1(160)
58	2S 14E 0 1900	2S 14E 0 1600	Martin Underhill P O Box 266 Dufur OR 97021			No	A-1(160)
59	2S 14E 0 2000	2S 14E 0 1800	Martin Underhill P O Box 266 Dufur OR 97021			No	A-1(160)
60	2S 14E 0 2300	2S 14E0 2000	Robert & Nancy Hammel 62250 Tygh Ridge Road Tygh Valley OR 97063			No	A-1(160)
61	1N 15E 0 2200	1N 15E 21 2100	William & Barbara Hammel 7075 Fifteen Mile Road The Dalles OR 97058			No	A-1(160)
62	1N 15E 0 2200	1N 15E 0 2100	William & Barbara Hammel 7075 Fifteen Mile Road The Dalles OR 97058			No	A-1(160)
63	1N 15E 0 2900	1N 15E 20 2700	Joanne Brewer			No	A-1(160)

			5854 Roberts Mkt Rd. The Dalles OR 97058				
64	1S 14E 0 4500	1S 14E 0 4900	Martin & Beverly Underhill PO Box 266 Dufur OR 97021			No	A-1(160)
65	1S 14E 0 5100	1S 14E 31 5600	Pamila Ruthorford 720 E. Scenic Dr. The Dalles, OR 97058			No	A-1(160)
66	1S 14E 0 2800	1S 14E 0 1900	William Bolton 66447 Bolton Rd. Dufur OR 97021			No	A-1(160)
68	2N 12E 4 1100 2N 12E 5 100	2N 12E 4/5	Wasco County 511 Washington St. The Dalles, OR 97058			No	NSA A-1(160)
70	2S 12E 0 1700	2S 12E 12 3000	Charlotte West 80852 South Valley Rd Dufur OR 97021			No	A-1(160)
71	2S 12E 0 5100	2S 12E 23 5700	Martin & Beverly Underhill P O Box 266 Dufur OR 97021			No	A-1(160)
72	3S 12E 0 1000	3S 12E 3	Wasco County 511 Washington St. The Dalles OR 97058			No	A-1(160)
73	3S 12E 25 300	3S 12E 25 3700	Russell & Wanda Sinclair 80624 Shadybrook Rd. Tygh Valley OR 97063			No	A-1(160)
74	2S 13E 0 5200	2S 13E 32 4900	Keith & Mary Smith 60538 Dufur Gap Rd. Dufur OR 97021			No	A-1(160)
75	4S 13E 0 2800	4S 13E 12 6800	Robert Ashley Trust 4120 River Rd. The Dalles, OR 97058		33-0015	No	R-I
76	3S 13E 0 3800	3S 13E 31 4000	Jonnie Justesen	Cancelled	33-0051	No	A-1(160)

			59720 Twin Lakes Rd Grass Valley OR 97029	1976			
77	4S 13E10 600	4S 13E 10 600	Wasco County 511 Washington St. The Dalles, OR 97058			No	TV-RR
78	4S 12E 0 2300	4S 12E 0 2700 Formerly Cody Logging	Michelle Detwiler 2513 NE Dunckley St. Portland, OR 97212		33-0048	No	A-1(160)
79	4S 13E 0 7100	4S 13E 31 10800	Joanne Gutzler 81610 Victor Rd. Maupin OR 97037			No	A-1(160)
80	5S 12E 0 400	5S 12E 0 400	FJR LLC PO Box 189 Boring, OR 97009			No	A-1(160)
81	5S 12E 0 800	5S 12E 4 800	Blue Pearl LLC ET AL 36855 Hauglum Rd Sandy, OR 97055			No	A-1(160)
82	5S 12E 0 2300	5S 12E 12 2100	Loren & Sandra MCLeod 1208 Toliver Rd. Mollala, OR 97038			No	A-1(160)
83	5S 13E 0 1400	5S 13E 6 1400	Eugene H. Walters 8050 Hwy 216 Maupin OR 97037			No	A-1(160)
84	5S 13E0 6300	5S 13E 28 5200	Lorraine Gabel 913 Cessna St. Independence, OR 97351			No	A-1(160)
85	5S 12E 0 7100	5S 12E 35 5400	Kenneth Hein 948 NE 175th Ave. Portland, OR 97230			No	A-1(160)
86	5S 11E 0 5100	5S 11E 35 4802	Wasco County 511 Washington St. The Dalles, OR 97058		33-0074	No	A-1(160)
87	6S 11E 0 1000	6S 11E 9	Mickey Snodgrass			No	Warm springs

			PO Box 325 Maupin, OR 97037				Reservation
88	4S 13E 11 100 4S 13E 0 2700	4S 13E 11 100 4S 13E 0 2700	Robert Ashley	CPA-01-101 CUP-01-112			A-1(160)
101	Site Not Identified		Port of The Dalles				
102	Site Not Identified		Interpretative Center				
150	4S 14E 0 3700		BLM 3050 NE 3rd St. Prineville, OR 97754		33-0093(?)	No	A-1(160)
151	4S 14E 0 2700	4S 14E 0 2400	Connolly Land & Livestock Inc. - Bakeoven Pit 412 W. 4th St. The Dalles OR 97058	CUP 93-110	33-0093(?)	No	A-1
152	4S 15E 0 800	4S 15E 30 800	Ruth Lindley 87670 Bakeoven Rd. Maupin OR 97037			No	A-1(160)
153	4S 15E 0 1000	4S 15E 30 1200	BLM 3050 NE 3rd St. Prineville, OR 97754			No	A-1(160)
154	5S 16E0 2000	5S 16E 20 2200	Janis Brown 91443 Hinton Rd. Maupin, OR 97037			No	A-1(160)
155	5S 16E 0 3300	5S 16E 32 3300	Lonny & Pamela Brown 91443 Hinton Rd Maupin, OR 97037			No	A-1(160)
156	5S 16E 0 3400	5S 16E 32 2401	Warnock Ranches Inc. 91440 Bakeoven Rd Maupin, OR 97037			No	A-1(160)
157	6S 19E 0 900	6S 16E 5 106	BLM 3050 NE 3rd St. Prineville, OR 97754			No	A-1(160)

158	6S 16E 0 900	6S 16E 5 106	Warnock Ranches Inc. 91440 Bakeoven Rd. Maupin, OR 97037			No	A-1(160)
159	6S 16E 0 2100	6S 16E 21 101	ODOT - 33-051-4 Bakeoven Quarry		33-0017	No	A-1(160)
160	7S 17E 0 1700	7S 17E 31 1990	Richard & Betty Baker 5200 SW Meadows Rd Ste. B-100 Lake Oswego, OR 97035		33-0032	No	A-1(160)
161	8S 17E 0 600	8S 17E 4 692	Eagle Valley Ranch LLC P O Box 70 Antelope OR 97001			No	A-1(160)
162	8S 17E 0 1400	8S 17E 14 1500	Wilton & Francis Dickson PO Box 156 Antelope, OR 97001			No	A-1(160)
163	8S 16E 0 4300	8S 16E 36 3400	James McNamee P O Box 99 Antelope OR 97001			No	A-1(160)
164	8S 17E 0 2000	8S 17E 35 2100	Herbert McKay P O Box 5 Antelope OR 97001			No	A-1(160)
165	8S 18E 0 900	8S 18E 34 800	Young Life Washington Family Ranch PO Box 20 Antelope, OR 97001			No	A-1(160)
166	8S 19E 0 1600	8S 19E 31 1900	BLM 3050 NE 3rd St. Prineville, OR 97754			No	A-1(160)
167	8S 14E 0 1400	8S 14E 13 101	Wasco County 511 Washington St. The Dalles, OR 97058			No	A-1(160)
168	8S 14E 0 2200	8S 14E 21 1900	BLM 3050 NE 3rd St.			No	A-1(160)

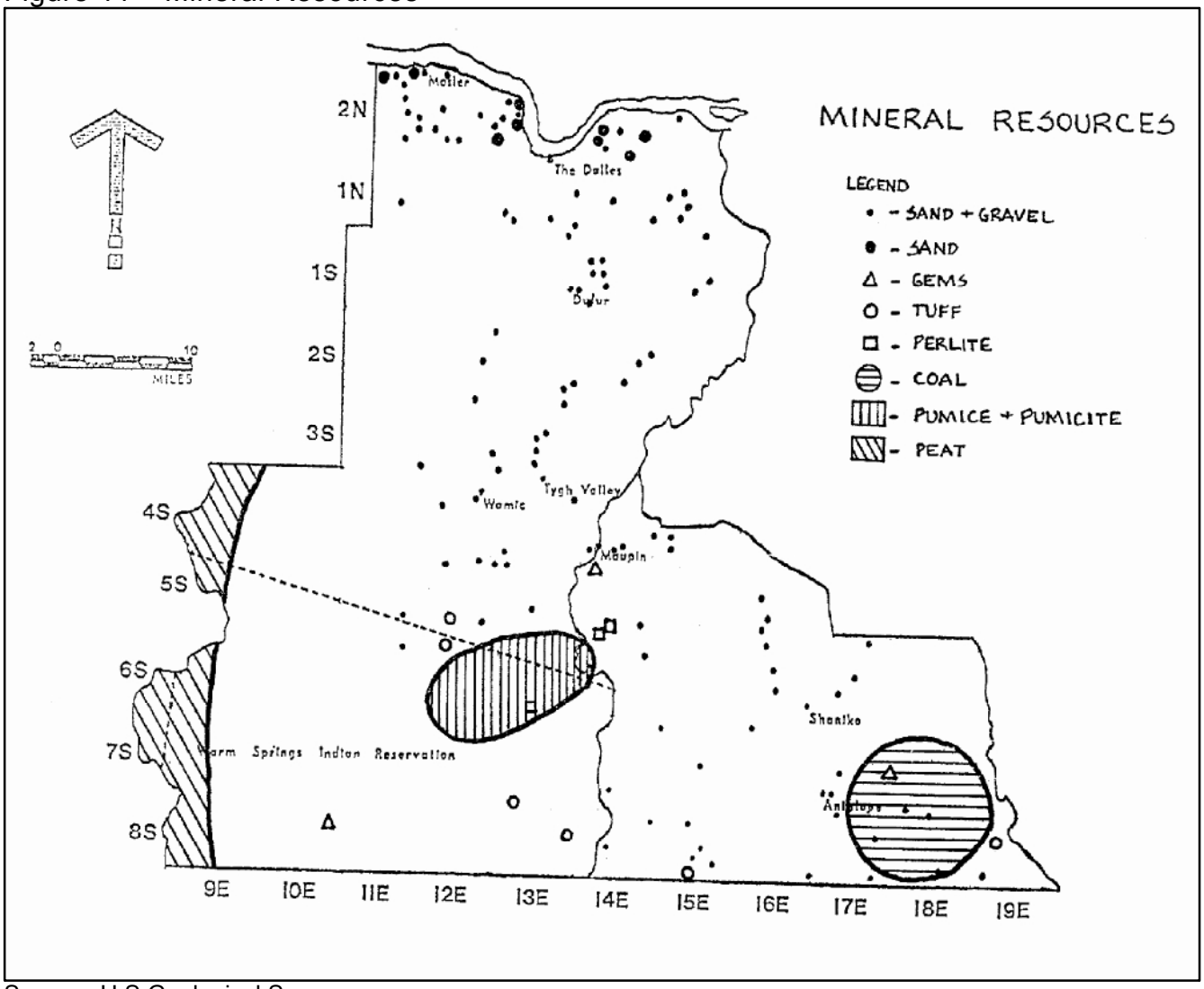
			Prineville, OR 97754				
169	7S 14E 0 3100	7S 14E 32 3000	Kaskela Farms 21180 S Leland Rd Oregon City, OR 97045			No	A-1(160)
170	3S 13E 0 4000	3S 14E 0 2800	Jack Stevens 56100 Smock Road Wamic, OR 97063	CPA-06-102 CUP-06-112 Added 12/28/06	33-0051		A-1
200	4S 14E 0 3700	4S 14E 33 3800	BLM 3050 NE 3rd St. Prineville, OR 97754			No	A-1(160)
201	5S 14E 35 C 400	5S 14E 35 4400	ODOT - 33-036-4 Maupin Pit		33-0004	Yes	A-1(160)
202	6S 14E 0 700	6S 14E 11 100	ODOT			Yes	A-1(160)
203	7S 14E 0 200	7S 14E 12 1200	ODOT - 33-038-4 Criterion Sum Pit		33-0078	Yes	A-1(160)
204	6S 17E 3 400	6S 17E 3 500	ODOT - 33-049-4 County Line Quarry		33-0102	Yes	A-1(160)
205	6S 17E 0 2000	5S 17E 0 2000	Wasco County 511 Washington St. The Dalles, OR 97058			No	A-1(160)
206	6S 17E 0 2300	6S 17E 19 1800	ODOT- 33-050-4 Hinton Quarry		33-0100	Yes	A-1(160)
208	7S 16E 0 1300	7S 16E 6 1000	ODOT - 33-053-4 Identifier Quarry		33-0024	Yes	A-1(160)
209	7S 15E 0 1600	7S 15E 22 1600	ODOT - 33-059-4 Garbage Pit Quarry		33-0097	Yes	A-1(160)
211	8S 15E 0 2200	8S 15E 22 1701	Marie Winkler Trust 18140 Couch Market Rd. Bend, OR 97701			No	A-1(160)
212	8S 15E 0 2000	8S 15E 27/28 1701	Robert Pamplin 805 SW Broadway #2400			No	A-1(160)

			Portland, OR 97205				
213	8S 15E 0 3500	8S 15E 26 2900	John Priday 89037 Hwy 293 Madras OR 97741 Priday Quarry	CPA 96-101	33-0094	Yes	A-1(160)
214	7S 17E 0 1500	7S 17E 20 2000	ODOT - 33-062-4 Shaniko Rock Production		33-0065	Yes	A-1(160)
215	8S 18E 0 600	8S 18E 6 501	ODOT - 33-064-4			Yes	A-1(160)
216	8S 18E 0 400	8S 18E 4 400	ODOT - 33-065-4 Antelope Rock Product		33-0069	Yes	A-1(160)
217	5S 12E 0 8500	5S 12E 33 7200	Richard Dodge 78888 Walters Rd. Maupin, OR 97037	CUP 87-104 Added 3/93	33-0080	No	A-1(160)
218	4S 12E 0 2800	4S 12E 17 1900	Everett Metzentine PO Box 615	CUP 91-102 Added 3/93	33-0086	No	A-1(160)
219	2N 11E 0 900	2N 11E 2 900	SDS Co LLC PO Box 266 Willard, WA 98605 Rock Creek Quarry 33-002			No	
220	2N 13E 20 800	2N 13E 20 800	ODOT - 33-007 Shooting Range Quarry			No	NSA A-1(160)
221	2N 13E 20 ROW Site Not Identified	2N 13E 20/21 500	ODOT - 33-008				NSA A-1(160)
222	1S 14E 0 3300	1S 14E 20 3700	ODOT Boyd Quarry - 33-021			No	A-1(160)
223	3S 13E 33 200	3S 13E 33 4100	ODOT - 33-028-4 Butler Canyon Quarry		33-0062	No	A-1(160)
224	5S 14E 6 200	5S 14E 6 200	ODOT - 33-032 Maupin Maintenance Yard			No	Maupin City Limits
225	7S 15E 0 2000	7S 15E 29 2100	ODOT - 33-039 Filler Pit			Yes	A-1(160)

226	8S 15E0 2000	8S 15E 15	ODOT - 33-040			Yes	A-1(160)
227	8S 15E 0 3100	8S 15E 22 2800	ODOT - 33-041 Cow Canyon Quarry		33-0075	Yes	A-1(160)
228	5S 11E 36 1600	5S 11E 36 5300	ODOT - 33-045-4 Pine Grove Quarry		33-0074	Yes	A-1(160)
229	Site Not Identified	5S 12E 30 200	ODOT			Yes	A-1(160)
230	6S 12E 2 700	6S 12E 2 300	ODOT 33-048-4 Paquet Gulch Quarry		33-0101	Yes	A-1(160)
231	7S 17E 0 600		Shaniko Ranch	CUP 93-106	33-0092	No	A-1(160)
232	1N 13E 0 1000		Marilyn Phetteplace 2028 Steel Rd. The Dalles, OR 97058	CUP 98-113 CPA 98-103	33-0098	No	A-1(160)
233	6S 17E 0 2400		Jonnie Justesen 59720 Twin Lakes Rd. Grass Valley, OR 97029	CUP 99-105 CPA-99-104	33-0072	No	A-1(160)
234	1N 13E 0 600	1N 13E 0 2900	Charles & Irene Kornegay 2880 Five Mile Rd. The Dalles, OR 97058	CUP 94-135	33-0096	No	A-1(160)
235	2N 12E 0 2000		Mueller Seven Springs Ranch 6300 Seven Mile Hill Rd. The Dalles, OR 97058	CUP 90-107	33-0081	No	A-1(160) & F-2(80)
625	1S 13E 36 200	1S 13E 36 102	Wasco County 511 Washington St. The Dalles, OR 97058 Dufur County Pit			No	A-1(160)
649	4S 12E 0 6100	4S 12E 36 7400	Wasco County 511 Washington St. The Dalles, OR 97058 Kennedy Pit			No	A-1(160)
673	8S 14E 0 101	8S 14E 13 101 a portion of	Wasco County 511 Washington St.			No	A-1(160)

			The Dalles, OR 97058 South Junction Pit				
713	5S 11E 35 4802	5S 11E 35 4802	Wasco County 511 Washington St. The Dalles, OR 97058 Kelly Springs Pit			No	A-1(160)
790	2S 14E 0 2700	2S 13E 33 2900 a portion of	Robert & Nancy Hammel 62250 Tygh Ridge Rd. Dufur, OR 97021 Hilgen Pit (Wasco County)			No	A-1(160)
800	8S 17E 0 400	8S 17 4 500	Wasco County 511 Washington St. The Dalles, OR 97058 Helyer Pit			No	A-1(160)
833	3S 12E 0 800	3S 12 3 1101	Wasco County 511 Washington St. The Dalles, OR 97058 Schindler Pit			No	A-1(160)
850	2S 12E 0 1700	2S 12E 12 3000	Charlotte West 80852 South Valley Rd. Dufur, OR 97021 West Pit (Wasco County)			No	A-1(160)
870	3S 12E 25 100	3S 12E 25 1102	Wasco County 511 Washington St. The Dalles, OR 97058 Shadybrook Pit			No	A-1(160)
871	2N 12E 0 1000 & 2N 13E 19 400	2N 12E 0 1000	Wasco County 511 Washington St. The Dalles, OR 97058 Harvey Pit		33-0009	Yes	NSA A-1(160)
872	2S 13E 0 4400 & 4900		Filbin Family RLT 61906 Dufur Gap Rd. Dufur, OR 97021	CUP-99-102 CPA-99-101	33-0099	No	A-1(160)

Figure 11 – Mineral Resources



Source: U.S Geological Survey

H. Soils

The soils in Wasco County have formed in a variety of parent materials. In the northeastern part of the county soils have developed from loess deposits. These deposits range from a few inches to more than fifteen feet in thickness. In a southerly direction, the deposits become finer textured and thinner. Where a thin deposit of loess occurs, the soils developed from a mixture of loess and basalt. In the western part of the area, soils have developed from volcanic ash deposited over sediments. Soils in the southern part of the area have developed in fine textured sediments. These soils are predominantly fine textured with high percentages of coarse fragments. Water deposited soils formed in recent alluvium also occur along the major drainages in the county. Small amounts of volcanic ash occur throughout the county (General Soil Map with Soil Interpretations for Land Use Planning, Wasco County, Oregon, Soil Conservation Service, U.S.D.A., June, 1972; (pp. 1 & 2)).

The Soil Conservation Service has prepared a general soils map showing soil associations. A soil association is a group of soils that are geographically associated in a repeating pattern on the landscape. It consists of one or more major soils and at least one minor, often contrasting, soil and is named for the major soils. The soils in one association may occur in another but in a different pattern and proportion. [Ibid]

These maps depict not only soil associations, but their suitability for agriculture and their limitations for septic tank absorption field and as building sites. These maps may be seen at the Wasco County Planning Office or at the Soil Conservation Service office in The Dalles.

Table 9 lists the various soil associations that occur in Wasco County and gives a brief description of each one. Table 10 rates the various soil associations on their suitability and limitations for various types of uses.

Soils have been classified into eight capability groupings by the Soil Conservation Service. These classifications show in a general way the suitability of soils for most kinds of field crops. The soils are grouped (a) according to their limitations when used for field crops; (b) the risk of damage when they are so used; and (c) the way they respond to treatment. The grouping does not take into account major and generally expensive land-forming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management.

Statewide Goals and Guidelines as adopted by the Land Conservation and Development Commission mandate the retention of areas which are predominantly Class I, II, III, IV, V, and VI soils, in farm use. Lands in other classes which are necessary to permit farm practices to be undertaken on adjacent or nearby lands, shall be included as agricultural land. Areas which are predominantly class VII and VIII soils are generally unsuited to intensive agricultural production.

Figure 12 shows the soil capability classifications for soils in Wasco County. These are general classifications; more detailed information may be necessary when

making site-specific decisions on land use. This information' is available from the Soil Conservation Service.

Table 9 – Soil Associations

Areas dominated by well drained soils formed in lacustrine material with 1 to 20 percent slopes	
1.	Chenoweth-Cherryhill association.Very deep loam soils with 1 to 20 percent slopes; and deep soils with a silt loam surface layer, loam subsoil and sandy clay loam substratum over semi-consolidated sediments and with 1 to 20 percent slopes.
Areas dominated by well drained soils formed in loess and well drained, very shallow, stony soils with 0 to 35 percent slopes	
2.	Walla Walla association.Very deep silt loam soils over basalt with 3 to 35 percent slopes.
3.	Cantala-Condon association.Deep silt loam soils over basalt with 1 to 35 percent slopes; and moderately deep silt loam soils over basalt with 1 to 7 percent slopes.
4.	Wapinitia-Stony land association. Moderately deep soils with a silt loam surface layer and heavy loam to silty clay loam subsoil over basalt and 0 to 12 percent slopes; and outcrops of basalt with 0 to 12 percent slopes.
5.	Maupin-Stony land association.Moderately deep loam soils over basalt with 0 to 12 percent slopes; and outcrops of basalt with 0 to 12 percent slopes.
6.	Bakeoven-Condon association.Very shallow soils with a very cobbly loam surface layer and very gravelly clay loam subsoil over basalt and 2 to 20 percent slopes; and moderately deep silt loam soils over basalt and with 1 to 20 percent slopes.
Areas dominated by well drained, very stony or rocky, shallow or moderately deep soils over basalt	
7.	Lickskillet-Wrentham association.Shallow soils with a very to extremely stony loam surface layer and very to extremely cobbly heavy loam or clay loam subsoil and with 15 to 70 percent south slopes; and moderately deep soils with a silt loan surface layer and very cobbly silt loam, clay loam or silty clay loam subsoil and with 35 to 70 percent north slopes.
Areas dominated by well drained soils formed in fine sediments with 1 to 70 percent slopes	
8.	Simas-Tub association.Moderately deep soils with a cobbly silty clay loam surface layer and calcareous silty clay subsoil over sediments and with 8 to 40 percent slopes; and Moderately deep soils with a gravelly clay loam surface layer and gravelly clay subsoil over sediments and with 1 to 40 percent slopes.
9.	McNeen association.Moderately deep soils with a silt loam surface layer and silty clay loam subsoil over very cobbly hardpan and with 1 to 12 percent slopes.
10.	Simas-Curant-Tub association.Moderately deep soils with a very stony silty clay loam surface layer and calcareous silty clay subsoil over sediments and with 35 to 70 percent slopes; deep soils with a silt loam surface layer, heavy silt loam subsoil and loam substratum and 40 to 70 percent slopes; and moderately deep soils with a very stony clay loam surface layer and gravelly clay subsoil over sediments and with 40 to 70 percent slopes.
Areas dominated by well drained soils formed in materials high in volcanic ash with 1 to 70 percent slopes	
11.	Hesslan-Frailey-Skyline association. Moderately deep soils with a stony loam surface layer and cobbly loam subsoil over semi-consolidated sediments and with 40 to 65 percent slopes; deep soils with a loam or stony loam surface layer and loam or cobbly loam subsoil over semi-consolidated sediments and with 30 to 70 percent north slopes; shallow very cobbly loam surface layer and cobbly loam subsoil over semi-consolidated sediments and with 40 to 65 percent slopes.

12.	Wamic-Ortley association. Deep loam soils over basalt bedrock and with 1 to 20 percent slopes; and deep soils with a loam surface layer and silt loam subsoil and with 1 to 20 percent slopes.
13.	Ketchly-Bins association. Deep soils with a loam surface layer and clay loam subsoil and sub-stratum and with 3 to 30 percent slopes; and deep soils with a very friable gravelly loam surface layer, firm, clay loam subsoil and heavy loam substratum and with 1 to 30 percent slopes.

Source: Soil Conservation Service

Table 10 – Soil Suitability & Limitations

Soil Associations	Area		Land Capability	Soil Suitability for:		
	%	Acres		Topsoil	Sand & Gravel	Road Fill
Chenowith-CherryHill	2	16,000	II, III, IV & VI	Good to Fair	Unsuitable	Fair
Walla Walla	6	63,000	II, III, IV, VI, VII & VIII	Good to Poor	Unsuitable	Fair
Cantala-Condon	14	140,000	I, II, III, IV, VI & VII	Good	Unsuitable	Fair
Wapanitia-Bakeoven	4	39,000	II, III, IV & VII	Fair to Good	Poor	Poor
Maupin-Bakeoven	3	33,000	I, II, III, IV, VI & VII	Good	Unsuitable	Fair
Bakeoven-Condon	16	153,000	I, II, III, IV, VI & VII	Fair	Unsuitable	Poor
Lickskillet-Wrentham	20	195,000	I, II, III, IV, VI, VII & VIIII	Poor	Unsuitable	Poor
Simas-Tub	13	127,000	I, II, III, IV, VI, VII & VIIII	Poor	Unsuitable	Poor
McKeen	1	7,000	I, II, III, IV, VI, VII & VIIII	Fair	Unsuitable	Poor
Simas-Currant-Tubl	3	33,000	I, II, III, IV, VI, VII & VIIII	Poor	Unsuitable	Poor
Hesslan-Fraily-Skyline	5	45,000	IIII, VI & VIII	Poor	Unsuitable	Poor
Wamic- Ortley	10	98,000	III, IV, VI & VII	Good	Unsuitable	Poor
Ketchley-Bins	3	30,000	III, VI and VII	Poor	Unsuitable	Poor
Soil Limitations For:						
Soil Association	Pond Embankment & Dikes	Terraces & Diversions	Playgrounds	Camp Areas	Picnic Areas	Paths & Trails
Chenowith-CherryHill	Mod	Mod	Sev	Sev To Mod	Sev To Slight	Slight
Walla Walla	Mod	Slight	Sev	Sev To Slight	Sev To Slight	Slight
Cantala-Condon	Mod	Slight	Mod	Slight	Slight	Slight
Wapanitia-Bakeoven	Mod	Mod	Sev	Mod	Sev	Slight
Maupin-Bakeoven	Mod	Mod	Sev To Mod	Slight	Slight	Slight
Bakeoven-Condon	Sev	Sev	Sev	Sev	Sev	Sev
Lickskillet-	Sev	N/A	Sev	Sev	Sev	Sev

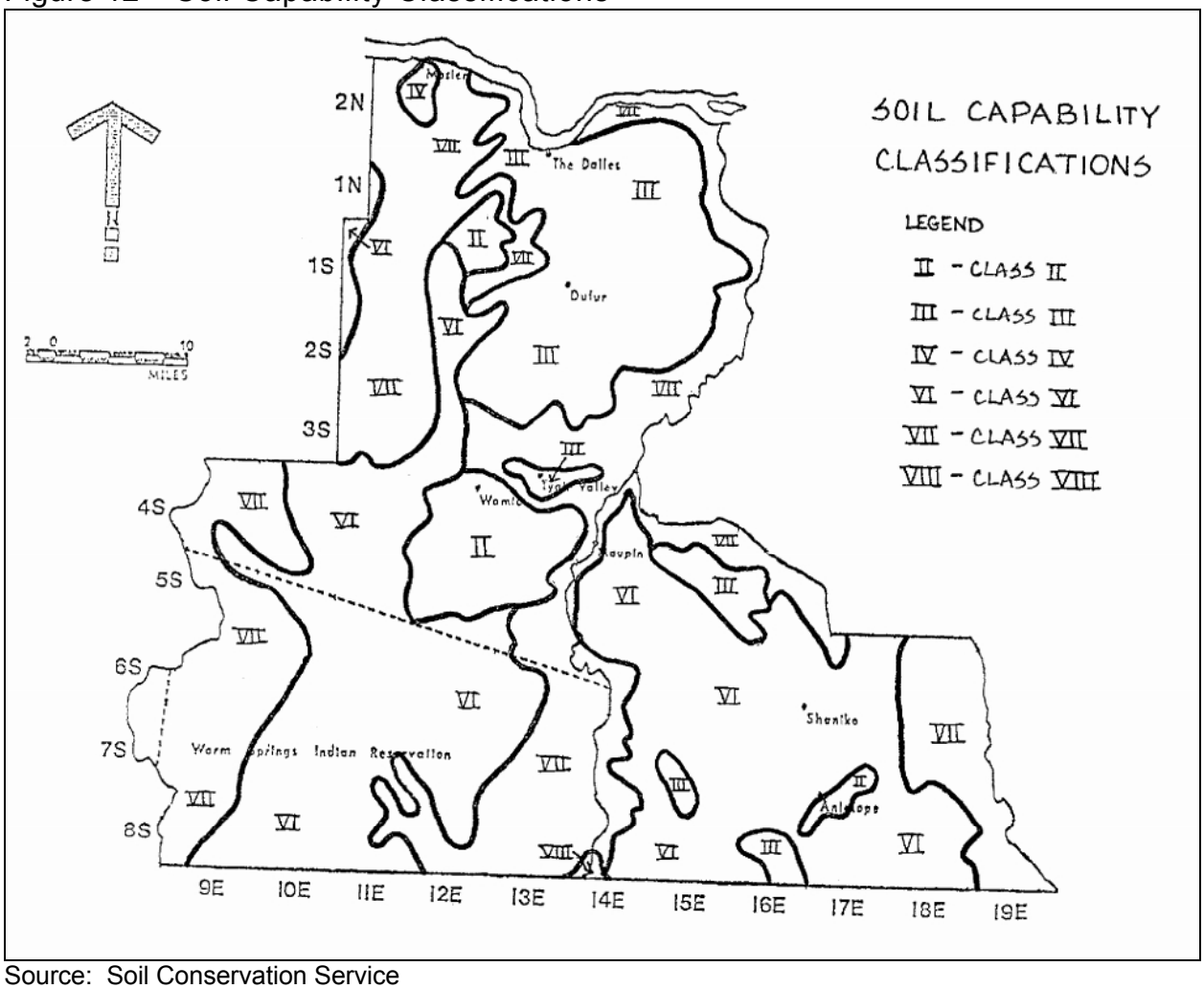
Wrentham						
Simas-Tub	Sev	Sev	Sev	Sev	Sev	Mod
McKeen	Mod	Mod	Sev	Mod	Mod	Slight
Simas-Currant-Tubl	Sev	Sev	Sev	Sevv	Sev	Sev
Hesslan-Fraily-Skyline	Sev	N/A	Sev	Sev	Sev	Sev
Wamic- Ortley	Mos	Sev	Mod To Sev	Mod	Slight	Slight
Ketchley-Bins	Sev	Sev	Sev	Mod	Mod	Mod
Sev = Severe			Mod = Moderate			
Soil Limitations For:						
Soil Association	Dwellings w/o Basements	Septic Tank Absorption Field	Sewage Lagoons	Sanitary Landfills (Trench Type)	Local Roads & Streets	Pond Reservoir
Chenowith-CherryHill	Mod	Sev	Sev	Mod	Mod	Sev
Walla Walla	Mod	Sev	Sev	Slight	Mod	Sev
Cantala-Condon	Mod to Slight	Sev	Sev	Slight	Mod	Sev
Wapanitia-Bakeoven	Mod	Sev	Sev	Sev	Sev	Sev
Maupin-Bakeoven	Mod	Sev	Sev	Sev	Mod	Sev
Bakeoven-Condon	Sev	Sev	Sev	Sev	Sev	Sev
Lickskillet-Wrentham	Sev	Sev	Sev	Sev	Sev	Sev
Simas-Tub	Sev	Sev	Sev	Sev	Sev	Sev
McKeen	Mod	Sev	Sev	Mod	Mod	Sev
Simas-Currant-Tubl	Sev	Sev	Sev	Sev	Sev	Sev
Hesslan-Fraily-Skyline	Sev	Sev	Sev	Sev	Sev	Sev
Wamic- Ortley	Mod	Sev	Mod to Sev	Mod	Mod	Mod to Sev
Ketchley-Bins	Mod	Sev	Sev	Mod	Mod to Sev	Sev
Sev = Severe			Mod = Moderate			

Source: Soil Conservation Service

I. Vegetation

The major vegetation species in each association are listed on the following page. The plant associations from east to west are grassland communities, chaparral-oak associations, ponderosa pine-white oak associations, Douglas fir-ponderosa pine association and forest land in higher elevations. These generalized categories have transitional zones between them which varies with topography, soil moisture, etc., and man's influences. Understory vegetation could occur in any of the tree covered areas as secondary vegetation. The main types of commercial vegetation are also listed.

Figure 12 – Soil Capability Classifications



Source: Soil Conservation Service

Natural Vegetation

Grassland Communities:

- Bluebunch wheatgrass
- Bitterbrush
- Idaho fescue
- Sandberg's bluegrass
- Cheatgrass

Shrub-Oak Association:

- Oregon white oak
- Elk sedge
- Common snowberry
- Oceanspray
- Heartleaf arnica
- Ceanothus
- Woods rose
- Wild strawberry
- Blue wildrye
- Bluebunch wheatgrass
- Cheatgrass
- Needlegrass
- Saskatoon serviceberry

Ponderosa Pine - White Oak Association:

- White oak
- Ponderosa pine
- Douglas fir
- Elk sedge
- Common snowberry
- Oceanspray
- Heartleaf arnica
- Ceanothus
- Woods rose
- Wild strawberry
- Blue wildrye
- Hairy lupine
- Woolly lupine
- Ornate lupine
- Poison oak

Douglas fir - Ponderosa Pine Association:

- Douglas fir
- Ponderosa pine
- Grand fir
- Western hemlock
- Western red cedar
- Willows
- Black cottonwood
- Bigleaf maple
- Western larch
- Incense cedar
- Western white pine

Higher Elevation Forest:

- Sub-Alpine fir
- Noble fir
- Pacific silver fir
- Engelmann spruce
- Mountain hemlock
- Lodgepole pine
- Whitebark pine

Understory Vegetation:

- Small golden chinkapin
- Vine maple
- Snowbrush
- Redstem ceanothus
- Deerbrush
- Prickly currant

Understory Vegetation:

- Big Huckleberry
- Wild rose
- Queencup beadlilly
- Hawkweeds Arnicas

Columbia brome
Bedstraw
Twinflower
White trillium
Poison oak
Common thistle
Bracken fern
Pacific rhododendron
Beargrass

Introduced Vegetation

Commercial:

Sweet cherries -
- Cultivars include:
- Lambert
- Bing
- Royal Anne

Black Republican
Apples
Pears
Peaches
Apricots
Alfalfa
Clover
White wheats

Other

Cheatgrass
Yellow star thistle
Diffuse knapweed
Whitetop
Canada thistle
Puncture vine
Sand bur
St. Johnswort
Crested wheatgrass
Intermediate wheatgrass
Bluestem wheatgrass
Slender wheatgrass
Pubescent wheatgrass
Alta fescue
Western fescue
Pacific fescue
Big bluegrass
Bulbus bluegrass
Canada bluegrass
Kentucky bluegrass
Prairie junegrass
Orchardgrass
Redtop
Mountain brome

Soft brome

Velvetgrass
Alaska oniongrass
Timothy
Sagebrush
Scab-land sagebrush
Hoary sagebrush
Wild onions
Yarrow
Locoweed
Balsamroot
Rattlesnake grass
Russian knapweed
Rabbit brush
Golden cleome
Meadow larkspur
Fleabone
Tarweed
Western iris
Western juniper
Biscuitroot
Prairie clover
Lewis mockorange
Phlox
Smooth sumac

Tumbling mustard
Thurber needlegrass

Many vegetative associations in the rangelands of the; county, especially in the southern part, have been disturbed by fire, grazing, trampling, and the effects of some types of introduced plants. For example, species such as sagebrush and bitterbrush are sensitive to fire, while many grasses are not as sensitive. A range fire will usually kill the brush without destroying the grass understory. This results in almost pure stands of bunch-grass. Overgrazing in rangelands and along streams have caused the reduction of vegetation in these areas, and has allowed new types of vegetation to become established. These new species of vegetation may greatly alter the ecology of the affected area, often in a detrimental way.

J. Natural Areas

Areas in Wasco County which appear to have ecological and scientific value have been identified by the Oregon Natural Heritage Program, Nature Conservancy. Personal interviews, extensive literature search, field investigations, and aerial photography were the basis of this inventory list of natural areas. The list does include some areas which have not yet been verified by research or field study, but are considered potentially significant. Table 11-A gives the list of natural areas in Wasco County as identified by the Nature Conservancy. These areas are shown in Figure 12.5.

A "site" as it appears in Table 11-A is the geographic location of one or more noteworthy element occurrences. An element is any one natural feature of the landscape; for example, a bald eagle nest or an age-old forest, and the site is where it occurs. A site may have only one feature, such as a nest, or it may include several features, such as a stretch of river surrounded by an old growth forest with a rare plant species and nesting areas for endangered bird species. Descriptions accompanying the site on the inventory list have been written to point out features at the site.

Not all lands identified by the Nature Conservancy are being considered as natural areas. Many of the elements have not been verified. Many of the ones that have been verified have not been located specifically. The attempt has been made to locate the most significant natural areas and identify them with specific boundaries. Ownerships, conflicts of use, location, surrounding uses, size of the area and citizen input were taken into account when designating natural areas: Additional sites not listed by the Nature Conservancy have been included as natural areas. Table 11-B lists these sites.

All natural areas have been identified on the zoning map by placement of an environmental protection district overlay zone, (Division 4). This zone is described in the Wasco County Zoning Ordinance in Section; 3.700.

Table 11A- Natural Areas as Identified by the Nature Conservancy (4/78)

REF NO.	*SR	**REFERENCE NAME	LOCATION Township, Range & Section	***PS	ELEMENT NO.	****VO	ELEMENT NAME
WC-4	+	Oak Springs (B)	-4S, 14E, SE1/4 17	3	1.18.986 2.02.402 2.02.402 4.11.110	V V V V	Wetland shrubland Rough-skinned newt Pacific giant salamander Cold spring
WC-6	+	Confluence of White River & Tygh Creek to Deschutes River (B)	-4S, 13E, 1, 2, 11, 12 -4S, 14E, 5 - 8	3	1.08.912 4.04.120 4.04.450 4.04.460 5.14.596	V V V V V	Wetland forest Low stream segment, low gradient reach River island Waterfalls Great blue heron rookery
WC-8	+	Lawrence Memorial Grassland Preserve (The Nature Conservancy) (B)	-7S, 16E, 15, 22	2	1.18.931 1.28.910 1.28.911 1.28.920 3.01.049 6.01.000	V V V V V V	Stiff sage/Sandberg's bluegrass Bluebunch wheatgrass-Idaho fescue Bluebunch wheatgrass-Sandberg's bluegrass Sandberg's bluegrass communities Lomatium minus Geologic feature
WC-11		Tygh Ridge Summit (C)	-3S, 14E, 16, 17, 20	3	1.28.910	V	Bluebunch wheatgrass-Idaho fescue
WC-13		Hollow Creek Area (A)	-7S, 18E, NW1/4 1 -8S, 17E, NE1/4 1	3	2.02.642	V	Golden eagle (2 nests)
WC-14		Mission Hollow (A)	-2S, 15E, 6	3	2.02.642	NV	Golden eagle
WC-15		Butler Canyon (B)	-3S, 13E, 14, 23	3	1.18.931 1.28.910 1.28.911	V V V	Stiff sage/Sandberg's bluegrass Bluebunch wheatgrass-Idaho fescue Bluebunch wheatgrass-Sandberg's bluegrass
WC-20		Buck Hollow Creek (C)	-6S, 17E, W1/2 16	3	1.18.931 1.28.910 1.28.911	V V V	Stiff sage/Sandberg's bluegrass Bluebunch wheatgrass-Idaho fescue Bluebunch wheatgrass-Sandberg's bluegrass
WC-28		Black Rock/Rotten Lake Basin (B)	-7S, 18E, 1-3, 10-15 -7S, 19E, 5-8, 18	3	2.02.642 4.07.110 4.10.100 6.01.000 6.02.000	NV NV NV NV NV	Golden eagle Low lake, permanent Lowland pond Geologic feature Paleontologic feature
WC-30		White River Canyon (B)	-4S, 5S, 11-13E	3	3.04.800	V	Isolated population, Douglas fir
WC-34		Camas Prairie (C)	-5S, 10E, 16, 17	3	1.25.118 3.04.000	V V	Marshland Wildflower area
WC-37		Mill Creek Falls (C)	-1S, 12E, NW1/4 5, NE1/4 6	3	1.05.620 4.04.460	NV V	Douglas fir forest Waterfalls

WC-38		Mill Creek Drainage (C)	-1S, 11E, NW1/4 3	3	3.01.037 3.02.000	V V	Hydrophyllum capitatum var. thompsonii Lomatium columbianum
WC-40		Nena Ranch (B)	-6S, 13E, 1, 12	3	1.05.913	NV	Wetland forest
WC-44		Oak Canyon (C)	-2S, 14E, 35, 36	3	1.05.621 1.05.911 1.25.114	V V V	Douglas fir-ponderosa pine Oregon white oak/grassland Bluebunch wheatgrass-Idaho fescue
WC-47		Boulder Creek Drainage (C)	-8S, 9S, 9-11E	3	1.05.600	V	Old growth Douglas fir forests
WC-50	+	Rowena Dell (The Nature Conservancy Preserve, part) (B)	-2N, 12E, 3, 4	2, 3	2.02.636 3.01.037 3.02.000 3.04.700 4.10.110 4.10.120 6.01.000 6.04.000	NV NV V V V V V V	Osprey Hydrophyllum capitatum var. thompsonii Lomatium Columbianum Wildflower area Lowland pond/wetland, permanent Lowland pond/wetland, intermittent Geologic feature Historic feature
WC-51		Mosier Area (C)	-2N, 11E, 2	3	1.05.912 3.04.700	NV V	East Col. Gorge rockfall with forest complex Wildflower area
WC-52		Seven Mile Hill Area (A)	-2N, 12E, 11	3	1.05.912 1.25.110	V V	East Col. Gorge rockfall with forest complex East slopes Cascade grassland
WC-56		Memaloose Island (B)	-3N, 12E, 32	3	2.02.636	V	American osprey
WC-61		Mill Creek Research Natural Ares (B)	-1S, 11E, 4, 8, 9, 16, 17	2	1.05.621 1.05.911 1.25.114	V V V	Ponderosa pine-Douglas fir Oregon white oak/grassland Bluebunch wheatgrass-Idaho fescue
WC-62		Persia M. Robinson Research Natural Area (C)	-6S, 10E, 10, 11	2	1.05.621 1.05.630 4.04.120	V V V	Ponderosa pine-Douglas fir Mixed conifers Lowland stream segment, low gradient reach
WC-65		Wapanitia Warm Springs (C)	-6S, 12E, 2, 11	3	4.11.120	V	Hot spring
WC-67		Deschutes Island (C)	-2S, 16E, 5	3	5.14.596	V	Great blue heron rookery
WC-69		Antelope Creek (A)	-8S, 15E, 25, NW1/4 35 -8S, 16E, NE1/4 4	3	2.02.642	V	Golden eagle (7 nests)
WC-70		Antelope Valley (C)	-S1/2 7S, 17E -N1/2 8S, 17E	3	2.02.640	V	Swainson's hawk (8 nests)
WC-71		Tygh Creek (C)	-3S, 12E, 26	3	2.02.643	V	Northern bald eagle
WC-72		White River Wildlife Management Area (B)	-4S, 5S, 11E, 12E	2	2.02.643 2.02.510 2.02.513 2.02.641 2.02.642	V V V V V	Northern bald eagle Ring-necked duck Bufflehead Ferruginous hawk Golden eagle

					2.02.654 2.02.752 2.02.881 2.02.902 5.14.621 5.17.806	V V V V V V	Western burrowing owl Gray-crowned rosy finch White-tailed jackrabbit Sagebrush vole Band-tailed pigeon mineral springs Elk critical winter range
WC-74		Sunflower Flat (C)	-6S, 11E, SW1/4 2, S1/2 3, NW1/4 11	3	1.05.710 1.05.810 1.05.911	NV NV NV	Ponderosa pine Western juniper woodland Oregon white oak/grassland
WC-75		Abbot Pass (proposed Research Natural Area (C)	-5S, 9E, 17	3	1.05.310	NV	Mountain hemlock
WC-76		Four Hills Grassland (C)	-8S, 17E, 2, 3, 10, 11	3	1.28.910 3.04.700	V NV	Blubunch wheatgrass-Idaho fescue Wildflower area
WC-77		Antelope Watershed (C)	-7S, 17E, 30	3	1.08.814	V	Western juniper/big sage/bitterbrush
WC-80		Unnamed (C)	-7S, 17E, 18	3	3.01.049	V	Lomatium minus
WC-81		Unnamed (C)	-7S, 16E, 5	3	3.01.049 3.02.000 3.02.000 3.02.000	V V V V	Lomatium minus Allium macrum Allium tolmiei var. tolmiei Claytonia minus
WC-82		Unnamed (B)	-4S, 14E, 20, SW1/4 29	3	3.02.000	V	Mimulus jungermannioides
WC-83		Dinger/Clear Lake proposed Research Natural Area (A)	-5S, 81/2E, W1/2 1	3	1.05.310	V	Western hemlock zone
WC-84		Wasco Lookout (C)	-2N, 12E, SE1/4 32	3	3.01.037	V	Hydrophyllum capitatum var. thompsonii

*SR = Site Report
**Areas Marked with:
-(A) have been designated as natural areas using locational description given.
-(B) have been designated as natural areas, although the area descriptions have been altered.
-(C) have been removed from the list because they are not considered unique or significant natural areas.
***PS = Protection Status
-1 = Preserved
-2 =Legally Protected
-3 = Unprotected
****VO = Verification of Occurrence
-V = Verified
-NV = Not Verified

Application of Statewide Planning Goal # 5 To Inventoried Natural Areas in Forest Lands

In the May 20, 1982, Land Conservation and Development Commission's "in order to comply statement", Wasco County was directed to analyze the economic, social, environmental and energy (ESEE) consequences of the conflicts between forest operations and inventoried natural areas and develop a program to achieve the goal (3). Wasco County has identified three natural areas that are within forested areas. These areas include: the western end of the White River Canyon, site "WC-30"; the Mill Creek Research Natural Area, site "WC-61"; and the Dinger/Clear Lake Proposed Natural Research Area, site "WC-83".

Sites "WC-30" and "WC-83" are within the "F-2 (80)" zone and are also within the Environmental Protection District, Division 4 (EPD-4) overlay zone which permits the following uses which are identified as conflicting ESEE uses:

Permitted:

--Management, production and harvesting of forest products, including primary wood processing and operations.
--Utility facility necessary for public service.

Conditional:

--Single family residences and mobile homes in conjunction with a farm or forest use.
--Public facilities
--Personal-use airports
--Public and private parks
--Mining
--Sanitary Landfill

The prime factor in analyzing the ESEE consequences on these sites is ownership. There are no private holdings involved within these sites. Site "WC-30" is owned by the Oregon State Game Commission and is being managed for Big Game Winter Range and other wildlife habitat. The conflicting uses identified above, except for timber harvesting, will not occur on state lands. Any timber harvesting will be controlled by the Oregon Department of Fish and Wildlife under their program for wildlife habitat. The conflicting uses are, therefore, controlled and limited by the Department of Fish and Wildlife's program for habitat improvement.

Site "WC-83" is owned by the United States Forest Service and is part of the Mt. Hood National Forest. Again, timber harvesting would be the only conflicting use and that activity is controlled by the Forest Service. Compliance with local plans is not mandatory of federal agencies, although their co-operation is encouraged by Wasco County.

Site "WC-61" is within the "F-1 (80)" zone. This zone includes only those lands within The Dalles Watershed. The EPD-4 over-lay zone permits only conditionally the following uses which are identified as conflicting ESEE uses:

-- Management, production and harvesting of forest products, including primary wood processing and operations.

-- Mining

-- Utility facilities necessary for public service.

Site "WO-61" is totally owned by the United States Forest Service and is within The Dalles Watershed. The watershed is managed through an agreement between The Dalles and the Forest Service called. "Comprehensive Management Plan for The Dalles Municipal Watershed". 1972. Forest harvesting activities as well as other uses is strictly controlled by both federal programs and regulations and by the cooperative agreement with The Dalles. The conflicting uses are, therefore, controlled and limited and no other measures need to be taken to protect the natural area.

Table 11B – Natural Areas

#	Site Name	Location	VO	Element Name
1	Cedar Island	T3S, R15E, Sec. 4	UV	River Island with a distinct population of incense cedars. (B.L.M.)
2	Sharps Island	T1S, R16E, Sec. 5	UV	Great Blue Heron rookery and riparian habitat.
3	Fall Creek Island	T1N, R16E, Sec. 31	UV	Great Blue Heron Rookery
4	Underhill Site	T2S, R11E, Sec. 15	UU	Environmental education site for children. Natural vegetation and habitats, trails, and historic sites are preserved (U.S. Forest Service)
5	Postage Stamp Lookout	T3S, R13E, Sec. 18, 19, & 20	UV	Laboratory research site. (State of Oregon)

VO = Verification of Occurance:
-UV = Unsurveyed, verified.
-UU = Unsurveyed, unverified.

K. Forest Resources

In accordance with Goal #4, lands suitable for forest uses have been inventoried by forest site class. The site class inventory is an estimate of the productive potential of forest land for wood growth. It is de-fined as the "height of a freely growing tree at age 100". The site class can be translated to cubic feet/acre/year. Generally, forest site classes less than VII are considered to be of commercial quality. (Refer to "Field Instructions for Integrated Forest Survey and Timber Management Inventories", United States Forest Service Manual; Oregon, Washington and California, 1974). Figure 13 shows the timber site productivity ratings for forest lands in Wasco County. A more detailed site class map can be found in the Planning' Office; the map on page 60 is highly generalized.

The following tables illustrate the land area and timber volume for forest land in Wasco County.

Land Area

Forest		
-Commercial	414,000 Acres	27%
-Unproductive	135,000 Acres	9%
-Reserve	1,000 Acres	0%
Non-Forest	974,000 Acres	64%
Total	1,524,000 Acres	100%

Commercial Forest - By Ownership (1973)

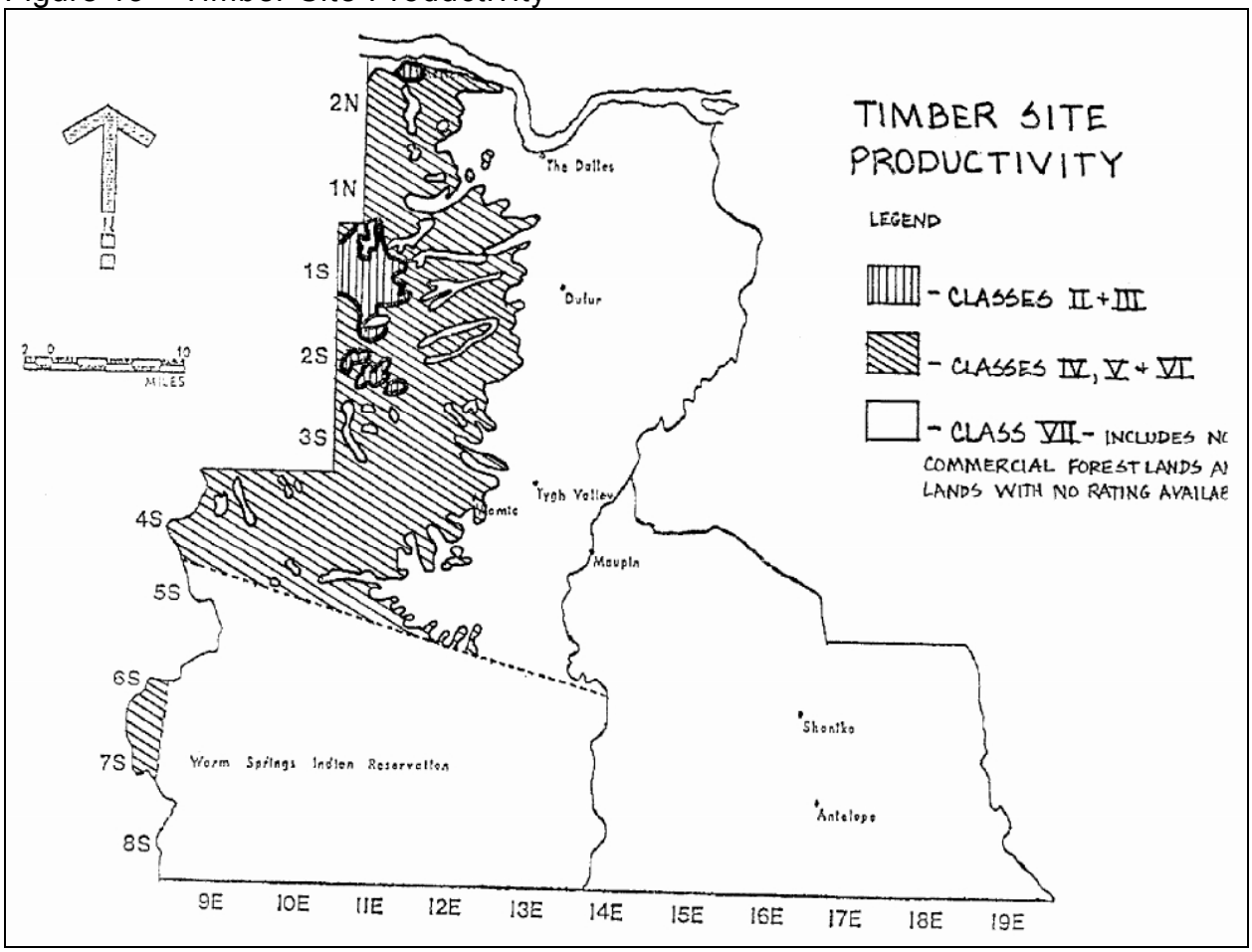
National Forest	153,000 Acres	37%
Other Public	199,000 Acres	48%
Forest Industry	15,000 Acres	4%
Other Private	47,000 Acres	11%
Total	414,000 Acres	100%

Commercial Forest – Net Volumes by Ownership (1973)

National Forest	3,521 Acres	53%
Other Public	2,855 Acres	42%
Forest Industry	78 Acres	1%
Other Private	266 Acres	4%
Total	6,720 Acres	100%

The U.S. Forest Service and other public agencies administer about 95 percent of the commercial timber volume. These public lands are characterized by large inventories of old growth timber. On the other hand, private lands contain a considerable amount of timber in the younger classes (less than 40 years old). These; stocking characteristics indicate that the public lands must absorb future timber supply demands. Intensified management of all timber lands may increase yields in eastern Oregon in the long run.

Figure 13 – Timber Site Productivity



Source: S.C.S Aerial Photos – Mt. Hood National Forest-Soil Resource Inventory

L. Land Use and Ownership

Land use information for Wasco County was obtained from aerial photographs and by field surveys. Figure 14 shows the generalized existing land use in Wasco County (*See Chapter 12 for legend definitions. Most of the county is in agricultural and, forestry uses, and urban development is concentrated in the Dalles Urban Area.

Existing land use is not shown within the boundaries of the Warm Springs Indian Reservation, nor are specific ownerships given. Due to their status as a nation, separate and independent from the jurisdictions of Wasco County, the State of Oregon or the U.S. Federal Government, the Warm Springs Reservation is included in this plan only briefly. Further information on the Confederated Tribes of Warm Springs Indians may be obtained through the Tribal Council and in the "Comprehensive Plan - Warm Springs Reservation, (1970)".

The exact boundaries of the Warm Springs Reservation had been disputed from 1871 until 1972 when Congress finally passed Public Law 92-427 ending the controversy. Following is a list of important dates describing the legal actions which have occurred regarding the disputed land. Wasco County fully recognized the McQuinn Strip as part of the Warm Springs Reservation.

1855 - The Warm Springs Reservation was established by treaty.

1871 - T.B. Handley made the first survey; the Tribes protested that the northern line of the survey was further south than agreed.

1886 - Congress authorized a resurvey.

1887 - John A. McQuinn completed the resurvey, establishing a line farther north than the Handley line.

1888 - The Commissioner of Indian Affairs approved the McQuinn line.

1890 - A commission appointed at the request of white settlers recommended the Handley line.

1894 - Congress approved the Handley line and established it as the reservation's boundary.

1917 - Fred Mensch made a study in response to continuing Indian protests, found the McQuinn line correct, but recommended revision with cash compensation to the Tribes in lieu of lands on which settlers had located.

1919 - The General Land Office approved the Handley line.

1921 - The Tribes refused to approve the Mensch Report.

1930 - Congress authorized the Tribes to sue in the Court of Claims.

1941 - The court accepted the McQuinn line except for a small triangle at the extreme northeast but said the Tribes should re-cover the value of the land and not the land itself.

1943 - Sen. Charles McNary and Rep. Lowell Stockman introduced a bill fixing the modified McQuinn line as the boundary; the bill failed.

1945 - The Court of Claims, setting the value under its 1941 decision, said the Tribes should get $80,925 as the 1855 value of the 80,000 acres plus $160,159. interest. However it applied an "offset" rule, said the government had expended more than that on the Tribes. It said this wiped out the claim, and it dismissed the suit.

1948 - Congress passed a bill by Sen. Guy Cordon providing that the Tribes should receive the net revenues from the 61,360 acres of government land within the disputed area.

1971 - Rep. Al Ullman introduced in the House and Sens. Mark Hatfield and Bob Packwood in the Senate a bill establishing the McQuinn line, as modified by the Court of Claims, as the north and west boundary of the reservation.

1972 - The bill ending the McQuinn Strip dispute became law.

Table 12 gives a listing of public and private land ownerships in Wasco County. The Assessor's records were the major source of information. Federal agencies were contacted for current ownerships.

It must be taken into account that ownerships, both public and private, are constantly changing. Figure 15 shows the ownerships in Wasco County as of July, 1980.

Figure 14 – Generalized Existing Land Use

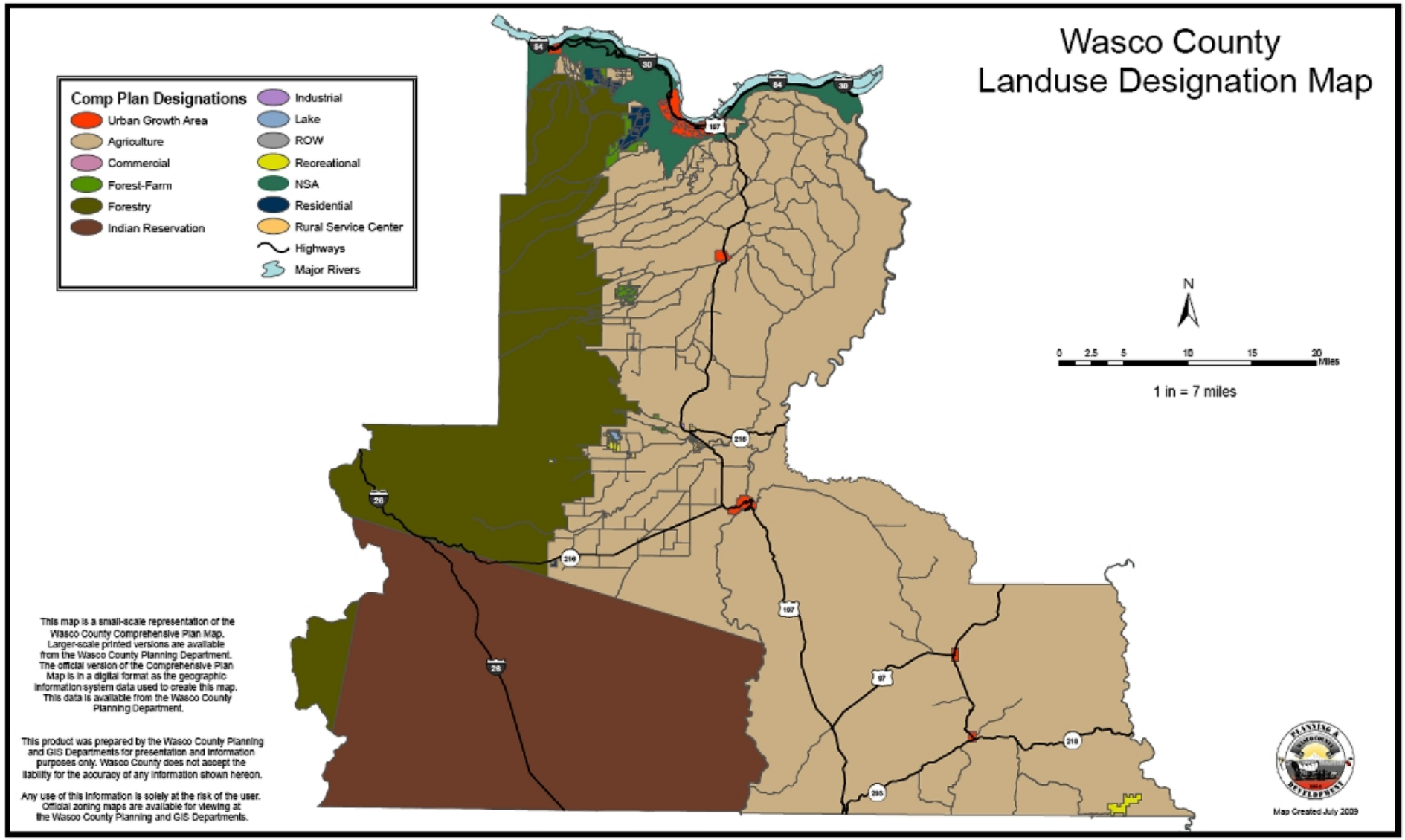
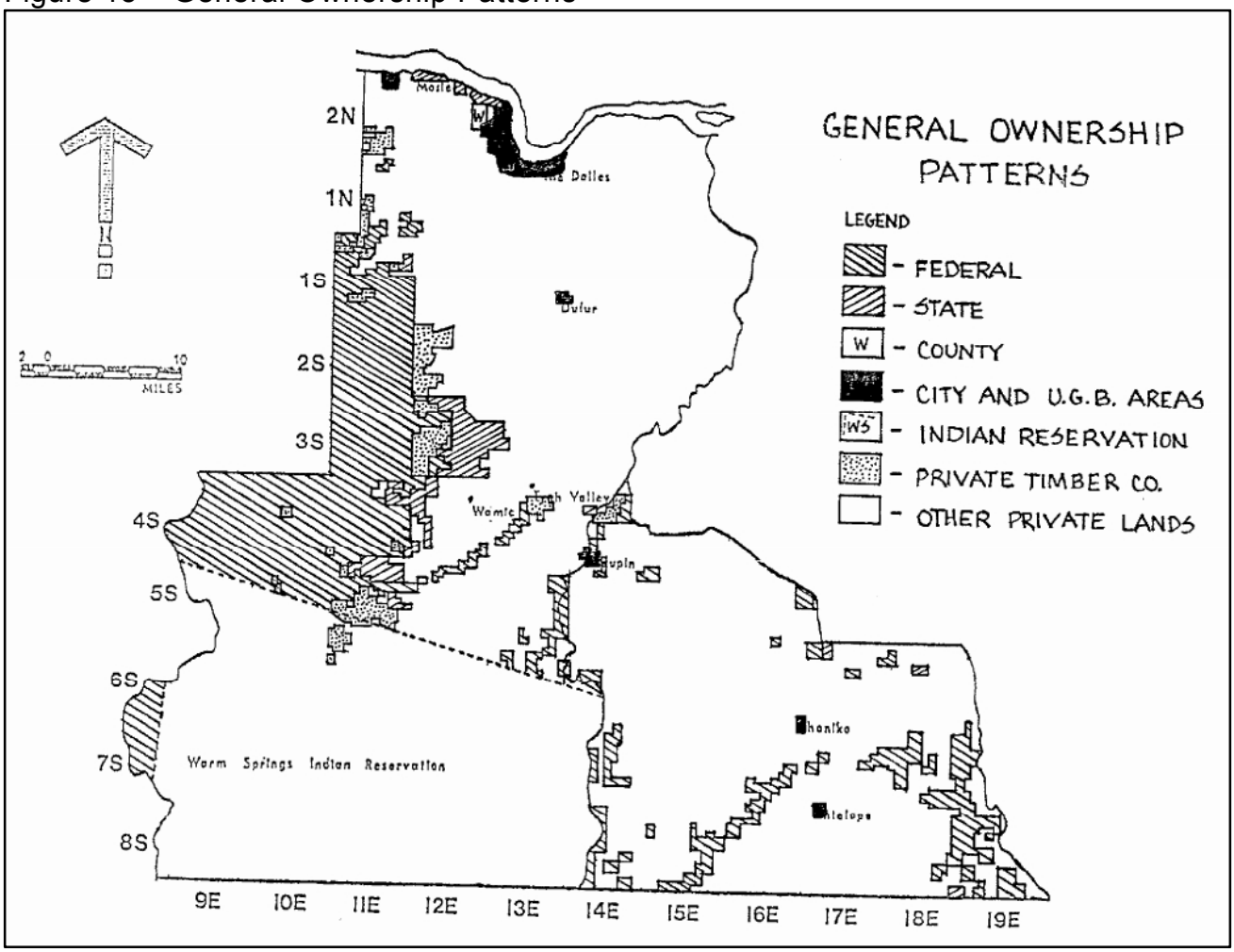


TABLE 12 COUNTY OWNERSHIP

OWNERSHIP	# ACRES	% of
Federal:		
U.S. Forest Service	177,888	
Bureau of Land Management	20,476	
Army Corps of Engineers	2,656	
Bonneville Power Administration	786	
	201,806	13.2
State:		
State of Oregon	1,566	
Highway Commission	1,285	
Forestry Department	3	
Fish and Wildlife	21,979	
State Parks	1,296	
State Land Board	1,760	
	27,889	1.8
County:		
Wasco County	200	
	200	
Incorporated Cities:(Includes all lands within City Limits)		
Antelope	288	
Dufur	367	
Maupin	795	
Mosier	401	
Shaniko	320	
The Dalles	3,300	
	5,471	0.4
School Districts:		
Hood River # 1	1	
Chenowith # 9	38	
The Dalles # 12	81	
Petersburg # 14	155	
Dufur # 29	2	
Tygh Valley # 40	5	
# 42	2	
# 48	17	
Antelope # 50	1	
# 53	1	
	303	
Utilities:		
Telephone	5	
Water	8	
Electric	1,611	
Gas	1	
Railroad	17	
	1,642	0.1
Other Semi-Public and Public:		
Hood River Port	80	
Land Bank	10.	
Boy Scouts of America	793	
Cemetery	10	
The Dalles General Hospital	14	
	907	0.1

Private Lands:		
Union Pacific	151	
OWR & N Company	9,279	
Boy Scouts of America	793	
Warm Springs Indian Reservation	387,113	
Mountain Fir Lumber Company	16,284	
Champion International	4,309	
Other Privately Owned Lands	871,533	
	1,289,462	84.4
TOTAL PUBLIC AND SEMI-PUBLIC LANDS	238,218	15.6
TOTAL PRIVATELY OWNED LANDS	1.289,462	84.4
TOTAL COUNTY LANDS	1,527,680	100. 0

Figure 15 – General Ownership Patterns



Source: Appropriate State & Federal Agencies and County Assessor Records

M. Fish and Wildlife Resources

The variety of vegetation and the abundance of streams and lakes in Wasco County provide good habitat for many types of fish and wildlife. These animals are an integral part of the environment and provide enjoyment for both wildlife enthusiasts and sportsmen. Their populations can only be maintained if their habitats are not greatly disturbed or destroyed. Careful management of these habitats can maintain and even improve wildlife populations.

1. Wildlife Habitat

Wildlife species are a product of vegetative community's water, and cover afforded by vegetation and geological features. Within the County each species of wildlife has its own habitat which is a complex and specific set of conditions to which it is adapted and without it, cannot survive. Destruction of the habitat need not be total to exclude a species from a given area. Loss of only one element which fills a critical need within the habitat is enough to render it inhospitable. Table 13 outlines the major habitat types found in the county, their general location and their relative importance to wildlife.

2. Wildlife Species

There are up to an estimated 230 different species of mammals, birds, reptiles and amphibians in different parts of Wasco County. More species are generally found in the western portions of the county, where habitats are varied and more diverse. Table 14 is a list of species, their habitats and the periods of usage.

3. Sensitive Wildlife Habitat Areas

All wildlife habitats can be considered sensitive to some degree as they all are affected by the impacts of man's use of the land. Changes brought about through soil tillage, livestock grazing, clear-cutting, and development have produced new landscapes, and with few exceptions, original vegetative cover has been altered.

Table 13 – Major Habitat Types

Habitat Name	Description	Wildlife Value
Mixed Conifer	Dense cover, natural open space and mountain meadows (generally in public ownership). Located in higher elevation in western part of county.	Summer range, cover for rearing young. Deer, elk, black bear, cougar, migratory birds.
Mixed Conifer Oak	Dense cover—mixed locations and ownerships in northwestern part of county.	Summer range and cover for all big game species. Cover and nesting areas for migratory and game birds.
Pine Oak	Mid-elevation areas of central and southwestern portion of county. Grass and browse provides excellent cover for Merriam turkeys.	Winter range for big game, Merriam turkey, Lewis woodpecker, silver grey squirrel.
Oak	Ponderosa Pine, oak. Located generally in Township 1 South, 2 South, and 3 South, Range 12.	Deer, elk winter range. Year round habitat for wild turkey. Feeding and nesting areas for Lewis woodpecker.
Oak Grass	Located in Sevenmile Hill areas of northwester Wasco County. Tall grass and scrub oak.	Provides cover and food for various types of big game animals, smaller animals, and birds.

Brush Grass	Occurs mainly on steep slopes and in dry drainage bottom. Dominated by big sage-brush, rabbit brush, horsebrush, cheatgrass, with lesser amounts of bitterbrush, bluebunch, wheatgrass and Idaho fescue.	Brush areas provide important habitat for deer, upland game and non-game wildlife.
Grass Shrub	Cheatgrass, blue grass, bluebunch, wheatgrass, bitterbrush, sagebrush, snowberry, wild rose, sunflower, paintbrush, Balssmorphiza, Eriogonum, Lomatum and wester Juniper; generally found in the southern portion of the County, east of the Deschutes River.	Deer range, bobcat, porcupine, packrat, cliff swallow, rock and canyon wrens, rattlesnakes, chukar partridge, bald and golden eagle, osprey.
Riparian	Vegetation along streams, streambeds and lakes. Found in all parts of the county. Consists of forbs and grasses, shrubs and trees.	Nesting, perching and feeding for many species of birds. Cover, feeding, and shade for all types of wildlife. Water quality is dependent upon the condition of riparian vegetation.
Cultivated Agricultural Land	Wheatland, grazing, hay, alfalfa and other commercial agricultural crops.	Deer, upland birds, waterfowl, raptors, small birds and mammal species. Use occurs mainly around field edges near areas of more substantial cover.
Rural Residential and Abandoned Homesites	Old tree plantings.	Utilized by several bird species including scarce nesting areas for several species of hawks and owls.

Table 14 – Animal Species in Wasco County

A = Abundant F = Few C = Common R = Rare U = Unknown											
	Habitat Types							Use Period			
	Mixed Conifer	Mixed Conifer Oak	Pine - Oak	Oak - Grass	Grass – Shrub Juniper	Riparian	Agricultural	Spring	Summer	Fall	Winter
Bird Species											
Kildeer					C	C		X	X	X	X
Mallard Duck						C	C	X	X	X	X
Wood Duck						F		X	X	X	X
Turkey Vulture	C	C	C	C	C	C	C	X	X		
Bald Eagle	F	F	F	F	F	F		X		X	X
Rough-legged Hawk	F	F	F	F	C	F	C			X	X
American Kestrel	C	C	C	C		C	C	X	X	X	X
Long-eared owl	C	C	F	C	F	F	F	X	X	X	X
Screech owl	F	C	F	C	F	F	F	X	X	X	X
Great-horned owl	C	C	C	C	C	C	C	X	X	X	X
Merriam's Turkey	C	C	C	C		C		X	X	X	X
California Quail	C	C	C	C	C	C	C	X	X	X	X
Ring-necked Pheasant		F	F	F	F	C	C	X	X	X	X
Mourning Dove		C	C	C	C	C	C	X	X	X	X
Rock Dove		C	C	C		C		X	X	X	X
Common Nighthawk	C	C	C	C	C	C	C	X	X		
Belted Kingfisher					F	C		X	X	X	X
Common Flicker	C	C	C	C	F	C	C	X	X	X	X
Lewis Woodpecker	C	C	C	C	F	C	C	X	X	X	X
Downy Woodpecker	C	C	C		F	C		X	X	X	X
Yellow Bellied Sapsucker	F	F	F			F		X	X	X	X
Western Kingbird	F	F	F		F	F	F	X	X		
Western Flycatcher	F	F	F		F	F	F	X	X		
Ash-throated Flycatcher	F		F		F	F	F	X	X		
Western Wood Pewee	F	F	F		F	F	F	X	X		
Horned Lark			C	C	C	C	C	X	X	X	X
House Wren	C	C	C		C	C	C	X	X		
Winter Wren	C	C	C			C	C			X	X
Bewick's Wren	F	F	F			F		X	X		
Rock Wren	F	C	F	C	C	F	F	X	X		
Hermit Thrush	C	C	F			F		X	X		

Fox Sparrow	F	C	C			C	C	X	X	X	X
Song Sparrow	F	C	C			C	C	X	X	X	X
Canada Goose						C	C	X	X	X	X
Pintail						F	F			X	X
American Widgeon						C	C			X	X
Blue Winged Teal						F	F			X	X
Cinnamon Teal						F	F	X	X	X	X
Green-winged Teal						F	F	X	X	X	X
Common Goldeneye	F					F		X	X	X	X
Bufflehead						F		X	X	X	X
Harlequin Duck						F		X	X	X	X
Common Merganser						C		X	X	X	X
Hooded Merganser						F		X	X	X	X
Goshawk	F	F				F		X	X	X	X
Coopers Hawk	C	F	C	F	F	C	C	X	X	X	X
Sharp-skinned Hawk	C	F			F	C	F	X	X	X	X
Osprey						F		X	X		
Ruffed Grouse	C	C	C			C		X	X	X	X
Blue Grouse	C	C	C			C		X	X	X	X
Spotted Owl	R							X	X	X	X
Great Blue Heron						C	C	X	X	X	X
American Coot						C		X	X	X	X
Common Snipe						F				X	X
Poor-will	F		F			F	F	X	X		
Hairy Woodpecker	F	F	F					X	X	X	X
Alder Flycatcher	F					F	F	X	X		
Bank Swallow			C	C		C	C	X	X		
Clark's Nutcracker	F	F	F			F				X	X
Townsends Solitaire	C					C	C	X	X		
Loggerhead Shrike			F		F		F	X	X	X	X
House Finch		C	C	C	C	C	C	X	X	X	X
Western Grebe						C		X	X	X	X
Marsh Hawk					F	F	F	X	X	X	X
Hungarian Partridge					F	F	C	X	X	X	X
Ferruginous Hawk					R	R	R			X	X
Swainsons Hawk					F	F	F	X	X	X	X
Golden Eagle	F		F		F	F	F	X	X	X	X
Chukar Partridge					C	C	C	X	X	X	X

Prairie Falcon					F	F	F	X	X	X	X
Sparrow Hawk		F	C	C	C	C	C	X	X	X	X
Burrowing Owl					F	F	F	X	X		
Red-shafted Flicker	F	C	C	C	F	C	F	X	X	X	
Red-Tailed Hawk	C	C	C	C	C	C	C	X	X	X	X
Eastern Kingbird				F	F	F	F	X	X		
Say's Phoebe				F	F	F	F	X	X		
Sage Thrasher					F			X	X		
Yellow Warbler	C	C	F			F	F	X	X		
Common Yellowthroat	C	C				F		X	X		
MacGilvray's Warbler	C	C				F	F	X	X		
Wilson Warbler	C	C				F	F	X	X		
Nashville Warbler	F					F	F	X	X		
Yellow-rumped Warbler	F					F	F	X	X		
Black-throated Gray Warbler	F					F	F	X	X		
House Sparrow	C	C	C	C	C	C	C	X	X	X	X
Western Meadowlark		C	C	C	C	C	C	X	X	X	X
Red-winged Blackbird		C	F	F	C	C	C	X	X	X	X
Brewer's Blackbird	F	C	F	F	C	C	C	X	X	X	X
Brown-headed Cowbird		C	F	C	C	C	C	X	X	X	X
Northern Oriole		C	F			F	F	X	X	X	X
Western Tanager	F					F	F	X	X		
Evening Grosbeak	C	F				C	C	X	X	X	X
Lazuli Bunting	F	F	F		F	F		X	X		
Purple Finch	F	F	F	F		F	F	X	X		X
American Goldfinch	C	C	F	C	F	F	F	X	X		
Rufous-sided Towhee	C	C	C	C	C	C	C	X	X	X	X
Savannah Sparrow		C	F	C	C	F	F	X	X		
Vesper Sparrow		C	F	C	C	F	F	X	X	X	
Lark Sparrow		C	F	C	F	F	F	X	X	X	
Dark-eye Junco	C	C	C		F	C	C	X	X	X	X
Chipping Sparrow	F	C	F	C	F	F	F	X	X		
White-crowned Sparrow		C	C	C	C	C	C	X	X	X	X
Hummingbirds	C	C	C	F	F	C	C	X	X		
Pine Siskin	C	C				F		X	X		
Mountain Quail	C	F	F	F	R	C		X	X	X	
Barn Swallow		C	C	C	F	C	C	X	X		
Violet-green Swallow	C	C	C	C	C	C	C	X	X		

Tree Swallow	C	C	F		F	F	F	X	X		
Stellars Jay	C	C	C	C	F	C	C	X	X	X	X
Scrub Jay	C	F	F	F	F	C	F	X	X	X	X
Black-billed Magpie		C	F	C	C	C		X	X	X	X
Common Raven	C	C	C	C	C	C	C	X	X	X	X
Common Crow	C	C	C	C	C	C	C	X	X	X	X
Black-capped Chickadee	C	C	C		F	C	C	X	X	X	X
Common Bushtit	C	C	F		F	F		X	X	X	X
Dipper						C		X	X	X	X
White-breasted Nuthatch	C	C	F			C		X	X	X	X
Brown Creeper	C	C	F	F	F	C		X	X	X	X
Red-breasted Nuthatch	C	C				C		X	X	X	X
Grasshopper Sparrow				C				X	X		
American Robin	C	C	C	C	C	C	C	X	X	X	X
Varied Thrush	C	C				C	C	X	X	X	X
Swainsons Thrush	C	C				C		X	X	X	
Western Bluebird	C	C	C	C	F	C	C	X	X		
Mountain Bluebird	C	C		C	F	C		X	X	X	X
Golden-crowned Kinglet	C	C				C		X	X	X	X
Ruby-crowned Kinglet	C	C				C		X	X	X	
Bohemian Waxwing	C	C				F	F	X	X	X	X
Cedar Waxwing	C	C				F	F	X	X	X	
Starling	C	C	C	C	C	C	C	X	X	X	X
Vaux's Swift	F				F	F	F	X	X		
Solitary Vireo	C	C	F			F	F	X	X		
Orange-crowned Warbler	C	C	F			F	F	X	X		
Sage Sparrow	F	C	F	C	F	F	F	X	X	X	X
Short-eared Owl	F	C	F	C	F	F	F	X	X	X	X
Amphibians Species											
Northern Long-Toed Salamander						U		X	X	X	X
Western Toad	F	F			F	F		X	X	X	X
Pacific Tree Frog	C					C	F	X	X	X	X
Rough-skinned Newt	C					C		X	X	X	X
Spotted Frog						F		X	X	X	X
Leopard Frog						F		X	X	X	X

Reptiles											
Painted Turtles						F		X	X	X	X
Northwestern Fence Lizard	C	C	C	C	F	C	C	X	X	X	X
Western Shink	F	F	F		F	F	F	X	X	X	X
Oregon Alligator Lizard		F	F			F	F	X	X	X	X
Rubber Boa						U		X	X	X	X
Sharp-tailed Snake		U	U			U		X	X	X	X
Stripped Whipsnake		U	U		F	U		X	X	X	X
Western Yellow-bellied Racer		U	U			U		X	X	X	X
Great Basin Gopher Snake	U	U	U	U		U		X	X	X	X
Pacific Gopher Snake		C	C	C		C	C	X	X	X	X
Valley Garter Snake		C	C	C		C	C	X	X	X	X
Wandering Garter Snake					U	U		X	X	X	X
Northern Pacific Rattlesnake	F	F	F	F	F	F	F	X	X	X	X
Western Ring-necked Snake	F	F	F	F	F	F	F	X	X	X	X
Great Basin Fence Lizard					F			X	X	X	X
Sagebrush Lizard	U	U	U	U	F	U	U	X	X	X	X
Side-blotched Lizard	U	U	U	U	F	U	U	X	X	X	X
Western Whiptail	U	U	U	U	U	U	U	X	X	X	X
Rocky Mt. Rubber Boa	U	U	U	U	U	U	U	X	X	X	X
Bullsnake			C	C	C	C	C	X	X	X	X
Night Snake	U	U	U	U	U	U	U	X	X	X	X
Mammals											
Mule Deer					C	C	C	X	X	X	X
Blacktail Deer	C	C	C			C	C	X	X	X	X
Coyote	C	C	C	C	C	C	C	X	X	X	X
Bobcat	F	F		F	F	F		X	X	X	X
Racoon	C	C	C		F	C	C	X	X	X	X
Long-tailed Weasel	F	F			F	F	F	X	X	X	X
Badger		F		F	C			X	X	X	X
Striped Skunk	C	C	C	C	F	C	C	X	X	X	X
River Otter					F	F		X	X	X	X
Mink					F	C		X	X	X	X
Beaver						C		X	X	X	X
Muskrat			F			F		X	X	X	X
Merriam Shrew					U			X	X	X	X
Vagrant Shrew	U	U	U	U	U		U	X	X	X	X

Water Shrew					U			X	X	X	X
Pacific or Coast Mole	U	U			U	F	F	X	X	X	X
Little Brown Myotis	U	U	U		U	U	U	X	X	U	U
Fringed Myotis	U	U	U		U	U	U	X	X	U	U
California Myotis	U	U	U		U	U	U	X	X	U	U
Western Harvest Mouse					C			X	X	X	X
Canyon Mouse					C			X	X	X	X
Deer Mouse	F	C	C	C	C		C	X	X	X	X
Northern Grasshopper Mouse					C			X	X	X	X
Bushy-tailed Wood Rat		C	C		C	C	C	X	X	X	X
Sagebrush Mole					U			X	X	X	X
Montane Meadow House					U			X	X	X	X
Norway Rat					F	C	C	X	X	X	X
House Mouse			C	C	F	C	C	X	X	X	X
Western Jumping Mouse			F	F	F			X	X	X	X
Opossum		F				F	R	X	X	X	X
Dusky Shrew	U	U	U	U			U	X	X	X	X
Trowbridge Shrew	U	U	U			U	U	X	X	X	X
Pacific Mole	U	U				R	F	X	X	X	X
Yuma Myotis	U	U	U			U	U	X	X	U	U
Spotted Skunk	F	F	F	F	R	F	F	X	X	X	X
California Ground Squirrel	C	C	C	C	F	C	C	X	X	X	X
Yellow Pine Chipmunk	C	C	C			C		X	X	X	X
Townsend Chipmunk	C	C	C			C		X	X	X	X
Small-footed Myotis	U	U	U		U	U	U	X	X	U	U
Hairy-winged Myotis					U			X	X	X	X
Long-eared Myotis	U	U	U		U	U	U	X	X	U	U
Silvery-haired bat	U	U	U		U	U	U	X	X	U	U
Big Brown Bat	U	U	U		U	U	U	X	X	U	U
Western Pipistrelle	U	U	U		U	U	U	X	X	U	U
Pallid Bat	U	U	U		U	U	U	X	X	X	X
Lump-nosed Bat					U			X	X		
Blacktailed Hare					R			X	X	X	X
Whitetailed Hare					F		F	X	X	X	X
Mountain Cottontail	F	C	C	C	C	C	C	X	X	X	X
Pygmy Rabbit	F	F			F	F	F	X	X	X	X
Yellow-bellied Marmot					F			X	X	X	X
Belding Ground Squirrel					C		F	X	X	X	X

Townsend Ground Squirrel					C		F	X	X	X	X
Least Chipmunk	F	F			F			X	X	X	X
Northern Pocket Gopher	C	C	C	C	C	C	C	X	X	X	X
Great Basin Pocket Mouse					U			X	X	X	X
Ord Kangaroo Rat					F			X	X	X	X
Western Gray Squirrel	C	C	C			C	C	X	X	X	X
Chickaree	C	C				C		X	X	X	X
Northern Flying Squirrel	F	F				F		X	X	X	X
Longtail Vole	C	C		C		C	C	X	X	X	X
Oregon Vole	C	C		C		C	C	X	X	X	X
Norway Rat						C	C	X	X	X	X
Black Rat						C	C	X	X	X	X
Porcupine	C	C	C	C	C	C	C	X	X	X	X
Snowshoe Hare	C							X	X	X	X
Black Bear	C							X	X	X	X
Mountain Lion	F	F	F					X	X	X	X
Rocky Mountain Elk	C	C	C	C		C	C	X	X	X	X
Pika	C							X	X	X	X
Nuttail Cottontail	C	C		C		C		X	X	X	X

The forested regions of the western portions of the county provide winter habitat for the deer and elk that range there from higher elevations. Migrational movements range from a few hundred feet to several miles. The winter range area varies in size depending on winter weather conditions and snow depth. Although much of the range area is in public ownership, many of the lower valley areas are now largely settled by private owners. Maintenance of the remaining big game winter range is necessary if viable herds of deer and elk are to remain in these portions of the county.

Also ranging in these forested areas are black bear, cougar; migratory birds, northern bald eagles and other species. Many of these species have large ranging requirements and feed on deer mortalities. Proper management and maintenance of these species includes maintaining road less areas and preserving key stands of old timber.

Timber management on forest land has both beneficial and detrimental effect on wildlife species. Clear-cutting methods have increased habitat for big game species but have at the same time eliminated habitat for some bird and mammal species. Consequently, proper timber management is essential.

In recent years, the productive pine-oak habitat has been undergoing development into recreational subdivisions. Road access, off road vehicles and free-ranging dogs can have detrimental effects on animals utilizing these areas. Harvesting of old growth pine will diminish necessary habitat for animals such as the introduced Merriam's turkey, which has a definite preference for pine as a food source and roosting area.

Riparian habitats are very sensitive to adverse impacts, as these areas serve a great number of wildlife species in a variety of ways. Not only does this vegetation provide habitat, but is instrumental in maintaining water quality and preventing soil erosion. In some parts of the county, particularly the eastern and southern portions, riparian habitat is scarce and must be protected.

Livestock grazing has had a tremendous effect on vegetative cover along streams. Intensive grazing has caused a decline of large native grasses, such as blue brush wheatgrass and Idaho fescue. The Columbian sharp-tailed grouse, which was associated with native bunchgrass and adjoining bushy areas, has disappeared. Heavy grazing of livestock and deer in the summer has an adverse impact on wintering deer and other wildlife species. Fires, as well as misuse and over-use of riparian habitats by man also have tremendous detrimental effects.

Figure 16 shows areas of sensitive big game winter range and riparian habitat. These areas were determined through research by the Oregon Department of Fish and Wildlife.

4. Unique Habitats

The unique rock formations, rock slides and overall variable terrain features of the southern portion of the county and along the Deschutes, John Day and

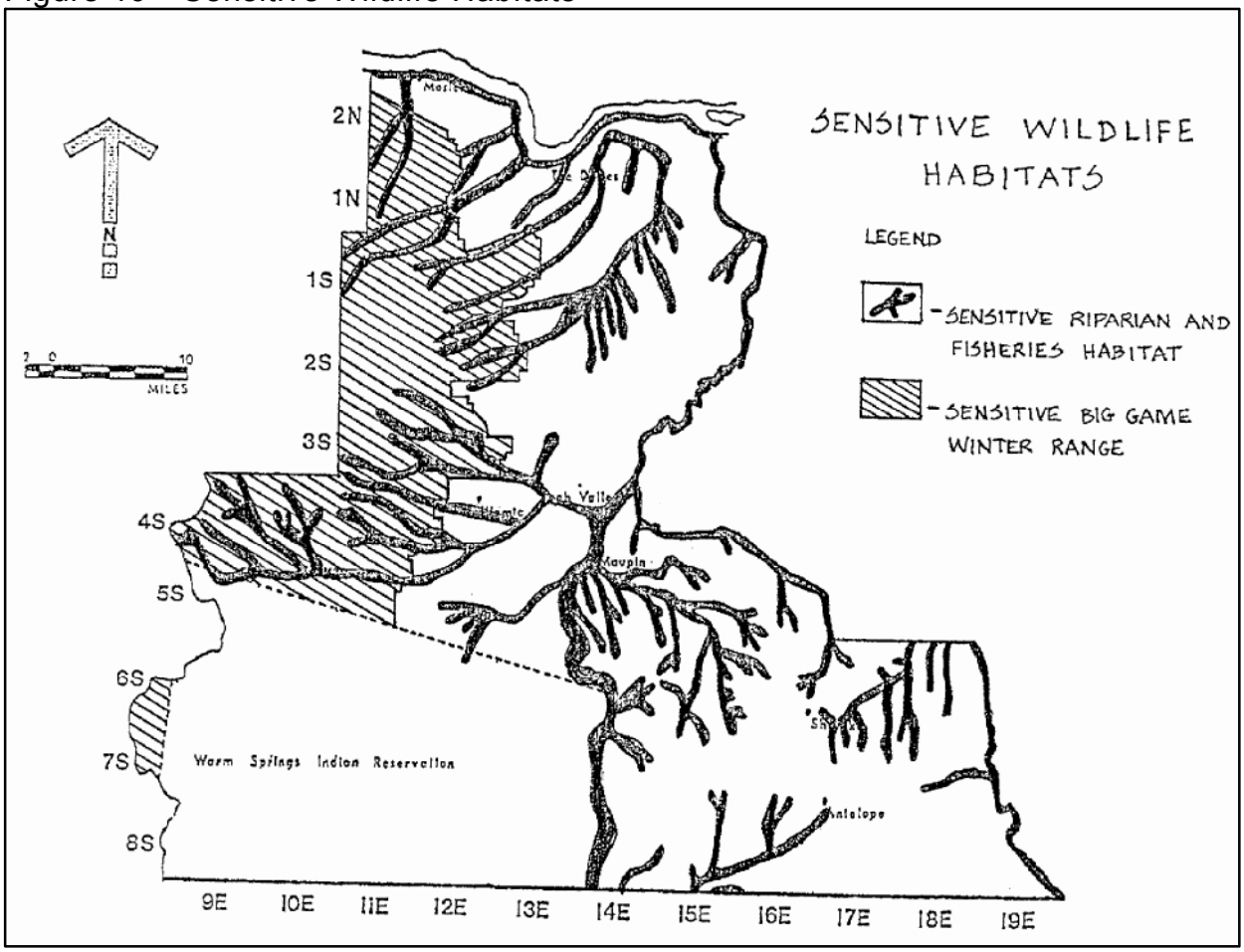
Columbia Rivers provide an important and unique wildlife habitat. Some wild-life species are directly associated with rock formations as a result of adaptation. An example is the chukar part-ridge. Rocky, steep terrain is an integral part of good chukar habitat, as these areas are utilized for shade, cover and escape routes. Other species closely associated with rock formations include bobcat, porcupine, wood rat, cliff swallow, rock and canyon wrens and the rattlesnake. Golden eagles and bald eagles nest in rock outcrops, cliffs and snags along the John Day and Deschutes Rivers, as do burrowing owls and the great blue heron. Osprey nest and feed along the Deschutes and Columbia.

Oregon white oak is a common deciduous tree species in central Wasco County, but it is considered to be a unique entity, as there is little in the remainder of eastern Oregon. Older age class oaks provide many nest cavities for a wide range of non-game wildlife species. Several species directly associated with Oregon white oak include the Lewis woodpecker, silver gray squirrel and Merriam turkey.

5. Land Use Conflicts and Resolutions

The type and severity of conflicts between wildlife and other land uses vary depending upon the habitats and land use involved. Conflicts to habitat frequently results in habitat loss or degradation and harassment which reduce animal numbers and correspondingly recreational opportunities. Land uses most compatible with Wasco County's fish and wildlife resources include open space, agriculture and forest. Land use designations which maintain large minimum lot size result in low residential densities and reduced conflicts between habitats and human activities. It is important to note that valuable habitat is found throughout the County, not just in those areas identified as sensitive.

Figure 16 – Sensitive Wildlife Habitats



Source: Department of Fish & Wildlife

The conflicts with wildlife in sensitive habitat such as big game winter ranges, riparian, and salmonid spawning areas are identified and protected by various means. Special consideration will be given to fish and wildlife concerns in these areas when conflicting uses occur. Zoning and conditional uses will be used to further maintain or enhance fish and wildlife habitat.

Much of the sensitive winter range (see Map 16) is on, or adjacent to, private lands. Conflicts occur when wintering big game migrate to the lowlands and cause damage to fencing and agricultural crops. In an attempt to reduce damage from big game, the Department of Fish and Wildlife has been obtaining lands through purchase and lease agreements. Many big game now winter in the White River Wildlife Management Area shown in Figure 17.

The White River Management Area was initiated in 1953 by what was then the Oregon State Game Commission. It is a 25,000 acre project which not only provides big game winter range, but also recreational and agricultural uses such as fishing, hunting, picnicking, livestock grazing, timber harvest, fur-trapping, horseback riding, and share-crop wheat production.

A fence along the management area boundary has been partially constructed to restrict big game movement onto private lands. The Department's goal is to maintain deer populations on agricultural lands at levels that are compatible with agricultural and residential uses.

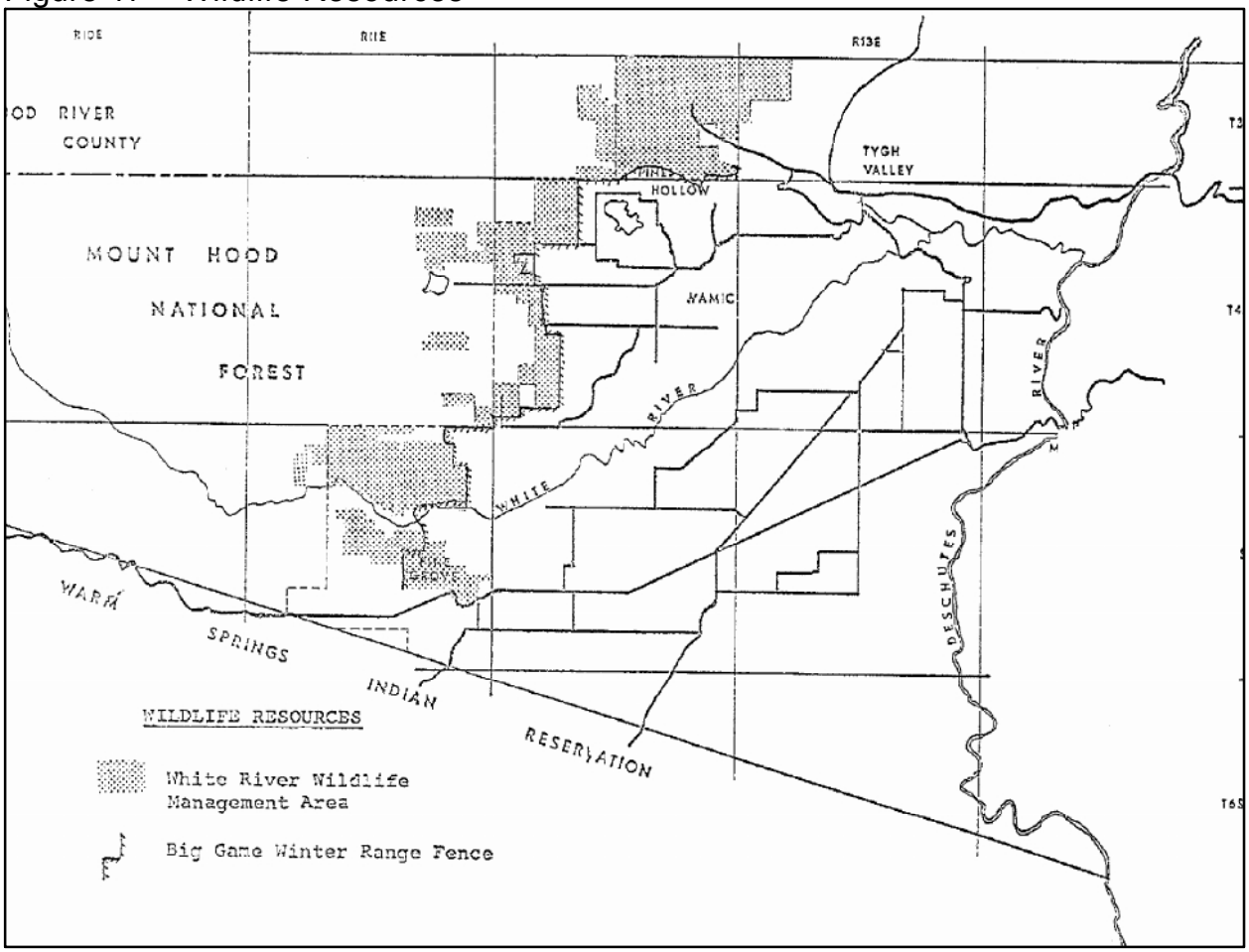
There are several means by which landowners can coordinate with the Department of Fish and Wildlife to achieve this goal. Each is briefly discussed below. This information was obtained by discussion with Department of Fish and Wildlife personnel, John Beck and Jim Torland, on September 2, 1980. Detailed information can be obtained from the local Department of Fish and Wildlife.

a. Damage control hunt: These hunts are tailored to meet the needs of landowners in specific areas. Farmers must agree to allow hunting on their properties. The duration of these hunts varies with the type of winter and population numbers in the area.

b. Kill permits: Landowners may be issued permits to kill a specified number of deer, or elk, as agreed upon by the Department of Fish and Wildlife prior to issuance.

c. Hazing permits: Allows the landowner to shoot to scare only. Fish and Wildlife Department personnel may use helicopters, cars, shotguns and even fire-crackers to scare wildlife from the area.

Figure 17 – Wildlife Resources



d. Repellents: The Department of Fish & Wildlife may utilize or authorize the usage of odiferous repellents applied to trees, orchards and plants to repel big game.

e. Fencing: The Department will provide small amounts of fencing free of charge and will participate in a cost-share program to provide fencing for large acreages. The Department will currently pay up to $7.50 per rod (one rod equals 16.5 feet) of fencing, with the landowner providing the additional cost and labor. The Department will also research and provide cost estimates for fencing supplies.

6. Fisheries Habitat

The fisheries resources in Wasco County can be broadly broken into six significant habitat types: the Columbia River, the backwater ponds of the Columbia, the Fifteenmile Creek drainage, the Deschutes River, the Deschutes River tributaries and lakes and reservoirs. The diversity of aquatic habitat provided by these water bodies supports an even wider variety of fish species. These species and their habitats are shown in Table 15, and discussed below.

a. The Columbia River:
The Columbia River is probably the single greatest fisheries resource in the Pacific Northwest. In recent years, the valuable anadromous salmonids in the Columbia River have been faced with increasing problems. At present, in the area between the Bonneville and the John Day dams, tens of thousands of adult salmonids are unaccounted for each year, probably largely due to mortalities from dam operations.

Juvenile fish suffer excessive delays during their down-stream migration through the numerous slow-moving Columbia River Reservoirs. Unscreened turbine intakes at most Columbia River dams allow a large percentage of the juvenile migration to pass through the turbines often killing large numbers.

Adult salmon and steelhead trout migrating up the Columbia River continue to face delays in passing some dams. These delays can be critical to those fish that are exposed to excessive river temperatures for an extended period. The warming of the water in the slow-moving Columbia River Reservoirs is favorable to outbreaks of bacterial and fun-gal infections. These infections can result in the death of the fish before they are able to spawn.

To date, dams on the main stream Columbia and Snake Rivers and their tributaries, have reduced by one-half the natural habitat available to Columbia Basin salmon and steelhead. Fortunately, artificial propagation has compensated for some of this loss and now accounts for an estimated fifty percent of the salmon and steelhead produced in the Columbia Basin.

Table 15 – Fish Species and Habitats

	Columbia River	Deschutes River	White River	Fifteenmile Creek	Eightmile Creek	Fivemile Creek	Dry Creek	Tygh Creek	Badger Creek	Jordan Creek	Little Badger Creek	Threemile Creek	Rock Creek	Clear Creek	Frog Creek	Crane Creek	Harlow Creek	Gate Creek	Wapinitia Creek	Nena Creek	Eagle Creek	Oak Brook Creek	Buckollow Creek	Deep Creek	Stag Canyon	Cove Creek	Brocher Creek	Trout Creek	Ward Creek	Antelope Creek	Bakeoven Creek	Columbia Bacwkater Podnds
A = Abundant F = Few C = Common R = Rare																																
Game Species																																
Chinook Salmon	A	A	F																			R								R	C*
Steelhead	A	A	C	F	R														F	F	F	F	A	C	F	R	F	C	F	F	A	C*
Coho Salmon	A	A	C	C	F	R																										C*
Chum Salmon	R																															
Sockeye Salmon	A	C																														F*
Rainbow Trout	C	A	A	A	A	C	F	A	A	A	F	C	C	A	C	C	C	C	F	F	F	F	A	A	F	F	F	C	F	F	A	F
Cutthroat Trout	R			R	R	R										C																
White Sturgeon	A																															
Green Sturgeon	F																															
Mountain Whitefish	A	A	C																													
American Shad	A																															
Channel Catfish	C																															C
Brown Bullhead	A																															A
Walleye	C																															C
Yellow Perch	C																															C
Largemouth Bass	A																															A
Smallmouth Bass	A																															A

Bluegill	C																														C
Pumpkinseed	F																														F
White Crappie	C																														C
Black Crappie	A																														A
Brook Trout									C					A	C	R	C														
Dolly Varden Trout		F																													
Non-Game Species																															
Carp	A	F																													A
Northern Squawfish	A	A	C																												A
Fine-scaled Sucker	A	A	A	C	C	C																	A	A	F		C	A	C	C	A	A
Coarse-scaled Sucker	A	A	A	F																			C	F	F			C	C	C	C	A
Pacific Lamprey	A	A		C	C	C																									
Chiselmouth	A	A	C																												
Peamouth	A	A	F																												
Red-sided Shiner	A	C																													
Speckled Dace	A	A	C	A	A	A	A	C	C	C	F	C	C						C	C			A	A	C	F	F	A	A	A	A	A
Long-nosed Dace	A	A	C	A	A	C	C	C	C	C	R	F	C						F	F			F	F				C	C	C	F	
Tench	A																														C
Sculpt	A	A	F	C	C	C		C	C	C	R	C	C				C	C					A	C				C	R	F	C	C

The utilization of the spillways cause nitrogen levels in .the water to reach 135 percent to 140 percent saturation, well above the critical thresholds for both adult and juvenile salmon and steelhead. Unscreened turbines account for significant mortalities ranging from eight to fifteen percent per dam.

Juvenile salmon and steelhead are faced with other threats in their downstream migration. Large predator populations, including the voracious Walleye Pike, which has recently found its way into the Columbia River, devour untold numbers.

The future of the anadromous fish species utilizing the Columbia River Basin will depend upon the efforts of numerous state (Idaho, Washington, and Oregon) fishery agencies, federal resource agencies, Army Corps of Engineers and the Bonneville Power Administration, and the coordination of these agencies with the private energy and fisheries sectors.

The outlook for summer steelhead, like that for spring and summer Chinook, is not good. The potential exists, however, for substantial recovery, if downstream migrant passage mortalities at main stream dams can be greatly reduced and additional mitigating measures provided.

b. Backwater Ponds of the Columbia River:
Production of warm water game fish in the Columbia River is affected by the fluctuating pool levels behind The Dalles and Bonneville Dams. Unfortunately, the backwater ponds adjacent to Interstate 84 are connected to the Columbia River with road culverts and, thus, fluctuate with the river. These fluctuations result in sporadic habitat change and reduction that may have detrimental effects on the resident fish populations.

c. Fifteenmile Creek Drainage:
Low summer stream flows, excessive water withdrawal, and extreme stream temperatures during the summer months of the year, are the most limiting fish production factors in the Fifteenmile Creek watershed. The excessive silt loads often carried by streams in this portion of the Fifteenmile system have drastically reduced the amount of quality of gravel available for resident and anadromous trout spawning. This silt originates from cultivated fields and stream banks during periods of heavy precipitation and run-off.

Much of the silt movement in this portion of the watershed could be checked with proper soil conservation practices. Many of the smaller intermittent feeder drainages could reduce silt movement if the vegetation in the bottom of the drainage was permitted to recover from overgrazing.

Deep, fertile bottomland within the flood plains of this watershed are often cultivated and planted with crops that are poorly suited for soil stabilization. These deep soil areas are often extremely vulnerable to flood erosion. Great quantities of valuable top soil can be lost during a short period of high water.

Preservation and/or re-establishment of riparian vegetation is essential to help alleviate the problems plaguing the Fifteenmile Creek watershed. Riparian vegetation not only provides good stream bank erosion control, but it also improves stream water quality. Future water quality and fish production within this system will be dependent upon good stream corridor management.

Water storage for irrigation, flood control and minimum stream flow would be beneficial within the Fifteenmile Creek watershed where not in conflict with anadromous fish migrations. Studies will have to be made to determine where these sites could be located.

d. Deschutes River:

The high quality water and stable flows of the Deschutes River provide optimum conditions for fish production. The river has a diverse fish population comprised of anadromous and resident game species, as well as non-game species.

Major salmon, steelhead and resident trout spawning grounds are located throughout the reach of the Deschutes River. Figure 18 is a periodicity chart for salmon, steelhead and trout in the river.

The aquatic habitat of the Deschutes River is in fairly good condition. It is imperative that the present flow of the river not be compromised. Any further reduction in stream flow can only have a detrimental effect on the stream's valuable fishery.

The riparian habitat along this portion of the river has been deteriorating for many years. In many areas, the dominant overstories of hackberry and alder have been unable to successfully reproduce as a result of excessive livestock overgrazing. Many dead snags along the river bear witness to the gradual demise of this segment of the riparian corridor.

Throughout this section of river there is evidence of stream bank erosion. In most instances, the erosion is a direct result of livestock trampling or wave action from passing power boats.

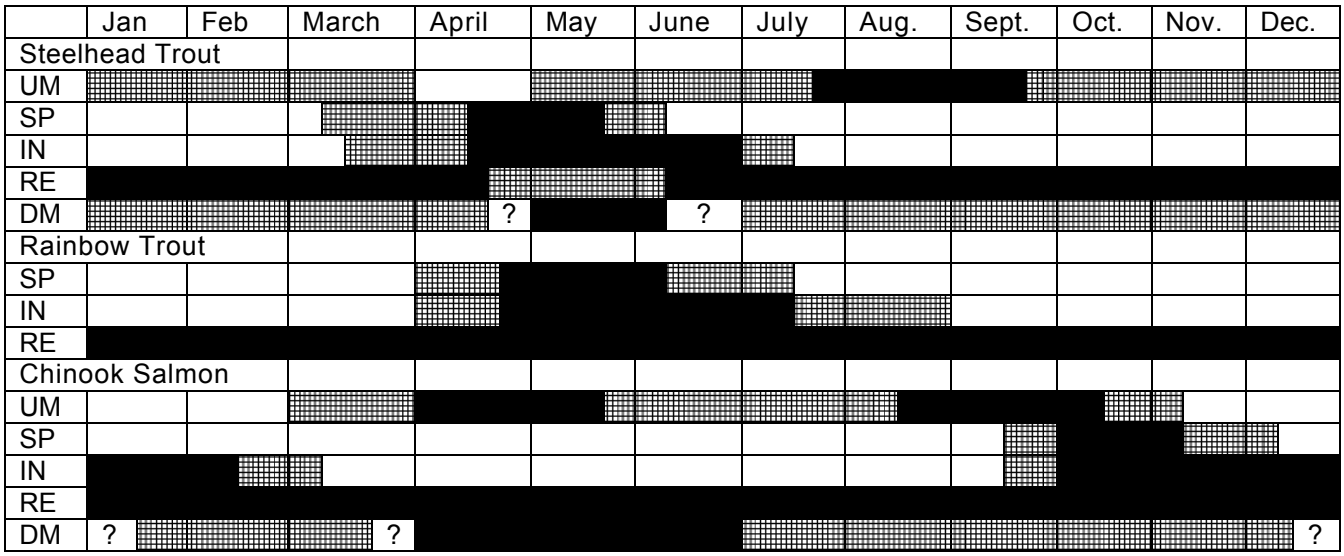
Fires, started by the railroad or negligent individuals, are a continual habitat threat along the Deschutes River. Valuable riparian habitat is destroyed each year by these remote blazes.

Reductions in flow of the Deschutes River would be detrimental to fish production. A report of a 1960's study, (Lower Deschutes River, Oregon: "Discharge and Fish Environment"), undertaken by the Oregon Game Commission, recommended a minimum Spring flow of 4,800 cubic feet per second, and a Fall flow of 4,500 cfs. The Federal Power Commission has directed the Portland General Electric Company to release a minimum of 3,000 cfs at Pelton Dam, which is below the recommended minimum flows.

e. Deschutes River Tributaries:

The tributary streams of the Deschutes include the following: Buck Hollow Creek, Bakeoven Creek, Trout Creek, Ward Creek, Antelope Creek, White River, Nena Creek, Wapinitia Creek, Oak Brook, Eagle Creek, and the streams that flow through Oak, Ferry and Fall Canyons. These streams support relatively small numbers of resident steelhead and trout.

Figure 18 – Periodicity Chart, Steelhead Trout, Rainbow Trout and Chinook Salmon, Lower Deschutes River



UM = Upstream Migration SP = Spawning IN = Incubations RE = Rearing DM = Downstream Migration

■	Periods of Heaviest Use
▒	Periods of Moderate Use
	Periods of Little or No Use

Fish production in the Buck Hollow, Bakeoven, and Trout Creek systems is limited by low summer flows and a general lack of good riparian vegetation. These streams may be-come intermittent during the summer months.

Migrations of fish from the Deschutes River into Nena Creek and White River are blocked by the impassable falls within two miles of the Deschutes River. White River and its tributaries above White River Falls support good numbers of resident trout. Good numbers of non-game fish are also found in the lower reaches of the streams, while trout are predominant in the upper reaches low summer stream flows, siltation and excessive summer water temperatures are factors most limiting fish production in the streams that flow through the lower stretches of Oak, Ferry and Fall Canyons. These streams are commonly intermittent during the summer months. Fish production during this "pinch period" is limited to scattered potholes and short sections of flowing water.

These streams regularly transport large silt loads during periods of heavy precipitation. Wheat fields above the Deschutes Canyon rim are the primary sources of this silt.

Riparian vegetation is in poor condition along sections of these streams as a result of unregulated livestock grazing. Periodic flash flood conditions in these short drainages have damaged considerable riparian vegetation; however, regeneration of this stream cover is often impossible as a result of livestock "camping" on these stream bottoms.

Headwater storage projects that would release good minimum flows throughout the summer would be beneficial when not in direct conflict with anadromous fish. Good riparian vegetation, encouraged by the stable flows, would provide important stream cover and have a moderating effect on high summer water temperatures.

f. Lakes and Reservoirs:
The high mountain, walk-in lakes, such as Big Twin, Catalpa, and Little Boulder Lake, are stocked with trout annually or every other year. Clear Lake, Frog Lake, Pine Hollow Reservoir, and Rock Creek Reservoir, and other impoundments are stocked annually with trout.

N. Environmental Considerations

1. Air Quality

   Wasco County's air quality is considered good by the Department of Environmental Quality, State of Oregon. It complies with all federal and state air quality guidelines. Air pollution rarely goes over the primary or secondary federal and state standards.

   The major sources of air pollution in Wasco County and their yearly emissions are listed in Table 16. Particulate levels are found to be generally higher here than in the Willamette Valley. Wind entrained soil dust is the cause of the higher particulate levels. The nature of the soils in the county, the agricultural practices of dry plowing and disking, and vehicular traffic on unimproved roads are all factors in this type of air pollution. Grain elevators are a source of more localized air quality problems. Table 16 lists the particulate level for: one such elevator in Wasco County.

   Although specific data is lacking, observed climatic conditions indicate that conditions are often adverse for air quality management. Due to rapid heat loss during the night, atmospheric temperatures decline. The reduction of warm air stratification lowers the mixing level from several thousand feet to only a few hundred feet, resulting in early morning inversions. During an inversion particulates and contaminants could be trapped and concentrated within a few hundred feet off the ground.

   The highest potential for temperature inversions and related pollution problems exists within The Dalles airshed, or "bowl". This "bowl" is centered at The Dalles (100 feet above sea level) and bounded by the surrounding topography (2,000 to 3,000 feet above sea level). This natural basin or "bowl" restricts lateral dispersion of air. Other areas in Wasco County have little potential for air pollution problems.

2. Water Quality

   a. Surface Water Quality:

      The Columbia, Deschutes, and John Day Rivers are the only streams that are monitored regularly for water quality. Generally, the state and federal standards for water quality are met.

Table 16 – Air Pollution Sources

Source	Particulate	Sulfurous Oxides
Tygh Valley Timber Co.	140.5	0.3
Martin Marietta Aluminum	806.5	528.5
Interior Elevator Co.	200.6	-0-
Light Duty Motor Vehicles	132.6	32.3
Heavy Duty Motor Vehicles	36.2	52.7
Railroads	17.4	39.6
Residential Space Heating	8.0	30.6
Commercial Space Heating	16.2	137.9

Slash Burning	396.1	-0-
Forest Fires	79.2	-0-
Orchard Prunings	29.2	-0-
Total	1952.5 or 12.7% of region total	821.9 or 23.1% of region* total

The Dalles Sampling Station	Days Exceeding Primary Air Standard	Days Exceeding Secondary Air Standard
1970	0	6
1971	0	2
1972	0	2
1973	2	2
1974	0	0
1975	0	1

Source: Department of Environmental Quality
*Region includes Crook, Deschutes, Hood River, Jefferson, Klamath, Lake Sherman and Wasco Counties.

The water of the Columbia River is relatively high in dissolved solids. High concentrations of fluoride, sulfate, and calcium ions are also apparent from water quality comparisons. Surveillance of radioactive contamination from upstream nuclear plants has shown that the water has not exceeded acceptable levels for drinking purposes. Following are typical water quality measurements:

Turbidity	1-4 Jackson Turbidity Units.
Color	1-30 Units
Total Alkalinity	30-60 mg/L.
Total Hardness	40-80 mg./L.
Algae Content	0-150/100 ml.
Bacteria Content	5-150/100 ml.
Total Solids	60-90 mg/L.

The water quality in the lower Deschutes River generally met the established standards for ph and for concentrations of dissolved oxygen and total coliforms except on occasions when minor technical violations of the ph and total coil-form levels occurred. These minor deviations from the standards, however, are not known to affect the uses of water for beneficial use.

There are four monitoring stations on the John Day River, although none are within Wasco County. There is no problem with coliform or other pollutants from septic systems due to the lack of development along this river. There are some non-point source water quality problems which are discussed below.

The State of Oregon, Department of Environmental Quality, has completed an assessment of non-point source problems throughout Oregon. It is a response to the Federal Clean Water Act of 1972, and specifically, to Section 208.

Table 17 outlines the non-point source pollution problems on various streams and rivers in Wasco County.

Table 17 – Non-Point Source Pollution

Stream	Streambank Erosion	Sedimentation	Excessive Debris	Water Withdrawal Causing Stream Quality Problem	Elevation Water Temperature	Nuisance Algae or Aquatic Plant Growth
S = Severe M = Moderate						
Mosier Creek	S/M			M	M	M
Mill Creek	S/M	M	M	M	M	
Mill Creek-South Fork	M	M	M	M		
Mill Creek-North Fork	M	M	M	M		
Threemile Creek	S	M		S/M	M	
Fivemile Creek	S/M	S/M		S/M	M	
Eightmile Creek	S/M	M	M	M	M	
Fifteenmile Creek	S/M	M		S/M	M	
Browns Creek	S/M			M		
Ramsay Creek	S/M	M	S	M		
Pine Creek	S	S			M	
Dry Creek	S	S				
Jorden Creek	M	M				
Tygh Creek	M	M	M	M	M	
Badger Creek	M		M	M	M	
Wapinitia Creek	M	M		M	M	
Nena Creek	S/M	S/M			M	
Buck Hollow Creek	M	M			M	
Bakeoven Creek	M			M	M	
Coyote Creek	S	S			M	
Quartz Creek	S	M			M	
Mill Creek	S					
Ward Creek	S	M		M	M	
Deep Creek	M	M			M	
Antelope Creek		M		M	M	
Trout Creek		S		M		
Muddy Creek				S		
Deschutes River	S*	S*				
John Day River	S/M	M		M	M	
White River	M	M		S/M		
Warm Springs River		S			M	

Source: Department of Environmental Quality, 1978

*The problem exists only on a very small stretch of this stream.

b. Sewer and Water Systems:
Communities with public sewerage systems and large industries which discharge waste water must obtain discharge permits from the Department of Environmental Quality. Twelve point source discharge permits have been issued in Wasco County. These permits allow the discharge of waste water into either public waterways or into waste treatment facilities, such as holding ponds. The permit holders are regularly monitored by the Department of Environmental Quality and are continuing to stay within the discharge limits allowed by their permits (Department of Environmental Quality, Bend, Oregon. Telephone conversation, Sept. 29, 1980)

According to the County Health Department, these are a few areas in Wasco County that have problems with septic or water systems. Pine Grove and Shaniko have very thin soils that cannot absorb large amounts of septic effluent. There is also some difficulty obtaining good wells in these areas. A study by the Health Department for the Environmental Protection Agency (EPA) has found that there may have been some pollution of one of the community water systems in Wamic by septic systems. The Environmental Protection Agency will analyze the extent of the problem and make a determination on how to resolve it. Misuse and over-use of septic systems is a problem in the Sevenmile Hill area, according to the Health Department. People who are used to city sewer and water systems may have a tendency to overload their drainfields with too much water at one time. The soils in this area allow for proper drainage and limiting the use of water would alleviate this problem. Other areas needing sanitary sewage disposal facilities in the near future include Tygh Valley and Pine Hollow.

All septic tank waste is handled by private pumpers under Department of Environmental Quality regulations for disposal. To date, no major problems exist.

c. Groundwater Quality:
According to the County Water master, groundwater quality in Wasco County is good. Wells are adequate and there does not appear to be any significant draindown of water tables.(Tom Paul, Wasco County Watermaster, Sept. 30, 1980)

There is a critical groundwater reservoir beneath The Dalles Urban Area that is currently being man-aged by the Water Resources Department. Excessive use of water from this pool in the 1950's prompted the placement of water restrictions. These restrictions limit the use of this water to residential use only arid limit the amounts that can be used.[5]Ibid

3. Land Resources Quality
The quality of land resources can be adversely affected by the improper disposal of solid waste. Several dumping areas in the county that have caused problems in the past have since been corrected. There appears to be few environmental problems connected with solid waste disposal in the county at the present time.

Open burning is allowed twice a year, in the winter at the Northern Wasco County Sanitary Landfill, located three miles south of The Dalles. The burning is

closely supervised by the Department of Environmental Quality and the Wasco Rural Fire Department and causes only minimal amounts of air pollution. As there is very little development in the area surrounding the landfill, the environmental impacts are minimal.

The landfill has had inadequate water supplies to meet its needs in the past. Water is needed for the operators who reside at the site, for dust control and for irrigating newly seeded areas. These water needs will increase as the size of the operation in-creases. The placement of new wells is currently being examined.

The Mid-Columbia Solid Waste Plan: Generation, Disposal and Management, (Mid-Columbia Economic Development District, November, 1975), outlines various other problems with solid waste disposal in Wasco County. Illegal and unsightly piles of refuse in alleys and streets and illegal burning of trash have been noted, possibly due to the fact that only 70 percent of the residents in The Dalles Urban area subscribe to garbage collection service. (pp. 40-41).

The other 30 percent must haul their own garbage to the landfill. Often refuse from private homes may be found in publicly and commercially owned garbage bins. One possible solution to these problems is mandatory garbage collection (p. 42). Re-cycling has also become a viable alternative, particularly in The Dalles area, where newspaper, glass, card board and metal are currently being recycled. (p. 43).

Other problems that plague proper rural area solid waste management are fire control, obtaining adequate revenues for operation and construction of new facilities and land acquisition, refuse collection and transfer to disposal sites and public participation in solid waste control. These difficulties may become more apparent as populations in rural areas increase.

4. Noise Pollution

Due to Wasco County's rural nature, noise pollution is not a serious problem. According to the County Sheriff's Office and The Dalles City Police, very few complaints about noise are received. Most complaints are received in the evening hours and are due to barking dogs or loud music and parties. More complaints (2-3 weekly), are received in the summer months, and are probably due to activities brought about by the longer summer days and the fact that students are out of school.

Additional noise sources that may be nuisances are agricultural equipment, especially large trucks and spray planes, industry and highway traffic; specifically Interstate Highway 84, Union Pacific Railroad, and lumber mills. Because agriculture is a common livelihood in Wasco County, the noise that accompanies it is generally accepted. Relatively few residential areas are affected by the noise from either highway traffic or industries. Generally, these uses are located away from residential neighborhoods.

There is presently no noise ordinance in effect for Wasco County. The City of The Dalles has a noise ordinance that specifies certain hours when noise must be kept at a minimum.

O. Energy

1. Sources

The continued development of energy sources will be important to supply increased energy consumption. The following is a brief discussion of the developed and potential sources of energy in Wasco County.

a. Hydroelectric:

Hydroelectric power will continue to be a major source of energy for the area. Use of dams and storage reservoirs has. made it possible to serve virtually all electric power requirements in the past. Most of the hydro power in the region has been developed; therefore, in the future other sources of energy will have to handle increased energy consumption.

Wasco County is served by three electric companies: Northern Wasco County P.U.D., Wasco Electric Co-op, and Pacific Power and Light. All of these companies obtain 100% of their power. from the Bonneville Power Administration. Much of this power is produced locally at The Dalles Dam.

b. Pumped Storage:

Pumped storage is basically a refinement of conventional hydro power. It involves storing energy by pumping water into a storage reservoir during off-peak periods, and releasing it when peaking power is most needed. Five potential sites in Wasco County have been inventoried by the Army Corps of Engineers. This includes three sites along the Deschutes River, one near White River, and one in the Sevenmile Hill area. No further investigation has been made of these sites.

c. Thermal:

Thermal generation includes both nuclear and coal-fired plants. It is estimated that by the year 1995, thermal plants will operate as the main source of electric energy, supplemented by hydro power for peak demands. Nuclear plant development is important because its energy source is almost inexhaustible, yet relatively economical. The potential risks to the public from accidents remain controversial and may hamper development and increase costs to consumers. Coal-fired plants have gained some attention after development of a plant near Boardman, Oregon. Coal sources in Wasco County include some low grade coal in the John Day Basin on Dry Creek (Township 8 South, Range 19 East). However, these sources are not presently of suitable quality or quantity for use for energy production.

d. Geothermal:

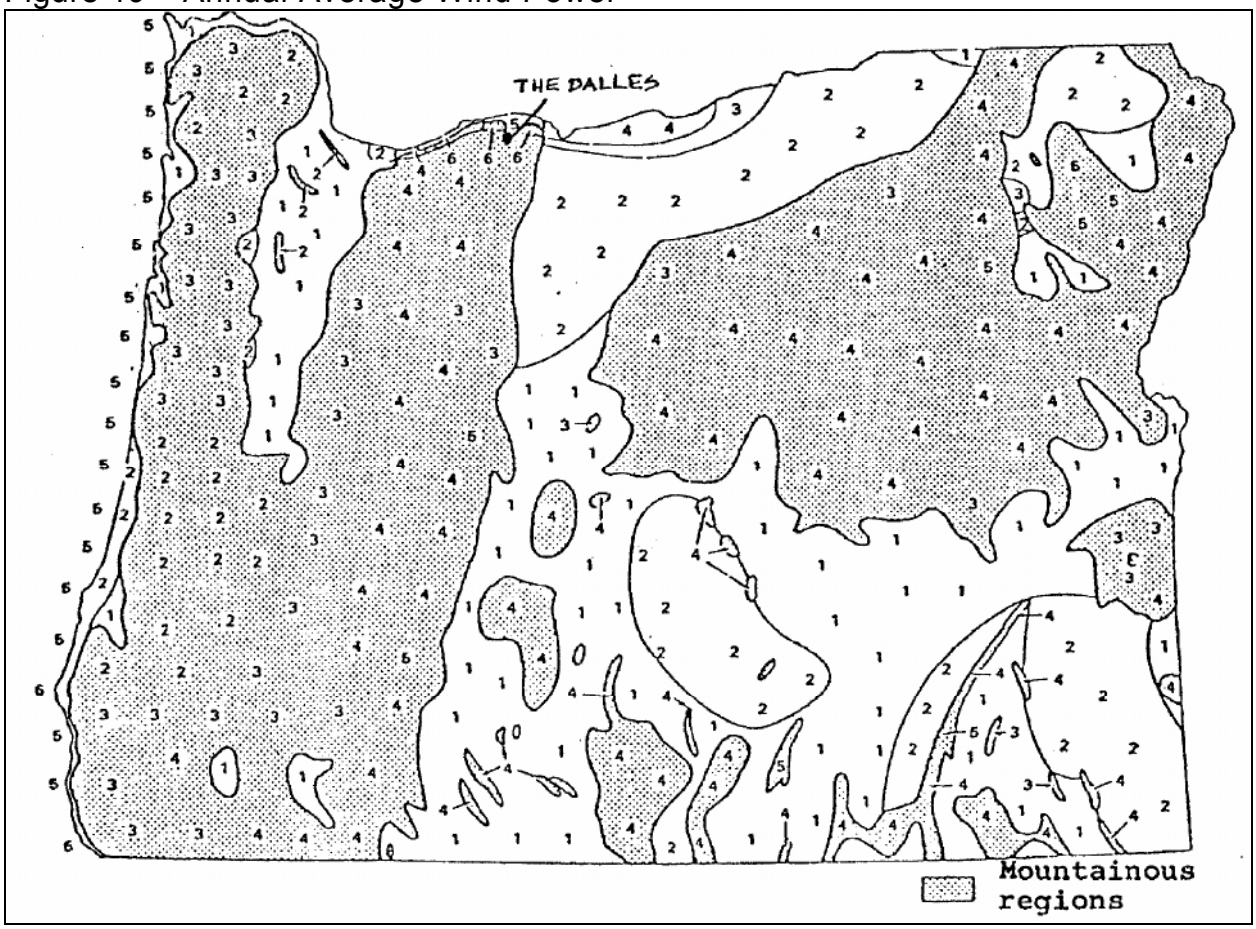
The Columbia River basalt formation, which covers most of the county, has little potential for geothermal power. However, several areas on the Warm Springs Indian Reservation have some potential. No geothermal energy is presently being utilized in the county.

e. Oil and Gas:
Exploration for oil took place in 1952, west of Dufur and The Dalles. The four exploration wells were drilled by small independent companies, and were dry. No other explorations for oil or gas have taken place.

Suppliers of natural gas in Wasco County include the Northwest Natural Gas Company and the Petrolane-Columbia Gas Service Incorporated. These companies obtain most of their supplies from Canadian sources (60 to 70 percent for Northwest Natural Gas Co.). Additional gas comes from Utah and six wells in Mist, Oregon. The construction of the gas line from Alaska will provide an additional source in the future.

f. Wind:
The utilization of wind for energy in Wasco County appears to be very feasible. Figure 19, taken from the Wind Task Force Final Report to the Oregon Alternate Energy Development Commission, (June, 1980, p. 5), shows that the Columbia Gorge and particularly the hills around The Dalles are some of the best potential sites for wind energy production in Oregon.

Figure 19 – Annual Average Wind Power



Source: Eliott, D.L. and W.R., Barchet. Wind Energy Resource Atlas Volume I – Northwest Region, PNL-3195 WERA-1. Richland: Battelle Pacific Northwest Laboratory, 1980.

Table 18 provides the scale for interpretation of the numbers given in figure 14 (p. 6).

Table 18 – Average Wind Power Density and Speed Class*

		33 ft (10 m) aloft		164 ft (50 m) aloft	
Wind Power Class	Percent Land Area	Wind Power Density Watts/m^2	Average Speed** Mph (m/s)	Wind Power Density Watt/m^2	Average Speed** Mph (m/s)
1	84.00	100	9.8 (4.4)	200	12.5 (5.5)
2	11.00	150	11.5 (5.1)	300	14.3 (6.4)
3	N/A	200	12.5 (5.6)	400	15.7 (7.0)
4	2.90	250	13.4 (6.0)	500	16.9 (7.5)
5	.17	300	14.3 (6.4)	600	17.8 (8.0)
6	.01	400	15.7 (7.0)	800	19.7 (8.8)
7	N/A	1000	21.1 (9.4	2000	26.6 (11.9)

Source: Elliot, D.L. and W.R. Barchet. Wind Ener, Resource Atlas Volume 1 - Northwest Region, PNL-3195 WERA- .Richland: Battelle Pacific Northwest Laboratory, 1980

* Mean wind speed is based on Rayleigh speed distribution of equivalent mean wind power density.

** Average wind speed is for standard sea-level conditions. To maintain the same power density, speed increases of 5 percent per 5000 ft (3 percent per 1000 m) of elevation are required.

According to the report, a wind speed of twelve miles per hour is sufficient for energy generation. This is equivalent Wind Power Class 3. The greater the wind speed, the greater the amounts of electricity that can be generated.

The environmental effects of energy production by wind turbine generators (WTG) are considered to be very minimal (p. 16). These effects are summarized below.

(1) Siting - WTG's must be placed far enough apart to effectively utilize the wind. This may re-quire a substantial land area. In areas with little development, as little as .41 acres of dedicated land per 300 foot diameter WTG may be required (P. 17). Agricultural activities could occur all around the site right up to the tower. If towers were placed in developed or developing areas, as much as 3.66 acres would be required around each tower (P. 17). Land would also be required for utility lines, access roads, and maintenance buildings.

(2) Electromagnetic interference - WTG's may cause interference with radio and television trans-missions. Television receiving antenna would have to be within three miles of the WTG for interference to occur.

(3) Ecology - There is little impact to the flora and fauna of the immediate area. Only the areas altered by the construction of the towers, roads and maintenance facilities would be affected (P. 19).

(4) Noise - The effects of the low-frequency noise emitted by the WTG is being studied by NASA. The effects are considered to be minimal (P. 20).

(5) Aesthetics - Often WTG's are placed along ridges and hilltops. In Wasco County, the placement of wind turbines would probably be along cliffs that would make them visible from the Columbia River Gorge. It is doubtful, however, that their presence would be any more visually unappealing than the high tension electrical lines and towers that are already present. They may even become a tourist attraction as the beneficial economic and environmental effects of wind energy become more widely acknowledged and accepted.

(6) Safety - Hazards could result from a fallen tower or thrown blade.It has been estimated that a blade could be thrown from 500 to 1500 feet. The danger is minimal if the area remains unimproved and has restricted access (P. 21).

The advantages and disadvantages to energy production using wind are many. They are listed in Table 19.

Table 19 – Wind Energy Production Advantages & Disadvantages

#	Advantages	Disadvantages
1	No air or water pollution	Visually unappealing
2	Produces more energy/acre than any other energy source except nuclear, but with far fewer negative externalities	Wind is often inconsistent in speed and direction (and availability)
3	Has little effect on the surrounding land or the ecology of the area	Conflicts of land use are likely as specific siting requirement must be met, due to nature of the areas wind resources
4	Are safer than many other forms of energy production	Initial development cost is high
5	Produces local employment	
6	Requires no waste disposal	
7	Promotes conservation of non-renewable resources	
8	Instills community pride in self sufficiency and promotes energy awareness	

Source: Wind Task Force Final Report to the Oregon Alternate Energy Development Commission, (June, 1980)

g. Solar:
The use of solar energy also has many advantages and disadvantages. Advantages include: simple access to a plentiful and free energy source, few environmental effects and conservation of non-renewable resources.

Disadvantages include: the high initial installation cost; possibility of extended periods of cloudiness or shading of solar collection equipment by trees or other structures, and consequent need for back-up systems.

Use of solar power is a feasible energy alternative that has not had widespread application in Wasco County. This is often due to the high installation costs of solar equipment. These costs can be offset by the savings accrued through the use of this free and renewable energy source.

h. Waste Products:

(1) Solid Waste - Incineration of solid waste to produce energy is not only expensive, but can produce large amounts of air pollution. This method is generally only feasible in areas where large amounts of solid waste must be disposed of in a small land area. This form of energy production is not currently being utilized in Wasco County.

(2) Timber Production Wastes - Only one mill in the county that was contacted used timber production waste to produce energy. The pine mill in Tygh Valley uses chips, shavings and hog fuel to fire the boilers, which run the kiln to dry the lumber. Steam heat helps heat the plant also (Mountain Fir Lumber Co., Tygh Valley, Oregon. October 3, 1980). Use of waste materials represents a substantial savings in electrical costs for the plant.[7ibid]

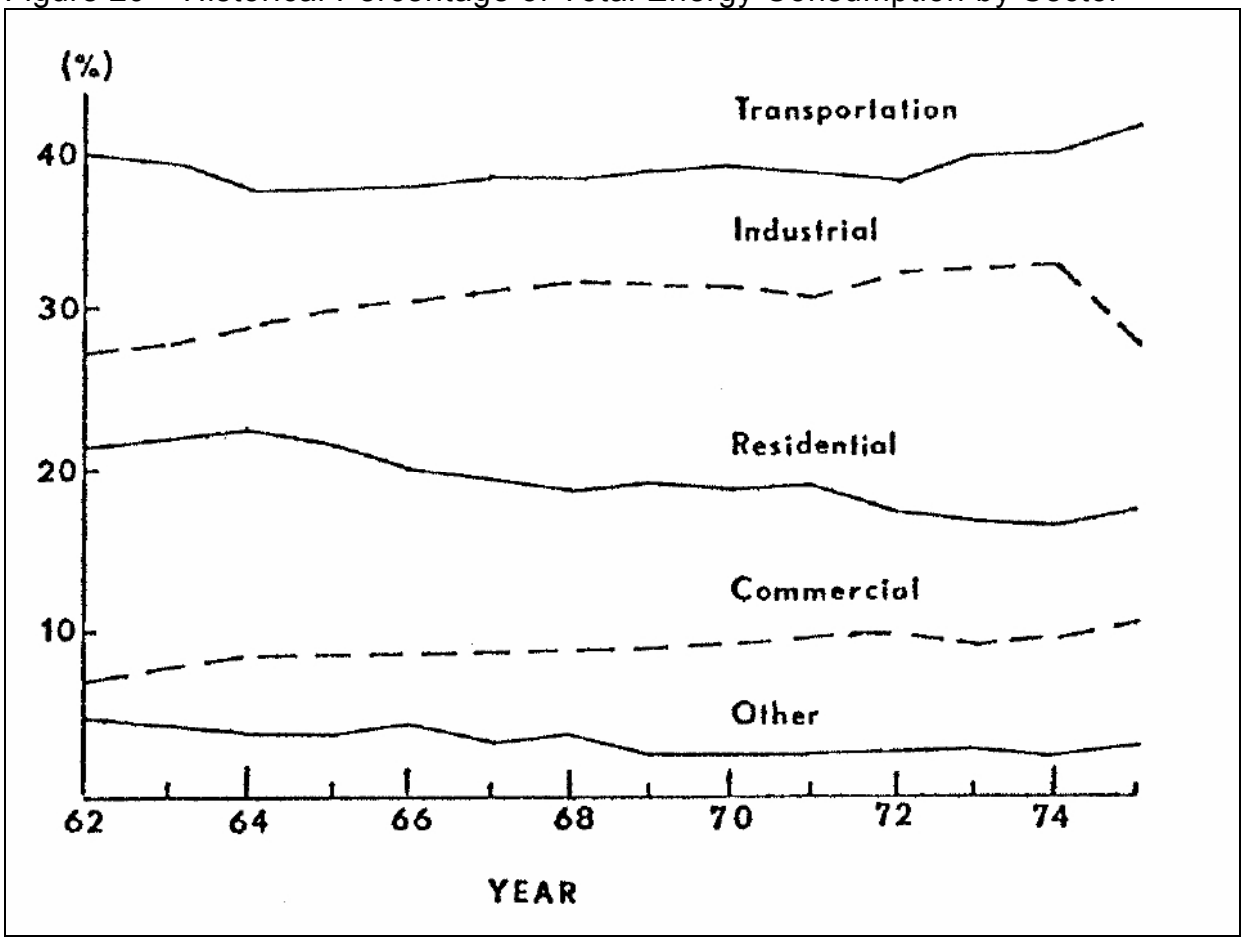
(3) Organic Wastes - Use of agricultural wastes to produce energy has been studied by farmers and ranchers in Wasco County. This type of energy production requires large amounts of cheap organic waste, a large initial investment for equipment, a substantial profit and stable market for producers and an assured supply of good standard quality fuel for consumers. None of these conditions can be realized at this time. Perhaps as fossil fuels continue to go up in price, production of energy from agricultural organic wastes will become a feasible alternative.

(4) Sewage - The Dalles Sewage Treatment Plant currently uses methane gas for a portion of its energy needs. The gas is produced during the treatment process and is used to run part of the equipment in the plant.

2. Consumption

It is important to understand trends in the consumption of energy so that adequate land use decisions can be made to affect these trends. Typical energy consumption in Oregon is shown in. Figure 20.

Figure 20 – Historical Percentage of Total Energy Consumption by Sector

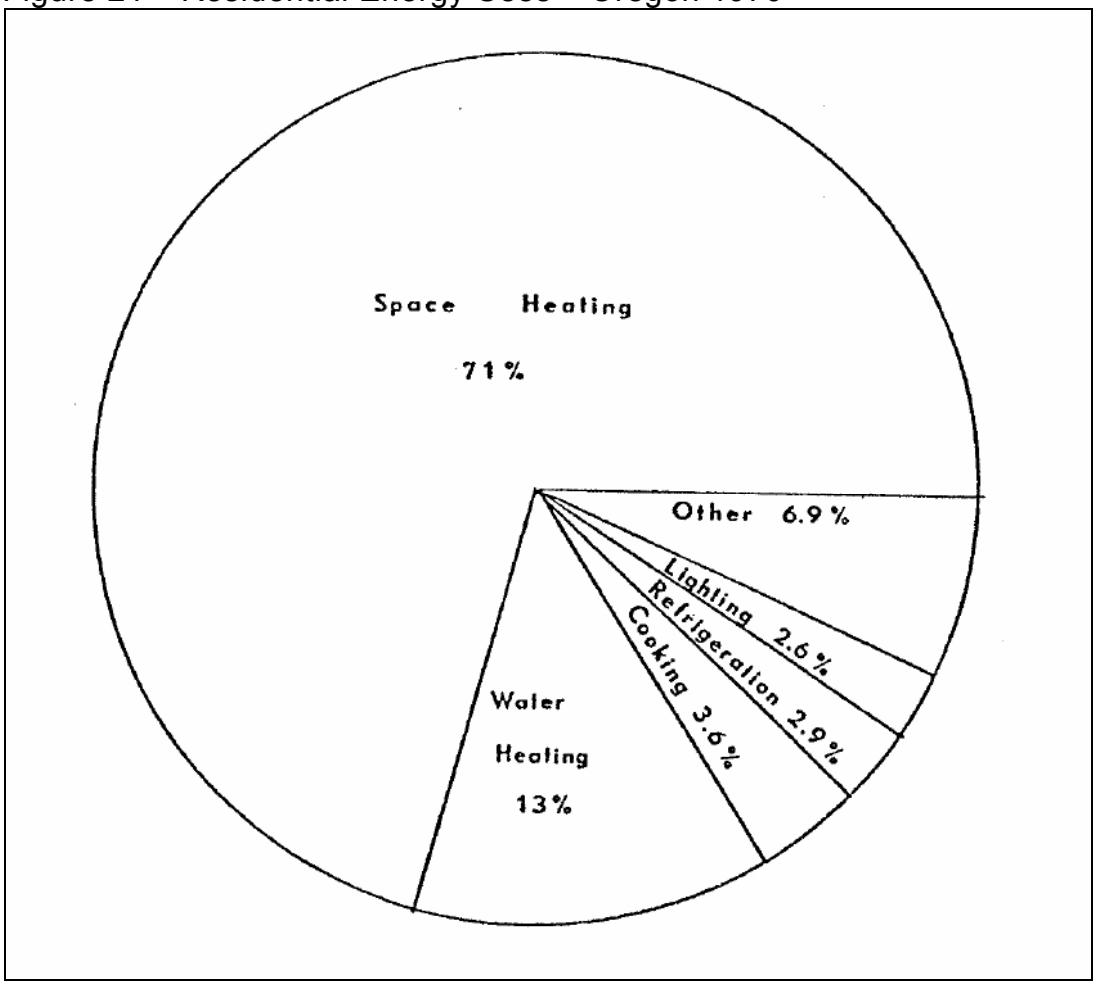


Transportation = 40% (3/4 for autos) Industrial = 32% Residential = 17% Commercial = 9% Agricultural = 1% Other = 1%

The transportation sector is the largest user of energy. Petroleum products account for almost all of the energy consumed. Growth in agricultural energy consumption will depend on trends in irrigation. There has been a slow increase in agricultural energy consumption in the past (1.6% annual growth rate).

Space and water heating dominate energy use in the residential sector. (See Figure 21.) There is an increase in the amount of electricity and natural gas consumed in residences, with a decrease in petroleum use. Single family residences consume more energy per square foot of floor area than multi-family buildings.

Figure 21 – Residential Energy Uses – Oregon 1970

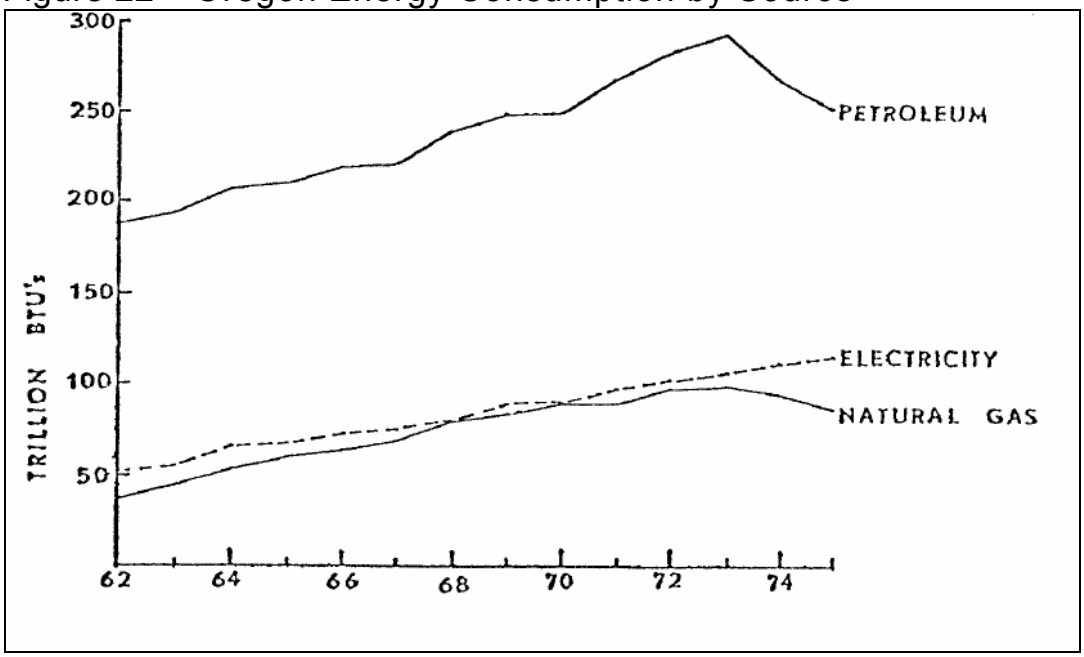


Source: Oregon Energy Future, Dept. of Energy 1978

The commercial sector's pattern of consumption closely resembles use in the residential sector with high energy use for space and water heating. Industrial energy use is very responsive to price fluctuations. A wide range of policy options can influence future industrial energy use.

All sectors consume approximately 57% petroleum, 23% electricity, and 20% natural gas. The trends in this use are shown on the graph in Figure 22.

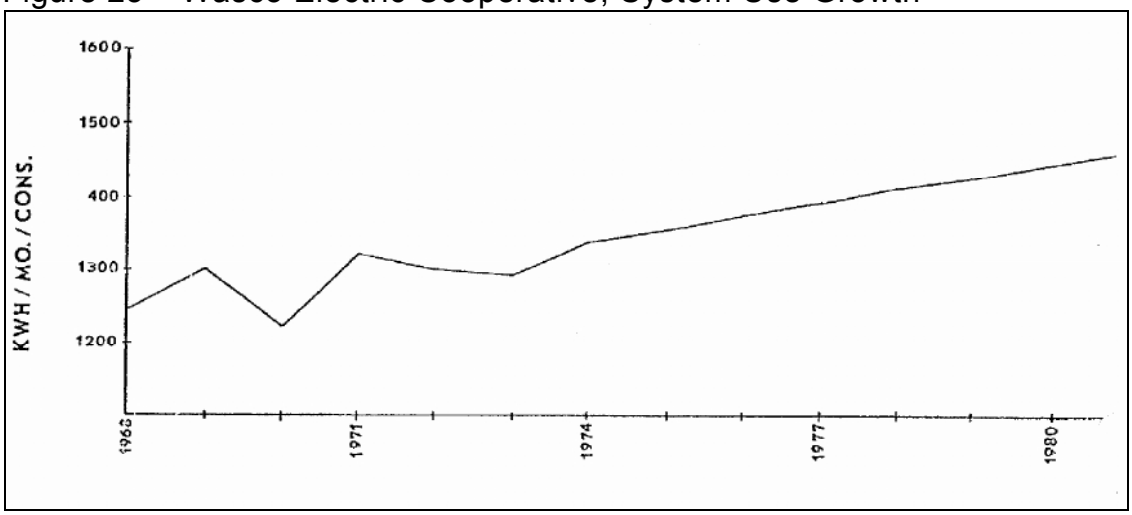
Figure 22 – Oregon Energy Consumption by Source



Source: Oregon's Energy Future

Electrical consumption in Oregon is 78% higher than the national average, which reflects the low cost of electricity and the electric intensity of industries. In rural Wasco County, electrical consumption includes approximately 1400 kilowatt hours per month per consumer (Wasco Electric Cooperative, Inc.). The forecast for increased electrical consumption is shown in Figure 23.

Figure 23 – Wasco Electric Cooperative, System Use Growth



As energy sources become more scarce and expensive, conservation and use of renewable energy resources, (sun, wind, water, waste), will become intense. Conservation is the key: wasteful use of energy is never profitable; no matter how plentiful the source.

Building codes aid the home builder in conserving energy. The addition of thermo pane windows and specified amounts of insulation are instrumental in a building's energy efficiency. Many power and gas companies will do free estimates of where a person's home needs weatherizing. All these factors can help conserve energy.

Recycling, use of bicycles, mopeds, pedestrian walkways and carpooling are all effective means of conserving energy. Local governments need to be responsive to programs which encourage these practices.