

9. LAND COVER AND LAND USE

Land use and land cover influence the movement of water within a watershed, describe (in part) the influence of human populations on a watershed, and can be used to calculate present day water usage and to estimate future water use. Estimates of natural vegetative cover (land cover) can be used to determine current water use in the basin, while information on land development by people (land use data) can be used to project how land cover and water use may change in the future. The distribution of land uses and historical changes in land use patterns can potentially have a large affect on water resources and water availability for instream flows and groundwater recharge.

The land use patterns in the Methow basin have developed over the last century and a quarter and been modified to fit the changing needs within the basin such as:

- Population growth;
- Forest management and logging;
- Agriculture; and
- Increased recreational use.

Despite the changes during the last century the Methow remains predominantly forested.

9.1 Background Issues

Changing land use patterns and transitioning land cover have affected the basin's water resources and instream flows. Both technical and regulatory issues will impact the effectiveness of watershed management and the ability to manage consumptive water use in the basin:

Technical Watershed Management Issues

- Trends in agricultural land use, crop type, and dryland farming determine surface water diversions required for irrigation and net water use for agricultural purposes. Irrigation technology and on-farm practices, crop type and water conveyance infrastructure determine net consumptive water use, and ultimately the net impact of agricultural diversions on instream flows.
- Much of the residential development (both permanent and seasonal) occurs outside of the towns of Twisp and Winthrop relies on exempt wells for water supply. Regulatory limitations placed on surface waters through Washington Administrative code (WAC 173.548) effectively translates to limitations on groundwater withdrawal, including allocation targets for exempt uses of 2 cfs per sub-basin for the purpose of future (post – 1976) single domestic and stock water. Accommodating projected growth in some sub-basins could be limited by these allocation targets.

- A significant percentage of the basin land cover is forestland. Transition of the primary tree species in the forests from Lodgepole Pine to fir may affect cumulative evapotranspiration from the basin and overall watershed hydrology. Forest management practices also impact the hydrology of the watershed.
- Future land use transitions in the basin from agricultural and undeveloped lands to residential use may impact the volume and timing of consumptive water use in the basin.
- The seasonal resident population of the Basin is difficult to estimate and is known to be growing at a faster rate than the permanent resident population. Domestic water use factors for seasonal residences are also difficult to estimate and little data are available to support estimates. The large number of seasonal residents and potential for a relatively high rate of growth in this type of land use may warrant further study and should be addressed in the update to the Okanogan County Comprehensive Plan.

Regulatory Watershed Management Issues

- Ability to influence forest practices;
- Coordination with comprehensive land use planning;
- Endangered Species Act (ESA); and
- Ability to influence change on private lands (eg., crop type, water use).

9.2 Presentation of Existing Data

9.2.1 Land Ownership

The United States Federal Government owns the majority of the land in the Methow. Other owners include the State of Washington and private parties.

- Approximately 80% of all of the lands in the Basin are owned by the federal government and are managed by the United States Forest Service (USFS). This land include portions of the Lake Chelan-Sawtooth Wilderness which lies along the southwest rim of the Basin, and the Pasayten Wilderness Area along the northeast portion of the basin(Methow Valley Water Pilot Planning Project, 1994).
- The remainder of the USFS-managed land is in the Okanogan National Forest. It is heavily forested in some areas, with mixed forest/shrub and grasslands, and rangeland consisting primarily of shrub and grassland. This land is managed for multiple uses of commercial logging, cattle grazing, mining, wildlife habitat, and recreational use (Methow Valley Water Pilot Planning Project, 1994).
- The Federal Bureau of Land Management (BLM) manages approximately 1% of the land in the Basin. BLM land consists of mainly mixed forest and grassland, used for commercial logging, grazing, and recreation. (Methow Valley Water Pilot Planning Project, 1994)

- The State of Washington owns 5% of the land in the Basin. Some of the state land is managed by the Department of Natural Resources and consists of grasslands and timberlands. The primary activities on this land are timber harvest, wildlife habitat, recreation, and grazing. The remainder of the state land lies within the Methow Wildlife Area, which is lower to middle elevation grasslands and timbered areas with peaks up to 6,000 feet in elevation. The main uses are wildlife habitat, recreation, and grazing (Methow Valley Water Pilot Planning Project, 1994).
- Based on 2002 Okanogan County Assessors parcel data, private lands make up approximately 9% of the Basin (Table 9-1). The land use categories comprising private lands in the Assessor's database include residential; commercial; cultural, entertainment and recreational; irrigated and dryland agriculture; and undeveloped private land. The private land in the Basin is used for primary and secondary residential homesites, small farms, irrigated alfalfa and other irrigated crops, non-irrigated grazing land, and some timberland and grasslands. South of Carlton, there is irrigated orchard land (Methow Valley Water Pilot Planning Project, 1994).
- Based on GIS coverages from Ecology (2002), Colville National Forest (1994) and the USGS (1991), land cover in the basin is dominated by forested lands. Forested land cover (on both private and public lands) makes up approximately 86% of the basin, rock and snow make up another 10.4%, and wetlands comprise 1.2% of the basin (Table 9-2).

9.2.2 Population

9.2.2.1 Current Population

Total resident population of the Methow watershed is 5600 (US Census Bureau, 2000). Table 9-3 breaks out current population by sub-basin. Population is generally concentrated along the valleys and surrounding hillsides of the land encompassing the Chewuch, Twisp and Methow rivers.

The Methow basin contains two major population centers, the Town of Twisp (Twisp) and the Town of Winthrop (Winthrop). Twisp is located at the confluence of the Methow and Twisp rivers with a population 955. It has a commercial district and a small light industrial area (MVWPP, 1994). Twisp is sited at the confluence of the Twisp, Middle Methow, and West Lower Methow sub-basins.

The Town of Winthrop is located at the confluence of the Chewuch and Methow rivers with a population of 350. It has a small business area comprised of shops, restaurants, lodges/hotels, and offices. Winthrop also has a small light industrial area containing a lumberyard, concrete plant and gravel pit. Winthrop is sited at the confluence of the Upper Methow, Middle Methow, and Chewuch sub-basins.

Seasonal population is not reported through the US Census Bureau and is difficult to measure. Highlands Associates estimated a 1990 seasonal resident population of 1215

people (Highlands Associates, 1993). However, out-of-basin zip codes from 2002 parcel data from the Okanogan County Assessors Office indicate that approximately 42% of parcel ownership (including both built and undeveloped parcels) in the valley is absentee. This implies that the seasonal population is currently much greater than the 1990 estimate. In fact, if the 42% absentee statistic can be applied to all developed residential parcels, it translates to a seasonal population of 4,005 persons in the basin. A summary of seasonal population estimates is provided in Table 9-4(a).

9.2.2.2 Population Growth

Recent growth trends indicate that the largest increases in population are occurring in unincorporated areas. Furthermore, the seasonal resident population has been growing at a significantly faster rate than the population of permanent residents in the basin. Estimates of seasonal population growth range from 4.0 to 5.4% per year, while permanent population growth has been estimated to range from 0.58 to 1.7% per year (Highlands Associates, 1993).

The Highlands Associates work from 1993 provides the most current estimate of future population that exists for the Methow Basin. The State Office of Financial Management (OFM) provides growth projections by County (see Table 9-4(b)), however, demographic trends for Okanogan County as a whole are not indicative of the seasonal and permanent residential growth in the Methow. Table 9-4(a) presents growth projections for seasonal and permanent residents based on growth rates estimated by Highlands Associates (1993).

The Okanogan County Assessor's database indicates there are currently 6,203 potential housing parcels (built and unbuilt, zoned as single and multi-family units and undeveloped land) in the Methow. Using these Assessors data and a rate of 2.54 people per housing unit, the population at full buildout in the Methow, if it were to occur as zoned today, is estimated to be 16,947 people. This includes seasonal/vacation residences. The breakdown of developable parcels by sub-basin is presented in Table 9-5.

9.2.3 Land Use and Land Cover Data Sources

Land Use and Land Cover mapping combines information on land development by people (eg., land use) and natural vegetative cover (eg., land cover). This section summarizes existing and available land surface cover and land use information for WRIA 48. Data are then summarized and discussed by land use category with a sub-basin focus. The land use categories used for data analysis are broad, and include urban/residential, irrigated acreage, forested lands, and wetlands. These broad land use categories were chosen for the purpose of water use estimates on a watershed scale.

Land use and land cover data for the Methow Basin are relatively abundant and maintained in electronic format by the US Forest Service, Ecology, the USGS, and Okanogan County. Existing data include:

- The Methow Basin Pilot Project summarizes land cover and land use in the basin. Some GIS work was conducted as part of the Pilot Project, but this data is apparently no longer available. One coverage of irrigated acreage developed for the Pilot Project was incorporated into the analysis.
- Base GIS coverages of topography, stream network, roads sub-basins, geology, and other features were provided by Okanogan County and are available on the web site.
- Digital orthophotos are available for the entire basin and have been merged and formatted on the Website.
- Land use data are available through Okanogan County Assessors Office.
- GIS coverages were developed by the Washington State Conservation Commission for the Limiting Factors analysis but were not made available for this project.
- The Okanogan National Forest GIS contains a variety of coverages including vegetation inventories for 1920, 1926, and 1989.
- A 1990 forest survey conducted by the USFS examined the breakdown by tree species, unit basal areas, and other forest parameters for five East Cascade National Forests, including the Okanogan.
- Okanogan and Colville National Forests Vegetation Mapping Project developed in a collaborative effort between the USDA Forest Service Okanogan and Colville National Forests (USFS), the Region 6 USDA Forest Service and BIO/WEST. The project was completed in conjunction with Utah State University's Remote Sensing and GIS Laboratory. The coverage was derived from Landsat Thematic Mapper satellite images from 1992 to 1994.
- Appleby 1929 Agricultural land survey (Ecology, 2001).
- USGS Irrigated Lands Survey based on county records (1954).
- Methow 1995 Air Photo Assessment Project (MAPA) (Ecology, 2001)
- Gap Analysis Program (GAP) Mapping funded by the Biological Resources Division of the USGS through the Washington Cooperative Fish and Wildlife Research Unit at the University of Washington.
- Land Use and Land Cover (LULC) Mapping developed by the USGS as part of its National Mapping Program. Land cover was derived from 1991 Thematic Mapper satellite images.
- National Land Cover Data (NLCD), Mapping developed by the USGS as part of its National Land Cover Characterization project. Derived from the early to mid-1990s Landsat Thematic Mapper satellite data.
- GIS coverage of US Census Bureau 2000 Census data.

Based on a review of these data, current land use/land cover coverage in the Methow Basin was determined using four data sources rather than one single coverage. This

approach will provide a more accurate assessment of all current land uses and vegetative cover in the basin since each coverage is focused on a specific type of land use. Current land use and land cover in the watershed are evaluated using:

- Methow 1995 Air Photo Assessment (MAPA) Project (Ecology, 2001) to determine irrigated acreage. The MAPA Project delineated irrigated lands and evaluated level of irrigation from aerial photographs based on established interpretation criteria. Agricultural lands were designated as: orchard, pasture, alfalfa/hay, lawn, wheat, unknown, other, and none. Using the established interpretation criteria a level of irrigation was established for each delineated area and was defined as currently irrigated, historically irrigated, dry land farming, possibly irrigated or cleared. This is the most recent coverage and the most comprehensive study of irrigated lands in the basin to date.
- Okanogan County Assessors Database (March 4, 2002) to determine residential and commercial/industrial acreage.
- Okanogan and Colville National Forests Vegetation Mapping Project (1999) to estimate forested acres and water bodies.
- 1994 National Wetlands Inventory (NWI) to estimate Wetland acreage in the basin.

9.2.4 Current and Historical Land Use

9.2.4.1 Irrigated Acreage

Historical

The 1926 Appleby study identified 11,719 acres or 1% of the basin as irrigated agricultural land. Irrigated acreage based on the Appleby map is presented in Figure 9-1 and summarized on Table 9-6.

Irrigated acreage probably peaked in the late 1940s and 50s, at approximately 20,500 acres. Estimates of irrigated acreage occurring between 1890 and 1946 are presented in Table 9-7.

Current

The 1993 Pilot Project determined total irrigated area at 17,600 acres or 1.5% of the total basin. Total irrigated acreages, as reported in the Pilot Project Plan, are shown by sub-basin in Table 9-8.

The Okanogan County Assessor's database (March 4, 2002) identifies 39,545 acres or 3.4% of the basin as agricultural land (this includes both irrigated and non-irrigated agricultural lands). The country database indicates that 35,435 acres are currently in use and 4,110 acres are not currently used for agricultural purposes.

The Methow Air Photo Assessment (MAPA) Project (Ecology, 2001) GIS coverage was used to assess irrigated acreage. Based on this coverage, irrigated lands make up less than 1.45% of the total basin area, equivalent to 16,729 acres. 77% of the irrigated acreage is planted in alfalfa. The remaining acreage is a mix of orchards and pasture/turf. At a sub-basin scale, irrigated lands make up about 8% of the total area of the Middle Methow sub-basin, while in all other sub-basins; irrigated lands make up less than 3% of the sub-basin area. The MAPA Project Survey detected no irrigated acreage in the Early Winters Sub-basin. MAPA Project irrigated acreage by crop type is presented in Table 9-9 and shown in Figure 9-2.

9.2.4.2 Residential and Commercial Acreage

Historical

Accurate residential and commercial acreage prior to 1990 is not available.

Current

The Okanogan County Assessors Database (March 4, 2002) was used to quantify land designated as residential and commercial in the basin (Table 9-10). Unlike the Gap Analysis Program (GAP), Natural Land Cover Data (NLCD), and the Land Use Land Cover (LULC) coverages, which determined land use from satellite images, the Assessors Database uses accurate tax parcel information. In addition the Assessor's database contains the most current information available for residential and commercial/industrial acreages in the Methow.

Commercial land comprises less than 0.05% of the watershed acreage. Residential properties make up 1.2%; of these properties approximately 42% are estimated to be seasonally occupied (based on absentee zip codes from the County Assessors database). Land use as delineated by the Okanogan County Assessor's office is presented in Figure 9-3.

9.2.4.3 Non-irrigated lands

Historical

Data describing vegetation species on US Forest Service lands are available for the year, 1924. In 1924, Lodgepole Pine was reported as the dominant tree type in the Chewuch Basin, accounting for 134,000 acres of land cover. Table 9-11 provides a summary of forest coverage by sub-basin based on 1924 mapping by the USFS.

Current

The Okanogan and Colville National Forests Vegetation Mapping Project (1999) is used to estimate current forested acres and water bodies. The Okanogan and Colville National Forests Vegetation Mapping Project coverage determines species type on a 25-meter grid resolution. This is the most recent coverage and the most comprehensive study to date. In addition, the focus of the study was specific to the Methow watershed

area (Okanogan and Colville National Forests). Table 9-12 provides a summary of forest coverage by sub-basin using these data and Figure 9-2 presents forest cover over the entire basin. Trees and shrubs on National Forest Land cover approximately 86% of the Methow Basin. Rock accounts for another 10% of the basin area.

A comparison of forest species distribution in 1924 and 1995 is presented in Table 9-13. Comparison of pine and fir species distribution in 1924 and 1995 indicate a trend of increasing fir and decreasing pine species in the watershed within this timeframe.

9.2.4.4 Wetlands

Historical

Accurate estimates of wetlands acreage prior to 1990 are not available.

Current

Based on the 1994 National Wetlands Inventory (NWI), Wetlands comprise 1.2% of the Methow watershed. The wetlands are generally located in or adjacent to waterways. Table 9-14 summarizes acreage of wetlands by sub-basin and Figure 9-4 shows the spatial distribution of wetlands. Wetland coverage in the basin ranges from 0.1% of the Early Winters sub-basin area to 2.3% of the Upper Methow sub-basin.

The total number of wetland acres identified in the NWI represents not only higher quality wetland environments, but also riparian corridors along irrigation ditches and rivers. Some portion of the 13,500 acres of identified wetlands in the basin therefore may include vegetation and moisture due to ditch leakage.

9.2.5 Future Land Use

Future land use in the Methow Basin must be addressed in basin scale watershed planning in order to estimate future water use, a required component for Phase II Watershed Planning under HB2514. In estimating future land use and water use over a 50 year planning horizon, assumptions must be made regarding the conversion of agricultural land to residential land use, growth and zoning changes in the basin.

Okanogan County intends to update its Comprehensive Plan in the near future. The new County Comprehensive Plan, when complete, will likely provide clear direction and policy regarding future growth and zoning, both of which affect overall water use in the basin. At this time, however, the calculation of future water use over a 50-year planning horizon will be based on land use assumptions developed by the Methow Basin Planning Unit (MBPU) and shown in Table 9-15. If, and when those assumptions change, the water use factors used in the estimate of future water use (Section 10) can be applied to the new land use assumptions. These assumptions are applied to a 50-year planning horizon.

9.2.5.1 Assumptions for Future Use Scenarios

Table 9-15 indicates the number of acres currently categorized as agricultural use (both irrigated and dry land) in the basin, and what portion of those agricultural acres are assumed to be converted to residential use over a 50 year planning horizon for purposes of estimating future water use.

Land use assumptions used to estimate future water use include:

- 20,000 of the currently zoned 34,000 acres in agriculture remain in agriculture (this includes both dry land and irrigated agriculture).
- The current number of acres currently in irrigated agriculture (16,729 acres) does not increase or decrease in the next 50 years, and crop type and overall farm efficiencies, on average, remain unchanged.
- 14,000 of the currently zoned 34,000 agricultural acres in the basin (all currently in dry land agriculture) are converted into 5 acre residential parcels (worst case residential growth scenario) in the next 50 years, and that these parcels are served by exempt wells.
- The residential build out of agricultural lands includes seasonal residential use. Future water use will be calculated assuming a percentage of the residential land use is for seasonal use.
- Full build-out of parcels currently under land use categories: residential and undeveloped.
- Currently zoned parcels categorized as residential and undeveloped are subdivided into 5 acres and developed.
- Acreage in forested lands remains the same for forest water use estimate.
- No appreciable increase in municipal residential/commercial use.
- No appreciable increase in Group A and B water systems.

Using the assumptions listed above, the basin population at full build-out of land currently categorized as residential and undeveloped into 5-acre lot sizes and the conversion of 14,000 acres of agricultural land 5-acre parcels would be 32,172 people. A breakdown of the full build-out population for the basin is shown in Table 9-16. If the conversion of 14,000 acres of agricultural land to residential use is not considered, the population associated with full build-out and 5 acre lot zoning single household parcels, undeveloped land and vacation and cabins would total 24,247 People; Table 9-17 summarizes the projected population by sub-basin for build-out.

TABLE 9-1

Land Use Summary of Private Lands by Sub-Basin

Sub-Basin	Sub-basin Area	Residential ^a	Commercial ^a	Cultural, Entertainment and Recreational ^a	Agriculture ^a	Irrigated Agriculture ^{b,1}	Undeveloped ^a	Other lands ^a
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Chewuch	331,163	2,340	16	5,504	2,819	1,458	3,177	687
Early Winters	51,012	1	9	29	0	0	7	0
East Lower Methow	158,410	2,663	202	7,349	16,561	4,747	5,698	414
Methow Headwaters	181,999	665	9	47	318	749	1,581	67
Middle Methow	30,763	2,502	170	4,640	5,739	2,949	4,070	114
Twisp	156,611	1,619	14	2,733	2,581	1,287	1,330	2
Upper Methow	89,014	1,221	124	2,784	3,118	2,554	4,223	909
West Lower Methow	157,007	2,271	16	1,439	8,409	2,985	2,288	301
Watershed Total	1,155,979	13,283	560	24,524	39,546	16,729	22,374	2,493
		% Cover	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Chewuch	331,163	0.7%	0.0%	1.7%	0.9%	0.4%	1.0%	0.2%
Early Winters	51,012	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
East Lower Methow	158,410	1.7%	0.1%	4.6%	10.5%	3.0%	3.6%	0.3%
Methow Headwaters	181,999	0.4%	0.0%	0.0%	0.2%	0.4%	0.9%	0.0%
Middle Methow	30,763	8.1%	0.6%	15.1%	18.7%	9.6%	13.2%	0.4%
Twisp	156,611	1.0%	0.0%	1.7%	1.6%	0.8%	0.8%	0.0%
Upper Methow	89,014	1.4%	0.1%	3.1%	3.5%	2.9%	4.7%	1.0%
West Lower Methow	157,007	1.4%	0.0%	0.9%	5.4%	1.9%	1.5%	0.2%
Watershed Total	1,155,979	1.1%	0.0%	2.1%	3.4%	1.4%	1.9%	0.2%

Source: (a) Okanogan County Assessors Office, 2002/

(b) MAPA Project - 1995 Orthophoto interpretation by Ecology (2001) /Department of Ecology, 2002

Note: 1) Irrigated acreage is a sub set of agricultural acreage, the remaining acreage is dry land farmed.

TABLE 9-2

Land Cover Summary by Sub-Basin

	Sub-basin Area	Forested^a	Wetlands^b	Burned^a	Rock^a	Snow^a	Water^a
	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Chewuch	331,163	299,634	4,668	7,111	20,064	750	1,120
Early Winters	51,012	36,066	68	8	12,901	1,929	78
East Lower Methow	158,410	146,463	1,400	1	3,064	0	483
Methow Headwaters	181,999	146,091	1,372	544	30,507	3,914	498
Middle Methow	30,763	25,138	1,230	1	434	0	602
Twisp	156,611	126,034	1,361	924	24,955	2,020	607
Upper Methow	89,014	74,829	2,011	2,851	7,982	288	611
West Lower Methow	157,007	139,833	1,476	5	11,207	252	1,216
Watershed Total	1,155,979	994,088	13,586	11,444	111,114	9,152	5,214
	Acres	% Cover	% Cover	% Cover	% Cover	% Cover	% Cover
Chewuch	331,163	90.5%	1.4%	2.1%	6.1%	0.2%	0.3%
Early Winters	51,012	70.7%	0.1%	0.0%	25.3%	3.8%	0.2%
East Lower Methow	158,410	92.5%	0.9%	0.0%	1.9%	0.0%	0.3%
Methow Headwaters	181,999	80.3%	0.8%	0.3%	16.8%	2.2%	0.3%
Middle Methow	30,763	81.7%	4.0%	0.0%	1.4%	0.0%	2.0%
Twisp	156,611	80.5%	0.9%	0.6%	15.9%	1.3%	0.4%
Upper Methow	89,014	84.1%	2.3%	3.2%	9.0%	0.3%	0.7%
West Lower Methow	157,007	89.1%	0.9%	0.0%	7.1%	0.2%	0.8%
Watershed Total	1,155,979	86.0%	1.2%	1.0%	9.6%	0.8%	0.5%

Source: (a) Source: USDA Forest Service, 1999, *Okanogan and Colville National Forests Vegetation Mapping Project*, developed in a collaborative effort between the USDA Forest Service Okanogan and Colville National Forests (USFS)

(b) Source: US Bureau of Reclamation - 1994 National Wetlands Inventory (NWI), GIS Coverage

TABLE 9-3

**US Census Bureau 2000 Census Population Distribution
(Resident Population)^a**

Sub-Basin	2000 Population	Percent of Basin
Chewuch	506	9.0%
Early Winters	40	0.7%
East Lower Methow	1432	25.6%
Methow Headwaters	124	2.2%
Middle Methow	947	16.9%
Twisp	886	15.8%
Upper Methow	413	7.4%
West Lower Methow	1251	22.3%
Total	5600	100

Source: US Census Bureau 2000 Census

^a - Does not include seasonal population

TABLE 9-4 (A)

Methow Basin Projected Growth

Year	Resident Population (a)	Seasonal Population (b)	Seasonal Population per Assessors Database (c)
2000	5600	2000	4,005
2005	5900	2700	N/a
2010	6400	3500	N/a
2015	7000	4500	N/a

Source: Highlands Associates, 1993.

(a) Approximate values from Highlands Associates based on 1.7% growth rate

(b) Approximate values from Highlands Associates based on 5.4% growth rate

(c) Current Absentee ownership based on out-of-basin zip codes in Okanogan County Assessors Database (2002)

TABLE 9-4 (B)

Okanogan County Projected Growth

Year	Resident Population	Percent Growth (%)
2000	39,564	---
2005	39,219	-0.9%
2010	40,712	3.8%
2015	41,776	2.6%
2020	42,170	0.9%

Source: State of Washington, Office of Financial Management, September 2001.

TABLE 9-5

Full Buildout – Current Zoning

Assessors Code	Description	Chewuch	Early Winters	East Lower Methow	Methow Headwaters	Middle Methow	Twisp	Upper Methow	West Lower Methow	Total Parcels in Basin	Basin Populaton
11	One Single Family Household	299	1	272	115	385	235	274	300	1,881	4,778
12	2-4 Household Units	9		6	1	9	8	11	12	56	853
13	5 Or More Household Units					1			4	5	51
14	Residential Hotel Or Condominium					3				3	60
15	Mobile Home Courts Or Parks						4			4	400
19	Vacation And Cabin	107	1	53	130	76	103	91	74	635	1,613
91	Undeveloped Land	455	3	361	636	727	279	901	257	3,619	9,192
										6,203	16,947

Source: GIS Coverage - Okanogan County Assessors Office, March 2002

TABLE 9-6

Summary of Irrigated Acreage – 1926 (Appleby)

Sub-Basin	Sub-basin Area (Acres)	Total Irrigated Acreage (Acres)	Percent of Sub-Basin
Chewuch	331,163	1,216	0.37%
Early Winters	51,012	0	--
East Lower Methow	158,410	1,386	0.87%
Methow Headwaters	181,999	665	0.37%
Middle Methow	30,763	2,775	9.02%
Twisp	156,611	1,154	0.74%
Upper Methow	89,014	3,177	3.57%
West Lower Methow	157,007	1,346	0.86%
Total	1,155,979	11,719	1.01%

Source: Digital GIS coverage of Appleby Irrigated Lands Survey, 1926, provided by Ecology (2001.)

TABLE 9-7

Summary of Irrigated Acreage Estimates in the Methow Basin

Period	Above Twisp (Acres)	Above Pateros (Acres)	Total (Acres)
1890-1905	626	6,100	6,726
1906-1920	6,780	11,590	18,370
1921-1930	6,457	12,120	18,577
1931-1940	6,313	12,540	18,853
1941-1946	7,410	12,830	20,240

Source: USGS, 1953

TABLE 9-8

Summary of Irrigated Acreage – 1993 (Pilot Project)

Sub-Basin	Sub-basin Area (Acres)	Irrigated Acreage (Acres)	Percent of Sub-Basin
Chewuch	331,163	1,546	0.5
Early Winters	51,012	35	0.1
Lower Methow	315,417	7,955	2.5
Methow Headwaters	181,999	627	0.3
Middle Methow	30,763	3,637	10.1
Twisp	156,611	882	0.6
Upper Methow	89,014	2,910	3.3
Total Basin	1,155,979	17,600	1.5

Source: Undocumented GIS coverage of irrigated lands provided by USGS (2000).

TABLE 9-9

MAPA Project Irrigated Acreage by Crop Type

Sub-basin	Sub-basin Area (Acres)	Crop Type (Acres)			Total	Percent of Sub-basin
		Alfalfa	Orchard	Pasture/ Turf		
Chewuch	331,163	918	26	514	1,458	0.45%
Early Winters	51,012	--	--	--	--	--
East Lower Methow	158,410	3,728	699	319	4,747	3.00%
Methow Headwaters	181,999	557	--	192	749	0.41%
Middle Methow	30,763	2,503	55	391	2,949	8.01%
Twisp	156,611	1,036	52	199	1,287	0.82%
Upper Methow	89,014	2,173	--	382	2,554	2.87%
West Lower Methow	157,007	1,952	741	293	2,985	1.90%
Total	1,155,979	12,868	1,572	2,288	16,729	1.45%

Calculation	a	b	c	d	e= b+c+d	f=(e/a)*100
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Source: MAPA Project - 1995 Orthophoto interpretation by Ecology (2001).

TABLE 9-10**Residential and Commercial Land Use Based on Assessor Parcel Data**

	Chewuch (acres)	Early Winters (acres)	East Lower Methow (acres)	Methow Headwaters (acres)	Middle Methow (acres)	Twisp (acres)	Upper Methow (acres)	West Lower Methow (acres)	Total (acres)
Sub-basin Area	331,163	51,012	58,410	181,999	30,763	156,611	89,014	157,007	1,155,979
Residential									
<i>One Single Family Household</i>	1,646	0	1,761	391	2,034	876	1,126	1,240	9,075
<i>2-4 Household Units</i>	38	0	61	3	81	69	95	67	416
<i>5 Or More Household Units</i>	0	0	0	0	1	0	0	4	5
<i>Mobile Home Courts Or Parks</i>	0	0	0	0	0	22	0	0	22
<i>Motels/Hotels</i>	5	0	3	4	10	20	0	0	42
<i>Vacation And Cabin</i>	650	1	838	267	365	631	0	960	3,713
Residential Total	2,340	1	2,663	665	2,491	1,619	1,221	2,271	13,273
Percentage of Sub-basin	0.7%	0.0%	1.7%	0.4%	8.1%	1.0%	1.4%	1.4%	1.1%
Commercial	16	9	202	9	170	14	124	16	560
Percentage of Sub-basin	0.00%	0.02%	0.13%	0.01%	0.55%	0.01%	0.14%	0.01%	0.05%
								Total	13,833

Source: GIS Coverage - Okanogan County Assessors Office, March 2002

Note: 1) "Commercial" Includes: Manufacturing, Trade, Services, Transportation, Communication and Utilities

2) All values are in acres.

TABLE 9-11

1924 USFS Vegetation Summary

Sub-Basin	Sum of Acreage	Vegetation Description
Chewuch	44435	White Fir, Larch, Douglas Fir type, Mature (East Side Mixed type)
Chewuch	10020	Sage Brush or Bunch Grass areas
Chewuch	134894	Lodgepole or Knobcone Pine (all ages except as under "Burns or cutover")
Chewuch	5455	Mature Douglas Fir, W. Hemlock, Spruce or Cedar in pure covered stands.
Chewuch	555	Areas of no fire risk, as glaciers, barriers, cultivated lands, cleared pasture.
Chewuch	63280	Yellow or Sugar Pine types, Mature
Chewuch	43345	Fir, Mountain Hemlock or Sub-Alpine type, Mature.
Chewuch	10642	Burns, or cutover areas of any type where tree reproduction is lacking, too small, or too sparse to shade 60% of ground (includes brush type where brush still dominates over the tree reproduction).
East Lower Methow	10251	White Fir, Larch, Douglas Fir type, Mature (East Side Mixed type)
East Lower Methow	5175	Sage Brush or Bunch Grass areas
East Lower Methow	22158	Lodgepole or Knobcone Pine (all ages except as under "Burns or cutover")
East Lower Methow	47059	Yellow or Sugar Pine types, Mature
East Lower Methow	778	Fir, Mountain Hemlock, or Sub-Alpine type, Mature.
East Lower Methow	13	Burns, or cutover areas of any type where tree reproduction is lacking, too small, or too sparse to shade 60% of ground (includes brush type where brush still dominates over the tree reproduction).
Methow Headwaters	1311	Background
Methow Headwaters	27509	White Fir, Larch, Douglas Fir type, Mature (East Side Mixed type)
Methow Headwaters	81	Sage Brush or Bunch Grass areas
Methow Headwaters	1021	Fir, Mountain Hemlock, or Sub Alpine types, Immature and young growth (except as provided under "Burns and cutover")
Methow Headwaters	7148	Lodgepole or Knobcone Pine (all ages except as under "Burns or cutover")
Methow Headwaters	10475	Areas of no fire risk, as glaciers, barriers, cultivated lands, cleared pasture.
Methow Headwaters	7027	Yellow or Sugar Pine types, Mature
Methow Headwaters	98463	Fir, Mountain Hemlock, or Sub-Alpine type, Mature.
Methow Headwaters	5791	Burns, or cutover areas of any type where tree reproduction is lacking, too small, or too sparse to shade 60% of ground (includes brush type where brush still dominates over the tree reproduction).
Middle Methow	1026	White Fir, Larch, Douglas Fir type, Mature (East Side Mixed type)
Middle Methow	1115	Lodgepole or Knobcone Pine (all ages except as under "Burns or cutover")
Middle Methow	7087	Yellow or Sugar Pine types, Mature
Twisp	34343	White Fir, Larch, Douglas Fir type, Mature (East Side Mixed type)

TABLE 9-11

1924 USFS Vegetation Summary (Continued)

Sub-Basin	Sum of Acreage	Vegetation Description
Twisp	14641	Sage Brush or Bunch Grass areas
Twisp	7326	Lodgepole or Knobcone Pine (all ages except as under "Burns or cutover")
Twisp	5980	Mature Douglas Fir, W. Hemlock, Spruce or Cedar in pure covered stands.
Twisp	10971	Areas of no fire risk, as glaciers, barriers, cultivated lands, cleared pasture.
Twisp	38454	Yellow or Sugar Pine types, Mature
Twisp	35895	Fir, Mountain Hemlock, or Sub-Alpine type, Mature.
Twisp	839	Burns, or cutover areas of any type where tree reproduction is lacking, too small, or too sparse to shade 60% of ground (includes brush type where brush still dominates over the tree reproduction).
Upper Methow	27282	White Fir, Larch, Douglas Fir type, Mature (East Side Mixed type)
Upper Methow	908	Sage Brush or Bunch Grass areas
Upper Methow	1166	Fir, Mountain Hemlock, or Sub Alpine types, Immature and young growth (except as provided under "Burns and cutover")
Upper Methow	4727	Lodgepole or Knobcone Pine (all ages except as under "Burns or cutover")
Upper Methow	3002	Areas of no fire risk, as glaciers, barriers, cultivated lands, cleared pasture.
Upper Methow	24381	Yellow or Sugar Pine types, Mature
Upper Methow	10919	Fir, Mountain Hemlock or Sub-Alpine type, Mature.
West Lower Methow	29721	White Fir, Larch, Douglas Fir type, Mature (East Side Mixed type)
West Lower Methow	16521	Sage Brush or Bunch Grass areas
West Lower Methow	7433	Lodgepole or Knobcone Pine (all ages except as under "Burns or cutover")
West Lower Methow	1521	Mature Douglas Fir, W. Hemlock, Spruce or Cedar in pure covered stands.
West Lower Methow	2795	Areas of no fire risk, as glaciers, barriers, cultivated lands, cleared pasture.
West Lower Methow	58598	Yellow or Sugar Pine types, Mature
West Lower Methow	13935	Fir, Mountain Hemlock, or Sub-Alpine type, Mature.
West Lower Methow	5618	Burns, or cutover areas of any type where tree reproduction is locking, too small, or too sparse to shade 60% of ground (includes brush type where brush still dominates over the tree reproduction).

Source: USFS Okanogan National Forest GIS Data (www.fs.fed.us/v6/oka/gis)

TABLE 9-12

Okanogan and Colville National Forests Vegetation Mapping Project
Land Coverage Summary by Sub-basin

	Chewuch		Early Winters		East Lower Methow		Methow Headwaters		Middle Methow		Twisp		Upper Methow		West Lower Methow		Total	
	Acres	% Basin Cover	Acres	% Basin Cover	Acres	% Basin Cover	Acres	% Basin Cover	Acres	% Basin Cover	Acres	% Basin Cover	Acres	% Basin Cover	Acres	% Basin Cover	Acres	% Basin Cover
Fir	148,931	45%	23,232	46%	47,278	30%	80,912	44%	6,395	21%	80,804	52%	41,334	46%	76,418	49%	505,307	44%
Pine	111,006	34%	4,984	10%	32,356	20%	22,002	12%	6,100	20%	23,315	15%	15,870	18%	26,927	17%	242,560	21%
Spruce	4,112	1%	763	1%	314	0%	4,744	3%	33	0%	1,096	1%	390	0%	1,200	1%	12,652	1%
Deciduous	2,379	1%	250	0%	1,202	1%	1,465	1%	731	2%	3,308	2%	2,155	2%	2,217	1%	13,707	1%
Shrub/ Herbacious	24,766	7%	2,365	5%	55,259	35%	14,438	8%	11,590	38%	13,920	9%	13,425	15%	30,956	20%	166,720	14%
Mixed Forest	8,441	3%	4,472	9%	10,054	6%	22,531	12%	288	1%	3,591	2%	1,655	2%	2,115	1%	53,148	5%
Burned	7,111	2%	8	0%	1	0%	544	0%	1	0%	924	1%	2,851	3%	5	0%	11,444	1%
Rock	20,064	6%	12,901	25%	3,064	2%	30,507	17%	434	1%	24,955	16%	7,982	9%	11,207	7%	111,114	10%
Snow	750	0%	1,929	4%	0	0%	3,914	2%	0	0%	2,020	1%	288	0%	252	0%	9,152	1%
Water	1,120	0%	78	0%	483	0%	498	0%	602	2%	607	0%	611	1%	1,216	1%	5,214	0%
Total	328,679	99%	50,981	100%	150,010	95%	181,554	100%	26,175	85%	154,539	99%	86,561	97%	152,513	97%	1,131,018	98%

Source: USDA Forest Service, 1999, *Okanogan and Colville National Forests Vegetation Mapping Project*, developed in a collaborative effort between the USDA Forest Service Okanogan and Colville National Forests (USFS)

TABLE 9-13

1990 USFS Forest Species Distribution

	1922 Vegetation Coverage				1998 Vegetation Coverage			
	Fir	Pine	% Fir	% Pine	Fir	Pine	% Fir	% Pine
Chewuch	93,237	198,175	30%	63%	146,795	109,278	45%	34%
Early Winters	-	-	-	-	23,232	4,984	46%	10%
East Lower Methow	11,031	69,218	13%	81%	47,278	32,356	30%	20%
Methow Headwaters	126,994	14,176	80%	9%	80,912	22,002	44%	12%
Middle Methow	1,027	8,204	11%	89%	8,545	7,843	23%	21%
Twisp	76,220	45,781	51%	31%	80,804	23,315	52%	15%
Upper Methow	39,367	29,109	54%	40%	41,334	15,870	46%	18%
West Lower Methow	45,179	66,032	33%	49%	76,418	26,927	49%	17%
Total	393,054	430,695	34%	37%	505,319	242,573	44%	21%

Source: Digitized map of 1922 USFS Forest Inventory Map (1922_veg).
 1998 Digital vegetation coverage for land type association mapping.
 Both files located at Okanogan National Forest GIS Data Center.

TABLE 9-14

Wetland Acreage Summary by Sub-basin

Sub-Basin	Sub-basin Area (Acres)	Wetland (Acres)	Percent of Sub basin
Chewuch	331,163	4,668	1.4%
Early Winters	51,012	68	0.1%
East Lower Methow	158,410	1,399	0.9%
Methow Headwaters	181,999	1,372	0.8%
Middle Methow	30,763	1,229	4.0%
Twisp	156,611	1,361	0.9%
Upper Methow	89,014	2,011	2.3%
West Lower Methow	157,007	1,476	0.9%
Total	1,155,979	13,586	1.2%

Source: US Bureau of Reclamation - 1994 National Wetlands Inventory (NWI), GIS Coverage

TABLE 9-15

Land Use Assumptions for 50-Year Planning Horizon

	Current (2002)	Future (2050)
Total Zoned Agricultural	34,000 acres	20,000 acres
Irrigated Agriculture	16,729 acres	16,729 acres
Dry Land Agriculture	17,271 acres	3,271 acres
Transition to Residential (exempt well use)	n/a	14,000 acres

Source: Methow Basin Planning Unit

TABLE 9-16

Future (2050) Population

Description	Use Code	Number of units per parcels	Count	Total Population
<i>Land Currently Classified as</i>				
One Single Household Unit, Undeveloped Land and Vacation And Cabin	11,19, 91	1	9,547	24,247
2-4 Household Units (Assume 4 Units)	12	4	56	569
5 or More Household Units (Assume 5 Units)	13	5	5	64
Residential Hotel or Condominium	14	10	3	76
Mobile Home Courts or Parks	15	10	4	102
<i>Land Converted From Agricultural Land</i>				
Land Converted From Dry Land Agriculture to Residential		1	2800	7112
Total Buildout				32,170

Source: GIS Coverage - Okanogan County Assessors Office, March 2002

- Notes: 1) Residential hotels and mobile home courts have 10 units each
 2) MBPU Assumptions: a) 14,000 acres of dryland Agricultural land converted to 5-acre parcels.
 b) Buildout of all parcels at a 5-acre lot size.

TABLE 9-17

Buildout of Parcels Currently Zoned as Undeveloped or Residential
(Assumes 5 Acre Parcels)

Sub-Basin Name	Number of Potential Residential Parcels	Number of People
Chewuch	1,376	3,495
Early Winters	5	12
East Lower Methow	1,756	4,460
Methow Headwaters	1,026	2,606
Middle Methow	1,725	4,381
Twisp	826	2,098
Upper Methow	1,754	4,455
West Lower Methow	1,079	2,740
Total	9,547	24,247

Source: GIS Coverage - Okanogan County Assessors Office, March 2002

Notes: 1) Residential parcels are one single household unit, undeveloped land and vacation and cabin and a minimum of 5 acres.

2) Population Per household = 2.54 people.