Table 3-H. Lands Potentially Suitable for Acquisition

Parcel #	Location	Est. Acres	Character of Land and Acquisition Rationale
6	T 1S R 19E Section 14, S½ SW1/4 NW1/4 SW1/4 Section 15, NW1/4 NE1/4 NE1/4 SE1/4 Section 22, S½ NE1/4 SE1/4 NW1/4 Section 23, W1/2 NW1/4 NE1/4 NW1/4	440	Consolidate public lands.
7	T 1S R 19E Section 4, SW 1/4 Section 9, NW 1/4 N½ SW1/4 Section 16, NE1/4 NE1/4	440	Acquire access.
8	T 1S R 20E Section 6, SW 1/4 SW1/4 SE1/4 Section 7, E½ NW1/4 W½ NE1/4 NE1/4 NE1/4 Section 8, N½ SE1/4 SW1/4 NE1/4 SE1/4 NW1/4 NW1/4 NW1/4	600	Acquire access.
9	T 1N R 19E Section 3, S1/2S1/2	160	Acquire Oregon Trail segment.

Table 3-H. Lands Potentially Suitable for Acquisition

Parcel #	Location	Est. Acres	Character of Land and Acquisition Rationale
9a	T 1N R 19E Section 11, NW 1/4	20	Provide additional parking and boat launch.
10	T 4S R 18E Section 11, W1/2 SW 1/4 SW1/4 NW1/4 Section 14, NW1/4 NW 1/4	160	Consolidate public land in Wilderness Study Area
11	T 3S R 18E Section 35, S1/2 SW1/4 T 4S R 18E Section 2, NW1/4 NW1/4	160	Consolidate public land in Wilderness Study Area.
12	T 4S R 18E Section 14, N1/2 SE1/4 NE1/4 SW1/4 SW1/4 NE1/4	160	Consolidate public land in Wilderness Study Area.
13	T 2S R 18E Section 13, SW1/4 SW1/4 Section 24, W1/2 NW1/4 NW1/4 SW1/4 SE1/4 NW1/4 S1/2 NE1/4 NE1/4 SE1/4	320	Consolidate public land in Wilderness Study Area.
14	T 8S R 19E Section 36, NW1/4 NW1/4	40	Acquire poor condition land for rehabilitation and campsite potential.
15	T 5S R 19E Section 30, NE1/4 SE1/4	40	Consolidate public land in Wilderness Study Area.

Table 3-H. Lands Potentially Suitable for Acquisition

Parcel #	Location	Est. Acres	Character of Land and Acquisition Rationale
16	T 1S R 19E Section 19, LOT 7, 8 and 12 Section 30, NW1/4 NE1/4 SW1/4 NE1/4 NW1/4 SE1/4 LOT 1 and 7	320	
16a	T 1S R 19E Section 32, SW1/4 NW1/4	40	
16b	T 1S R 19E Section 32, SW1/4 NE1/4 SE1/4 NW1/4 E1/2 SW1/4 W1/2 SE1/4	240	
17	Cherry Creek		Preserve undeveloped character of the area.
	Total Acres (approximate)	**4,036**	

APPENDIX G
Water Quality Managing Plan for Lower John Day River

Introduction 127

Element #1 - Condition Assessment and Problem Description of Lower John Day Basin 127
- Hydrologic Unit Code (HUC) 17070204 127
- 303(d) Parameters 127
- Beneficial Uses 127
- Condition Assessment 130
  - John Day Basin 130
  - Segments 1, 2 and 3 131
  - are more numerous here than
  - Land Use and Ownership 133
    - Management 133
- Ownership 133
  - Public and Private Ownership 133
  - Land Use Patterns 134
  - County Land Use Zoning 134
- Agriculture and Grazing 135
- Lumber and Wood Production 136
- Special Designation 137
  - Navigability 137
  - Withdrawal 138
  - State and Federal Designations 138
- Problem Description 139
  - John Day Basin 139
  - Segment 1 139
  - Segment 2 140
  - Segment 3 141

Element #2 - Resource Considerations 143
- OWRD Beneficial Uses 143
- Endangered Species Act 143
  - Salmonid Habitat 143
- Fish Distribution 145
- Game Fish, Non-Native Habitat 146
- Botanical Special Status Species 146
- Wild and Scenic River Outstandingly Remarkable Values 146
  - Federal Wild and Scenic River 146
- River Values 147
- ICBMP Proposed Decision and FEIS 148

Element #3 - Limiting Factors Analysis 149
- Watershed Characteristics at the Landscape Scale 149
  - Geological Provinces of the Entire Basin 149
  - Basin Morphometric Variables 150

Drainage Pattern 150
Elevation and Slope 150
Hydgrography 150
Rainfall in Upper and Lower Elevation Areas 150
Dominant Land Vegetation Condition 151
Vegetation 151
Riparian Areas 151
Riverine Terrace 152
Upland 152
Forests and Woodland 153
Ecological Condition and Trend 153
Noxious Weeds 154
Fire 155
Flows 155
Ground Water 156
Water Rights 156
Consumptive Use 157
Instream Leases 159
State and Federal Recommended Flows 159
Rangeland Health and Productivity 161
Roads 161
Water Quality Parameters Driving Analysis—Temperature 162
Beneficial Uses Affected by Temperature Parameter 162
Applicable Oregon Water Quality Standard 162
Basis for Listing 163
Data Available to Address Temperature Standard 163
Conditions Affecting Parameters 163
Shade 164
Geographic Location 164
Vegetation, Climate and Topography 164
John Day Riparian Vegetation 164
Segment 1 Riparian Vegetation 166
Segment 2 Riparian Vegetation 167
Segment 3 Riparian Vegetation 168
Flow 169
Instream, Baseflows, Ground Water 169
Peak Flows 169
Incidence and Effect of Devastating Events 169
Water Velocities 170
Hydrologic Recovery 170
Channel Morphology (Sediment) 170
Channel Geometry 170
Bedload 170
Anthropogenic Influence on Parameters 170
Grazing 171
Grazing in Segment 1 171
Grazing in Segment 2 171
Grazing in Segment 3 173
Effects of Grazing Systems 173
Agricultural Lands 176
Agricultural Use in Segment 1 176
Agriculture Use in Segment 2 176
Agriculture Use in Segment 3 177
Using Ecological Sites to Assess Condition 177
Data Gaps 177
Riparian Ecological Site Description 178
Analysis 178

Maximum Potential 178

Element #4 - Goals, Objectives, and Management Actions 179
Endangered Species Act, Clean Water Act (CWA), and the Two Rivers Resource Management Plan (RMP)
Interior Columbia Basin Management Plan (ICBMP) 179
WQRP Goals/Objectives 180
Management Actions - River Plan Actions 180
Cooperation and Education 180
Grazing 181
Agriculture 183
Riparian and Aquatic Restoration 185
Effect of River Plan Actions on Water Temperature 186
Vegetation 186
Flow 187
Milestones 187
Compliance Standard for Authorized Grazing 187
Riparian Use Standards for Authorized Grazing 188
Recovery Standard for Authorized Grazing 188
Interim Targets 189

Element #5 - Timeline for Implementation, Cost, Funding 189
Priorities for Correct Cause of Problems 189
Cost/Funding Identify Sources of Funding 190
Restoration Planning Opportunities 190
Implementation Timeline 190

Element #6 - Responsible Parties 191
Land Included in WQRP 191
Parties Responsible for Plan Implementation 191

Element #7 - Reasonable Assurance of Implementation 191
Funding 191
Responsible Federal Officials 192
Problems with Implementation 192

Element #8 - Monitoring and Evaluation 192
Current Monitoring 192
Monitoring for Restoration 193
Monitoring Area 193
Objectives of Monitoring Plan 193
Interdisciplinary Process 193
Priorities and Intensities of Monitoring 193
Data Collection Methods 193
Implementation Monitoring 194
Effectiveness Monitoring 194
Validation Monitoring 194
Data Storage and Filing 195
Analysis 195
Validation of Decisions 195
Program Revision 195
Monitoring Schedule 196
Costs of Monitoring 197
Reporting - Report Contents 197
Reporting – External Coordination 197
Implementation Monitoring - Report Contents 197
Study Types -- Monitoring Grazing Management Actions 198

Study Types – Monitoring Hydrology 200
Study Types – Monitoring Agricultural 200
Study Types – Monitoring Fish and Aquatic Habitat 200
Study Types – Other Monitoring 201

Element #9 - Public Involvement 201
Process for Public Involvement 202
WQMP Involvement Process for Public Involvement 202

References 203

Tables

Note: Tables, maps and figures are numbered as in FEIS-June 2000, except for G-1 and G-2 which are new tables.

Introduction

This plan is a work in progress. A Water Quality Restoration Plan (WQRP) for the federally designated segments of the South Fork John Day Wild and Scenic River is being developed to accompany this WQRP.

The WQRP includes the following nine elements:
Condition Assessment and Problem Description of Lower John Day Basin
Resource Considerations
Limiting Factors
Goals, Objectives, Management Actions
Timeline for Implementation, Cost, Funding
Responsible Parties
Reasonable Assurance of Implementation
Monitoring and Evaluation
Public Involvement

Element #1 - Condition Assessment and Problem Description of Lower John Day Basin

Hydrologic Unit Code (HUC) 17070204

The John Day River Proposed Management Plan divides the John Day River system into 11 segments, based on divisions of the river system by land use, ownership, access, and other factors (Maps 1-A and 1-B). The Lower John Day Sub-basin (HUC 17070204) contains Segments 1, 2, and 3 of the Federally Designated Segments of Wild and Scenic River. These three segments are addressed in this WQRP.

303(d) Parameters

All segments of the Wild and Scenic River are listed on the ODEQ 303(d) list of affected waters for temperature (Table 2-K below, reprinted from FEIS-June 2000). The Upper John Day from the North Fork confluence (RM 185) to Reynolds Creek (RM 274) is listed for bacteria, dissolved oxygen, flow modification, and temperature (ODEQ 1998). Low summer flows on the mainstem John Day River above Dayville contribute to problematic eutrophication and consequent elevation of pH and dissolved oxygen in the South Fork and mainstem John Day rivers (Cude 2000). Segments 1 , 2 and 3 are only listed for temperature.

This Water Quality Restoration Plan focuses on human-caused disturbance in the lower John Day Basin Wild and Scenic River Corridor (Segments 1, 2, and 3) that is under the control of federal land management agencies. The water quality of these three downstream segments is highly dependent on the watershed health upstream. Therefore, a basic description of the entire basin has been incorporated into the condition assessment of Segments 1, 2, and 3.

Beneficial Uses

The ODEQ has identified much of the John Day Basin as water quality limited (see Table 2-K). This designation derives from the condition of waters that do not meet instream water quality standards for certain water quality parameters for all or a portion of the year. A stream, or portion thereof, is designated as water quality limited, as follows: if, after implementation of standard technology, the stream fails to meet water quality standards; if a stream utilizes higher than standard technology to protect designated

LEGEND

- BLM State Office
- BLM District Office
- BLM Resource Area Office
- BLM District Boundary
- BLM Resource Area Boundary

40 0 40 80 Miles

40 0 40 80 Kilometers

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Prineville District

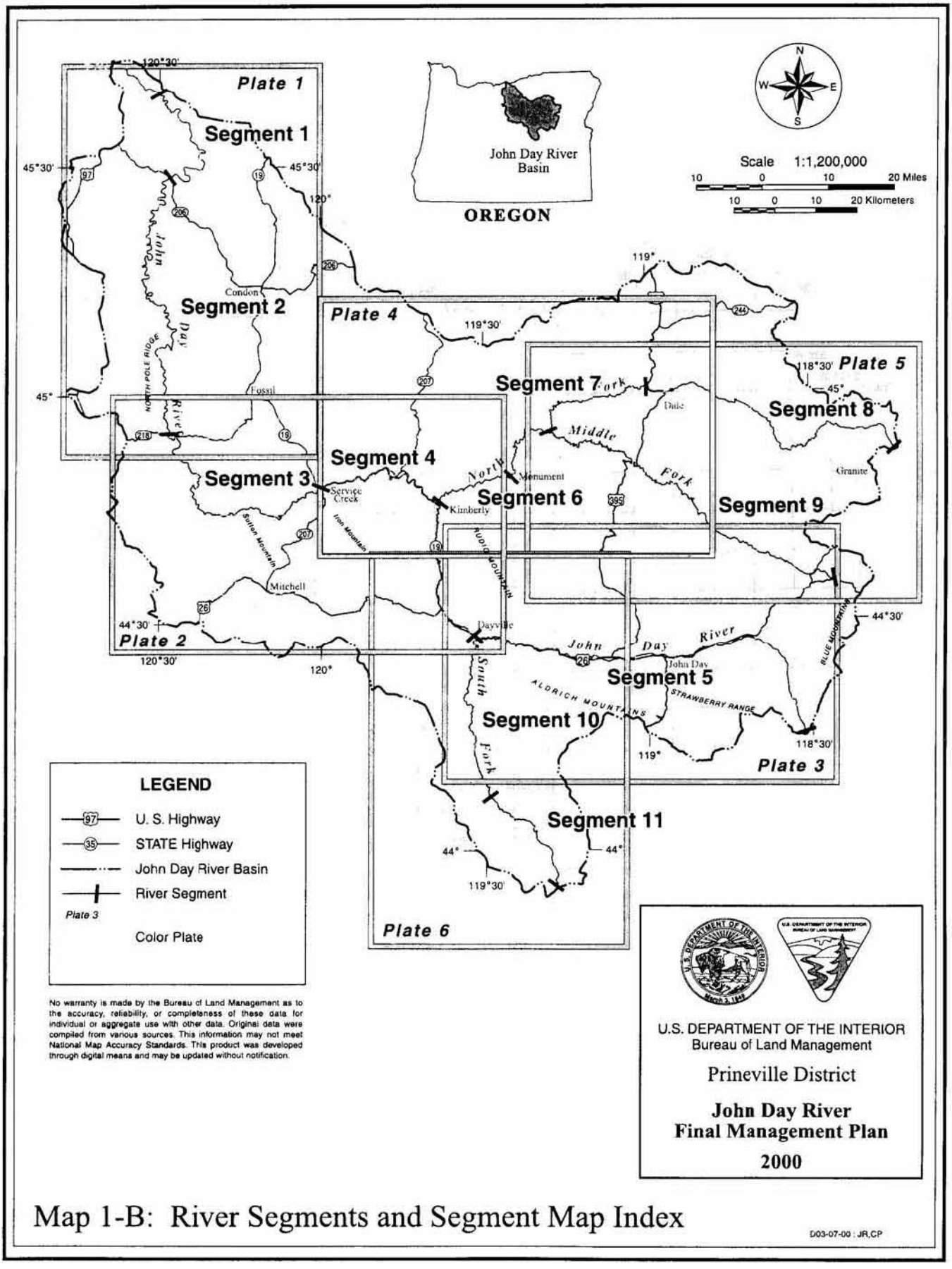
John Day River
Final Management Plan

2000

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Map 1-A: General Location

D03-07-00 : JR,CP



Map 1-B: River Segments and Segment Map Index

D03-07-00 : JR,CP

Table 2-K. John Day River Segments and 303(d) Listing Criteria

River Segment	303(d) Listing Criteria
Segment 1	Temperature
Segment 2	Temperature
Segment 3	Temperature
Segment 4	Bacteria, Dissolved Oxygen, Flow Modification and Temperature
Segment 5	Bacteria, Dissolved Oxygen, Flow Modification and Temperature
Segment 6	Temperature
Segment 7	Temperature
Segment 8	Temperature and Habitat Modification
Segment 9	Temperature
Segment 10	Temperature
Segment 11	Temperature

beneficial uses to achieve instream water quality; if there is insufficient information to determine if water quality standards are being met; or if it is determined that a stream would not be expected to meet water quality without higher than standard technology (OAR 340-041-0006-30). Designated beneficial uses referenced above are the purposes or benefits to be derived from a water body, as determined by the Oregon Water Resources Department Commission (OAR 340-41-0006-34). Among the designated beneficial uses of the John Day Basin surface and ground waters are domestic, livestock, municipal, ground water recharge, irrigation, agriculture, power generation, commercial, industrial, mining, fire protection, recreation, pollution abatement, wildlife, and fish life uses (OAR 690-506-0040-2).

As a part of the agency's responsibility to comply with the Clean Water Act, the BLM will work with ODEQ , ODA, and private landowners to develop a TMDL and a companion WQMP for the portion of the John Day Basin where BLM land management could affect a change in water quality. The BLM protocol for addressing 303(d) affected waters will guide development of Water Quality Restoration Plans (WQRPs) that will be incorporated into the ODEQ WQMPs. The WQMPs will guide restoration actions to improve water quality in those areas where BLM land management actions have an effect.

Condition Assessment

John Day Basin

The John Day River system includes the mainstem John Day River and its North, Middle and South forks. This system has more than 500 river miles and is one of the longest free-flowing river systems in the continental United States. The system drains 8,000 square miles of northeast Oregon (Map 1-A).

The mainstem John Day River flows 284 miles from its source in the Strawberry Range to its mouth at River Mile (RM) 218 on the Columbia River. The largest tributary in the John Day basin is the North Fork John Day River, which originates in the Blue Mountains at elevations near 8,000 feet. It flows southwesterly for 117 miles and joins the John Day mainstem near Kimberly. The Middle Fork John Day River originates just south of the North Fork and flows in a similar direction for 75 miles until the two forks merge about 31 miles above Kimberly. The South Fork John Day River, tributary to the mainstem near Dayville (RM 212), extends 60 miles north from its headwaters in the southwest portion of Malheur National Forest (ODFW 1990).

The North Fork John Day is listed by ODEQ as water quality limited for habitat modification and temperature. In this condition, the North Fork does not meet PACFISH pool frequency management objectives. Because the North Fork contributes 60 percent of the flow to the mainstem John Day, the influence of the North Fork on temperature and, therefore, fisheries is significant. Converse to the North Fork, the basin drainage area between Service Creek and McDonald Ferry gaging stations contributes only 13, 9, and 1 percent of the flow during July, August, and September, respectively, to the mainstem John Day. This exemplifies the limited influence that flows in the lower basin have on water quality and quantity.

During the summer months from approximately July to September, groundwater provides much of the base flow to the Lower John Day River. Although ODEQ has listed the lower river as water quality limited for temperature, other water quality constituents such as total phosphates, biochemical oxygen demand, and fecal coliform could also become limited during late summer when flows are the lowest and water temperatures are the greatest (Cude 2000).

Temperature gains per river mile in the John Day vary widely between basins and are influenced by aspect, channel geometry, vegetation, river width, and latitude. The ODEQ will model the temperature load allocation throughout the John Day Basin during their TMDL process in 2003 (North Fork), 2004 (Upper John Day), and 2005 (Lower John Day) (see Map 2-D).

Segments 1, 2 and 3

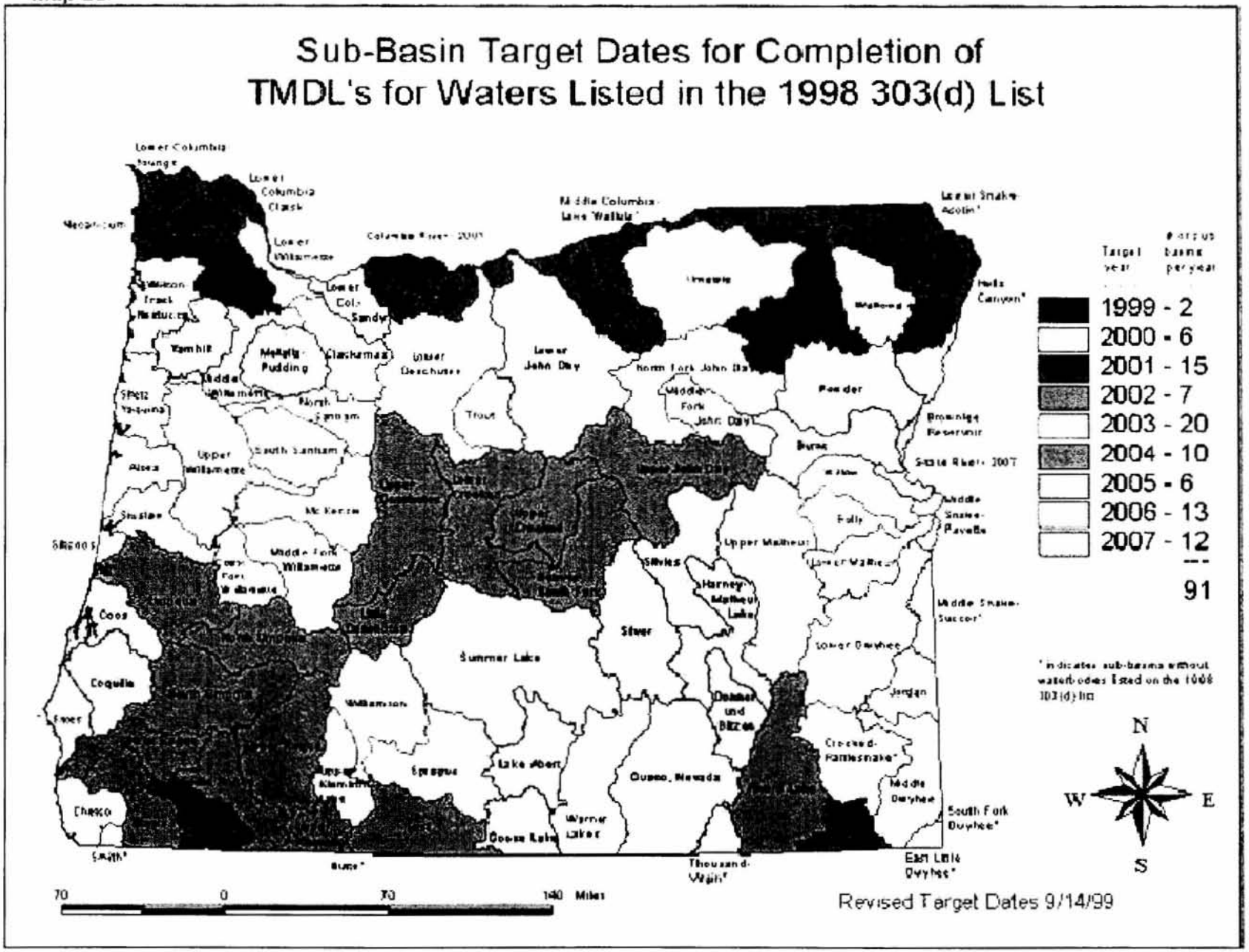
The lower John Day subbasin drains an area of about 2,030 square miles. It is physiographically different from the upstream segments in that it generally lacks the mountainous terrain and high elevations that accumulate significant snow pack.

Segments 1, 2 and 3 are designated as a State Scenic Waterway and federal Wild and Scenic River. Segment 1 is the lowest in elevation of the John Day River. It lies between Tumwater Falls (RM 10) and Cottonwood Bridge (RM 40), where State Highway 206 crosses the John Day River.

Segment 2 winds 70 miles downstream from Clarno Bridge at State Highway 218 (RM 109) to Cottonwood Bridge on State Highway 206 (RM 40). This segment is well known for spectacular scenery and contains very high canyon walls. The river meanders more in this segment than in adjacent segments. This segment is also very remote and contains no public road access, except for two roads at each end of the segment.

Segment 3 is a 48-mile segment between Clarno and Service Creek. Segment 3 has wide valleys with high, colorful hills and rimrock in some areas. The segment contains agricultural lands, especially hay fields and pastures. This segment is in a remote setting, but roads and human-made structures are more numerous here than in Segment 2.

Map 2D


Sub-Basin Target Dates for Completion of
TMDL's for Waters Listed in the 1998 303(d) List
Target year
# of sub basins per year
1999 - 2
2000 - 6
2001 - 15
2002 - 7
2003 - 20
2004 - 10
2005 - 6
2006 - 13
2007 - 12
91
* indicates sub-basins without waterbodies listed on the 1998 303(d) list
N
W
E
S
70
0
70
140 Miles
Revised Target Dates 9/14/99

Land Use and Ownership

Management

Livestock production and agriculture are the primary land uses and contribute significantly to the economy of the John Day basin. Cattle ranching and associated hay crops are major components of these activities. Grass and alfalfa hay, grown mostly along stream bottoms, are the predominant irrigated crops in the basin. The forest products industry is most important in the forested upper portions of the basin around Spray, John Day, and Prairie City. Although dryland production of grain crops remains the major economic activity, tourism and recreation are growing and contribute significantly to the basin's economy.

Human uses of public resources generate a significant portion of economic activity in the John Day Basin. Recreational visitors spend money locally at retail stores, service stations, and for lodging services. Many service businesses (such as guide services and shuttle operators) exist or operate in the basin. Much of the land administered by the BLM within the river corridor is leased for cattle grazing through a permit system (43 CFR 4100). Water from the river is diverted for agricultural uses on both private and public lands. Although water rights filed with the state govern the use of water resources. Depending on the commodity, mineral resources on public land are available for location, sale, or lease by private individuals or companies. Small amounts of BLM-managed timber within the basin are sold to private companies.

Historically, various tribal groups used the region for root collecting, hunting, fishing, and religious activities. There is little information available on specific current Native American use of the river segments. However, the Confederated Tribes of Warm Springs Reservation of Oregon and the Burns Paiute have indicated that some of their tribal members continue to use the region for hunting, fishing, gathering and religious activities. The Confederated Tribes of Umatilla Reservation of Oregon use lands on the Forth Fork of the John Day. Information regarding areas visited by individual families for root collecting, hunting, fishing or religious practices is not formally shared within or outside a tribe. For many segments, access for traditional activities is an issue due to land ownership and geography.

Ownership

Public and Private Ownership

The John Day River basin is sparsely populated. The 1998 population in the eight main counties in the John Day basin was 127,650. Wasco County boasts the largest population that is concentrated along the Columbia River at the mouth of the John Day. The 1998 population for incorporated communities on or near the river totaled 7,065 (Table 2-A, reprinted below from the FEIS-June 2000).

Three of the eight counties (Jefferson, Umatilla, and Wasco) have strong populations of Native American and Hispanic origin. Protection of cultural sites, hunting, fishing, mushroom gathering, and gathering of other special forest and range products are of importance to these populations.

The ratio of private to public land in the basin has changed little within the last decade, although several federal-private land exchanges have occurred over the last ten years. The Northwest Power Planning Council (1991) reported that 62 percent of the land in the basin is privately owned (5,027 square miles), 29.6 percent is under USFS management (2,396 square miles), 7 percent is under BLM management (587 square miles), and 1.4 percent is managed by the state of Oregon (83 square miles).

Table 2-A. Populations for John Day River Communities

Community	Population
Antelope	65
Canyon City	725
Condon	830
Dayville	185
Fossil	530
John Day	2,015
Mitchell	200
Monument	165
Moro	340
Mt. Vernon	650
Prairie City	1,195
Spray	165

Source: Center for Population Research and Census (1998)

The BLM administers about 25 percent of the 30 miles of river frontage in Segment 1, and the remaining 75 percent is privately owned land. River-front ownership is mixed, so along many stretches, one side of the river is private, and the other side is BLM-administered land.

In Segment 2, the BLM manages approximately 50 of the 70 miles of river frontage. Several small tracts of private land are scattered throughout the length of this segment.

The BLM administers approximately 50 percent of the river frontage and most of the lands near the river in Segment 3. Lands administered by the BLM are scattered along the river, separated by private land tracts of various sizes. Private lands on the river in this segment are often cultivated and irrigated, especially near Twickenham and Clarno.

Land Use Patterns

County Land Use Zoning

The river serves as a boundary for Sherman, Gilliam, Wasco, Jefferson and Wheeler counties.

Sherman County has planned and zoned private lands adjoining the west bank of the river as 'Exclusive Farm Use.' The purpose of Exclusive Farm Use is to protect agricultural uses from encroachment by incompatible uses and to provide tax incentives to assure that agricultural land is retained in agricultural use. The minimum lot size for this zone is 40 acres. Subdivisions and major partitions are prohibited.

Gilliam County has also planned and zoned private lands along the east bank of the river as Exclusive Farm Use. A lot or parcel of 160 acres or more is considered a farm

unit. A lot or parcel of less than 160 acres, but not less than 100 acres, may be acceptable as a farm unit if approved through the conditional use process. The Gilliam County Comprehensive Plan recognizes the existence of the State Scenic Waterway designation along the John Day River, and county policy states they will cooperate with OPRD when development is proposed on private lands along the river.

Wasco County has planning and zoning jurisdiction for private lands on the west side of the river, between RM 95 upstream to Rhodes Creek at RM 122. These lands have been zoned for agricultural use. The purpose of this zone is to protect agricultural uses from encroachment by other, incompatible uses. The lot size minimum for this zone is 80 acres, and there is no administrative mechanism for allowing a variance to this standard.

The Wasco County Comprehensive Plan, Goal 5, acknowledges that the John Day River is a State Scenic Waterway. Because Wasco County has recognized the John Day Scenic Waterway as a Goal 5 resource, the county has adopted a special overlay zone entitled the 'Natural Areas Overlay.' This overlay zone is designed to protect identified natural values along the river by allowing 'only uses which will not permanently destroy the natural value.'

Wheeler County has planning and zoning jurisdiction for all lands east of the river, from RM 95 to RM 130 (Cherry Creek). Wheeler County has planning and zoning jurisdiction along both the north and south sides of the river between Service Creek and Cherry Creek.

Wheeler County has planning and zoning jurisdiction on private lands on the east side of the river, between RM 95 and RM 130. These lands have also been zoned for agricultural use. The purpose is to provide areas for the continued practice of agriculture and permit only new uses that are compatible with agricultural activities. Lands in this zone may be subdivided when lots or parcels created are 160 acres or more in size. The Wheeler County Comprehensive Plan includes a policy that recognizes the existence of the State Scenic Waterway designation. The policy also states that the County will notify OPRD prior to issuing any land use or building permits proposed within a State Scenic Waterway for compatibility review.

Jefferson County has planning and zoning jurisdiction on the west side of the river, from Rhodes Creek at RM 122 upriver to Cherry Creek. These lands have also been zoned for agricultural use. The purpose of this zone is to protect agricultural uses from encroachment by other incompatible uses. The lot size minimum for this zone is 80 acres, and there is no administrative mechanism for allowing a variance to this standard. The Jefferson County Comprehensive Plan acknowledges that the John Day River is a State Scenic Waterway. The county passed an ordinance in May of 1993, stating that it will develop a program to protect cultural and natural resources in the State Scenic Waterway corridor within six months of the completion of the plan. In the meantime, the county will rely on the State Scenic Waterway program and existing standards for stream and rim setbacks of the county's zoning ordinance, to protect resources along the John Day River. Presently, the Jefferson County Plan Policy states that the county will coordinate with OPRD staff when proposals for development are made along the John Day River.

Agriculture and Grazing

Agricultural sales in the eight counties that include portions of the John Day basin totaled over $628 million in 1997 (Oregon State University Extension Service, Various Years). This represented 19 percent of all agricultural sales in Oregon. Umatilla and Morrow counties were the leading agriculture producers in the basin, with $308 million and with $110 million in sales, respectively. In Umatilla County, grain crops were the

most valuable ($93 million), followed by field crops ($57 million), and vegetable crops ($54 million). Sales of cattle and calves in Umatilla County totaled $33 million in 1997. Field crops were the most valuable in Morrow County ($39 million), followed by grain crops ($36 million). Sales of cattle and calves totaled $16 million. Morrow and Umatilla counties benefit significantly from irrigation from the Columbia and Umatilla Rivers, and only small portions of these counties are drained by the North Fork John Day River.

Sherman, Gilliam, and Wasco counties abut the lower John Day River. Grain crops are the leading cash crop in Sherman ($24 million) and Gilliam ($19 million) counties. In Wasco County, sales from grain crops ($14 million) are surpassed by tree fruit and nut crop production ($33 million). This production is centered around The Dalles, and is somewhat distant from the John Day River. Sales of cattle and calves for these three counties account for $1.6 million, $3.6 million, and $6.8 million in Sherman, Gilliam, and Wasco Counties, respectively. Jefferson County abuts the mainstem John Day River at its eastern border, but the majority of agricultural lands in the county are located in the Deschutes River basin. Total farm sales in 1997 for Jefferson County were $50.9 million, with field crops ($14 million) and cattle and calves ($7.7 million) the leading producer. Wheeler County has limited agricultural activity with total 1997 agricultural sales of $6.98 million. Sale of cattle and calves represent more than half of this, totaling $4.3 million.

Grant County is located at the headwaters of the John Day River. Livestock is the primary agricultural activity with $19.8 million in sales for 1997. A variety of other agricultural sales account for another $27.3 million (1997 statistics).

Livestock grazing on BLM-administered lands contributes to agricultural activity in all the counties. Private livestock owners are authorized to graze a specified number of cattle for a specified period in exchange for fees. Access to this public forage resource increases productivity for ranchers. The U.S. Forest Service has a similar permitting process for National Forest lands.

There are 119 grazing allotments, 64 of which are within the designated WSR segments fully or partially within the entire corridor affecting a total of 22,781 Animal Unit Months (AUMs). An AUM is the amount of forage necessary to sustain one cow and calf for one month. Given the existing inventory of cattle (estimated at a total 328,370 head, including 95,300 calves and 233,00 adults and yearlings) within the eight-county region, AUMs attached to BLM-administered lands within the corridor comprise approximately 1 percent of the total forage consumed by livestock. This represents a very marginal economic contribution to the region.

Approximately 220 acres of BLM-managed land are leased for irrigated agricultural/ cultivation. The majority of these lands were acquired through land acquisitions. Some were created to curb unintentional trespass that resulted due to the lack of an accurate survey. These lands are leased to private individuals for cultivation. Six individuals hold these leases. The lands are generally used grain, hay, alfalfa, dry bean, and speciality crop production (such as mint, onion seed, carrot seed and corriander). The BLM does not currently dictate the type of crops that can be grown of these lands.

Lumber and Wood Production

The upper elevations of the John Day River basin are important for timber production. There is no significant timber harvest in Sherman and Gilliam counties. A large percentage of timber harvest has historically been from National Forest lands, especially in Grant County. The forest industry and other private timber managers own a significant percentage of the basin.

Timber harvest also occurred on tribal lands in Wasco, Jefferson, and Umatilla counties. All of these lands are located in portions of the counties outside of the basin.

Historically, timber production from the National Forest lands was greatest in the counties located along the John Day River. However, since production peaked in 1989, harvest from public lands has decreased dramatically and now accounts for a relatively minor percentage of overall production. For example, in Grant County, in 1989 the National Forest harvest totaled 256.1 million board feet (MMBF), or 87 percent of total harvest. By 1996, harvest volume had dropped to 21.3 MMBF, or 30 percent of total harvest.

Total harvest from BLM-administered lands in the John Day basin between 1987 and 1997 was 20.5 MMBF, with 16.1 MMBF of production occurring in 1987 and 1988.

Rudio Mountain and Dixie Creeks are areas under BLM management that have produced the greatest yields. Dixie Creek, a tributary of the mainstem John Day River, is located north of Prairie City (RM 263). Rudio Mountain is located between Dayville and Kimberly east of the river. No recent BLM harvest activities have occurred within the Wild and Scenic River corridor. Smaller salvage and selective harvests have been the emphasis of BLM's timber management program since implementation of the John Day Resource Management Plan in August 1985.

Purchasers of sales since 1987 have included Malheur Lumber Company of John Day, Ochoco Lumber Company of Prineville, Ellingson Lumber Company of Baker City, Widows Creek Timber of Mt. Vernon, and D.R. Johnson Lumber of Prairie City. As of December 1998, estimated hourly earning in the lumber and wood products industry in Oregon was $13.63 (Oregon Employment Department 1999)

Special Designation

Navigability

Navigability has not been established for the John Day River. Navigability has more than one meaning. Primarily, navigability has been used to resolve whether the states or the federal government own the beds under navigable water. The test for this is known as "navigability for title" and examines what the natural conditions of the water and whether the waters could have been used for commerce at the time the state entered the union.

Under Oregon law, the Division of State Lands is responsible for managing the beds and banks of navigable waterbodies. These assets are to be managed for the greatest benefit of the people of Oregon under sound techniques of land management. Protecting public trust values of navigation, fisheries and public recreation is also important.

Although the Division of State Lands has determined that there is sufficient evidence to support a claim of navigability of at least part of the John Day River system, no such legal claim on the navigability of the system has been filed.

If non-navigable, a federal patentee (private landowner) or the federal government would own the bed underlying the water.

If navigable, the state acquires the bed under these waters. The states hold title to land under all non-tidal navigable waters. However, the federal government owns title to the beds underlying navigable waters that are affected by the ebb and flow of the tide. Navigability, in fact, is the test to determine the federal government's ability to regulate

the use of waters. This is important to defining the jurisdiction of Federal Energy Regulatory Commission (FERC) and some actions of the Army Corps of Engineers.

Withdrawal

A 'withdrawal' is a land classification that removes lands from actions under various public land laws, including the mining laws. Withdrawn lands may be transferred from BLM to another federal agency's jurisdiction. Numerous 'withdrawals' along the John Day River were made to reserve areas for future hydroelectric power projects. However, these areas were never developed for hydroelectric power production nor are there plans for future development. The WSR Act of 1988 resulted in the remaining federal lands within the designated WSR segments being withdrawn from entry, sale, or other disposition.

State and Federal Designations

Segment 1 was designated as a federal Wild and Scenic River by Congress in 1988 and as a State Scenic Waterway in 1970 by the State of Oregon. The river corridor between Thirtymile Creek and the Columbia River is a State of Oregon Wildlife Refuge that prohibits waterfowl hunting. This segment contains no designated Wilderness and no Wilderness Study Areas. The Oregon Trail crosses the river near RM 21.

In Segment 2, land designations include three BLM Wilderness Study Areas and a State of Oregon wildlife refuge from Thirtymile Creek downstream to the Columbia River. Segment 2 is presently classified as a State Scenic Waterway 'Scenic River Area,' from Cottonwood Bridge to Ferry Canyon. State classifications in this segment include 'Scenic River Area' from Clarno to Thirtymile Creek, 'Natural River Area' from Thirtymile Creek to Ferry Canyon, and 'Scenic River' from Ferry Canyon to Cottonwood Bridge. State guidelines under the existing Oregon Administrative Rules (OAR 736-040- 0065) describe how lands should be managed under these classifications.

The three Wilderness Study Areas in Segment 2 include the North Pole Ridge WSA (7,609 acres), Thirtymile WSA (7,538 acres), and the Lower John Day WSA (19,587 acres). Wilderness values identified in the wilderness review process for these three WSAs are naturalness, opportunities for solitude and primitive and unconfined recreation, critical anadromous fish habitat, Columbia River Basalt Formations, outstanding scenic qualities, cultural sites, a potential natural community of bluebunch wheatgrass, and protected plants and wildlife. Detailed Wilderness inventory information on each of these WSAs is available from the BLM in Prineville.

Segment 3 is designated as a federal Wild and Scenic River. This segment also was designated as a State Scenic Waterway in 1970. The existing State Scenic Waterway classification for this segment is 'Scenic River Area.'

Segment 3 includes several WSAs. The Spring Basin WSA (5,982 acres) lies to the east of the river and southeast of Clarno in this segment. Although most of the WSA is outside the WSR boundary, a small portion lies within the boundary. The BLM recommended to Congress that this WSA is suitable for designation as Wilderness, but no further legislative action has occurred. Until the wilderness review process is complete, this area will be managed so as not to impair its suitability for designation as Wilderness.

The BLM completed the Sutton Mountain Land Exchange in 1992, which added 48,000 acres of land to public ownership. Most of these acquired lands, as well as 16,500 acres of adjacent public lands, were inventoried for wilderness characteristics. A wilderness inventory analysis concluded that 39,370 of the acres inventoried were found to possess wilderness characteristics and are worthy of further wilderness review. The

BLM identified these lands as WSAs through the Sutton Mountain Coordinated Resource Management Plan (CRMP) (USDI-BLM 1996d), a public planning process. A decision was made to identify 29,400 acres as the Sutton Mountain WSA, and 9,970 acres as Pats Cabin WSA, and the BLM began to manage these WSA lands under IMP guidance. Approximately 2,400 acres of the acquired lands adjacent to Pats Cabin WSA, but outside the planning boundary for the CRMP, have yet to be inventoried for wilderness characteristics.

Problem Description

John Day Basin

Historic land use practices have degraded the watershed and widened the river channel. Channel widening has removed vegetation along the riverbanks and continues to reduce reestablishment where the widening processes are still active. The widening of the river channel has contributed to temperature elevation through exposure to air and sunlight.

The majority of water in the John Day Basin originates in the upper watershed. As a result, water quantity and quality in the river below Kimberly at RM 185 are determined more by input from upper basin tributaries (such as the North Fork, South Fork and upper mainstem) than by inputs originating below Kimberly (OWRD 1986).

The flow regime of the John Day affects the shape of the river channel, the ability of riparian sites to support vegetation, and the extent of river uses and access. For example, river flow affects water temperature, which has consequent effects on dissolved oxygen and the suitability and productivity of habitat for fisheries production. Most water quality problems in the John Day Basin stem from historical mining and dredging, livestock grazing, cumulative effects of timber harvest and road building, and water withdrawals (OWRD 1986, ODEQ 1988). Soils and geomorphological processes that drive the system contribute to naturally elevated sediments in the basin.

Segment 1

The lower subbasin, including Segment 1, can be characterized as an area that receives water, as opposed to one that produces it. Most tributary streams in the subbasin are nearly ephemeral and many cease to flow in summer (approx. July through September). There are three main tributaries that flow into the lower mainstem: Rock Creek, Hay Creek, and Grass Valley Canyon. Rock Creek is the largest with a mean monthly flow ranging from 120 cfs in March to less than 1 cfs in September. Lone Rock Creek, a tributary to Rock Creek, stopped flowing at some time in at least 10 out of the 13 years between 1966 (first year of record) and 1978 (last year of published record). Generally, non-flow conditions last from August through September in these tributaries. In especially dry years, flows can stop as early as July and not resume until October.

The stream gauge at McDonald Ferry records discharge for over 95 percent of the John Day basin. It has been in operation since 1905 and provides an excellent record of stream flow variability. Discharge varies seasonally, from year to year, and from decade to decade (OWRD 1986). Peak discharge occurs between late March and early June, with 22 percent of runoff occurring in April and 21 percent in May. Low flows occur between July and November. The average monthly high flow is during April (5,710cfs). Minimum monthly low flow occurs during September (87 cfs); no flow occurred for part of September 2, 1966, August 15 to September 16, 1973, and August 13, 14 and 19 to 25, 1977.

Frequency of peak flows has changed. The number of flow events exceeding 6,900 cubic feet per second (cfs) (defined by the USGS as a peak flow for the gauge at

McDonald Ferry) was greater from 1980 to 1985 than any other five-year period since 1948. The flows during the 1964 and 1997 floods of 40,200 and 35,200 cfs respectively, exceeded any other flows on record by 35 percent. Changes in discharge may be caused by climatic variation or watershed alteration (OWRD 1986). The average annual discharge for the period of record is 1,524,000 acre feet. On some occasions, such as in 1966, 1973 and 1977, the river ceased to flow.

In 1996, the 29.5 miles of Segment 1 were included in the Oregon Department of Environmental Quality (ODEQ) 303(d) list of water quality limited streams as exceeding the state criteria of 64°F for summer water temperatures (ODEQ 1998). This river segment has a relatively high width-to-depth ratio, as would be expected with a river of this length, sediment load, and extreme flow variations. Low summer flows are spread into wide cross-sections, increasing the volume of water exposed to solar radiation. The percent of effective shade provided by vegetation decreases as channel width increases and is expected to be minimal for this segment. Temperature gains per mile vary widely between basins and depend on variables such as aspect, geology, vegetation, river width, and latitude. It is anticipated that the ODEQ will conduct temperature modeling to develop TMDLs for the Lower John Day as scheduled for 2005.

Instantaneous water temperature measurements at Cottonwood Bridge have been measured on a monthly basis by ODEQ for their Oregon Water Quality Index Reports. The 11 instantaneous measurements for June averaged 66° F. According to 18 afternoon measurements, the average daily afternoon water temperature is about 75° F in July and August.

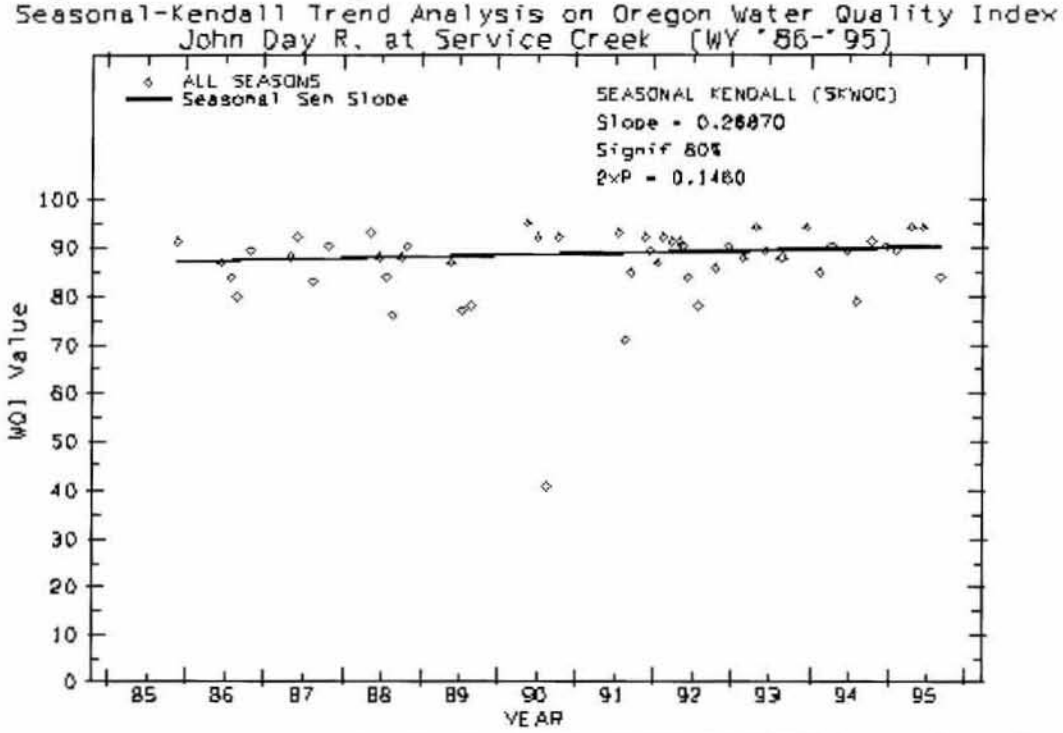
As presented in the general discussion above, water quality in the lower river and in this segment is the result of upstream and local conditions. During the summer when flows are low, water temperatures exceed the criteria for rearing anadromous fish (ODEQ 1998). During low flow periods, water samples collected from McDonald Ferry indicate high levels of total phosphates, total suspended solids, biochemical oxygen demand, and fecal coliform. High levels of these pollutants also occur during periods of high runoff as a result of erosion and field runoff (Cude 2000).

The ODEQ non-point source assessment maps (August 1988) identify severe stream bank erosion and sedimentation in some of the major tributaries to the mainstem John Day. The OWRD (1986) has reported that water quality for cold water and warm water fish '...is on a downward trend threatening continued use of the water by that use.' Since the time OWRD published these conclusions, however, ODEQ (1999) has noted, in reference to the entire lower John Day River, that water quality has 'significantly improved' and utilizes a graph (Figure 2-C, reprinted below from FEIS-June 2000) to illustrate the upward trend of water quality since 1985 (water quality parameters that make up the water quality index are temperature, dissolved oxygen, biochemical oxygen demand, pH, ammonia+nitrate nitrogen, total phosphates, total solids, and fecal coliform). The ODEQ data collected between 1985 and 1998 at Cottonwood Bridge, the upstream end of Segment 1, revealed no improvement or decline in water quality.

Segment 2

Segment 2 drains about 906 square miles of arid lands. Precipitation here is around 10 inches per year, and mean annual runoff is between 0.5 and 0.75 inches per year. This means that this segment contributes between 35 and 50 cfs per year, based on OWRD data (1986). Discharge patterns, peak flows, and duration of flow events are similar to those of Segments 1 and 3. Butte, Thirtymile, and Pine Hollow Creeks are the main tributaries to this segment. Butte Creek flows average 1 to 5 cfs during July through October.

Figure 2-C. Trend Analysis Results for John Day River Near Service Creek



In 1996, the ODEQ included the 70 miles of Segment 2 in the 303(d) list of water quality limited streams for temperature. The temperature criteria of 64° F is the minimum standard necessary to maintain the beneficial use of the waters for fish rearing in Segment 2. Instantaneous water temperature measurements recorded at Cottonwood Bridge have been measured monthly by ODEQ for their Oregon Water Quality Index Reports. These measurements are recorded at the downstream end of Segment 2. Based on 11 instantaneous June water temperature measurements recorded between 1985 and 1998, June afternoon water temperature averaged 66° F. Based on 18 afternoon measurements, the average daily afternoon water temperature is about 75° F in July and August (Cude 2000).

Water quality impairment in this segment may be a consequence of stream bank erosion and sedimentation. In addition, Condon and Fossil municipal sewage treatment facilities historically discharged poor quality effluent into the segment two tributaries, Thirtymile and Butte Creeks (OWRD 1986.) The ODEQ is pursuing corrections at both facilities. However, this history of sewage discharge is of significance as current water quality conditions reflect some degree of pollution associated with eutrophication during low flow periods and result in an elevated release of effluents during periods of high flow. 'Water quality constituents such as total phosphates, biochemical oxygen demand, and fecal coliform are typically elevated during late summer when flow is lowest and water temperatures are the highest' (Cude 2000). Average Oregon Water Quality Index scores for this segment are poor in the summer and fair during the fall, winter and spring (Cude 2000).

Segment 3

This segment drains an area of approximately 1,431 square miles, including water from the upper basin. Peak discharge occurs from late-March to early-June, and low flows occur from July through November. Local ground water provides some base flow to this segment. Major tributaries are Bridge, Muddy, Service, Rowe, and Pine creeks.

Water entering this segment is recorded by a gage at Service Creek; 28 miles downstream from the confluence of the North Fork, and roughly at the midpoint of the

basin. The area above the gage produces an average of 1,415,000 acre-feet of water per year (USGS 1999). There is no gauge near Clarno, so the amount of water flowing out of this segment is unknown.

Basin discharge has changed over time, with higher peak flows, and more discharge occurring in the winter months. The maximum discharge, or flood flow, recorded at Service Creek was 40,200 cfs on December 23, 1964. The minimum recorded flow was 6 cfs on August 23 and 24, 1973.

Water quality here is similar to water quality in the North Fork. Since the North Fork contributes 60 percent of the flow to the John Day, its influence on the water quality parameter of temperature is substantial. Eutrophication during the summer months exacerbates conditions of elevated pH and dissolved oxygen supersaturation (Cude, 2000). Average OWQI scores for the John Day River at Service Creek are "fair" in the summer and "excellent" during the remainder of the year. This site exhibited a significant increase in water quality from 1985 to 1998 (see Figure 2-C)(Cude 2000).

Peak flows have great erosive power and have the capacity to change the stream profile of this fragile system. Surface runoff and erosion increase during periods of high flows and in relation to episodic weather events like thunderstorms. As a result, during these periods turbidity, fecal coliform, and sediment transport are elevated. During low flow periods elevated water temperatures reduce dissolved oxygen. This segment was placed on the ODEQ 303(d) list for exceeding state criteria for water temperature during the summer months (Table 2-W, reprinted below from FEIS-June 2000). Since the monitoring data used to determine site water quality is located at the upstream end of these segment, temperature conditions may reflect upstream land management activities or may vary in relation to natural background.

Thus, decreasing water temperatures could be achieved by: 1) radiative (heat) loss from water when the surrounding environment is cooler than the stream (this occurs mainly at night when air temperature is lower); or, 2) input from groundwater or surface flow (such as stream confluences) where the new water is at a lower temperature than the water already instream. At Service Creek, 13 instantaneous water temperature measurements for June averaged 17.8° C (64° F). At Service Creek during July and August, afternoon water temperature measurements averaged 23 °C (73.4° F), and water temperatures measured at Cottonwood Bridge about two hours later in the day averaged 24°C (75° F) for the same period (Cude 2000-20 data points 1981-1998). During the summer months, there is very little input of water into the system between Service Creek and McDonald Crossing, so decreases in temperature within stream are not likely below Service Creek.

Table 2-W. Percent of Time Water Temperature Exceeded State Water Quality Temperature Standard of 64° for 7-day Running Maximum Temperature at Service Creek

Year	Beginning Date	Ending Date	Percent of Days Exceeded Standard
1993	34142	34220	73
1994	34465	34502	27
1995	34906	34967	98
1997	35582	35703	90
1998	35961	36044	100

Element #2 - Resource Considerations

OWRD Beneficial Uses

Water quality parameters that relate to designated beneficial uses of the John Day include: temperature, dissolved oxygen, and habitat modification, that relate to beneficial uses for fish life; flow modification that relates to the beneficial use for fish life; and bacteria that relates to the beneficial use for recreation (ODEQ1998). Of these, water temperature is the only parameter that has been monitored intensively throughout the basin.

Endangered Species Act

Salmonid Habitat

The John Day River provides habitat for a number of native and non-native fish populations, including five special status species (Tables 2-L and 2-M, reprinted below

Table 2-L. Fish Species Occurring in the John Day System

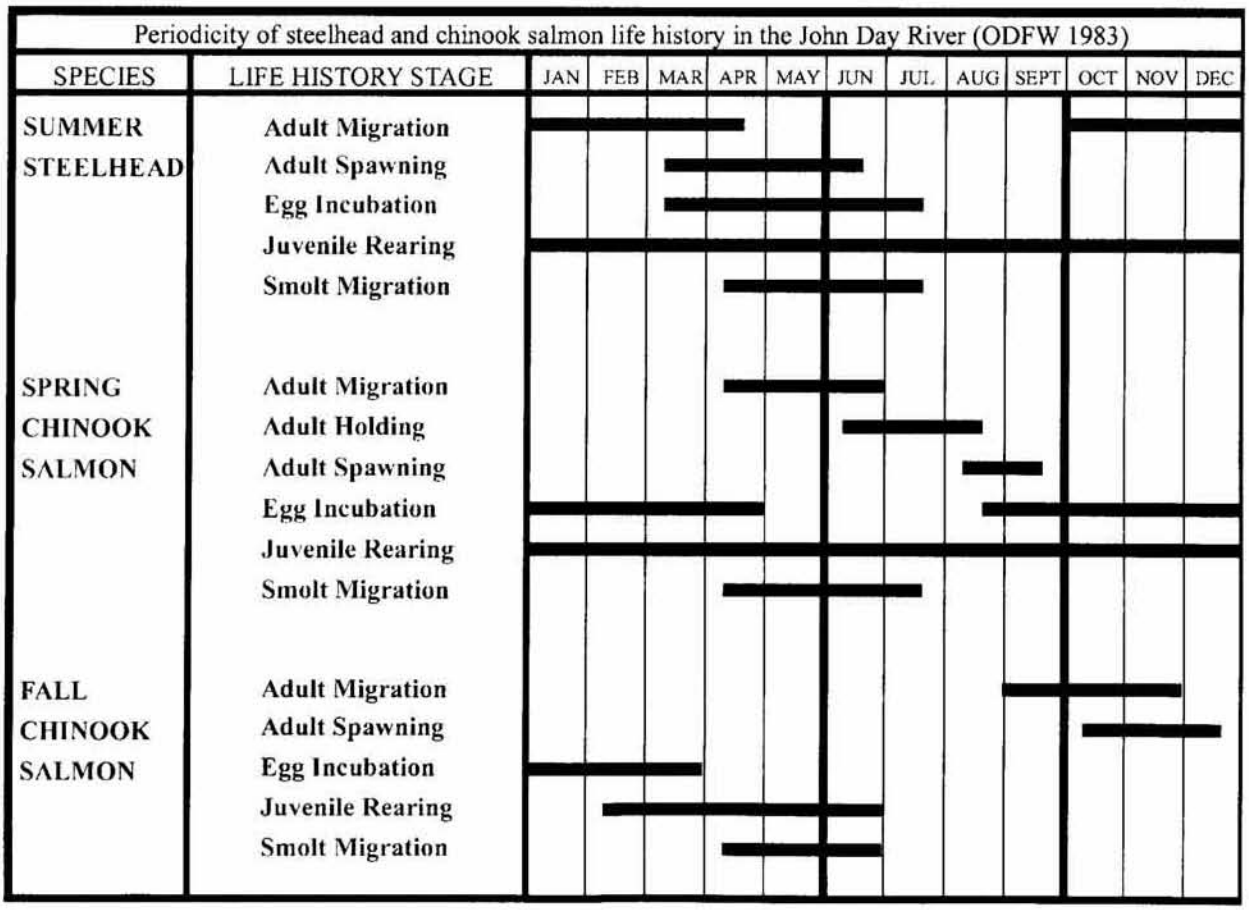
Common Name of Species	Scientific Name of Species	Origin
Chinook salmon	*Oncorhynchus tshawytscha*	Native
Rainbow trout (resident and	*Oncorhynchus mykiss*	Native
West slope cutthroat trout	*Oncorhynchus clarki lewisi*	Native
Yellowstone cutthroat trout	*Oncorhynchus clarki bouvieri*	Introduced
Lahonton cutthroat trout	*Oncorhynchus clarki henshawi*	Introduced
Mountain whitefish	*Prosopium williamsoni*	Native
Bull trout	*Salvelinus confluentus*	Native
Brook trout	*Salvelinus fontinalis*	Introduced
Paiute sculpin	*Cottus beldingi*	Native
Shorthead sculpin	*Cottus confusus*	Native
Bridgelip sucker	*Catostomus columbianus*	Native
Largescale sucker	*Catostomus macrocheilus*	Native
Mountain sucker	*Catostomus platyrhynchus*	Native
Carp	*Cyprinus carpio*	Introduced
Chiselmouth	*Acrocheilus alutaceus*	Native
Northern pikeminnow	*Ptychocheilus oregonensis*	Native
Longnose dace	*Rhinichthys cataractae*	Native
Speckled dace	*Rhinichthys osculus*	Native
Redside shiner	*Richardsonius balteatus*	Native
Peamouth	*Mylocheilus caurinus*	Native
Small mouth bass	*Micropterus dolomieui*	Introduced
Largemouth bass	*Micropterus salmoides*	Introduced
Bluegill	*Lepomis macrochirus*	Introduced
Black crappie	*Pomoxis nigromaculatus*	Introduced
Channel catfish	*Ictalurus punctatus*	Introduced
Brown bullhead	*Ictalurus nebulosus*	Introduced
Pacific lamprey	*Lampetra tridentata*	Native
Western brook lamprey	*Lampetra richardsoni*	Native

Source: ODFW (1989)

from FEIS-June 2000). Special status fish species in the John Day River basin include Mid-Columbia steelhead (Federal Threatened), Bull trout (Federal Threatened), Interior redband trout, westslope cutthroat trout, and pacific lamprey (Federal Sensitive). Information on population trends and distribution has focused primarily on anadromous salmonids, and to a lesser extent on resident salmonids and warm water game species. Native, non-game species have received even less attention. It is presumed that activities designed to benefit anadromous and resident salmonids will be advantageous to these species which have evolved under similar environmental conditions.

Efforts to correct fish habitat degradation and promote restoration have been pursued in the past several years in response to concerns about declining fish populations. Recent planning efforts directed through the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program generated the Columbia Basin System Planning Salmon and Steelhead Production Plan-John Day River Sub-Basin (ODFW 1990). The John Day River Subbasin Plan and the Columbia River Anadromous Fish Restoration Plan (CRITFC 1996) established spring chinook salmon and summer steelhead production goals and objectives for the John Day subbasin (see Table 2-N, reprinted below from FEIS-June 2000). Under the Wild Fish Management Policy (OAR 635-07-525), spring chinook salmon and summer steelhead are managed exclusively for wild fish production (ODFW 1990). An amendment to the Columbia River Basin Fish and Wildlife Program, known as the Strategy for Salmon (Collette and Harrison 1992a,b), called on resource management entities to implement measures designed to rebuild Columbia Basin anadromous fish populations. Subsequent to the Strategy for Salmon, the BLM adopted PACFISH (USDA-FS and USDI-BLM 1995), which was designed to

Table 2-M. Periodicity of Steelhead and Chinook Salmon Life History in John Day River.



halt the degradation and promote restoration of riparian areas. Additionally, efforts by private landowners in the John Day basin have also contributed to restoring watersheds and fish habitat. Pacific lamprey and a small run of fall chinook salmon also inhabit the John Day River. Although much less is known of these runs, restoration efforts designed to protect and restore habitat for spring chinook salmon and summer steelhead will benefit these species, as well as native resident species in the John Day River system.

Fish Distribution

The John Day River supports one of the few remaining wild runs of spring chinook salmon (*Oncorhynchus tshawytscha*) (Lindsey et al. 1986, OWRD 1986, Quigley and Arbelbide 1997) and summer steelhead (*Oncorhynchus mykiss*) (Quigley and Arbelbide 1997, OWRD 1986) in the Columbia Basin, providing approximately 1,800 miles of spawning habitat for summer steelhead and 117 miles for spring chinook (ODFW 1997). Table 2-M illustrates when and how salmon and steelhead use the river.

The lower (RM 0 to 109) and middle (RM 109 to 212) subbasins (Segments 1, 2, 3, and 4) function primarily as a migration corridor for anadromous salmonids. This portion of the basin accounts for an estimated 6 percent of the steelhead production in the John Day basin and a small run of fall chinook salmon (OWRD 1986). The upper mainstem (RM 212 to headwaters) produces an estimated 18 percent of the spring chinook salmon and 16 percent of the summer steelhead in the John Day basin (OWRD 1986). Increasing population trends for spring chinook salmon are reported for the upper mainstem John Day River. This increasing trend has been attributed to management and restoration implemented over the last few decades (ODFW 1997). The South Fork subbasin (Segments 10 and 11) produces approximately 7 percent of the summer steelhead in the John Day (OWRD 1986). The North Fork and Middle Fork subbasins (Segments 6, 7, 8, and 9) produce approximately 82 percent of the spring chinook salmon and 73 percent of the summer steelhead population in the John Day (OWRD 1986). There has been no sport fishing of spring chinook salmon since 1977, and steelhead have been limited to the catch-and-release of 'wild' fish from 1996 to the present. Steelhead production takes place in the tributaries and headwaters of the river, mostly outside the river corridor.

Several species of resident salmonids inhabit the John Day River. Redband trout occur throughout the John Day River. The primary habitat is found in the upper subbasins and tributaries. Hatchery supplementation with rainbow trout has occurred in the past, but the ODFW no longer releases hatchery fish in streams associated with the John Day River. Two subspecies of cutthroat trout, Yellowstone and Westslope, are found in tributary streams of the upper John Day River. Yellowstone cutthroat trout were introduced in the 1900s and have not been stocked since that time (ODFW 1989). The Westslope cutthroat trout is native to the North Fork and upper mainstem John Day. The

Table 2 -N. Average Annual Production Goals for Spring Chinook Salmon and Summer Steelhead in John Day Basin

Species	Sport and Tribal Harvest Estimate	Natural Reproduction Escapement Estimate	Total Escapement Goal	Average Escapement 1989-1998
Spring Chinook Salmon	1,050	5,950	7,000	2,310
Summer Steelhead	11,250	33,750	45,000	8,370

Source: ODFW (1990)

current distribution of these species is confined to headwater tributaries in the upper mainstem and North Fork subbasins (Duff 1996). Bull trout occupy habitat in the upper mainstem John Day subbasin, North Fork subbasin, and Middle Fork subbasin. The primary habitat occurs upstream of Camas Creek in the North Fork subbasin, upstream of Big Creek in the Middle Fork subbasin, and upstream of Canyon Creek in the upper mainstem John Day River subbasin (ODFW 1996). Winter distribution in the North Fork includes Segments 6 and 7, downstream to Wall Creek, with one documented sighting as far downstream as Rudio Creek in 1999 (Unterwegner 1999).

Game Fish, Non-Native Habitat

The John Day River also supports an increasingly popular warm water sport fishery. A review of habitat requirements revealed the river exhibits good conditions for both smallmouth bass and channel catfish. Upon assurance that warm water predation on salmonids would be minimal, these species were introduced into the John Day River in the early 1970s (ODFW 1999). Today, smallmouth bass are distributed throughout the mainstem, from Tumwater Falls to Picture Gorge (Segments 1,2, 3, and the lower portion of Segment 4) and in the North Fork from Kimberly to Wall Creek (RM 0 to RM 22, lower portion of Segment 6). Smallmouth bass have successfully filled a niche in the John Day River, which has developed into a nationally recognized sport fishery.

Botanical Special Status Species

The John Day River basin supports several special status plants normally associated with a specific, limited habitat. A Bureau Sensitive species, *Thelypodium eucosmum* (arrowleaf thelypody), is found within Segments 3, 4 and 6 and is suspected to occur in Segments 10 and 11. *Rorippa columbiae* (Columbia cress), another Bureau Sensitive species, has not been found on the John Day River, but is suspected to occur along the entire river since one of its known habitats is river gravels subjected to ephemeral flooding.

Mimulus jungermannioides (hepatic monkeyflower) is a Bureau Sensitive species found on moist rock walls in Segment 2 and is suspected to occur anywhere there are moist cliffs, particularly on the lower river. *Astragalus collinus* var. *laurentii* (Lawrence's milkvetch) is a Bureau Sensitive species found east of the Prineville District, but is suspected to occur within the basin. Another Assessment Species, *Juncus torreyi* (Torrey's rush), is found in Segments 2 and 3 and is suspected to occur along the entire river.

Wild and Scenic River Outstandingly Remarkable Values

Federal Wild and Scenic River

The National Wild and Scenic Rivers System was created by Congress in 1968 with the passage of the Wild and Scenic Rivers Act (PL 90-542). Its purpose is to preserve certain rivers with outstanding natural, cultural or recreational features in a free-flowing condition for the enjoyment of present and future generations. As of August 1996, the system included 151 rivers or sections of rivers in 35 states.

The Omnibus Oregon Wild and Scenic Rivers Act of 1988 (Public Law 100-558) designated several segments of Oregon rivers as Wild and Scenic, including three segments of the John Day River. Each of these segments has one of three sub-classifications assigned to it by Congress. These sub-classifications are:

Wild - Those rivers or sections of rivers that are free of impoundment and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and

waters unpolluted. These represent vestiges of primitive America.

Scenic - Those rivers or sections of rivers that are free of impoundment, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational - Those rivers or sections of rivers that are readily accessible by road or railroad that may have some development along their shorelines and that may have undergone some impoundment or diversion in the past.

The Lower John Day River mainstem (Tumwater Falls upstream to Service Creek) is classified as Recreational..

Table 1-A (reprinted below from the FEIS-June 2000) shows designations on the Mainstem John Day River.

River Values

The Federal Wild and Scenic Rivers Act requires WSRs be managed to 'protect and enhance' the 'outstandingly remarkable and significant values' that Congress lists. Congress also encourages managing agencies to assess the designated river segment to identify any additional outstandingly remarkable and/or significant values the segment may contain.

Table 1-A. Designations on Mainstem John Day River (Segments 1-5)

Designation	Location
Segment 1 - Tumwater Falls (RM 10) to Cottonwood Bridge (RM 40)	
Federal Wild and Scenic	Tumwater Falls to Cottonwood Bridge
State Scenic Waterway	Tumwater Falls to Cottonwood Bridge
John Day River State Wildlife Refuge	Tumwater Falls to Cottonwood Bridge
Segment 2 - Cottonwood Bridge (RM 40) to Clarno (RM 109)	
Federal Wild and Scenic	Cottonwood Bridge to Clarno
State Scenic Waterway	Cottonwood Bridge to Clarno
Thirtymile/Lower John Day Wilderness Study	RM 46 to RM 83
North Pole Ridge Wilderness Study Area	RM 85 to RM 95
John Day River State Wildlife Refuge	Cottonwood Bridge to Thirtymile Creek (RM 84)
Segment 3 - Clarno (RM 109) to Service Creek (RM 157)	
Federal Wild and Scenic	Clarno to Service Creek
State Scenic Waterway	Clarno to Service Creek
Spring Basin Wilderness Study Area	RM 113 to RM 119
Segment 4 - Service Creek (RM 157) to Dayville (RM 213)	
State Scenic Waterway	Service Creek to Parrish Creek (RM 170)
National Monument	John Day Fossil Beds National Monument (RM 195, 206)
Segment 5 - Dayville (RM 213) to Headwaters (RM 284)	
No Designations	

Similarly, Oregon State law requires State Scenic Waterways to be managed to protect the 'Special Attributes' identified for those segments. However, since the John Day River was designated a State Scenic Waterway through the initiative process, the special attributes were never formally identified.

When designating the mainstem from Tumwater Falls to Service Creek a Wild and Scenic River, Congress noted in the Federal Register:
'The outstandingly remarkable qualities (values) include scenic, recreation, and fish.'

The majority of the land adjacent to the John Day River is primitive and undeveloped. The river flows through gentle farmland that is privately owned, as well as through rugged 1,000 foot deep basalt canyons that are predominantly public land. In the Dayville to Kimberly segment, it flows through the John Day Fossil Beds National Monument. In the area between Butte Creek and Cottonwood Bridge, the river flows through three Wilderness Study Areas that possess outstanding natural values. The river and the unconfined primitive recreation opportunities of the John Day Canyon in these areas are a major attraction for whitewater boaters and other recreationists. Besides the outstanding scenery, the area also offers outstanding bass and steelhead fishing, as well as excellent hunting, archaeological, paleontological, geological and historic values. The river offers whitewater boating opportunities, ranging from 1 to 5 days, during the spring months of April, May, and June.

In the resource assessment for the John Day Wild and Scenic River, the BLM found wildlife, geological, paleontological, and archaeological and historical values to be outstanding; and botanical and ecological values as significant (see Table 1-E, reprinted below from FEIS-June 2000)).

ICBMP Proposed Decision and FEIS

The ICBMP used broad-scale aquatic restoration priorities to identify the broad-scale restoration priorities of subbasin and to provide context for finer-scale restoration priorities and approaches. The Lower John Day Subbasin, which includes the river corridors for Segments 1, 2 and 3, received a High Priority for Broad-Scale Aquatic, Economic, and Biophysical Restoration. On a finer-scale, ICBMP identifies some A1 and A2 subwatersheds because of the urgency to secure habitats in the short term to support attainment of long-term broad-scale restoration objectives. One finer-scale watershed, an A2, was identified within the Wild and Scenic River corridor of Segments 1, 2, and 3. It is at the confluence of Bridge Creek and the John Day River at RM 135.

Table 1-E. Outstandingly Remarkable and Significant Values for Lower Mainstem John Day River

River Value	Congressional Values	Additional or Upgraded Values Identified by BLM
Scenery	Outstandingly Remarkable	
Recreational Opportunities	Outstandingly Remarkable	
Fish	Outstandingly Remarkable	
Wildlife		Outstandingly Remarkable
Geological	Significant	Outstandingly Remarkable
Paleontological	Significant	Outstandingly Remarkable
Archeological	Significant	Outstandingly Remarkable
Historical	Significant	Outstandingly Remarkable
Botanical		Significant
Ecological		Significant

However, none of the BLM-administered land in this A2 subwatershed is within the Federal Wild and Scenic River corridor (ICBMP Proposed Decision, pp. 96, 113,126).

Element #3 - Limiting Factors Analysis

Watershed Characteristics at the Landscape Scale

Geological Provinces of the Entire Basin

The John Day Basin (HUC #170702) has a complicated geologic history that defines the complex and diverse geologic character of the basin. These rocks include masses of oceanic crust, marine sediments, a wide variety of volcanic materials, ancient river and lake deposits, and recent river and landslide deposits. Distribution of the basin's major geologic units has largely been controlled by the structural evolution of the basin.

Lava flows and volcanic ash, sandstone, and shale deposits more than 250 million years old comprise the earliest rock formations in the John Day basin. More than 65 million years ago, during pre-Tertiary time, sediments and volcanic rocks of the oceanic crust were contorted, uplifted, and eroded. Roughly 54 to 37 million years ago, a series of widespread volcanic eruptions produced the lava, mudflows, and tuffs of the Clarno Formation. As this activity waned, new eruptions in the area of the present day Cascade Range began depositing thick layers of volcanic ash, which resulted in the John Day Formation. Extensive deposits of ancient mammals, leaves, and petrified woods have been preserved in volcanic ash within these formations. During a period approximately 19 to 12 million years ago, the region (along with much of northern Oregon, southern Washington and western Idaho) experienced volcanic eruptions that resulted in a series of flood basalts known collectively as the Columbia River Basalt Group. Much of the modern landscape of the basin is still highly influenced by these lava flows, which are more resistant to erosion than the older John Day and Clarno formations. Sometime after these basalt flows blanketed the region, fine-grained volcanic sediments of the Mascall Formation were deposited locally atop the basalts. At around 10 million years ago, the eruptions ceased and the processes of erosion and faulting continued to alter the landscape. The Rattlesnake Formation, a thick sequence of sand and gravel, was deposited in the ancestral John Day Valley. An east-west fault zone, which includes the John Day fault, probably controls the location of the John Day River upstream of Picture Gorge.

The John Day basin includes portions of two major physiographic provinces: the Deschutes-Columbia Plateau and the Blue Mountains. The Deschutes-Columbia Plateau Province is a broad upland plain formed by floods of molten basalt overlain with wind-deposited loess. In contrast, the Blue Mountains Province is a diverse assemblage of older sedimentary, volcanic, and metamorphic rock that was uplifted, tilted, and faulted to form rugged hills and mountains. These two physiographic provinces roughly divide the basin in half near Service Creek. The mountainous upper basin lies to the south and east, and the plateau-like lower basin is to the north and west. The Blue Mountain anticline, a broad up-arching of the earth's crust, forms part of the divide between the John Day basin and Columbia River tributaries to the north.

The Blue Mountains Province is one of Oregon's most physiographically diverse regions, containing mountains, rugged hills, plateaus cut by streams, alluvial basins, canyons, and valleys. The present day landscape and river morphology is highly influenced by landslides that develop when softer rock layers erode. The area downstream from Picture Gorge illustrates this characteristic. Many alluvial stream bottoms and adjacent bench-lands are suitable for irrigated agriculture. In contrast to the upper basin, the lower basin is a plateau of nearly level to rolling, loess-covered Columbia River basalt that is deeply dissected by the John Day River and its tributaries.

Basin Morphometric Variables

Drainage Pattern

Segments 1 and 2 exhibit a Trellis drainage pattern. This is common in geologic provinces with alternating bands of hard and soft strata, such as the lava flows and volcanic ash of the Deschutes-Columbia Plateau physiograhic province. In Segment 3, where the forested headwaters exhibit more dendritic drainage patterns, the geologic composition of the area is more uniform. Deep layers of Clarno formation ashes extend toward the headwaters upstream near Service Creek where the Picture Gorge Basalts replace the ash. As a consequence, the drainage pattern of the watershed alternates between trellis and dendritic patterns.

Elevation and Slope

In Segment 1, the river elevation rises from 270 feet to 520 feet above sea level, and the canyon walls rise to 1,600 feet above sea level. In Segment 2, the river elevation rises from 520 feet to 1,380 feet above sea level, and the canyon walls rise to 2,600 feet above sea level. Canyon slopes in this segment are extreme, often exceeding 70 percent. In Segment 3, the river drops from 1,640 feet above sea level to 1,380 feet above sea level, and the canyon walls rise to around 3,500 feet above sea level. The canyon wall slopes are similar to Segment 1 (35 to 70%), except for one section between RM 119 and RM 126, where the slopes can vary from 50 to 90 percent.

Average slope (obtained from initial and final elevation) varies among the segments. Segment 1 has an average slope of 0.16 percent. Segment 2 has an average slope of 0.23percent. Segment 3 is the flatted reach with an average slope of 0.10 percent.

Hydgrography

The Prineville District BLM is currently in the process of updating and completing the spatial and tabular hydrography information. This effort is part of a state-wide 'Hyd-Update' process. As accurate spatial information about watercourses is obtained, it is sent to the Pacific Northwest Regional Hydrography Framework Clearinghouse. The Clearinghouse spatial database project is an inter-agency effort to develop a common system, data model, and standards for referencing surface water bodies and watercourses. The Clearinghouse data model provides a common hydrographic foundation upon which individual agencies may build and maintain their own hydrologic and fisheries databases. When the 'Hyd-Update' process is complete, spatial morphometric variables such as drainage density, stream order, total stream miles, and flow duration and season will be available to supplement WQRP analysis.

Rainfall in Upper and Lower Elevation Areas

The climate in the John Day basin ranges from sub-humid in the upper basin to semi-arid in the lower basin. Mean annual temperature is 38°F in the upper basin, to 58°F in the lower basin. Throughout the basin, actual temperatures vary from sub-zero during winter months to over 100° F during the summer. Seventy percent of the precipitation falls between November and March. Only 5 percent of the annual precipitation occurs during July and August. The upper elevations receive up to 50 inches of precipitation annually, and 12 inches or less fall in the lower elevations. The average frost-free period is 50 days in the upper basin and 200 days in the lower basin.

According to the state climatologist, the Northwest experiences 20- to 25-year cycles between wetter than average years or mostly dry years. The dry years tend to be warm, and the wet years cool. The years from 1975 to 1994 were a very dry period; the entire state saw two significant droughts and 10 consecutive dry years.

Intensity, duration, and frequency of precipitation for Oregon are illustrated by isopluvials in NOAA Atlas 2 published in 1973. Segment 1 is the lowest segment of the river, and receives less rainfall than the upper two segments. For this lowest segment, a 24-hour storm that contributed 0.048 inches per hour or 1.15 total inches of rainfall would be considered a 2-year precipitation event. A 24-hour storm contributing 0.094 inches per hour for or 2.25 total inches of rainfall would be considered a 100-year precipitation event.

According to the Gillliam County Soil Survey, the average number of days with more than 0.1 inches of precipitation is 32 for Condon and 48 for Arlington. The heaviest 1-day rainfall on record was over 2 inches in Arlington on December 22, 1964.

The table below is based on visual estimates.

Dominant Land Vegetation Condition

Vegetation

Oosting (1956) discusses vegetation in terms of plant communities and how they are affected by landscape and climate, referring to classifiable plant communities as ecological sites. Ecological sites are grouped according to specific physical characteristics that differ from other kinds of land in the ability to produce a distinctive kind and amount of vegetation (such as potential vegetation). Potential vegetation is a function of soil, parent material, relief, climate, flow regime (for riparian communities), biota (animals), and time (time for the biotic community to approximate a dynamic equilibrium with soil and climate conditions) (USDA NRCS 1997). Ecological sites along the John Day River can be broadly categorized into four basic divisions according to the topographic position that they occupy: riparian, riverine terrace, upland, and forest-woodland.

Riparian Areas

The riparian zone is the area that normally receives some degree of inundation (or saturated soil conditions) during the growing season (for more information refer to U.S. Army Corps of Engineers 1987 and USDI-BLM 1993). In most of the John Day River, the majority of the riparian zone is flooded during part of the growing season and dry during mid to late summer. There are several riparian ecological sites that have distinct potential plant communities. Some of these sites have potential for dense riparian plant communities. In areas where the soils are not developed enough to moderate the annual wet-dry cycle, vegetation is either lacking completely or restricted above the normal high water line to plants such as service berry, hackberry, mock orange and

Table G-1. Total Inches Precipitation Received in 2-Year and 100-Year Events Over 6-Hour and 24-Hour Durations

Duration	2-year precipitation event (total inches)	100-yr. event (total inches)
6-Hours		
Segment 1	0.65	1.55
Segment 2	0.70	1.60
Segment 3	0.75	1.65
24-Hours		
Segment 1	1.2	2.3
Segment 2	1.25	2.65
Segment 3	1.5	2.8

Source: maps in the NOAA Atlas 2 (1973).

various annual and perennial grasses and forbs. The areas where soils are developed and well-drained have more shrubs that are traditionally considered riparian, such as willow and alder. Where water flow is slow or where saturated soil conditions last longer into the growing season, sedges and rushes occupy more of the plant composition.

The BLM currently uses several techniques for monitoring riparian conditions on the John Day River. One technique is the Proper Functioning Condition (PFC) ratings, which have been done by a BLM interdisciplinary team for most river segments (see PFC ratings in individual river segment descriptions later in the chapter). An inventory of willow communities along the river in Segments 2 and 3 was completed in 1981 and 1995 (USDI-BLM 1996a). Willow communities expanded from unmeasurable in 1981, to 15.56 river bank miles (35.84 acres) in 1995 (results by allotment are presented in Appendix L in the Record of Decision). Photopoint monitoring occurs at 51 randomly selected sites along river Segments 1, 2, 3, 10 and 11. Photos are taken at 1 to 5 year intervals. Results of this monitoring show variations depending on site potential and water flow, but overall, where riparian-oriented management has been implemented, vegetative structure, density and diversity have increased (results by allotment are summarized in Appendix L in the Record of Decision; examples are shown in Appendix M of the FEIS). In 1990, prior to implementation of most riparian-oriented management, an additional 329 photopoints were established at 1/4 mile intervals along public land portions of the river.

Riverine Terrace

Riverine terraces are formed from abandoned floodplains. When the John Day River channel eroded, the water table dropped and the floodplain soils drained. Due to lack of subsurface water, vegetation on the abandoned floodplain changed to more xeric plants, such as sage brush and annual grasses. Leopold and Vita-Finzi (1998) documented riverine terraces of similar ages throughout broad geographic areas and correlated them with climate cycles. Depositional periods were wet, or were periods of small rainfall events. Erosional periods were either dry or periods of large, infrequent storms. Two and, in many cases, three such deposition and erosion cycles are represented by remnant terraces in stream and river valleys throughout the semi-arid western United States. The latest erosional event (since about 1860) could have been intensified by land use activities that increased the susceptibility of the basin to erosion, disrupting the hydrological function of the watershed. The period of adjustment that follows channel downcutting includes widening and development of a new floodplain within the confines of the eroded channel.

The riverine terrace includes the primary terrace immediately adjacent to the river, as well as any secondary or tertiary terraces above. Depending on the subsurface water regime, the zone is more or less a transition between riparian and upland vegetation. The vegetation on these (typically) deeper soils is sagebrush, annual grasses, Great Basin wild rye, a mix of perennial bunchgrass and forb species, and western juniper.

Upland

The upland zone is often characterized by steep slopes with shallow soils on ridges, south and west-facing slopes, and deeper well-drained soils on the north and east-facing slopes. The upper layer of soil is sometimes bound by a biological soil crust consisting of algae, fungi, mosses and lichens. Plant communities may include scattered junipers and low shrubs, such as sagebrush and snakeweed, with an herbaceous layer of cheatgrass and cold season grasses including bluebunch wheatgrass and Idaho fescue.

Formal inventories of the upland vegetation were completed in 1974 (range surveys) and 1982 (ecological site inventories). The range surveys determined the amount of

harvestable forage, and the ecological site inventories determined the condition class of vegetation (see discussion below). The results of both inventories are presented by allotment in Appendix L in the Record of Decision. Monitoring includes photopoints and species composition measurements using such sampling techniques as line intercept, Daubenmire and nested frequency. There are 117 monitoring sites in pastures that are partially within the WSR boundaries. Results show variations, depending on site potential and climate; overall, where management has been applied, conditions have improved (results are summarized by allotment in Appendix L in the Record of Decision).

Forests and Woodland

Higher elevation sites have greater effective precipitation and cooler temperatures. These factors, combined with parent material, slope, and time can produce deeper soils which, in turn, may allow for the growth of larger trees. Half of the basin's uplands are forested. On the southerly aspects, there are ponderosa pine-mountain mahogany/elk sedge-Idaho fescue communities. Steep north-facing slopes support Douglas fir/elk sedge communities. Western juniper occur throughout these communities (USDI-BLM 1991c).

Ecological Condition and Trend

The condition of vegetative communities of the John Day River has been improving due to the efforts of private landowners and local, tribal, state, and federal agencies. Vegetative condition refers to the similarity of a site with an 'undisturbed' ideal. Vegetation condition and trend is a concept created out of succession concepts pioneered by Clements near the turn of the century and elaborated on by others (Smith 1989). The model predicted that all effects of abusive grazing or drought (changes in the vegetative community away from the undisturbed ideal, stable state or climax) could be reversed by reduced grazing or increased precipitation (Westoby et al. 1989). In spite of these concepts being challenged at first by plant ecologists, range managers have, until recently, ignored the controversy (Smith 1989). A second concept on plant succession, called 'multiple stable states' or 'state and transition' model, has recently gained acceptance (Quigley and Arbelbide 1997). This model recognizes that a site may be capable of supporting numerous stable vegetative communities. This new model recognizes relatively stable groups of species that change after a threshold of tolerance has been exceeded (Laycock 1991, Friedel 1991). The results of this change persist, in spite of removal of the forces which caused the change. For example, in a stable sagebrush-bunchgrass community where heavy livestock grazing has occurred for many years, the bunchgrass component may have been removed, thereby allowing sagebrush to occupy the vacated site (Laycock 1991). This produces a new stable state dominated by sagebrush. Although livestock may be completely removed, the community will remain in this new stable state.

To date, the 'state and transition' model is assumed to be the most accurate model for arid and semi-arid ecosystems. Where water is less limiting, the Clementsian model is thought to be the more accurate representation (Quigley and Arbelbide 1997). Inventory, monitoring and research techniques vary depending on the model assumed to be operable (Westoby et al. 1989). Data interpretation also varies widely, depending on the model used as the underlying concept of ecosystem processes. For example, in the past, climax was thought to be the most productive state and early seral the least productive. Recent studies have shown little or no correlation between production and seral state (Tiedeman et al.1991, Frost and Smith 1991). Climax was thought to provide the best wildlife habitat, but wildlife are more likely to respond to stand structure than to species composition (Smith 1989). The lower John Day basin range conditions and trends were inventoried in the late 1970s and early 1980s, at a time when the "state and transition" model was not a recognized model. The results of the inventory are presented in Appendix L of the Record of Decision by allotment. In interpreting the data,

it is important to remember that a "low seral" ecological status does not imply that there are necessarily opportunities for improvement to "mid seral" or "high seral" status through changes in grazing management alone (Friedel 1991).

Riparian areas are one example of where the Clementsian model is still thought to be operable (Quigley and Arbelbide 1997). The BLM technical reference 1737-7 (USDI-BLM 1992a) describes the procedure for inventorying riparian conditions. So far, in the John Day basin, seven different site types have been identified: basalt ledge/cliff, colluvium, cobble/gravel bar, terrace edge, non-riparian terrace, alluvial fan, and hill. Potential vegetation communities vary not only with each site type, but also with topographic position within a site type (that is, whether the plant community is covered by water at river flows of 15,000 cfs, 2000 cfs, or 200 cfs). For example, basalt cliffs do not produce the same vegetation communities as areas of alluvial fan. Similarly, sites with free water in August, but covered by 5 feet of water in April, support a different vegetative community than sites with free water in April and dry soils in August (see FEIS-June 2000, Appendix M, photos 11-14). The rates of successional change could vary within and between site types as well. With respect to river management, resource objectives and monitoring standards must take into account the differences in site potentials.

The increase in the amount of woody riparian vegetation along the river (see USDI-BLM 1996a, monitoring studies presented in Appendix L in the Record of Decision, and before and after photo sequences in Appendix M in the FEIS) indicate vegetation is increasing in density and diversity on sites with potential to support vegetative communities. The plant communities along the John Day River express a broad range of potentials, ranging from sagebrush flats to ponderosa pine forests, from basalt cliffs adorned with toe-holds of moss and monkey flowers, to riparian soils with willow and alder thickets. Some areas within the river floodplain have conditions that inhibit development of plant communities. Examples are gravel bars, which can wash away and reform several times a year, depending on flooding patterns; and ice flows that can shear off established woody plants at ground level. Where management has been implemented that meets the physiological needs of plants, vegetative communities are coming into balance with the potential of the site.

Noxious Weeds

'Noxious' is a legal classification rather than an ecological term. Plants that can exert substantial negative environmental or economic impact can be designated as noxious by various government agencies. The single greatest threat to the native rangeland biodiversity and recovery of less than healthy rangelands and watersheds is the rapidly expanding invasion of noxious weeds (Asher 1993). Both forestland and rangeland are being invaded by noxious weeds at an accelerated rate. Noxious weed encroachment reduces the potential of forest and rangeland to support grazing timber production, wildlife use, and viewing by displacing native plant species and reducing natural biological diversity; degrading soil integrity, nutrient cycling, and energy flow; and interfering with site-recovery that allow a site to recover following disturbance (Quigley and Arbelbide 1997).

The weeds of most concern in the John Day basin are diffuse, spotted and Russian knapweeds; Dalmatian toadflax; yellow starthistle; Scotch thistle; purple loosestrife; rush skeletonweed; leafy spurge; poison hemlock; and medusahead rye. Weeds of special concern are those beginning to occupy very small niches with just a few plants along the high water line, and small patches on islands (mainly diffuse knapweed and Dalmatian toadflax) that could spread very rapidly. Also, small infestations of Russian knapweed and dalmatian toadflax are becoming more prevalent on the upper, sheltered alluvial flats. This is especially noteworthy for riparian areas below the confluence of Thirtymile Canyon at RM 84. In the Clarno area, medusahead rye is prevalent in the burned areas

on the west side of the river, north and south of Highway 219. It is also prevalent in the Murderer's Creek drainage, a tributary of the South Fork of the John Day River. Diffuse knapweed is found along the road right-of-way, south of Clarno. Russian knapweed is prevalent in the Clarno and Bridge Creek areas, and has been found in numerous small patches on alluvial flats. Dalmatian toadflax has also been observed on these flats and up slope areas, particularly below Thirtymile Canyon. The thistles (Scotch, bull and Canada) and poison hemlock commonly occur at the small tributaries near and in riparian areas. Yellow starthistle has been found in several locations in the Clarno area and is especially prevalent in the upper Bridge Creek area near Mitchell. It is also prevalent around the Columbia River near Biggs and the Horn Butte ACEC, an area north and east of the John Day/Columbia River confluence. Leafy spurge is found in Grant County in the upper watersheds (Fox Valley and Cottonwood Creek) of the North Fork of the John Day. Four sites were found and treated in 1995, and 18 sites were found and treated between Monument and Spray in 1996. A very serious threat is noted in the recent increase of perennial pepperweed in the Bridge Creek drainage.

Federal and state laws require certain actions be directed at managing noxious weeds. In large part, the 'invasion of alien plants into natural areas' and the crowding 'out of native flora and fauna has been stealthy and silent, and thus, largely ignored' (Cheater 1992).

Fire

Modern fire suppression and recent fire management plans have greatly altered natural fire frequency and intensity. Fire has changed, and sometimes drastically, the species composition, vegetative diversity, and ecosystem structure of much of the Pacific Northwest (Norris 1990). Although varied across the landscape, the interval of natural fires ranged from 15 to 25 years in the John Day basin. For ponderosa pine forests east of the Cascade mountain range, the historic fire frequency has been documented to be as little as 5 years (Agee 1990, 1993). Many plants that occur in the John Day basin, such as ponderosa pine and numerous grasses, are adapted to fire and have thick bark, buds protected from heat-induced mortality, and fire-stimulated flowering or sprouting parts. Without periodic fire, these species will decline in number and condition. Species not adapted to a fire ecology, such as the western juniper and sagebrush, are also present in abundance, responding to the fire suppression management policy.

Flows

The John Day River basin drains nearly 8,100 square miles of an extensive interior plateau covering central and northeastern Oregon. Elevations range from about 265 feet at the confluence with the Columbia River to over 9,000 feet in the Strawberry Range. Land forms in the basin range from plateaus in the northwest to glaciated alpine peaks in the southeast. The basin includes portions of the Deschutes-Columbia Plateau and the Blue Mountains physiographic provinces.

Average annual discharge of the John Day River into the Columbia River is slightly more than 1.5 million acre-feet. Due to variations in yearly weather patterns, the total annual discharge has varied between 1 million and 2.25 million acre feet. As is typical of free flowing rivers in semi-arid environments, the annual range of flows for the John Day River is variable. At McDonald Ferry, the peak flow during the October through September water year typically is over 100 times greater than the lowest flow during the same water year. Peak flows can vary as much as 300-700 percent from year to year. The flow variations within the water year and from year to year can be illustrated by displaying flow levels over the most recent 10-year period for which data is available.

Large fluctuations in flow over the course of a year, and from year to year, are products of variable weather and the free-flowing condition of the John Day River. The bedload materials in the river channel now consist of large gravels, cobbles and boulders. During large flow events, the bedload is moved and deposited downstream, either as part of a new gravel bar or eventually as part of the sediments in the Columbia River. When the bedload is deposited in mid-channel, hydrologic forces are exerted against river banks, causing more lateral expansion, adding more sediment and gravel to the system, and decreasing water quality. Overall, the John Day River can be characterized as a system dominated by geologic and geomorphic processes that can, at times, introduce large amounts of sediment into the system. These sediments are typically deposited in downstream reaches of the basin or flow into the Columbia River system.

This process has some implications for many different aspects of the WSR outstandingly remarkable values. The widening of the channel has contributed to the heating of the water through exposure to air and sunlight and, therefore, resulted in elevated water temperatures. Channel widening has removed vegetation along the river banks and continues to reduce reestablishment where the widening processes are still active.

The North Fork John Day is listed by ODEQ as water quality limited for habitat modification and temperature. In this condition, the North Fork does not meet PACFISH pool frequency management objectives. Because the North Fork contributes 60 percent of the flow to the mainstem John Day, the influence of the North Fork on temperature and, therefore, fisheries is significant. Converse to the North Fork, the basin drainage area between Service Creek and McDonald Ferry gaging stations contributes only 13, 9, and 1 percent of the flow during July, August, and September, respectively, to the mainstem John Day. This exemplifies the limited influence that flows in the lower basin have on water quality and quantify.

Ground Water

During the summer months (approx. July to September), groundwater provides much of the base flow to the Lower John Day River. Although ODEQ has listed the lower river as water quality limited for temperature, other water quality constituents such as total phosphates, biochemical oxygen demand, and fecal coliform could also become limited during late summer when flows are the lowest and water temperatures are the greatest (Cude 2000).

Water Rights

Two types of water rights exist on the public lands: federal water rights, which consist of reserved water rights that originate under Federal law; and water rights, which are acquired pursuant to State water law.

All waters in Oregon are publicly owned, so users must obtain water rights from the Oregon Water Resources Department (OWRD) to use waters under ground, in a lake, or flowing in a stream. This principle of prior-appropriation is the foundation of water law in

Table G-2. Principal Aquifers in John Day River System

Aquifer	Square Miles	Rock Type
Columbia Plateau aquifer system	1679	Basalt and other volcanic-rock aquifers
No Principal Aquifer	930	N/A
Miocene basaltic-rock aquifers	238	Basalt and other volcanic-rock aquifers
Volcanic- and sedimentary-rock aquifers	162	Basalt and other volcanic-rock aquifers
Pacific Northwest basin-fill aquifers	132	Unconsolidated sand and gravel aquifers

(Source: USGS Principal Aquifers of the 48 Contiguous United States 1998)EPA web site