Jordan/Alder Watershed Assessment

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Acronyms

ACEC	Area of Critical Environmental Concern
BLM	Bureau of Land Management
cfs	cubic feet per second
dbh	diameter at breast height (4.5’ above ground level)
FPA	Forest Practices Act
HUC	hydrologic unit code
I-5	Interstate-5
IVMP	Interagency Vegetation Mapping Project
LASAR	Laboratory Analytical Storage and Retrieval
LWD	large woody debris
NOAA	National Oceanic and Atmospheric Administration
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OWRD	Oregon Water Resources Department
RMA	riparian management areas
RMP	Resource Management Plan
RV	recreational vehicle
TMDL	total maximum daily load
TSZ	transient snow zone
UGB	urban growth boundary
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1. Introduction

1.1 Purpose of Watershed Assessment

The purpose of this watershed assessment is to identify habitat restoration opportunities that will facilitate the return and sustainability of anadromous fish to Jordan and Alder creeks. This assessment identifies current habitat limitations and recommends corrective actions. The action recommendations are prioritized by potential benefit to salmonids in the Jordan/Alder Watershed.

1.2 Watershed Location, Size, and Major Features

The Jordan/Alder Watershed is a 2,459-acre watershed located in southwest Oregon immediately west of Canyonville in Douglas County. This watershed – a portion of the O'Shea Creek HUC6, or sixth-field watershed – lies within the bounds of the South Umpqua River HUC5, or fifth-field watershed.[1] Jordan Creek is a tributary to the South Umpqua River immediately downstream of the City of Canyonville, while Alder Creek is a tributary of Jordan Creek. The South Umpqua River bounds the watershed on the north. See Figure 1 for a general location and vicinity map of the watershed.

Interstate-5 (I-5) runs through the north end of the watershed, paralleling the South Umpqua River. The freeway and its right-of-way encompass 38 acres, or approximately 2% of the watershed. The Canyonville-Riddle Road (Douglas County Road #21) runs east to west through roughly the middle of the watershed.

The City of Canyonville, an incorporated city, occupies a portion of the center-east side of the watershed. Ten of the city's approximately 594 acres are within the bounds of the watershed; this acreage equates to approximately 2% of the city's land base.

Canyonville's urban growth boundary (UGB, or the area around the periphery of the city where future development is planned) extends into the north end of the watershed. The UGB occupies 235 acres, or 10%, of the watershed and includes nearly all the watershed northeast of I-5, a portion of the watershed southwest of I-5, and a portion of the watershed along its center-east side coincident with the city limits. The 235 acres of UGB within the Jordan/Alder Watershed equates to 23% of the 1,010 acres in Canyonville's UGB.

The Canyonville-Riddle Road divides the Jordan/Alder Watershed into two roughly-equal portions. Throughout this assessment, the Canyonville-Riddle Road will serve as the boundary dividing the watershed into two halves to be identified as the north half and the south half.

[1] "Watershed" can refer to drainage areas of a wide variety of sizes. A large watershed can be broken down into smaller watersheds. For example, the South Umpqua River fifth-field watershed is comprised of eight sixth-field watersheds. Watersheds at all levels are given a HUC, or hydrologic unit code, for identification and size classification purposes.

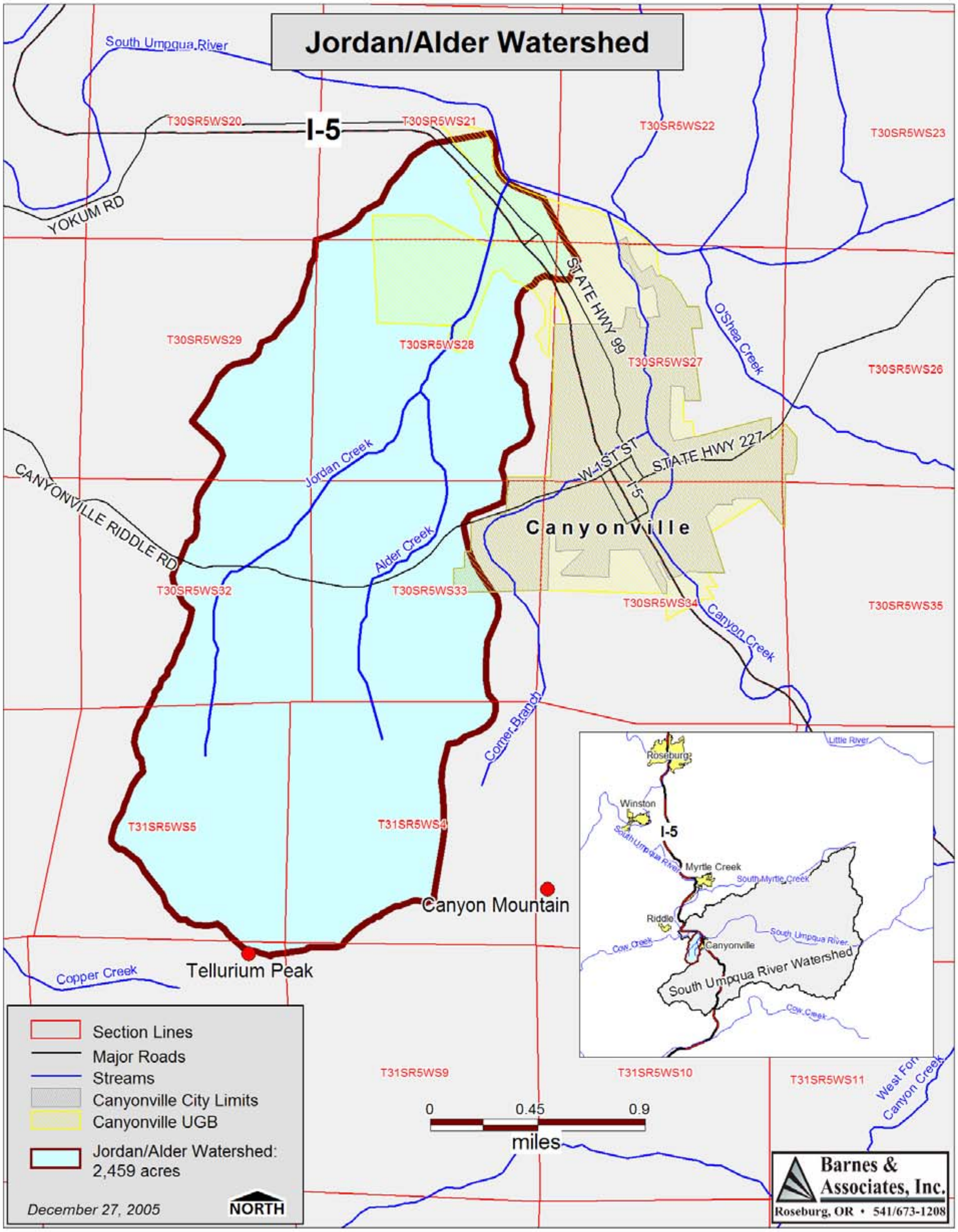

Figure 1. General location and vicinity map of the Jordan/Alder Watershed.

1.3 Topography and Climate

1.3.1 Topography

The Canyonville-Riddle Road splits the watershed into two roughly equal-sized, fairly distinct areas of topography. Topography tends to be steep to very steep in the south half, with a highly-dissected landform characterized by sharp ridges and deep draws. Most slopes in the south half exceed 35%, with some slopes approaching and a few exceeding 100%. Elevations at the top of the watershed rise as high as 3,495 feet at Tellurium Peak at the center-south end of the watershed.

Topography is more gentle in the north half of the watershed. There are moderate to steep hillsides within the north half, but also flat to nearly flat expanses as well. Most of the watershed downstream of the Jordan Creek/Alder Creek confluence is of very gentle topography, as are the narrow bands of land along each of the creeks upstream of their confluence. The minimum elevation is at the farthest downstream point of the watershed along the South Umpqua River. This point is at 667 feet. See Figure 2 for the U.S. Geological Survey (USGS) 7.5' topographic map of the watershed and Figure 3 for a slope class map of the watershed.

The transient snow zone (TSZ) in the Jordan/Alder Watershed includes all land above 2,000 feet in elevation. Within the TSZ, snow can be quickly melted away by warm, heavy rains. This zone – occupying 572 acres, or 23% of the watershed area – can be the source of heavy streamflows when snowmelt occurs, especially when the snow has a high moisture content, as is common with low-elevation snows. These events are often times called "rain-on-snow" events. Figure 4 displays elevation bands and the TSZ for the Jordan/Alder Watershed.

1.3.2 Geology

The Jordan/Alder Watershed is composed of sedimentary and volcanic rocks of the Klamath Mountains geologic province. Geologic provinces are areas of similar geomorphology. The Klamath Mountains Province lies in the southwest corner of Oregon and extends south into California as an elongated north-south lying province.

The Klamath Mountains are an ancient province, created by the collision of the oceanic crust underlying the Pacific Ocean into the North American continent during the late Triassic (248 to 206 million years ago) to the late Cretaceous (144 to 65 million years ago) period. The sedimentary rock on top of this crust, as well as volcanic islands, were scraped off the crust and deposited on the North American continent. The variety of deposited rocks, and the intense geological processes that placed them on the continent and transformed them after their deposition, created the highly complex geology of today's Klamath Mountains. This complexity of rock is exhibited throughout the South Umpqua River Watershed (Geyer 2003).

The diversity of rocks ("geologic units" as described by Walker and MacLeod 1991) and geological processes exhibited in the Jordan/Alder Watershed are displayed in Figure 5. The geologic units shown on the map are defined in Table 1. See Jackson (1997) for an explanation of terms within this table.

Table 1. Descriptions of Walker and MacLeod's geologic units in the Jordan/Alder Watershed.

Map Symbol	Geologic Period	Geologic Unit Description
Qal	Holocene	**Alluvial deposits**: Sand, gravel, and silt forming floodplains and filling channels of present streams. In places includes talus and slope wash. Locally includes soils containing abundant organic material, and thin peat beds.
KJm	Lower Cretaceous and Upper Jurassic	**Myrtle Group:** Conglomerate, sandstone, siltstone, and limestone. Locally fossiliferous.
KJg	Cretaceous and Jurassic	**Granitic rocks:** Mostly tonalite and quartz diorite but including lesser amounts of other granitoid rocks.
Jv	Jurassic	**Volcanic rocks:** Lava flows, flow breccia, and agglomerate consisting dominantly of plagioclase, pyroxene, and hornblende porphyritic and aphyric andesite. Includes flow rocks that range in composition from basalt to rhyolite as well as some interlayered tuff and tuffaceous sedimentary rocks. Commonly metamorphosed to greenschist facies; locally foliated, schistose or gneissic. Considered to be accreted island-arc terrane.

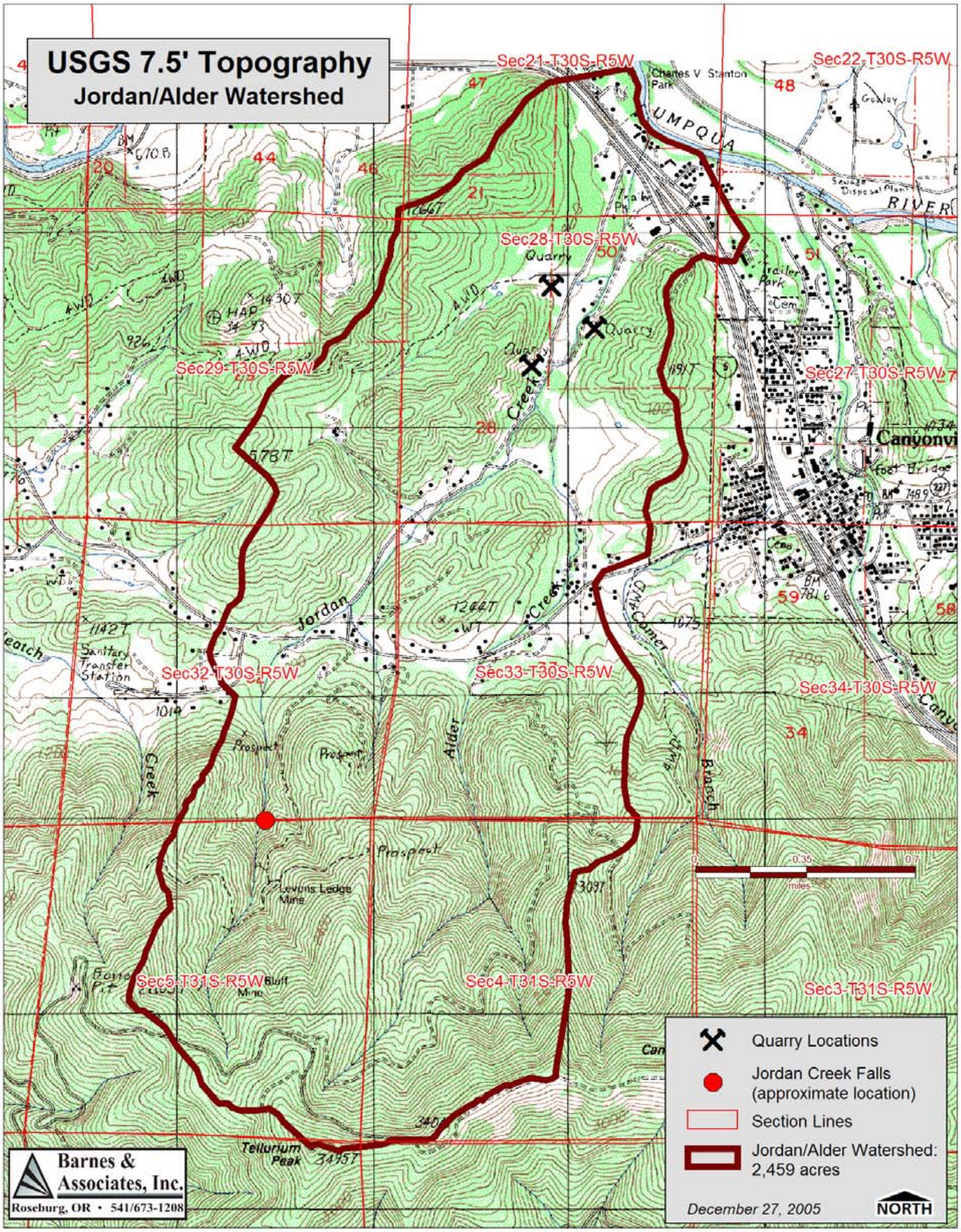

Figure 2. USGS 7.5' topographic map of the Jordan/Alder Watershed.

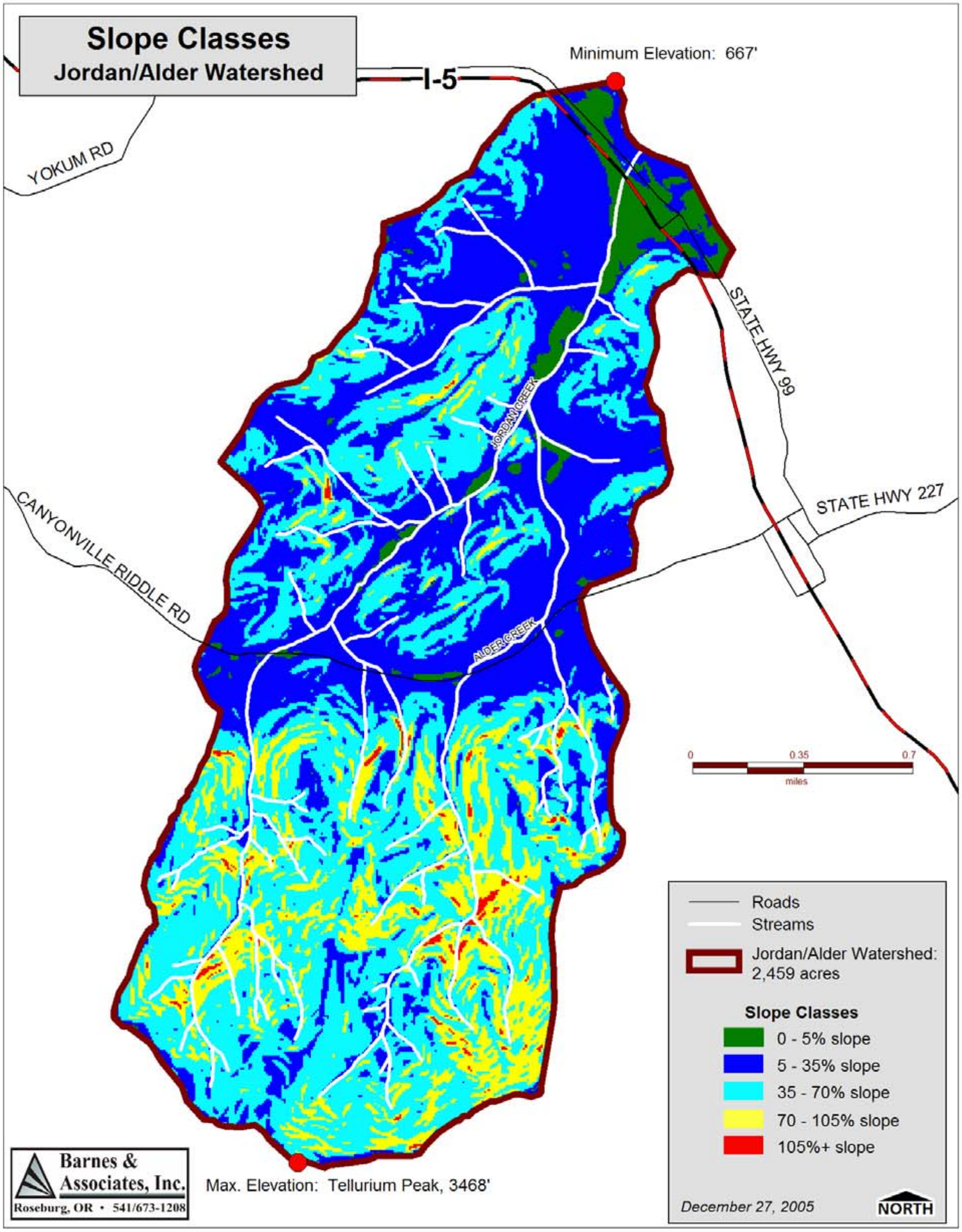

Figure 3. Slope classes map of the Jordan/Alder Watershed.

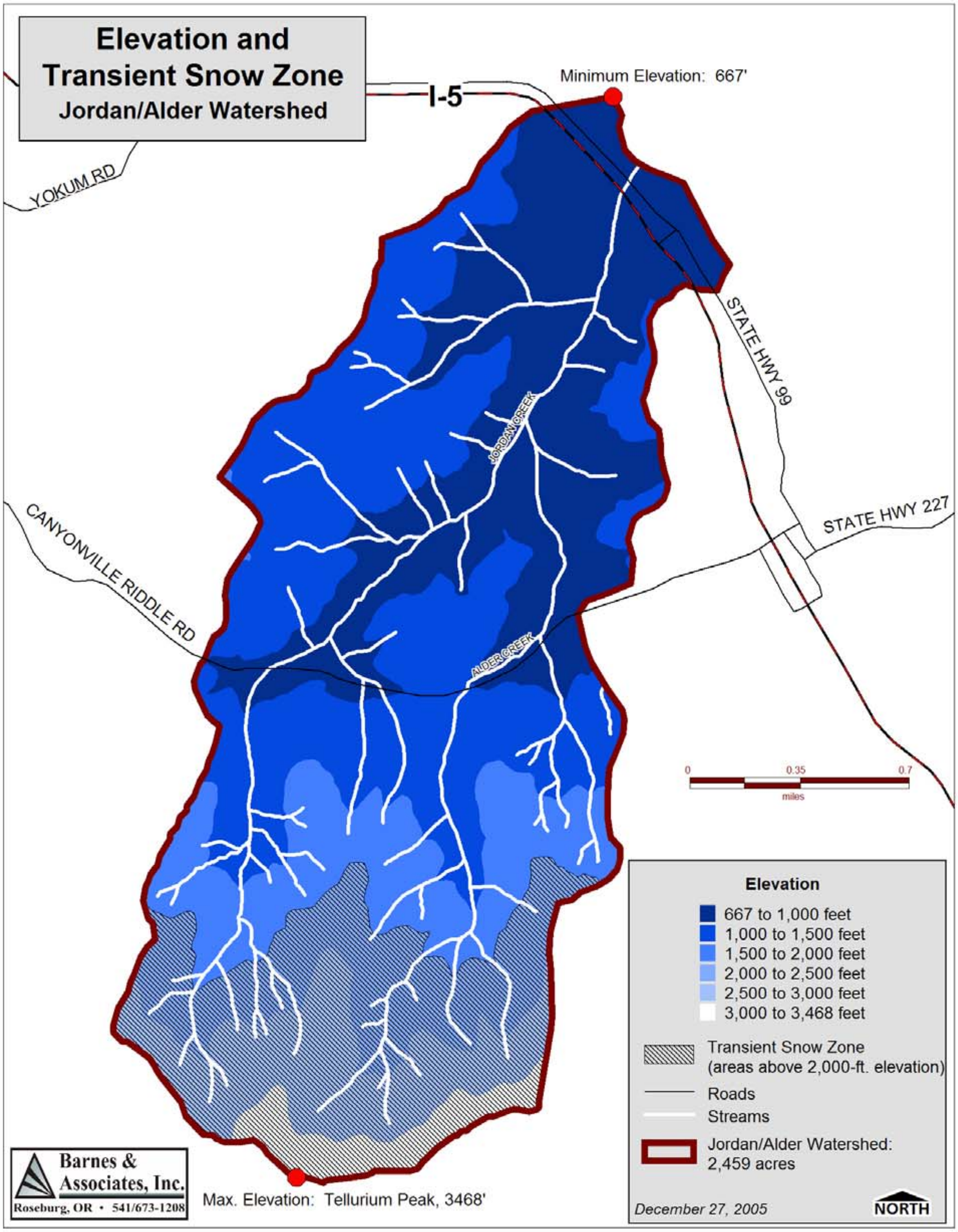

Figure 4. Elevation bands and transient snow zone map of the Jordan/Alder Watershed.

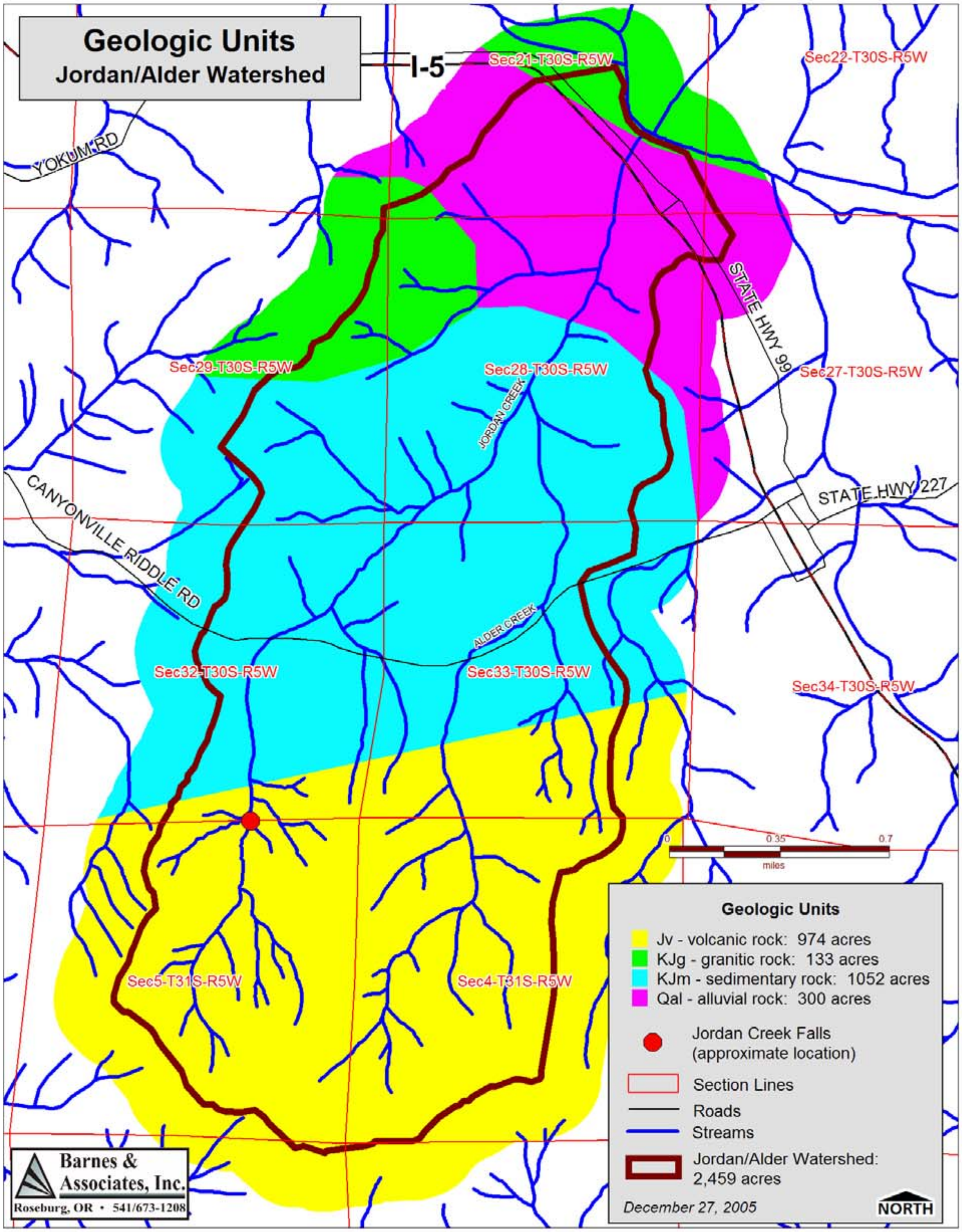

Figure 5. Geologic units map of the Jordan/Alder Watershed (per Walker and MacLeod 1991).

1.4 Climate

As with most of the Pacific Northwest, the climate of the Jordan/Alder Watershed is characterized by warm, dry summers and cool, wet winters. The summer dry season typically lasts from June through September, while the wettest months are from November through April.

Precipitation totals through the years are of interest because of their influence on water tables and streamflows in the watershed. Table 2 and Figure 6 display annual precipitation for Riddle, Oregon (reporting station name: Riddle 2 NNE, reporting station #: 357169), according to data available from the Oregon Climate Service (OCS 2005a). This reporting station is located immediately southeast of the town of Riddle as shown in Figure 7. Figure 7 displays iso-precipitation lines, or precipitation "contours," for the general area surrounding the Jordan/Alder Watershed (OCS 2005b).

The reporting period is for the years 1900 through 2004. The average annual precipitation for the town of Riddle across this reporting period is 30.67 inches. Data is missing or incomplete for the 24 years with precipitation reported as "ND."

In Figure 6 below, the lighter blue line represents the linear trend line of precipitation through the reported period, 1900 through 2004. Anecdotal reports from watershed residents suggest that precipitation in the watershed has decreased since the 1960s. Reduced precipitation in recent decades has been suggested as a reason for reduced streamflows. A strict interpretation of the trend line in Figure 6 indicates otherwise.

However, if a large proportion of the total precipitation for the recent high precipitation years of 1983 (47.89 inches), 1996 (53.29 inches), and 1998 (45.56 inches) came in a few heavy-rainfall events, much of that water may have run off quickly without providing long-term streamflow benefit. If that were true, the anecdotal reports of seemingly-reduced precipitation might have merit, as shown in the following calculations.

Average annual precipitation for various reporting periods reveals the following results:

- 1950 through 1975: 32.78 inches
- 1976 through 2004: 30.92 inches
- 1976 through 2004, excluding years 1983, 1996, and 1998: 28.35 inches

Topography plays an important role in precipitation levels. Rainfall tends to increase with increasing elevation, as moisture-laden air is lifted up by the topography and forced to dump its moisture in the form of rain and/or snow. The precipitation contours in Figure 7 suggest that average precipitation in the watershed's upper elevations exceeds 40 inches per year.[2]

[2] "Upper" refers to the higher elevation portions of the watershed. "Upper elevations" includes those areas of the watershed at and near 3,468-foot high Tellurium Peak, the highest elevation point in the watershed.

Table 2. Annual precipitation for the Riddle, Oregon reporting station #357169 (OCS 2005a).

Year	Precipitation	Year	Precipitation	Year	Precipitation
1900	25.50	1936	ND	1972	28.67
1901	31.06	1937	ND	1973	36.85
1902	36.61	1938	34.49	1974	36.67
1903	ND	1939	27.27	1975	34.17
1904	ND	1940	39.27	1976	17.30
1905	ND	1941	33.07	1977	27.74
1906	ND	1942	ND	1978	23.19
1907	ND	1943	28.77	1979	33.17
1908	ND	1944	ND	1980	ND
1909	ND	1945	ND	1981	ND
1910	ND	1946	ND	1982	35.45
1911	ND	1947	29.58	1983	47.89
1912	ND	1948	36.28	1984	37.71
1913	ND	1949	21.15	1985	20.45
1914	28.91	1950	ND	1986	33.84
1915	26.53	1951	35.02	1987	26.89
1916	30.57	1952	25.69	1988	25.79
1917	23.83	1953	37.96	1989	ND
1918	23.01	1954	32.06	1990	ND
1919	36.92	1955	38.07	1991	25.09
1920	27.48	1956	34.82	1992	28.13
1921	25.16	1957	35.00	1993	ND
1922	29.92	1958	35.87	1994	22.86
1923	22.88	1959	25.36	1995	38.18
1924	28.31	1960	32.07	1996	53.29
1925	30.08	1961	34.48	1997	31.75
1926	32.10	1962	ND	1998	45.56
1927	32.88	1963	29.95	1999	30.15
1928	25.71	1964	39.06	2000	28.45
1929	27.52	1965	28.28	2001	24.51
1930	23.00	1966	29.46	2002	29.72
1931	31.92	1967	22.53	2003	29.09
1932	28.52	1968	32.75	2004	25.88
1933	23.31	1969	31.40	average	30.67
1934	29.60	1970	31.20		
1935	24.60	1971	39.34		

ND = no data or incomplete data

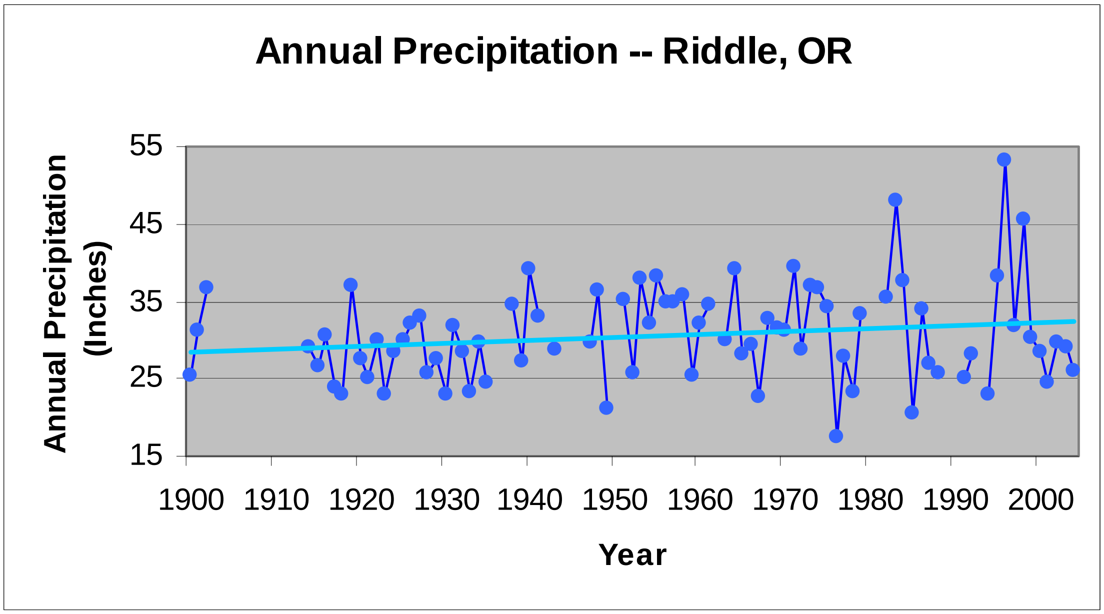

Figure 6. Annual precipitation and precipitation trend (light blue line) for the Riddle, Oregon reporting station #357169 (OCS 2005a).

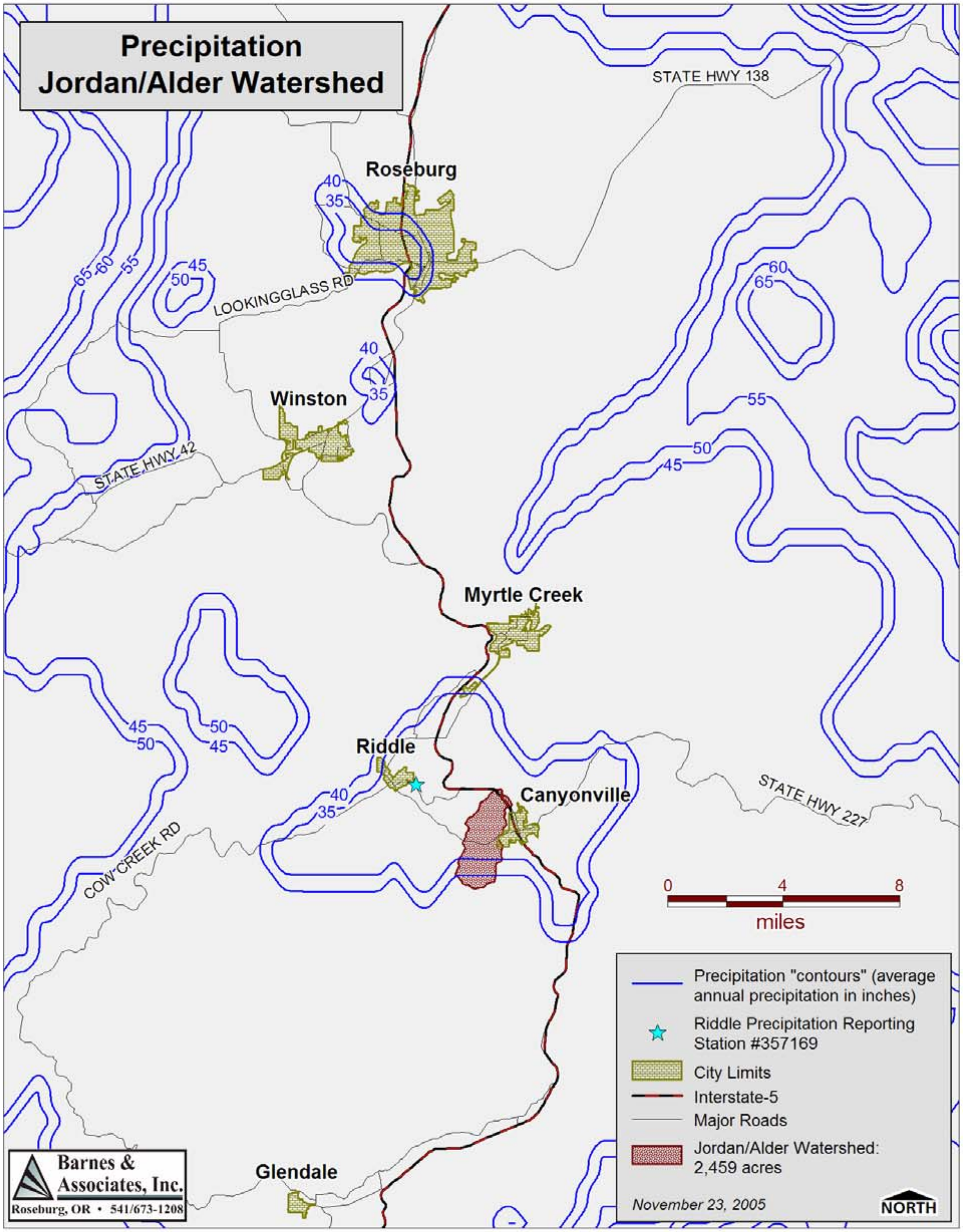

Figure 7. Average annual precipitation for the Jordan/Alder Watershed and surrounding area.

1.5 Land Ownership and Use

1.5.1 Land Ownership

Ownership of land within the Jordan/Alder Watershed is dominated by private non-industrial owners with 39% of the watershed area, followed by private forest industry at 24%, Cow Creek Band of Umpqua Tribe of Indians (hereinafter referred to as “the Tribe” or “Tribal”) with 22%, federal ownership (all managed by the Bureau of Land Management, or BLM) at 12%, Oregon Department of Transportation (ODOT) at 2%, and Douglas County/other public with 1%. See Figure 8 for a map of land ownership in the watershed.

Forest industry ownership is confined to the south half of the watershed. Tribal ownership is located strictly in the north half of the watershed. BLM ownership includes scattered uplands parcels in the upper reaches of the south half of the watershed, with an additional parcel in the north half.

Private non-industrial ownership is located throughout the entire watershed, with the exception of the very upper reaches of the south half of the watershed. This ownership component is the most diverse of all ownerships groups in the watershed, with many small tax lots located along Jordan and Alder creeks and the Canyonville-Riddle Road as well as larger, pure forest tax lots in the upper watershed.

1.5.2 Land Use

Figure 9 shows a breakdown of the Jordan/Alder Watershed by land use. Land use for forestry purposes makes up the largest share of the watershed at 70% of the watershed’s 2,459 acres. Other land uses include commercial (13%), agriculture (10%), and residential (7%).

Nearly all of the south portion and approximately half of the north portion of the watershed are occupied by forestry use. Included in this “forestry” designation is Douglas County’s Stanton Park, located on the north end of the watershed between I-5 and the South Umpqua River.

Riparian areas on forestry lands are protected by the Oregon Forest Practices Act. Protected zones called riparian management areas (RMAs), are required on all fish-bearing and domestic-use streams, as well as larger non-fish bearing streams. These RMAs vary in width from 50 to 100 feet (slope distance on each side of the stream), dictated by the presence or absence of fish and the size classification of the particular stream. Riparian areas on other land uses may be protected as well, especially where commercial timber harvesting and other forest practices occur.

Commercial use occupies 13% of the land base of the watershed. Owned primarily by the Tribe, this land includes most of the watershed between I-5 and the South Umpqua River, as well as a large block immediately south of I-5 on both sides of Jordan Creek. The large block south of I-5 includes the Tribe’s Creekside RV (recreational vehicle) Park, scheduled for completion in May 2006.

The 10% of the watershed used for agricultural purposes is primarily grazing pasture. Though assessed as agricultural ground and mapped accordingly in Figure 9, the northernmost and westernmost "agricultural" blocks appear to be in a forested condition, rather than agricultural.

Residential use makes up 7% of the watershed. These residential tax lots are located primarily along Alder and Jordan creeks. Some of the riparian area along the residential portions of Jordan and Alder creeks has been reduced in diversity through the years by mowing and other yard manicuring. In many places, non-native Himalayan blackberries (See Section 1.6 for further discussion of this and other noxious weeds in the watershed.) are the primary vegetation along the streams. Any historical in-stream structural diversity is now largely absent, partly a result of residential landscaping. In many cases, it appears that channel sinuosity has been reduced through the years, perhaps as a way to make more usable land either through improved drainage or land recapture.

Most of the watershed's sewer needs are served by individual septic systems. The integrity and function of these systems is unknown.

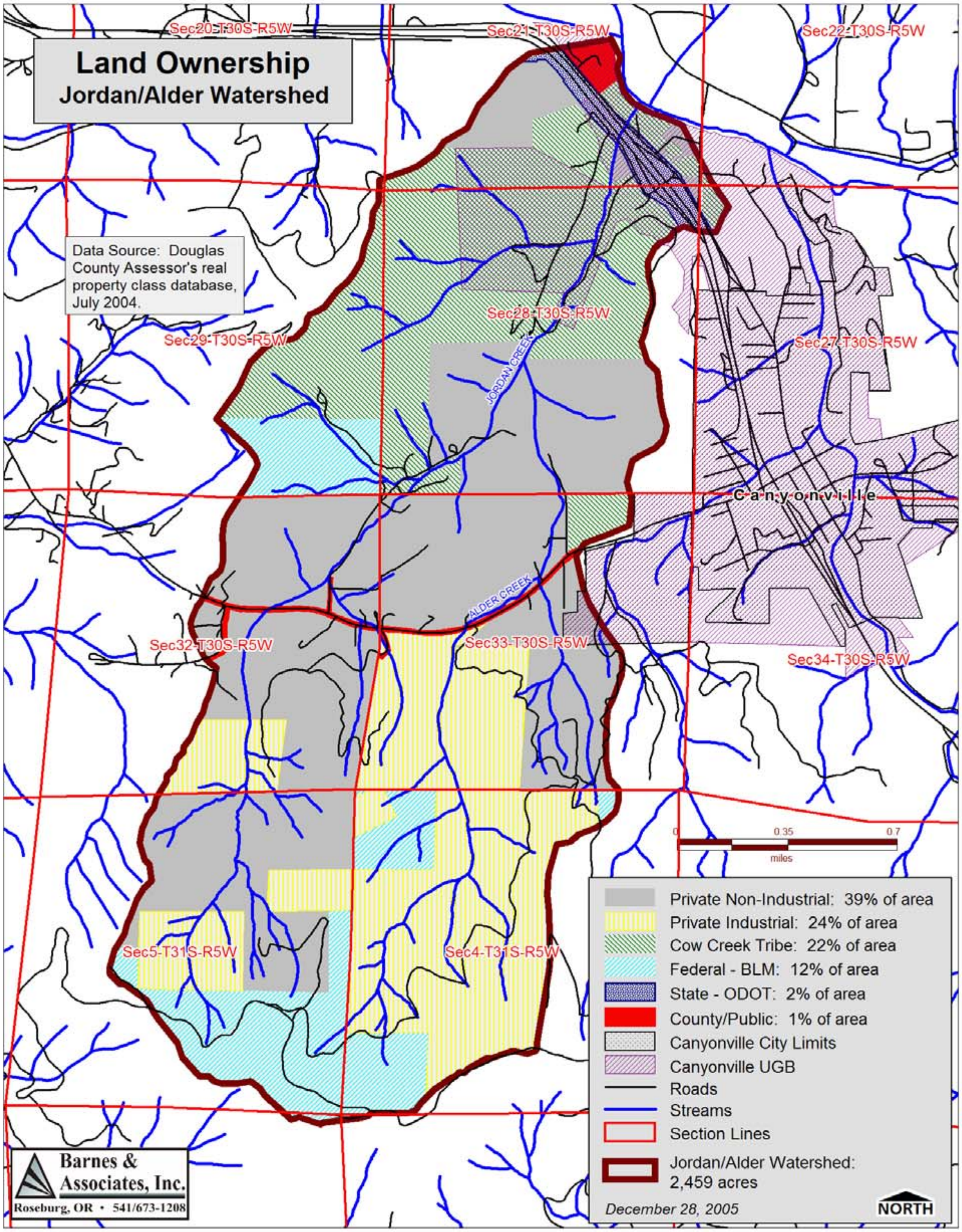

Figure 8. Land ownership in the Jordan/Alder Watershed.

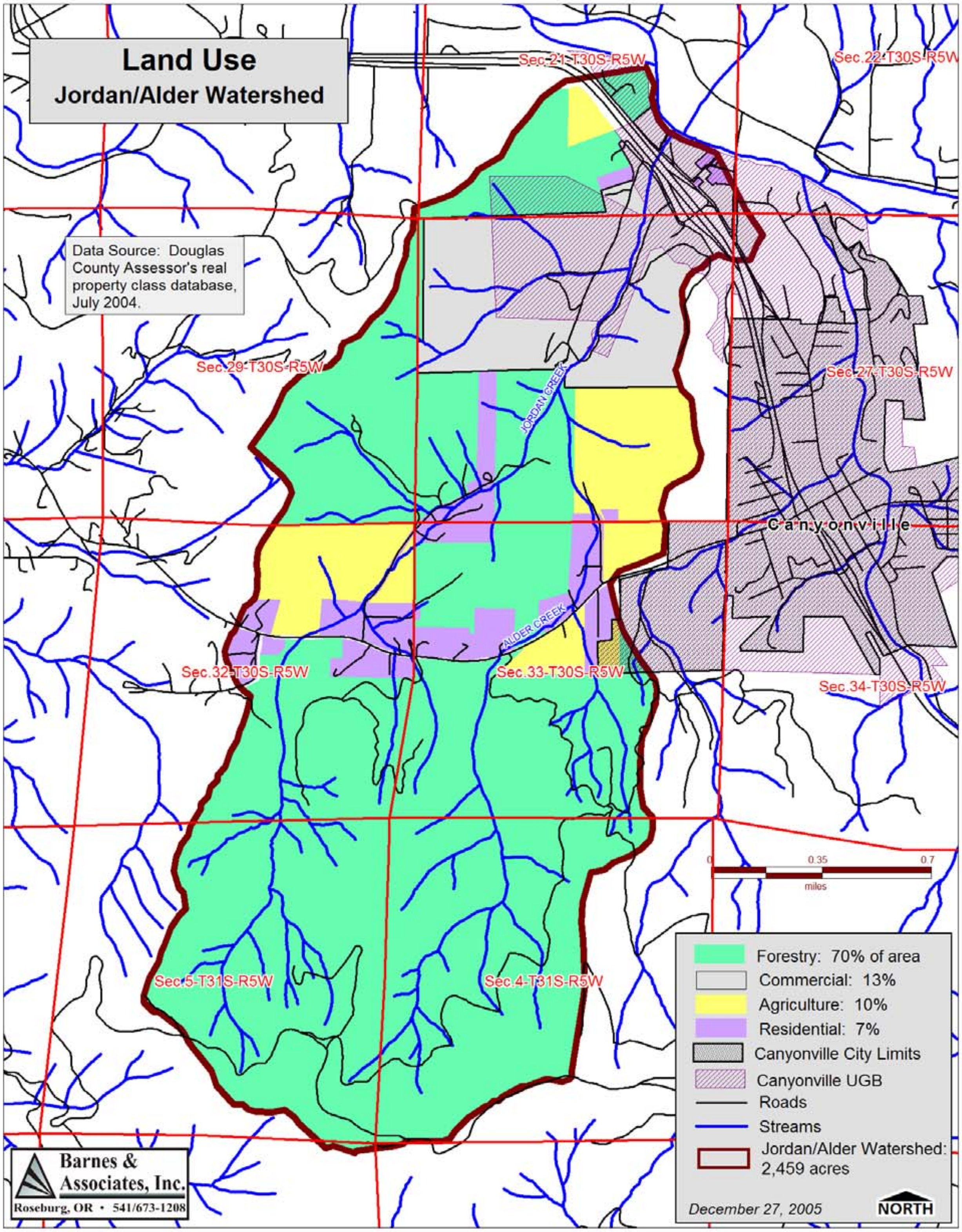

Figure 9. Land use in the Jordan/Alder Watershed.

1.6 Vegetation

Southwest Oregon's climate pattern and topography influence the vegetation in the watershed. Dry summers favor tree and shrub species that can tolerate summer drought. This influence expresses itself in the Douglas-fir, ponderosa pine, incense cedar, Pacific madrone, and oaks that dominate the watershed.

As with topography, vegetation in the watershed is split on the Canyonville-Riddle Road into two different classes. Conifer stands – primarily Douglas-fir – dominate the forest environment in the south half of the watershed, while mixed conifers and hardwoods prevail in the north half.

In the north half of the watershed, elevations are predominantly below 1,200 feet, with a wide variety of slopes and aspects. Further, rainfall in the north half is lower (see Figure 7), while summer temperatures are higher than in the south half. These and other factors contribute to a diverse mix of hardwoods and mixed conifer stands occupying most forest sites. Other factors include:

- Wider array of growing conditions, including many hot, dry, south-facing slopes dominated by madrones and oaks.
- Broken nature of the ownership, with generally smaller tax lots than in the south half of the watershed. A greater diversity of owners leads to a wider array of land management practices, all of which impact vegetation in different ways.
- Greater diversity of land uses in the north half of the watershed. The mix of commercial, agricultural, and residential uses found in the north half is largely absent from the south half. Forestry use is common in the north half, but isn't the dominant use as it is in the south half. See Figure 9 on land use for further details.
- Greater accessibility, allowing for more frequent timber harvest entries, and land management activities in general.
- Easier operability, allowing for less expensive ground-based harvest methods and the more frequent harvest entries sometimes associated with more easily operable ground.

In the south half of the watershed, the land has a distinct northern exposure with elevations above 1,000 feet elevation and most slopes exceeding 35%. These are less droughty conditions and good for the Douglas-fir that dominates the site. The occurrence of western hemlock in the south half of the watershed increases with increasing elevation in the watershed. Less common species growing in the south half include grand fir, Pacific yew, incense cedar, and Pacific madrone.

The composition, age, and extent of vegetation in the watershed have also been influenced by the land ownership patterns in the watershed. As can be seen in Figure 8 for land ownership, much of the south half of the watershed is owned by private forest industry companies and the federal Bureau of Land Management (BLM). All of the BLM lands in the watershed are designated as "matrix" lands.[3]

Private forest industry typically manages for conifer production at varying levels of intensity and rotation ages, depending on the specific company and site productivity. While the management objectives of the BLM are more diverse today, the objective at the time the younger BLM stands in the watershed were established was one of emphasis on conifer production. Timber ages in the watershed are varied, from stands established within the last five years to those over 200 years old. The older stands in the watershed are located predominantly on BLM lands. Growing conditions and ownership patterns have resulted in most of the forest vegetation in the south half of the watershed being predominantly a Douglas-fir forest type.

Figure 10 displays vegetation classes according to the Interagency Vegetation Mapping Project (IVMP) data produced by the BLM and U.S. Forest Service (USFS). This data was derived from satellite imagery from 1996. Table 3 displays acreage and percentage for each of the vegetation classes within the Jordan/Alder Watershed.

Table 3 shows that the hardwoods/mixed class occupies the largest area of the watershed at 35%. Mid seral forest is the second largest class at 25%, followed by late seral at 19% and early seral at 13%.[4] Excluding the water class at less than 1%, the smallest class in the watershed is agriculture at 3%. Differences between the data in Table 3 and Figure 10 and that in Figure 9 relates to the methods of compiling the data. Data in Table 3 and Figure 10 are derived from satellite imagery, while data in Figure 9 is based on assessment records from the Douglas County Assessor.

[3] The term "matrix" is defined as those areas of BLM and U.S. Forest Service lands that are managed primarily, but not exclusively, for timber production. The objective of matrix lands is to provide a steady supply of timber that can be sustained over the long-term without degrading the health of the forest or other environmental resources. There are a variety of standards and guidelines, protection measures, and environmental requirements in place for the management of these lands.

[4] Seral stages refer to forest structural and compositional components that are associated with forest succession. The early seral stage is the youngest stage and includes trees with dbh (diameter at breast height, or 4.5' above ground level) less than 8". Late seral is the oldest stage and includes trees with 25" and larger diameters. Late seral classes include mature and old growth forests. Mid seral stage is in between early and late seral in size.

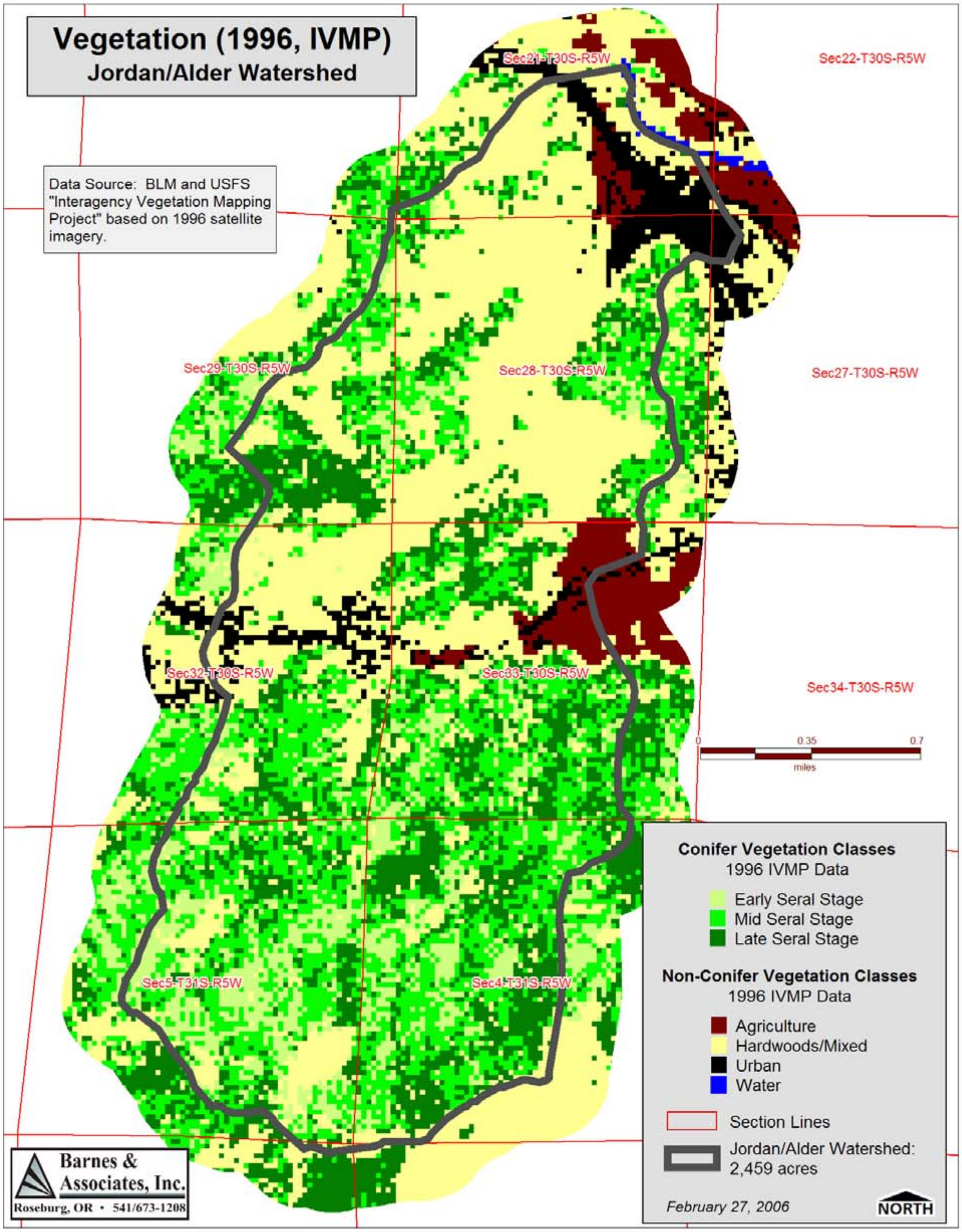

Figure 10. Vegetation classes within the Jordan/Alder Watershed based on 1996 satellite imagery.

Table 3. Vegetation class breakdown for the Jordan/Alder Watershed.

Vegetation Class	Acres	Percent
Hardwoods / Mixed Conifer & Hardwood / Barren	873	35%
Conifer mid seral	623	25%
Conifer late seral	474	19%
Conifer early seral	312	13%
Urban	113	5%
Agriculture	63	3%
Water	1	<1%
Total	2,459	100%

There are at least three noxious weeds in the Jordan/Alder Watershed. These weeds are French broom (*Genista monspessulana*), Himalayan blackberry (*Rubus discolor*), and Scotch broom (*Cytisus scoparius*). All three of these species are on the Oregon Department of Agriculture's (ODA) Noxious Weed "B" list.[5] None of the three are on ODA's "T" list of species especially targeted for control efforts. The Douglas Soil and Water Conservation District has undertaken efforts to control noxious weeds in the watershed.

[5] "Noxious weed" means any plant designated by the Oregon State Weed Board as injurious to public health, agriculture, recreation, wildlife, or any public or private property. A weed assigned the "B" designation by the Oregon State Weed Board is of economic importance and regionally abundant, but which may have limited distribution in some counties. An "A" designated weed is one of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states makes future occurrence in Oregon seem imminent. A weed on the "T" list will be the target for prevention and control by the state's Noxious Weed Control Program. "T" list weeds – pulled from both the "A" and "B" lists – are considered to be an economic threat to the state of Oregon.

2. Past Conditions

This section describes historical events that have shaped the aquatic and forested environments of the Jordan/Alder Watershed. See Figure 11 for a 1953 aerial photo of the Jordan/Alder Watershed. For a broader view of the area's history, including that of the South Umpqua River Watershed and Douglas County in general, see the South Umpqua River Watershed Assessment and Action Plan (Geyer 2003).

In many ways, the history of the Jordan/Alder Watershed mirrors that of the larger-scale South Umpqua River Watershed. Both were strongly influenced by mining, development of the transportation network, and the timber and agriculture industries made possible by the area's productive growing conditions.

The region's natural resources were a major attraction to the Euro-American settlers drawn to the area after the Lewis and Clark Expedition in 1804 to 1806. In the 1820s through 1840s, Hudson's Bay Company fur trappers and other explorers penetrated the interior of southwestern Oregon. Trappers were instructed to "trap out" beaver in the remote streams of southwest Oregon. The Donation Land Claim Act passed in 1850 and the "gold rush" moved into southern Oregon, attracting more settlers to the area.[6]

2.1 Transportation

An important factor in the eventual settlement and development of the Jordan/Alder Watershed was the area's location along a major south-to-north travel route. In 1837, Ewing Young and his entourage led the first cattle drive through Cow Creek on their way to the Willamette Valley from California with 700 head of cattle. Later, in 1846, Lindsay Applegate along with others began development of a new emigrant trail through Canyon Creek into the Willamette Valley. The "Applegate Trail" became a southern alternative to the final leg of the Oregon Trail, developed to avoid the travel obstacles through the primary route across northern Oregon. After its opening, Oregonians used the Applegate Trail to travel back and forth to California's gold fields.

Portions of the original Applegate Trail eventually became the route of the trans-state Highway 99. Construction on this precursor to I-5 started in the 1910s (some time in the 1912 to 1915 period), with paving of the highway completed in the Canyonville area in 1922 (A plaque on the south end of the Highway 99 bridge over Canyon Creek in Canyonville is stamped "1921.").
Construction of I-5 was completed north of Canyonville by around 1958, while the segment over Canyon Creek Pass to the south of Canyonville was completed in 1962.

[6] The Donation Land Claim Act of 1850 was an historic law passed by the Congress of the United States to promote homestead settlement in the Oregon Territory (comprising the present-day states of Oregon, Washington, and Idaho). The law, considered a forerunner of the later Homestead Act, brought thousands of settlers into the new territory by offering settlers up to 640 acres of land in exchange for living on and cultivating the land for four years. A total of 7,437 patents were issued under the law until its expiration on December 1, 1855.

I-5 and its predecessor routes were noteworthy in the development of the Jordan/Alder Watershed. That importance continues today. Not only does this freeway and its right-of-way occupy roughly 2% of the watershed area (approximately 52 of the watershed's 2,459 acres), but it has led to much of the major development in the watershed. The current Seven Feathers Truck and Travel Center in the north end of the watershed began as 3-Js Truck Stop in the early 1960s. It later became Fat Harvey's sometime in the 1970s before its current existence as Seven Feathers in 1998. Interestingly, the truck stop site served as a rodeo grounds in the 1950s.

The Canyonville-Riddle Road was built in its current location in 1919. This road, cutting west to east through the heart of the watershed, previously followed Alder Creek downstream from the current county road crossing of Alder Creek rather than continuing directly east to Canyonville.

2.2 Mining

Mining played an important role in the early development of the Jordan/Alder Watershed. It appears that today's Jordan Creek runs along the course of an ancient river channel. Nearly all the past and present mining in the watershed took place along Jordan Creek in the ancient river channel or in volcanic rock in the "hard rock" mines in the upper watershed.

The first significant mining in the watershed began in the late 1800s at the Gold Bluff and Levens Ledge mines in the upper Jordan Creek Watershed. The locations of these "hard rock" gold and silver mines are shown in Figures 2 and 11. Besides the mines themselves, there were several "prospects" throughout the Jordan Creek Watershed where the search for gold took place. It is believed that the majority of the mining operations at Gold Bluff and Levens Ledge mines ceased in around 1900.

The quest for gold took place downstream in Jordan Creek proper sometime in the early 1900s after the bulk of the "hard rock" mining in the upper watershed came to an end. Mining was conducted by both floating dredge and hydraulic (pressurized water) methods. A floating dredge was known to have been used on Jordan Creek immediately south of the current Canyonville-Riddle Road. Hydraulic mining took place lower down on Jordan Creek. The Bollenbaugh family, one of the earliest Euro-American families in the area, was involved in much of the mining on Jordan Creek.

Mine tailings – residue from either floating dredge or hydraulic mining operations – are still evident today along Jordan Creek from the Canyonville-Riddle Road south to Jordan Creek Falls (The location of the falls is shown in Figures 2, 5, and 11.). In fact, Jordan Creek flows through old mine tailings along much of this stretch of the creek, occasionally flowing sub-surface through the coarse tailings rock. Many of the tailings piles are grown up with trees and other vegetation and are not apparent upon first observation. Figure 12 shows an example of one of the more noticeable piles of mine tailings.

It is believed that parts of Jordan Creek were moved by Chinese laborers in the late 1800s. The strategy was to build a new channel for the stream to allow unencumbered mining in the original channel. There is on-the-ground evidence of this work in Tax Lot 1100, Section 28, T30S, R5W, about halfway down the Rod & Gun Club Road from the Canyonville-Riddle Road. Figure 36 is an image of the historical and current channels.

Anecdotal evidence suggests there was little early-day mining on Alder Creek. Nonetheless, this creek did not escape the impacts of mining, as water from Alder Creek was diverted to Jordan Creek for mining purposes, possibly as a water source for hydraulic mining. Remnants of the water-carrying ditch can still be seen along the Canyonville-Riddle Road.

It is believed that most of the commercial mining operations in the watershed were finished by the time the Canyonville-Riddle Road was built in its present location in 1919. Since then, there has been “hobby” mining on Alder Creek and, likely, throughout the watershed.

2.3 Timber Harvest

Timber harvesting, construction of access roads, and rock quarries were major influences on the landscape of the South Umpqua Watershed, and that of the Jordan/Alder Watershed, through the 1950s and 1960s. Much of the private land in the upper watershed was harvested during this time frame.

There have been at least two sawmills in the watershed through the years. The first mill known to have operated in the watershed was located just south of the Canyonville-Riddle Road near the crest of the hill between Jordan and Alder creeks. According to Larry Moulton (Moulton 2002), this sawmill was moved from Riddle before 1900 by John Dunbar and Bert Ross and ran through 1908, operated as Cooper Lumber Company from 1941 through 1944, then purchased by and operated as Canyonville Lumber Company in 1944. It is believed that this mill burned down in the late 1940s. Cooper’s Mill utilized a pond for log storage. This pond fed water into Alder Creek, thus helping to maintain streamflow throughout the year.

The second mill known to have operated in the watershed was Jefferies Lumber Company, located immediately north of the 3-Js Truck Stop. This mill, operated by Jim Jefferies and sons Lyle and Michael (same owners as 3-Js Truck Stop), produced chips, studs, and cedar fencing. It is not known how long this mill operated after its establishment in 1969 or 1970.

It appears that timber harvest in the watershed has been minimal in the recent past. Much of the conifer forest in the south half of the watershed is “mid-rotation” between the aforementioned 1950s through 1980s harvests and a future harvest of unknown date when the trees are mature.

Figure 2 shows the locations of three rock quarries in the north half of the watershed. Rock from these quarries may have been used in the construction of I-5 and other development projects throughout the watershed and elsewhere. The southernmost of these three quarries has been used in the development of the Creekside RV Park. The other two quarries are within the RV park development and were inactive for an unknown number of years prior to this development.

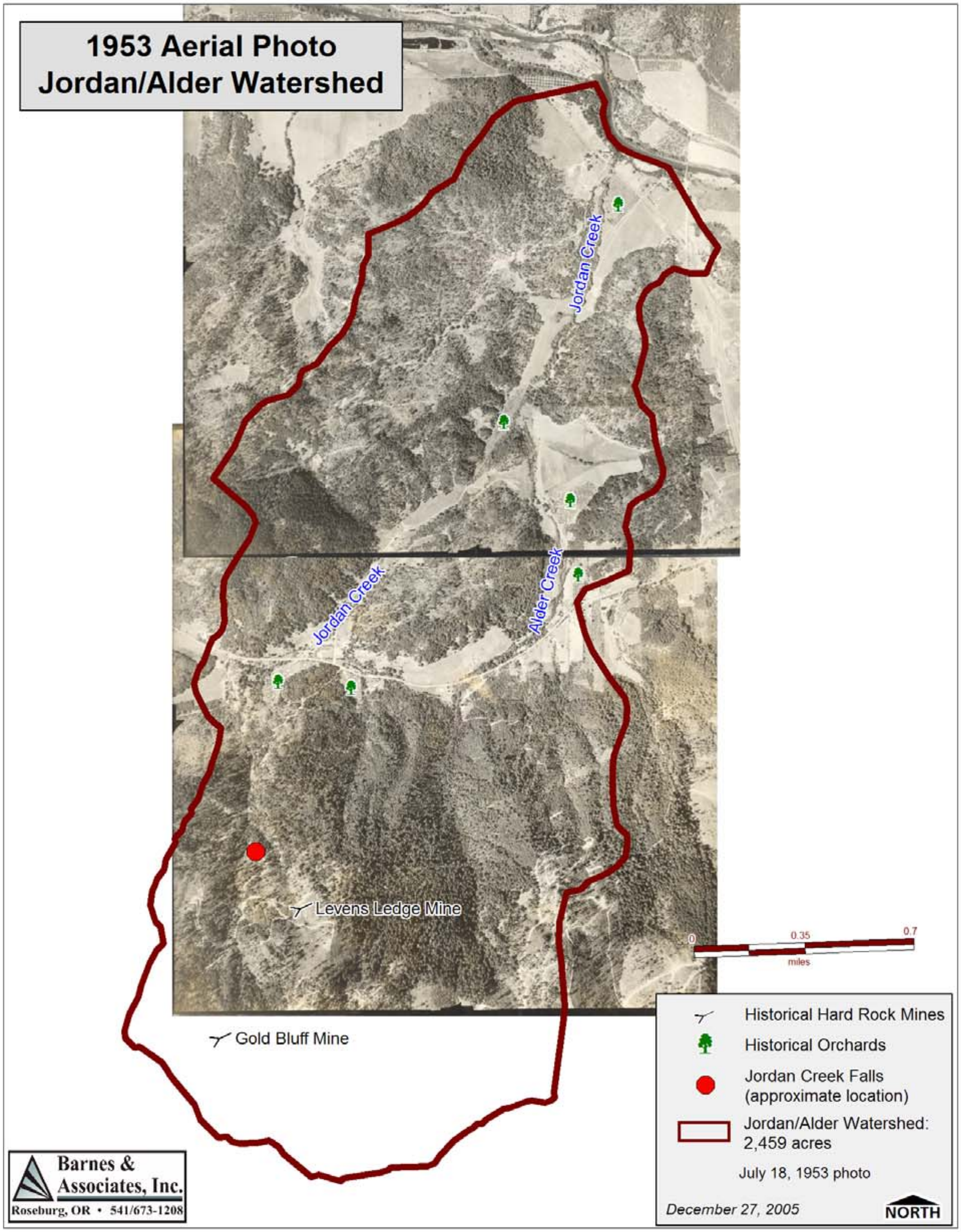

Figure 11. 1953 aerial photo of the Jordan/Alder Watershed.

Figure 12. Mine tailings on Jordan Creek south of the Canyonville-Riddle Road.

2.4 Agriculture

Although approximately 10% of the watershed is used for agricultural purposes, much of the watershed is too steep for agricultural use. But, there are gentle slopes in the lower watershed that are of sufficient size for farming.

In the 1880s through 1890s, prune trees were planted on thousands of acres throughout the Umpqua Valley. Italian prunes and walnuts were grown in orchards in several places in the lower Jordan/Alder Watershed in the early to mid 1900s. Some of these orchards are shown on the 1953 aerial photo of the watershed in Figure 11. The prune orchards were at their peak in the 1920s and 1930s, but their importance started to fade in the 1940s. It is believed that the prune and walnut orchard industry had all but faded away by the 1960s.

2.5 Development

The town of Riddle was incorporated in 1893, while Canyonville was incorporated in 1901. The building of homes and their associated driveways/access roads – primarily along Rod & Gun Club Road and Meyer Lane – has had a profound influence on the aquatic and riparian areas of Jordan and Alder creeks, respectively.

Commercial development in the watershed has been spurred on by the presence of I-5 and its predecessor highways. In addition to the Seven Feathers Truck and Travel Center previously discussed, the major transportation corridor has provided demand for lodging services and other businesses as well.

Several motels have developed in the watershed over the years, including two older motels between I-5 and the South Umpqua River, the Seven Feathers Hotel Casino and Resort (the northern part of which is in the Jordan/Alder Watershed, while the balance is in the Canyon Creek Watershed to the east and south of Jordan Creek), and a newer motel immediately north of the Seven Feathers Truck and Travel Center. Other commercial enterprises in this north end of the watershed include a fast food restaurant and self-storage units.

2.6 Land Ownership Changes

Land management practices and the resulting impacts – positive and negative – on the environment are often directly tied to the management practices of individual landowners and classes of landowners. For example, timber harvest rotations, riparian area management, and other forest management practices are different for BLM lands than for private lands. As land ownership changes, so do the associated management practices and the resulting view of the landscape.

Metsker's maps from the Douglas County Museum of History and Natural History from the year 1967 were analyzed to ascertain changes in ownership over time. Though specific landowners have changed through the years, the 1967 ownership assessment shows that there has been very little change in ownership class (e.g. private, federal, county) through time.

The only major change in ownership has occurred in the lower watershed where the Tribe has purchased many private, non-industrial tax lots over the last several years. Further, one small tax lot of approximately 20 acres in the center of Section 5, T31S, R5W moved from government (City of Canyonville) to private, non-industrial ownership. Some lands in the upper watershed have switched between industrial and non-industrial, but all are still in private ownership with similar land management practices.

2.7 Native Americans

2.7.1 Native Americans in the Umpqua River Basin

At least four tribal groups historically lived in the Umpqua River Basin. The Southern Molalla Tribe lived in the headwaters of the South Umpqua River. The Lower Umpqua Tribe (also known as the Kalawatset) lived on the coast from the Siltcoos River south to Tenmile Creek, along the Umpqua Estuary to just above the head of tide (near present-day Scottsburg), and up the tributaries to the estuary, including Smith River. The Upper Umpqua Tribe and the Cow Creek Band of Umpqua Tribe of Indians lived along the Umpqua River upstream of the head of tide, occupying most of the basin.

Exactly when each of these tribes settled in the Umpqua Basin is uncertain, but archaeological evidence indicates that Native American settlement began at least 8,000 years before the arrival of Euro-American settlers. In the 1700s, even before the first white fur trappers had explored the watershed, smallpox and other diseases were introduced to the Columbia River region during contact with Spaniards exploring the coast by ship. These diseases may have swept as far south as the Umpqua Basin. Although the population of Native Americans prior to Euro-American contact is uncertain, estimates from around the time fur trappers entered the watershed were 3,000 to 4,000 Native Americans in the Umpqua Valley and 500 along coast and estuaries. The extent to which the population had already been reduced by disease epidemics is unknown.

The Native Americans that lived along the Umpqua rivers and their tributary streams were highly dependent on the annual cycle of nature. Their cultures were rich and complex, with distinct rituals, rites and responsibilities. Staple foods in the basin included shellfish, various marine and estuarine finfish, salmon, lamprey eel, camas bulbs, myrtle nuts, acorns, berries, and deer.

Throughout the year, the people gathered shellfish on the coast and in the estuary, and caught finfish using wood stake fish weirs in the estuary. In winter, the people lived in cedar plank houses in permanent villages. Here they made baskets, clothing, tools, and weapons, and recounted a wide variety of stories including creation stories and tales of a magical time when animals and humans shared the same language. In the spring, summer, and fall, they went to seasonal camps to take advantage of seasonally-abundant food resources. In the spring, they hunted ducks and geese along the Umpqua River, and gathered shoots and greens in the meadows. Spring runs of salmon were fished and dried over smoky fires. In the late spring and early summer they harvested camas bulbs and kitten's ears from the meadows, and picked salmonberries, thimbleberries, and strawberries. Brush fences and snares were set for deer drives. Pit traps were used to trap elk. In the late summer the inland tribes moved to high country, including Huckleberry Lake, Abbott Butte, and other places in the high Cascades, where they escaped the heat of summer and harvested late-summer berries and hunted deer. When fall arrived, the inland tribes returned to their permanent homes – well-crafted cedar plank houses in the valleys – where they harvested fall runs of salmon and completed storage of food for the upcoming winter. On the coast, the year-round villagers on the estuary caught salmon and completed storage of food gathered at seasonal camps for the coming year while continuing to thrive off of the abundant year-round estuarine and marine food resources. Harvested areas were burned to stimulate new growth in the next season. Acorns, hazelnuts, tarweed, and dried berries were saved for the dark, gray months ahead.

The information in Section 2.7.1 came from UBE 2006.

2.7.2 Cow Creek Band of Umpqua Tribe of Indians

The Cow Creek Band of Umpqua Tribe of Indians' historical range encompassed a large area in southwest Oregon, including the area around Canyonville (Baun & Lewis 1991). Cow Creek people lived seasonally along Canyon Creek, the mouth of which enters the South Umpqua River just south of the mouth of Jordan Creek. It is likely that tribal members made heavy use of the Jordan/Alder Watershed, though that use is not stated directly. It is well documented, however, that Cow Creek tribal members made extensive use of local fisheries, including trout, salmon, steelhead, and lamprey (Beckham 1983).

On September 19, 1853, the Cow Creek Band of Umpqua Tribe of Indians became the first Oregon Tribe to enter into a treaty with the Unites States Government, signing the treaty after one day of negotiations between the Tribe's Chief Miwaleta and the Superintendent of Indian Affairs. This treaty called for the Tribe to cede its entire homeland, including the Jordan/Alder Watershed, to the United States Government. The treaty was ratified in 1854 and proclaimed by President Franklin Pierce in 1855. In 1954 U.S. Congress passed the Western Oregon Termination Act, suspending recognition to every tribe in western Oregon, including the Cow Creek Band of Umpqua Tribe of Indians.

In 1982, President Reagan signed "Public Law 97-391," the "Recognition Law," which restored the Cow Creek Band of Umpqua Tribe of Indians and established formal relations with the United States Government through its trust agency, the Bureau of Indian Affairs. In 1984, a land claim settlement was negotiated before the Cow Creek's claim went to court. The Bureau of Indian Affairs allowed the Tribe to use the settlement funds as collateral for the purchase of land within the Jordan/Alder Watershed, including land that currently houses the casino complex. In addition, the tribe was allowed to draw the interest on their endowment for the purposes of economic development, education, housing, and assistance for the elderly.

3. Current Conditions

3.1 Fish Distribution/Populations

3.1.1 Historical Fish Distribution/Populations

It is believed that Jordan and Alder creeks historically had populations of coho salmon, winter steelhead, and cutthroat trout. Estimates of fish abundance and distribution are not known. Nonetheless, fish distribution maps as shown in Figures 13 and 14 in Section 3.1.2 give an indication of possible historical distribution.

Causes of anadromous fish decline and, ultimately, their absence in the watershed include the construction of I-5 over Jordan Creek in 1958 and other potential factors addressed in this assessment. The construction of I-5 included a set of twin box culverts, each approximately 360 feet in length, through which Jordan Creek passes under the freeway. The culverts are fish passage barriers, most likely because of the high water velocities through the culverts. The darkness inside the culverts may be another passage barrier factor.

Historically and presently, the falls on Jordan Creek serve as a natural barrier to fish passage. These falls are located near the headwaters of Jordan Creek as shown on Figures 2, 5, and 11. The falls are in two stages: the lower stage is approximately 30 feet in height, while the upper stage is approximately 10 feet in height. Figure 15 shows the falls.

3.1.2 Current and Potential Fish Distribution/Populations

With the possible exception of cutthroat trout, there are currently no salmonid fish in the Jordan/Alder Watershed upstream of I-5. No coho salmon of any life stage were found during nine coho spawner survey visits by Oregon Department of Fish and Wildlife (ODFW) to most of Jordan Creek Reach 2 in 2002 (Sam Dunnavant, ODFW, email communication, September 16, 2005). See Figure 19 for the locations of Jordan and Alder stream reaches. But, coho salmon have been observed at the mouth of Jordan Creek between the South Umpqua River and the freeway. The mouth of Jordan Creek is believed to serve as an important resting and hiding refuge for fish when conditions in the South Umpqua River are undesirable, such as during high flow events (Bill Cannaday, ODFW Habitat Restoration Biologist, personal communication, December 21, 2005).

Based on fish presence in nearby watersheds, it is likely that one or more resident sculpin species are present in the Jordan/Alder Watershed. The torrent sculpin is the most likely sculpin species to reside in the watershed. Other species that may or may not be present in the Jordan/Alder Watershed include: longnosed dace, speckled dace, suckers (various species), Pacific lamprey, brook lamprey, river lamprey, redside shiners, Umpqua chub, and Umpqua pikeminnow. These non-sculpin species migrate at some point during their life histories, so their populations may have been cut off from the watershed by the same I-5 passage barrier that has precluded salmonid presence in the watershed (Bill Cannaday, ODFW Habitat Restoration Biologist, personal communication, January 3, 2006).

According to data from StreamNet (StreamNet 2005), areas of potential habitat believed to be suitable for coho salmon and winter steelhead are as shown in Figures 13 and 14. This fish distribution potential was assembled based on the best available data and professional judgment of local fish biologists.

In addition to the historical falls that serve as a fish passage barrier on upper Jordan Creek (as mentioned above), tailings from mining activity in the early 1900s obstruct fish passage on most of Jordan Creek in the south half of Section 32, T30S, R5W (this portion of Jordan Creek is south of the Canyonville-Riddle Road). Here, Jordan Creek streamflow goes subsurface in places, thus precluding further fish passage.

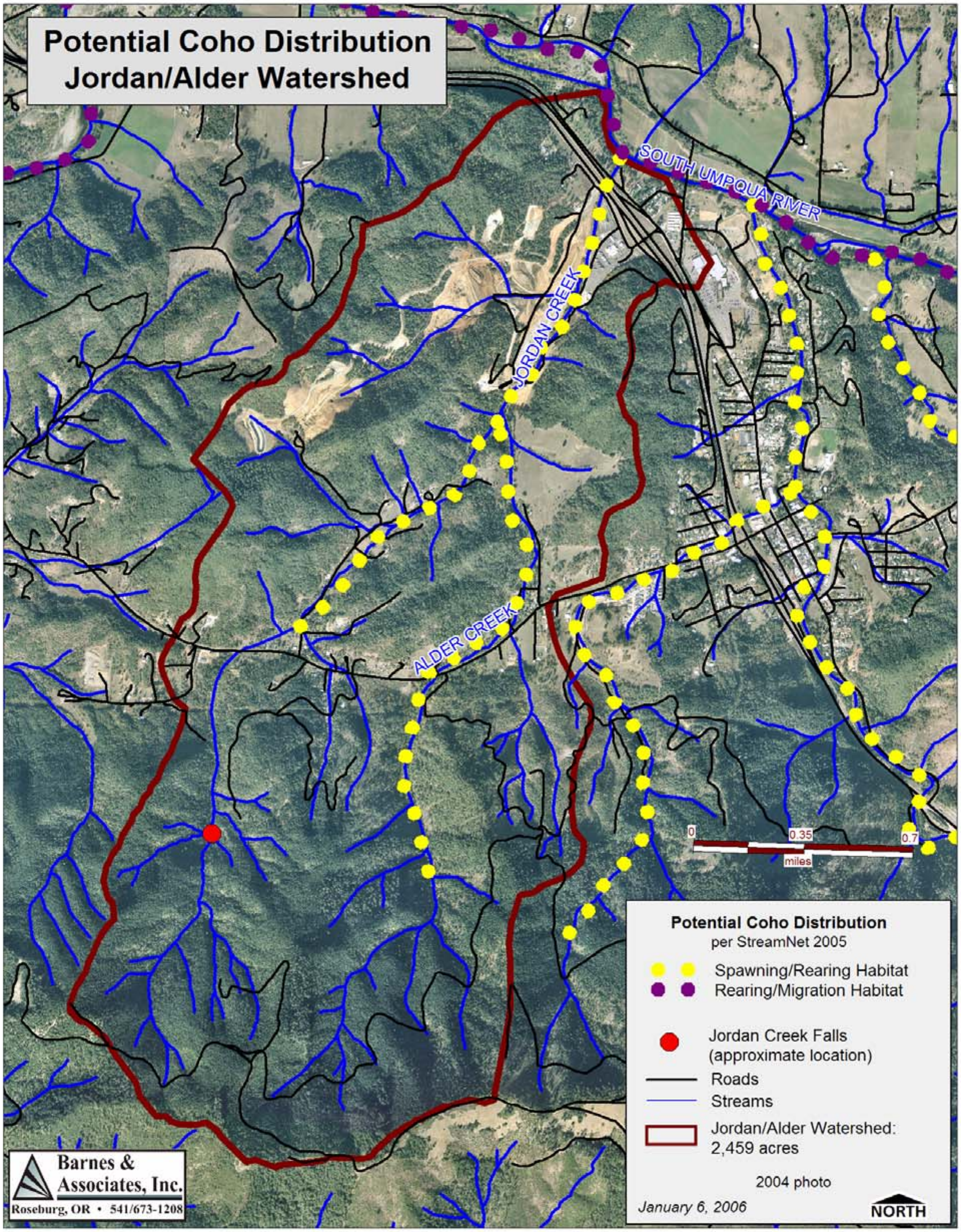

Figure 13. Potential coho salmon distribution in the Jordan/Alder Watershed.

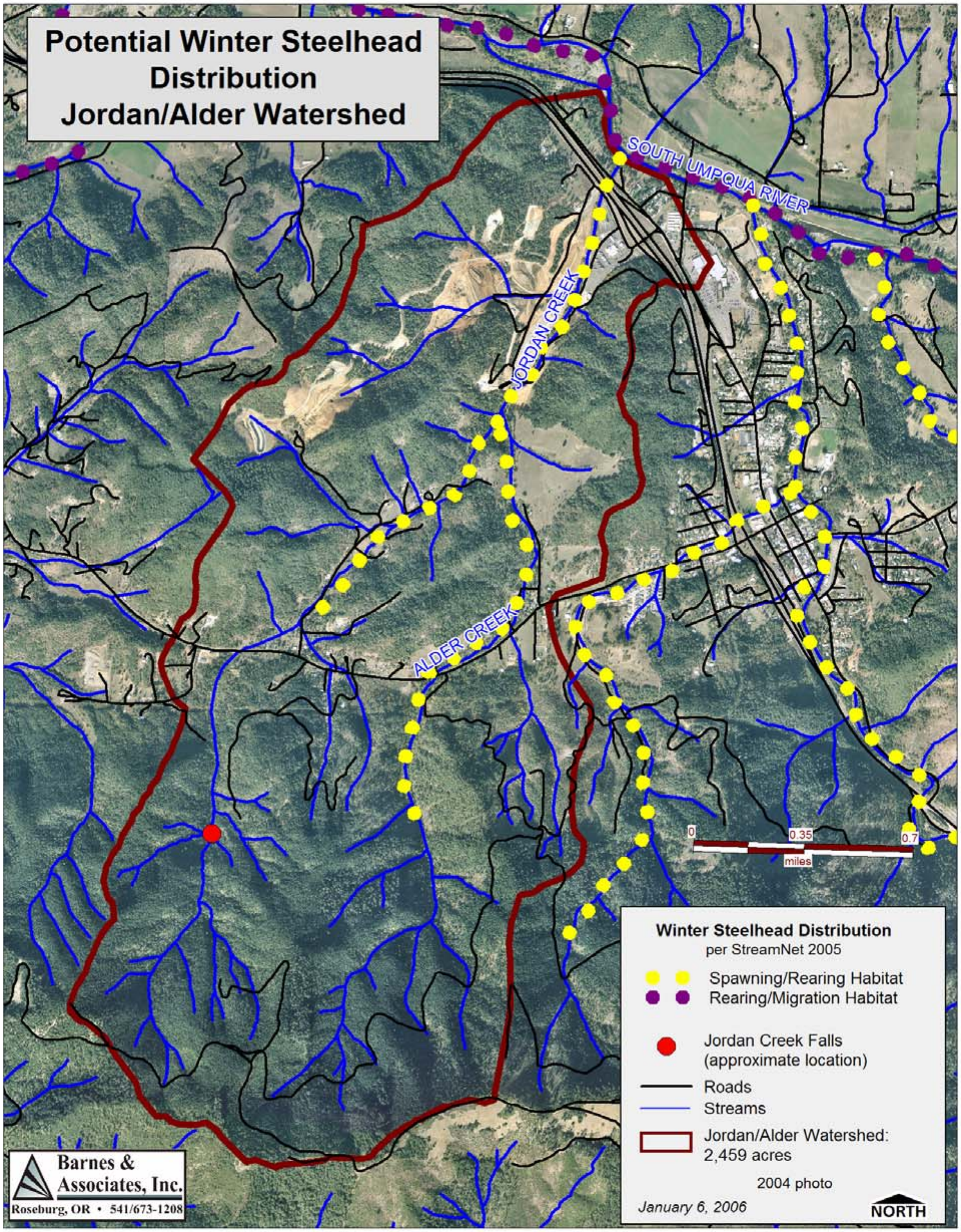

Figure 14. Potential winter steelhead distribution in the Jordan/Alder Watershed.

Figure 15. Jordan Creek Falls.

3.2 Stream Function

3.2.1 Stream Morphology

The morphology of Jordan and Alder creek channels can be characterized by their location in the watershed. In the north half, these two streams mostly have confined channels, constrained by a single terrace on each side of the channel. Some stretches of stream have multiple terraces in places, while other stretches are characterized by very narrow floodplains. The valley floor in the north half is very broad. These same characteristics apply to the northernmost portion (approximately one-third) of the south half of the watershed.

In the balance of the south half, Jordan and Alder creek channels are hillslope constrained, typically with moderate, V-shaped hillsides. Floodplains are minimal to non-existent. The valley floor in this southernmost portion of the south half is narrow.

Channel habitat types according to the Oregon Watershed Enhancement Manual (OWEB 1999) include (working from lower to upper watershed):

- Low gradient confined – Jordan Creek Reach 1 (See Figure 19 for reach locations.).
- Moderate gradient confined – North half of watershed (except Jordan Creek Reach 1) and the extreme lower end of south half of watershed.
- Moderately steep narrow valley channel – transition from moderate gradient confined to steeper channel habitat types in the upper watershed
- Steep narrow valley channel/very steep headwater – upper end of watershed

Most of Jordan and Alder creeks' stream channels appear stable, with little evidence of significant, recent downcutting of the channels. In many places, the channel is down to bedrock, indicating that downcutting happened in the past, perhaps several decades ago.

The high energy of heavy streamflows in confined channels can easily displace accumulations of woody debris and in-stream structures. The design and location of any future in-stream structures are critical to their long-term success.

Stream Gradients. As with most other Pacific Northwest streams, gradients for Jordan and Alder creeks and their tributaries are steep (up to 75%) in the headwaters, flatten out somewhat mid-length, and become flat or nearly so toward their mouths. Table 4 and Figure 16 display the breakdown of stream gradients for the Jordan/Alder Watershed.

Sediment and woody debris tend to come from the steeper gradient portions of streams. These steeper stream segments are called "source" segments and are generally classified as having a gradient of 20% or greater. Lower down in the watershed, "transport" segments carry downstream the inputs from the source reaches. Transport segments are those stream segments having a gradient between 3% and 20%. For the purposes of this analysis, this larger grouping has been broken into two subgroups: 3% to 12% and 12% to 20%. The 12% threshold is sometimes considered to be the upper limit for some fish species such as coho. "Deposition" segments – or those with a gradient less than 3% – are those stream segments found at the bottom of the watershed where gravels, other sediment, and debris from upstream is deposited.

Table 4. Stream Gradients in the Jordan/Alder Watershed.

Gradient Class	Gradient Range	Stream Miles	% of Total
Deposition	0 – 3%	1.9	11
Transport -	3 – 12%	4.4	27
Transport +	12 – 20%	2.3	14
Source	20%+	8.0	48
Total		16.6	100

The placement of logs (large wood debris, or LWD) and other structures into stream channels is typically done in "deposition" segments. In the low gradients of deposition segments, LWD and other structures are more likely to remain stable when placed in appropriate locations. Further, the very nature of "deposition" segments of streams allows gravels to accumulate more readily behind structures placed in these low gradient stream segments than further up in the watershed.

There is a relatively high proportion of "source" stream segments in the Jordan/Alder Watershed. Such a large share of source segments might typically indicate an abundance of woody material inputs to the watershed system. However, the Canyonville-Riddle Road at the lower end of many of these source segments acts as a barrier to the downward migration of LWD to the deposition segments of these streams.

Ancillary to and possibly related to the construction of the I-5 culverts are a steepened stream gradient from the outlet of the culverts to the mouth of Jordan Creek at the South Umpqua River and a step along that same stretch approximately 150 feet upstream from the mouth of Jordan Creek.[7] Figure 16 shows that the lowest 660 feet of Jordan Creek, from the mouth upstream, has an 8% gradient.

The step near the mouth of Jordan Creek is shown in figures 17 and 18. The image in Figure 17 was captured on October 6, 2005, at relatively low streamflows. Note that the orange hard hat in Figure 17 is on top of a six-foot fence post. The image in Figure 18 was taken on January 1, 2006, one day after a very heavy rainstorm.

While this step may be a barrier to all life stages of fish at low streamflows, adult salmonids are able to pass through this point at higher streamflows (Bill Cannaday, ODFW Habitat Restoration Biologist, personal communication, November 14, 2005). As noted in Section 3.1.2, coho salmon have been observed at the Jordan Creek culvert under I-5, upstream of the step.

Bedrock comprises much of the Jordan Creek substrate below I-5. High streamflows through the I-5 culverts may have washed away gravel and other loose substrate material downstream of the culverts. The strategic placement of large boulders above and below the Jordan Creek step would return "roughness" to this part of the stream channel and facilitate fish passage upstream from the South Umpqua River.

[7] Steps are abrupt, discrete breaks in channel gradient. Steps are usually much shorter than the channel width. Steps can be thought of as small waterfalls.

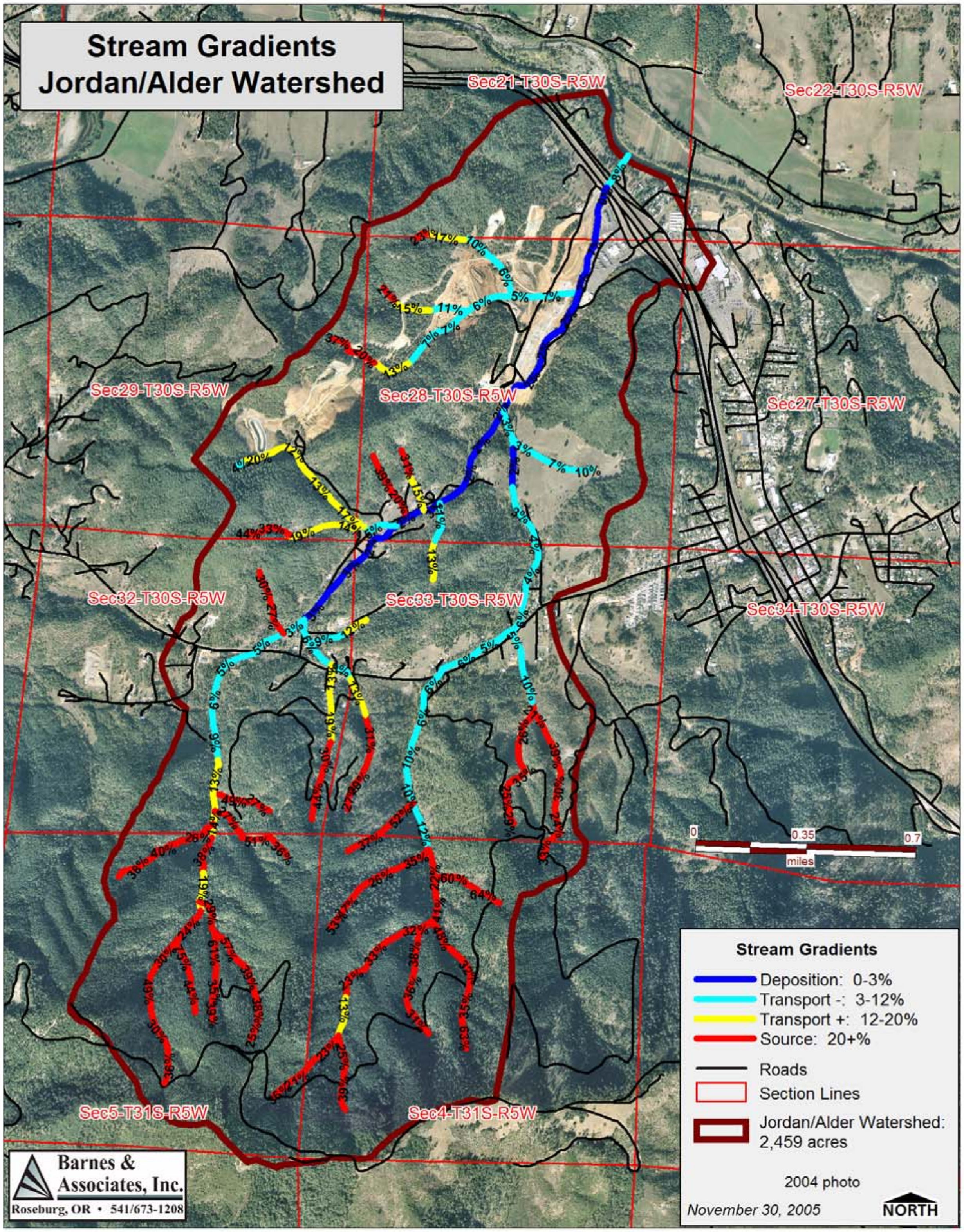

Figure 16. Stream gradients in the Jordan/Alder Watershed.

Figure 17. Step upstream of mouth of Jordan Creek on October 6, 2005. Hard hat is resting on top of a six-foot metal fence post. Latitude/longitude: -123.29/42.9443.

Figure 18. Step upstream of mouth of Jordan Creek on January 1, 2006.

Stream Characteristics from Stream Habitat Surveys. For this watershed assessment, Jordan and Alder creeks were surveyed using Oregon Department of Fish and Wildlife's Aquatic Inventories Project's stream habitat survey protocol (ODFW 2002). These surveys were conducted between October 6 and October 12, 2005.

Jordan and Alder creeks were surveyed as shown in Figure 19. The extent of surveys was dictated by the approximate uppermost potential distribution of salmonids (see figures 13 and 14) and the amount of time allotted by ODFW to complete the work.

ODFW rates stream habitat by applying "benchmarks" to stream habitat survey data such as that collected for this watershed assessment. Those benchmarks and the ratings scale for each are shown in Table 5.

Table 5. ODFW benchmarks and ratings scale for western Oregon salmonid habitat.

Benchmark	**Weight 1-5**	**Excellent** (4 pts.)	**Good** (3 pts.)	**Fair** (2 pts.)	**Poor** (1 pt.)
Pools					
Pools area %	3	>44.99	30-44.99	16-29.99	<16
Residual pool depth (small streams)	4	>=0.7	0.5-0.6	0.3-0.4	<0.3
Substrate in Riffles					
Silt/sand/organics %	2	<=1	2-7	8-14	>=15
Gravel %	3	>=80	30-79	16-29	<=15
Reach Averages					
Width/depth ratio	3	<=10.4	10.5-20.4	20.5-29.4	>=29.5
Riparian vegetation (species/size)	2	conifer >15 cm DBH	conifer <15 cm DBH	mixed species	shrubs, other
Shade % (stream widths <12 m)	2	>=80	71-79	61-70	<=60
Large Woody Debris					
Pieces/100 m	3	>=29.5	19.5-29.4	10.5-19.3	<=10.4
Volume/100 m	3	>=39.5	29.5-39.4	20.5-29.4	<=20.4

Each habitat benchmark for any given stream reach may be given a numeric rating according to the "excellent" to "poor" scale in Table 5 above. Ratings may then be weighted according to the "Weight 1-5" field in the habitat benchmark table. The sum of the weighted ratings gives an overall habitat quality rating for the stream reach. The habitat benchmark rating system is as shown in Table 6.

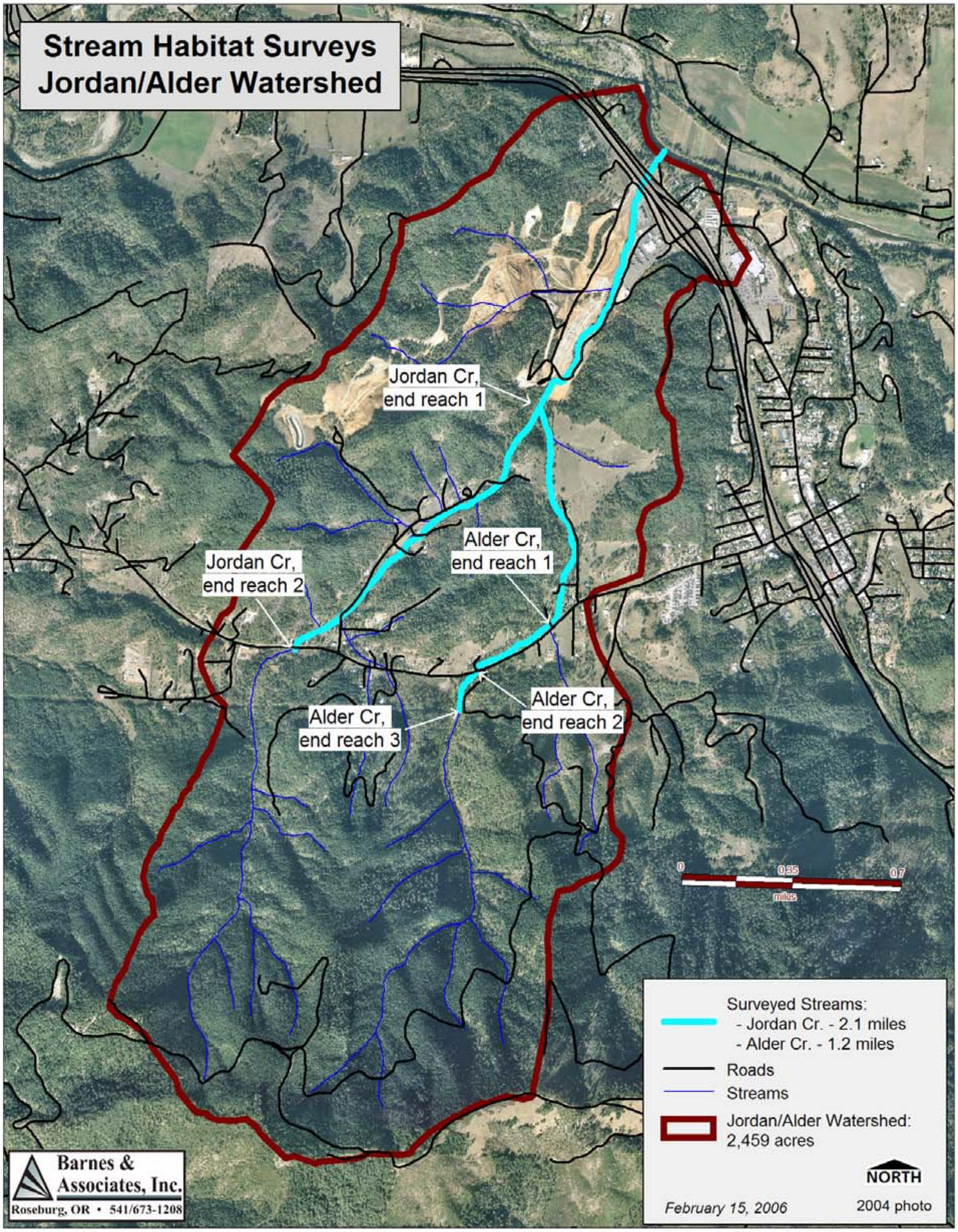

Figure 19. Streams and reaches surveyed during October 2005 stream habitat surveys.

Table 6. ODFW salmonid habitat benchmark rating system.

Habitat Benchmark Rating System	
Total Weighted Score	Rating
82 – 100	Excellent
63 – 81	Good
44 – 62	Fair
25 – 43	Poor

Table 7. Salmonid habitat benchmark scores for October 2005 stream habitat surveys.

Benchmark	Weight 1-5	Jordan Creek				Alder Creek					
		Reach 1		Reach 2		Reach 1		Reach 2		Reach 3	
		Score 1-4	Wt. Score	Score 1-4	Wt. Score	Score 1-4	Wt. Score	Score 1-4	Wt. Score	Score 1-4	Wt. Score
Pools											
Pools area %	3	1	3	1	3	1	3	1	3	1	3
Residual pool depth	4	2	8	1	4	1	4	2	8	2	8
Substrate in Riffles											
Silt/sand/organics %	2	1	2	1	2	2	4	1	2	2	4
Gravel %	3	3	9	3	9	3	9	3	9	3	9
Reach Averages											
Width/depth ratio	3	3	9	4	12	4	12	4	12	4	12
Riparian vegetation	2	1	2	1	2	1	2	1	2	1	2
Shade %	2	2	4	3	6	3	6	3	6	3	6
Large Woody Debris											
Pieces/100 m stream	3	1	3	1	3	1	3	1	3	1	3
Vol./100 m stream	3	1	3	1	3	1	3	1	3	1	3
Reach Totals			43		44		46		48		50

Interpretation. The summary data in Table 7 above point out the weakest habitat elements in the Jordan/Alder Watershed: lack of deep and plentiful pools, poor riparian vegetation condition (in terms of species and size), and lack of large woody debris. Much of the stream survey interpretation text below originated in the ODFW document "A Guide to Interpreting Stream Survey Reports" (Foster 2001).

Pools. Deep pools of cool water are critical habitat elements for fish, especially for streams with weak late summer/early fall streamflow such as Jordan and Alder creeks. Fish can seek refuge and survive in deep pools over the summer as streamflow dwindles and disappears. These pools are important for capturing hyporheic flow, or water flowing through the area below the streambed where it percolates through spaces between the rocks and cobbles (this space is also known as interstitial space). Hyporheic flow is important as a source of cold water input to streams.

The reaches with the largest surface area of pools are Jordan Creek Reach 1 (12% of the stream surface area) and Alder Creek Reach 3 (13%). The other stream reaches have considerably less area of pools, ranging from <1% in Jordan Creek Reach 2 to 4% in Alder Creek Reach 1.

This habitat data reveal a clear lack of pools in Jordan and Alder creeks. Particularly lacking are the important "deep" pools, or those greater than one meter in depth. Only one deep pool was found during the October 2005 stream survey – an artificially-created, isolated pool located in reach 3 of Alder Creek. This pool was two meters deep at the time of the survey.

Ideally, planned pools should be situated next to springs for the cool water they typically deliver. Though none were located during stream habitat surveys, local landowners suggest that there are springs located in the watershed near Jordan and Alder creeks, including three pools in Tax Lot 1300, Section 28, T30S, R5W (the Rod & Gun Club property).

Substrate in Riffles. The substrate composition of riffles is important for salmon and trout, as most spawning and egg deposition occurs in this habitat type. Salmon and trout use areas of gravel for spawning.[8] Spawning gravels must be free of silt, sand, and organics in order for developing young fish to survive.[9] Though these fine particles are natural components of any aquatic system, excessive deposits of fine sediments severely restrict spawning habitat by filling in the spaces between gravel particles. Aquatic insects and other macroinvertebrates, the primary food source for juvenile salmonids, are negatively impacted by fine sediments. Sediment can also fill in pools and other refuge for juveniles.

Each species prefers different particle sizes for spawning. Resident cutthroat trout prefer small gravel, while salmon prefer larger gravel and cobbles for their "redds," or nesting sites.[10] Redds are usually constructed in riffle habitat and the downstream edges of pools.[11]

Alder Creek reaches 1 and 3 are rated "fair" for silt, sand, and organics. All other reaches are rated "poor." The high proportion of fine sediments in the substrates of these "poor" reaches is likely related to a high level of development along these reaches. Some of the fine sediment in Jordan Creek Reach 1 may be related to the current development of the Tribe's RV park. This extra sediment input is expected to subside after the current construction is completed.

All reaches are rated as "good" for gravel composition. This factor bodes well for the spawning potential of Jordan and Alder creeks. In addition, the high level of gravel in the system substrate will allow more rapid recruitment of gravel to streambeds with a high level of bedrock. All of Jordan Creek's Reach 1 and the upper half of Reach 2 have substrates that are heavy to bedrock. Appendix A displays stream habitat survey results for substrate components of Jordan and Alder creeks.

[8] Gravel is particles of rock ranging in size from a small pea to roughly baseball-sized.
[9] Silt, sand, and organics are smaller in size than gravel, and are often collectively referred to as "fines."
[10] Cobble is substrate material larger in size than gravel, but smaller than boulders. Cobble is roughly baseball to bowling ball in size.
[11] Riffle is fast, turbulent, shallow streamflow over submerged or partially submerged gravel and cobble substrates. Riffles are generally broad with a uniform cross section. Riffle gradients are low, usually 0.5-2.0% slope, and rarely up to 6%.

Width/Depth Ratio. Streams with deep, narrow channels (i.e., low width/depth ratios) provide better fish habitat than wide, shallow streams. Deep, narrow streams are exposed to less solar radiation and maintain cooler water temperatures than wide, shallow streams. Streams with a low width/depth ratio also tend to have more undercutting of streambanks, providing critical cover preferred by many salmonids.

All but Jordan Creek Reach 1 have width/depth ratios rated as "excellent." Jordan Creek Reach 1 is rated as "good" for width/depth ratio. Narrow, deep channels, along with high gravel composition in the substrate, are two of the strongest habitat features of Jordan and Alder creeks.

Riparian Vegetation/Shade %. Riparian vegetation and shade are addressed in Section 3.3.

Large Woody Debris. Large woody debris within the stream provides many benefits to fish and other aquatic organisms. LWD provides important cover for fish, especially in pools. In fast water such as riffles and rapids, LWD creates a physical barrier that dissipates the energy flow of fast-moving water. The LWD acts to divert flow, leading to the formation of all-important pool habitat and new stream channels. LWD also creates an energy source for the food chain as it decomposes. For the purposes of the stream habitat survey, LWD includes pieces of wood at least 15 centimeters (approximately 6 inches) in diameter and 3 meters (approximately 10 feet) in length, plus all rootwads, within the stream channel.

LWD is lacking throughout the Jordan/Alder Watershed, both in terms of the number of pieces of wood and the volume of that wood. Those deficiencies are quantified in Table 7 with the lowest possible rating for both LWD benchmarks: number of pieces and volume. A significant proportion of the LWD present is small hardwoods. Small pieces of LWD are less able to provide the flow diversion function and is more easily transported downstream than big wood. Small wood – in particular small hardwoods – are shorter-lived in the system, too, as they decompose more quickly than larger wood, especially conifers. See Appendix A for a chart of LWD encountered during the stream habitat survey.

"Key" pieces of LWD are those that are at least 12 meters (approximately 40 feet) in length and 0.6 meters (approximately 24 inches) in diameter. Key pieces provide the same in-stream benefit to fish as other LWD, but their size allows them to withstand high streamflows and anchor other woody debris in place for long-term benefit. Only two pieces of key LWD were identified during the stream survey. These pieces are in Jordan Creek Reach 2 on the Rod & Gun Club property.

Appendix A displays stream habitat survey results for substrate components of Jordan and Alder creeks.

3.2.2 Stream Connectivity

In order for fish to fully utilize the habitat in a stream, the connectivity of that stream must be intact. Barriers prevent fish passage and the use of upstream habitat for all or some life stages of fish. Barriers such as dams can prevent passage of fish at all life stages. Other barriers, such as suspended culvert outlets, can prevent juvenile and small fish from moving upstream while allowing larger fish to pass more freely.

For the Jordan/Alder Watershed, culverts are the only known barriers to fish passage. There are no known dams, irrigation ditches, or other barriers that impede fish passage. Low streamflows can also serve as a barrier to fish passage. Streamflows are addressed in Section 3.5, Water Quantity.

There are several culverts in the Jordan/Alder Watershed known to be barriers to upstream fish passage. All culverts encountered during the October 2005 stream habitat surveys are shown in Figure 20. Table 8 lists these culverts and documents their physical condition, flow capacity, and fish passage considerations.

All of these culverts, except for culvert #7, are within ODFW's potential habitat range for coho salmon and winter steelhead as identified in Figures 13 and 14. The most limiting for fish passage of all culverts in the Jordan/Alder Watershed are the twin culverts through which Jordan Creek passes underneath I-5 and the frontage roads on either side of I-5, noted as culvert #1 in Figure 20 and Table 8. Here, Jordan Creek passes through twin reinforced concrete box culverts, each of which is approximately 360 feet in length. These culverts act as barriers because of the high streamflow velocity as water flows through these concrete "chutes." The lack of light within the culverts may also serve as a barrier to fish passage.

There are ongoing discussions between the Tribe, Oregon Department of Transportation, and others regarding a fix for the I-5 culvert. Possible solutions include a replacement bridge, weirs or baffles inside the existing culverts to decrease stream velocity, skylights to provide natural light, and/or artificial lighting inside the culverts.

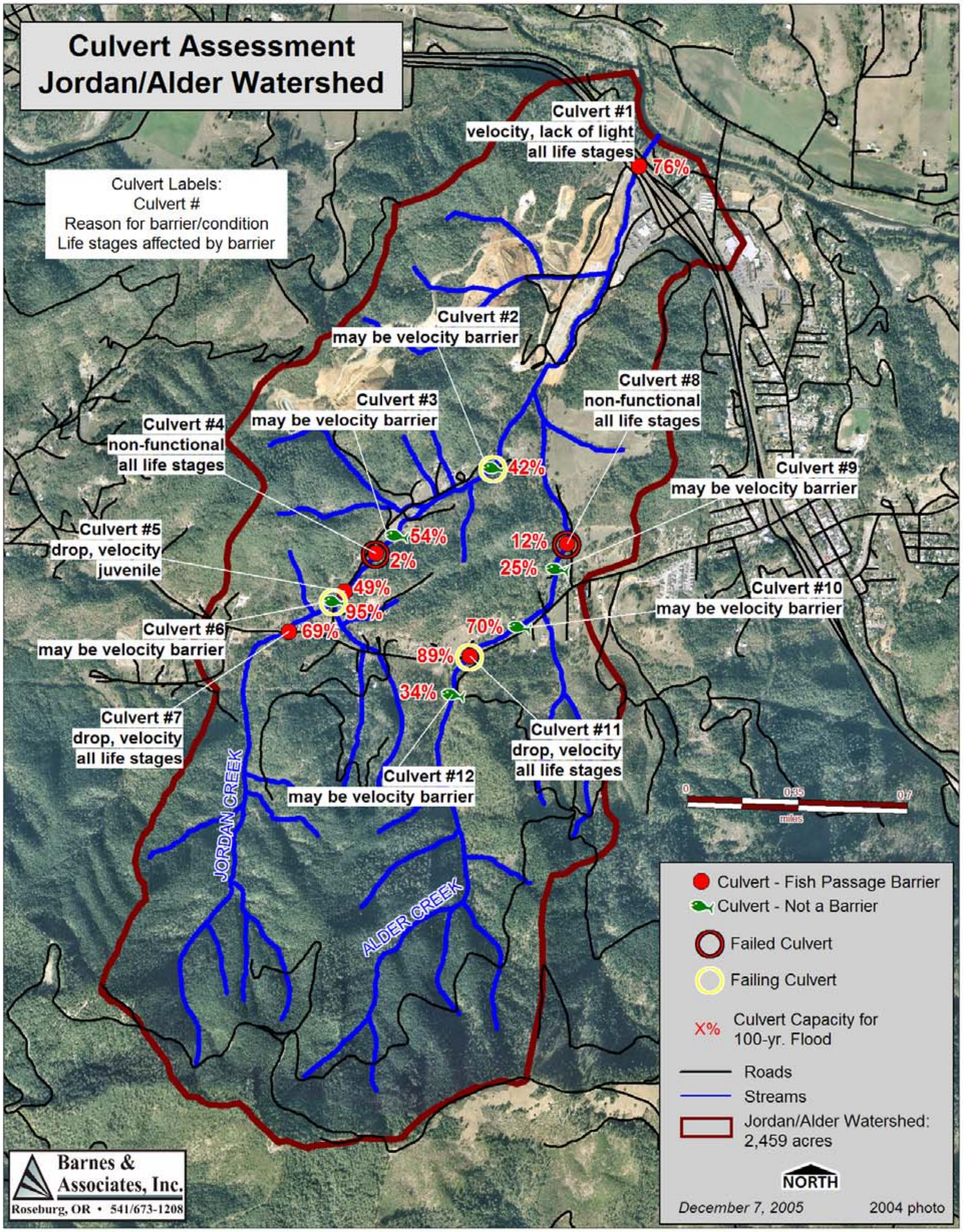

Figure 20. Fish passage, capacity, and physical assessment of Jordan and Alder creek culverts.

Table 8. Flow capacity assessment of Jordan and Alder creek culverts.

	Culvert #												
	#1 design[12]	**#1 effective[13]**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	**#10**	**#11**	**#12**
Culvert size[14] (in.)	96X72	96X54 96X48	48	48	18	60	72	72X42	36	48	48X42	72	48
# Culverts	2	2	2	2	1	1	1	1	1	1	2	1	1
Culvert Capacity (cfs)	691	481	128	128	5	112	177	122	31	64	147	177	64
Physical Condition	Failing	Failing	Failing	OK	Failed	OK	Failing	OK	Failed	OK	OK	Failing	OK
Passage Barrier?	Yes	Yes	?	?	Yes	Yes	?	Yes	Yes	?	?	Yes	?
Barrier Reason	Velo., Drop	Velo., Drop	Velo.?	Velo.?	Failed	Velo., Drop	Velo.?	Velo., Drop	Failed	Velo.?	Velo.?	Velo., Drop	Velo.?
Life Stages Impacted	All	All	?	?	All	Juvenile	?	All	All	?	?	All	?
50-year Event (cfs)	543	543	214	160	157	151	117	110	180	176	135	126	119
Capacity for 50-year Event	127%	89%	60%	80%	3%	74%	151%	111%	17%	36%	108%	140%	54%
100-year Event (cfs)	636	636	302	239	236	228	186	177	263	258	209	198	189
Capacity for 100-year Event	109%	76%	42%	54%	2%	49%	95%	69%	12%	25%	70%	89%	34%

Velo. = velocity (velocity of flow prevents or inhibits passage)

[12] Assumes culvert size and capacity as designed and constructed.
[13] Assumes culvert size and capacity with 11/15/05 gravel and cobble accumulation at outlet.
[14] Diameter of round culvert for single numbers (e.g. 48 = 48" diameter round culvert), width X height for double numbers (e.g. 96X54 = 96" wide X 54" height)

Fish Passage. As noted in Figure 20 and Table 6 above, six of the 12 culverts (culverts #1, 4, 5, 7, 8, and 11) documented during the October 2005 stream habitat survey currently act as barriers to fish passage, either for juveniles or all life stages. These six culverts are barriers because of the drop from the outlet to the active stream or because of the high velocity of water as it flows through the culvert. The other six culverts are likely passage barriers, too. These "likely barrier" culverts are not barriers because of any drop from the outlet to the stream surface below. Rather, they are likely barriers because of the velocity and "sheeting" action of water through the culvert. The "sheeting" action results from the flow of water spreading out in a thin, fast-flowing layer across the relatively smooth bottom of the culvert, making passage difficult for fish.

Culvert Capacity. In their current condition, none of the 12 culverts is adequately sized to handle the streamflow associated with a 100-year storm event. Furthermore, one-half of the culverts are not capable of handling 50% of a 100-year storm event. Culvert #1 – the Jordan Creek culvert at I-5 – is adequately sized to pass a 100-year storm (its capacity is 109% of the storm volume). However, the outlet end of these twin concrete box culverts is filled with 1 to 1-1/2 feet of gravel and cobble, thus reducing their functional capacity. In their current configuration, only four of the 12 culverts (culverts #6, 7, 10, and 11) are capable of carrying a 50-year streamflow.

Culvert Physical Condition. Two of the 12 culverts (culverts #4 and 8) failed at some time in the past. These culverts may have failed during the high streamflows of the 1996 storm events. These two failed culverts are now only partially functional, with at least some of the water flowing around rather than through the culverts. Note that the two failed culverts have the lowest flow capacity relative to the 50-year and 100-year storm events. The original size of culvert #4 would allow it to carry 3% of a 50-year storm event and 2% of a 100-year event. Culvert #8 was sized to carry 17% and 12% of a 50-year and 100-year storm event, respectively. These culverts no longer serve the purpose of allowing for a road crossing of the streams.

Four other culverts (culverts #1, 2, 6, and 11) are currently failing. One of the two corrugated metal pipes at culvert #2 is being flattened vertically. There is a "ram" inside this culvert to prevent it from collapsing. Anecdotal evidence suggests that this culvert began to fail during the 1996 high streamflow events. Culverts #6 and 11, also corrugated metal pipes, are rusting out and failing at their bottoms.

Culvert #1 – the twin concrete culverts under I-5 – was inspected for structural integrity by engineers from Roseburg's Pinnacle Engineering, Inc., in January 2006. Pinnacle stated in its report to the Tribe that, "Considering the potential serious distress, it is our recommendation that the culvert should be replaced as part of the interchange reconstruction." A copy of this report can be found in Appendix C.

Figures 21 through 35 are images of all 12 culverts. These images were taken during the October 2005 stream habitat survey.

Bridges. There are several bridges for vehicle and foot traffic across both Jordan and Alder creeks. These bridges appear to be of sound construction. None of the bridges appear to be fish passage barriers or problematic from a watershed restoration standpoint.

Figure 21. Culvert #1 outlet on Jordan Creek at I-5.

Figure 22. Culvert #1 outlet on Jordan Creek at I-5 (south half of twin box culverts).

Figure 23. Culvert #2 outlet on Jordan Creek at north end of Rod & Gun Club Road.

Figure 24. Culvert #2 inlet on Jordan Creek at north end of Rod & Gun Club Road.

Figure 25. Culvert #3 outlet on Jordan Creek at driveway off Rod & Gun Club Road.

Figure 26. Culvert #4 outlet on Jordan Creek at washed-out road off Rod & Gun Club Road.

Figure 27. Culvert #5 outlet on Jordan Creek at driveway off Rod & Gun Club Road.

Figure 28. Culvert #6 outlet on Jordan Creek at south end of Rod & Gun Club Road.

Figure 29. Culvert #7 outlet on Jordan Creek at Canyonville-Riddle Road.

Figure 30. Culvert #7 outlet on Jordan Creek at Canyonville-Riddle Road.

Figure 31. Culvert #8 inlet on Alder Creek at washed-out road off Meyer Lane.

Figure 32. Culvert #9 outlet on Alder Creek at driveway off Meyer Lane.

Figure 33. Culvert #10 outlet on Alder Creek at driveway off Canyonville-Riddle Road.

Figure 34. Culvert #11 outlet on Alder Creek at Canyonville-Riddle Road.

Figure 35. Culvert #12 outlet on Alder Creek at forest road south of Canyonville-Riddle Road.

3.2.3 Channel Modification

Evidence suggests that Jordan Creek has been modified since settlement times in order to develop and extract resources from the watershed. Miners searching for gold and silver in Jordan Creek in the 1860s re-routed the creek in order to facilitate mineral exploration in the original channel. There is direct evidence of this re-routing in Tax Lot 1100, Section 28, T30S, R5W (the Nunes property). Here, the riparian area along the "new" channel is free of vegetation for some stretches while vegetated with blackberries and annual plants in others. The "old" channel has a narrow, forested riparian area. Figure 36 below shows both channels. In this image, the direction of streamflow is from the background to the foreground.

Figure 36. Jordan Creek showing evidence of historical channel (left) and current channel (right, with gravel in channel). Latitude = -123.304º, longitude = 42.9271º.

Other anecdotal evidence from watershed residents suggests that portions of lower Jordan Creek's channel were modified by early truck stop development. In addition, channelization, removal of woody debris, and cutting of riparian vegetation are evident along the stretches of both Jordan and Alder creeks north of the Canyonville-Riddle Road. Most of this simplification appears to be related to residential development along the streams.

Current RV park development along lower Jordan Creek has also simplified Jordan Creek's channel by removing vegetation and, perhaps, in-channel woody debris. Figure 37 shows a stretch of lower Jordan Creek (upper end of reach 1) just below the upper bridge in the RV park. This is by far the most notable case of channel disturbance in the RV park area. But, the extent of simplification of this reach of Jordan Creek relative to its condition prior to the RV park development is unclear.

Figure 37. Jordan Creek channel below upper bridge on October 6, 2005.

It should be noted that, while this riparian disturbance may be significant in the short term, it is anticipated that there will be long-term benefits from the removal of riparian blackberries and other shrubs less desirable from a riparian vegetation standpoint. Also, the RV park development has included the removal of tires, batteries, and other debris from Jordan Creek left over from truck stop operations prior to those of the current Seven Feathers Truck and Travel Center (Jeff Byers, Creekside RV Park Project Manager, personal communication, August 5, 2005).

There are several water diversions on Jordan and Alder creeks. Some are old and non-functional, while others are still in use. All of these diversions are small and include only minor modifications to the stream channel. It does not appear that these channel modifications are a serious distraction to the streams as fish habitat from a channel morphology standpoint. Conversely, the loss of water from these diversions may be significant. Water quality is addressed in Section 3.4.

Figure 38 shows what is likely the most significant of the water diversion channel modifications. This diversion is located on Alder Creek. In the figure, Alder Creek runs perpendicular to the short piece of black plastic pipe shown in the bottom middle of the photograph. The gravel diversion structure, routing water through the black plastic pipe, is shown in the bottom left of the photograph, to the left of the wooden staff pole.

Figure 38. Water diversion on Alder Creek.

3.2.4 Stream Function: Key Findings and Recommendations

Stream Morphology

Key Findings:

1. There are 1.9 miles (11% of the stream miles analyzed for gradient) of "deposition" gradient (0-3%) streams in the Jordan/Alder Watershed. These lesser gradient streams provide the best opportunity for placement of logs and other in-stream structures.
2. The channels of Jordan and Alder creeks are confined by adjacent terraces. Though these channels appear stable, the high energy associated with the confined channel habitat types makes placement and design of in-stream structures critical to their long-term success.
3. Appropriate design and placement of in-stream structures along Jordan Creek Reach 1 is especially critical given the development of the Creekside RV Park.
4. Stream habitat surveys for Jordan and Alder creeks point out major deficiencies in the following fisheries habitat attributes:
    a. Lack of deep pools.
    b. Lack of large woody debris, especially key pieces of large wood debris (0.6 meters diameter by 12 meters length).
    c. Small component of coniferous riparian vegetation.
    d. Excessive silt/sand/organics composition in the substrate.

    (Deficiencies "c" and "d" will be addressed in Sections 3.3 and 3.4, respectively.)
5. The watershed has many areas with very deep gravel and possibly summer hyporheic flow. These areas may be good candidates for creating deep pools.
6. The lower half of Jordan Creek Reach 1 has a high component of bedrock substrate.

Recommendations:

1. Develop contours and gradient profile to support the planning of in-stream activities and appropriate placement of in-stream structures.
2. Create pool habitat by placing large woody debris and boulders (collectively, "structures") in streams at carefully chosen locations. Structures should generally be located in "deposition" segments of Jordan and Alder creeks. Structures may also be placed in lesser gradient stretches of "transport" segments of these two streams.
3. Create deep pools to capture hyporheic flow in areas of deep gravel. Design and construct structures that force streamflow to create scour pools.
4. Construct off-channel pools for resting habitat for fish. Off-channel pools are best located near springs to provide cool water.
5. Place boulders in the lower half of Jordan Creek Reach 1 to add roughness to the stream channel to lessen flow velocities, provide resting and feeding areas for fish, and capture gravels to improve spawning habitat and add roughness to the stream channel.
6. Place large woody debris in the lower half of Jordan Creek Reach 1 specifically to capture gravels to improve spawning habitat and add roughness to the stream channel. Note the pooling effect and the beginning of spawning habitat riffle creation taking place in Jordan Creek Reach 1 below bridge #3 in the Creekside RV Park as shown in Figure 39 below. For comparison, Figure 37 shows the same stream stretch six weeks earlier, prior to the onset of fall rains.

Figure 39. Jordan Creek on November 14, 2005, looking upstream toward upper bridge in Creekside RV Park.

Stream Connectivity

Key Findings:

1. Culverts appear to be the only stream connectivity problems in the watershed. There are no known dams, irrigation ditches, or other significant impediments to fish passage.
2. All but one of the 12 culverts assessed during the stream habitat survey are within potential salmonid habitat according to ODFW. Culvert #7 is the exception.
3. None of the 12 culverts in their current conditions are adequately sized to handle a 100-year storm event. Culvert #1, the Jordan Creek culvert at I-5, as constructed would pass a 100-year streamflow. However, 1 to 1-1/2 foot of gravel buildup at the outlet decreases the effective capacity of these twin box culverts.
4. Half of the 12 assessed culverts (culverts #1, 4, 5, 7, 8, and 11) are certain fish passage barriers because of their outlet configuration or streamflow velocity through the culverts. The other half are probably passage barriers as well, a result of the "sheeting" action of water flowing through the culverts.
5. Four of the 12 culverts (culverts #1, 2, 6, and 11) are currently failing and are in need of replacement even without fish passage issues. Two of the 12 culverts (culverts #4 and 8) have already failed and appear to be serving no desired purpose.

6. The “step” in Jordan Creek approximately 150 feet from the confluence with the South Umpqua River allows passage to adults at high streamflows, but is likely a passage barrier to all life stages at low streamflows. An 8% gradient from the mouth of Jordan Creek upstream to I-5 adds further difficulty for fish passage.

Recommendations:

1. Remove the two failed culverts.
2. Replace all but culvert #7 of the currently-functioning culverts upstream of the Jordan Creek culvert at I-5 with “stream simulation” culverts such as half round or arched corrugated metal pipes. These pipes allow for natural streambeds and avoid the passage barriers of whole round pipes. Design culverts to handle a 100-year storm event.
3. Replace the Jordan Creek culvert at I-5 with a bridge to allow unimpeded fish passage and advance the Tribe’s cultural connection to the watershed. At a minimum, retrofit this culvert with full-span, notched weirs to accommodate fish passage.
4. Add boulders in key locations (sometimes referred to as a “roughened chute”) in Jordan Creek from the step upstream to I-5 in order to facilitate fish passage by slowing streamflow velocities and creating resting places to facilitate upstream fish passage.
5. Conduct all culvert replacements during ODFW’s in-stream work period, typically July 1st through September 15th, or as negotiated with ODFW.

Channel Modification

Key Findings:

1. The Jordan and Alder creek channels appear to have had debris removed through the years, especially in the rural residential areas along Jordan Creek Reach 2 and Alder Creek Reach 1.
2. Some of Jordan Creek Reach 1 through the Creekside RV Park development has been channelized and simplified as a result of the cleanup necessary for development.

Recommendations:

1. See recommendation #5 under “Stream Morphology.”
2. Conduct education and outreach with landowners in the watershed to familiarize these stakeholders with overall watershed restoration efforts, garner support for restoration activities, and recruit sites and volunteers for specific restoration projects.

3.3 Riparian Zones, Wetlands, and Off-Channel Habitat

3.3.1 Riparian Zones

Within Stream Habitat Survey Area. Shade is provided by riparian vegetation and cliffs, terraces, and other steep topography adjacent to the streambed. Shade is important for maintaining cool water temperatures, especially during summer months when streamflows are low, air temperatures are high, and the sun's high overhead position increases the amount of solar radiation reaching the stream. Riparian trees are the major source of LWD inputs into streams and help to anchor trees that do fall into the stream. Vegetation along streams stabilizes banks, serves as habitat for terrestrial invertebrates that are food for salmonids, and provides nutrients to the streams. Well-vegetated riparian zones also serve as a filtering buffer between terrestrial and aquatic environments.

The riparian shade ratings from the stream habitat surveys are displayed with the other stream habitat survey ratings in Section 3.2.1. Appendix A displays the stream habitat survey results for percent shade measurements.

The average percent shade for Jordan Creek is 69%; the average for Alder Creek is 75%. These percent shade values are reach length-weighted averages across all reaches for each of the two creeks. According to ODFW, for westside streams less than 12 meters (approximately 39 feet) in width, less than 60% percent shade is undesirable, while greater than 70% shade is desirable.

The shade rating for Jordan and Alder creeks is "good" for all reaches except Jordan Creek Reach 1, where the rating is "fair." Ratings are based on the chart in Table 5. These ratings may be attributed, at least in part, to the dense cover of blackberry and other shrubs growing in the riparian areas upstream of Jordan Creek Reach 1.

This same shrub cover is also the source of the "poor" rating for riparian vegetation. Though blackberries and other shrubs provide some shade, they provide no potential for large woody debris input into the stream. Conifers are the best source of future large woody debris, while hardwoods are of moderate benefit (Large woody debris is discussed in more detail in the next section.). The widespread, interconnected root systems of hardwood and conifer trees provide better bank stabilization than blackberries and other shrubs. Stabilized stream banks are more likely to develop bank undercut, which can provide excellent cover for fish to rest and escape from predators. Banks vegetated with only shrubs cannot provide this same level of benefit.

Figure 40 shows riparian planting opportunities along Jordan and Alder creeks. The riparian areas shown in red are the best opportunities for riparian planting, as they currently have minimal to no vegetation and few impediments to planting. These areas would be the easiest to plant in terms of locating plantable spots. Those areas shown in yellow currently have shrubs (such as blackberries) and small trees. Vegetation in these areas may provide reasonable levels of shade, but not the longer-term benefits of large conifers as discussed above. These areas are also more difficult to plant because of the current riparian vegetation, which is very dense in places. This vegetation presents a further challenge, beyond simply finding and digging planting holes, as competition from this vegetation will make it difficult to establish new plantings. Areas shown in green currently have larger hardwoods and conifers.

The final 150 feet (approximate) of Jordan Creek fills with backwater from the South Umpqua River up to the step noted in Section 3.2.1. This "pool" of water, as shown on November 14, 2005, in Figure 41, serves as a very important resting refuge for salmonids, especially during heavy streamflows in the South Umpqua River. The retention and, where needed, establishment of riparian vegetation along both sides of this pool is critical.

Some of the conifer trees in the riparian area at the mouth of Jordan Creek are dead or dying. The cause of the mortality and loss of vigor is not clear, but it may be a result of root compaction caused by the recreational use of this area.

Upstream of Stream Habitat Survey Area. The October 2005 stream habitat survey included most of the potential salmonid habitat in the Jordan/Alder Watershed. This habitat includes both Jordan and Alder creeks in their entirety downstream of the Canyonville-Riddle Road and approximately 1/8 mile of Alder Creek upstream of the same road.

Casual observations along Alder Creek upstream of the Canyonville-Riddle Road indicate that riparian areas are intact and well-stocked with conifers and large hardwoods, including bigleaf maple, red alder, black cottonwood, Douglas-fir, grand fir, incense cedar, Pacific madrone, and canyon live oak.

Riparian conditions along Jordan Creek upstream of the Canyonville-Riddle Road are somewhat similar to those on Alder Creek upstream of the same road. Riparian vegetation is largely intact and stocked with a similar mix of species.

A 50-foot unharvested riparian management area (RMA) was observed adjacent to a recent timber harvest unit immediately south of the Canyonville-Riddle Road on both sides of Alder Creek. Along Jordan Creek, there has been little timber harvest in recent years. However, as has occurred along Alder Creek with its recent harvest, RMAs required by the Oregon Forest Practices are expected to maintain adequate streamside trees and other vegetation.

Himalayan blackberries are common throughout the watershed, both in riparian and upland areas. As discussed above, blackberries are an impediment to the planting and establishment of native shrubs and trees in riparian areas. Other noxious weeds in the watershed include French broom and Scotch broom. Noxious weeds in the Jordan/Alder Watershed are further discussed in Section 1.6.

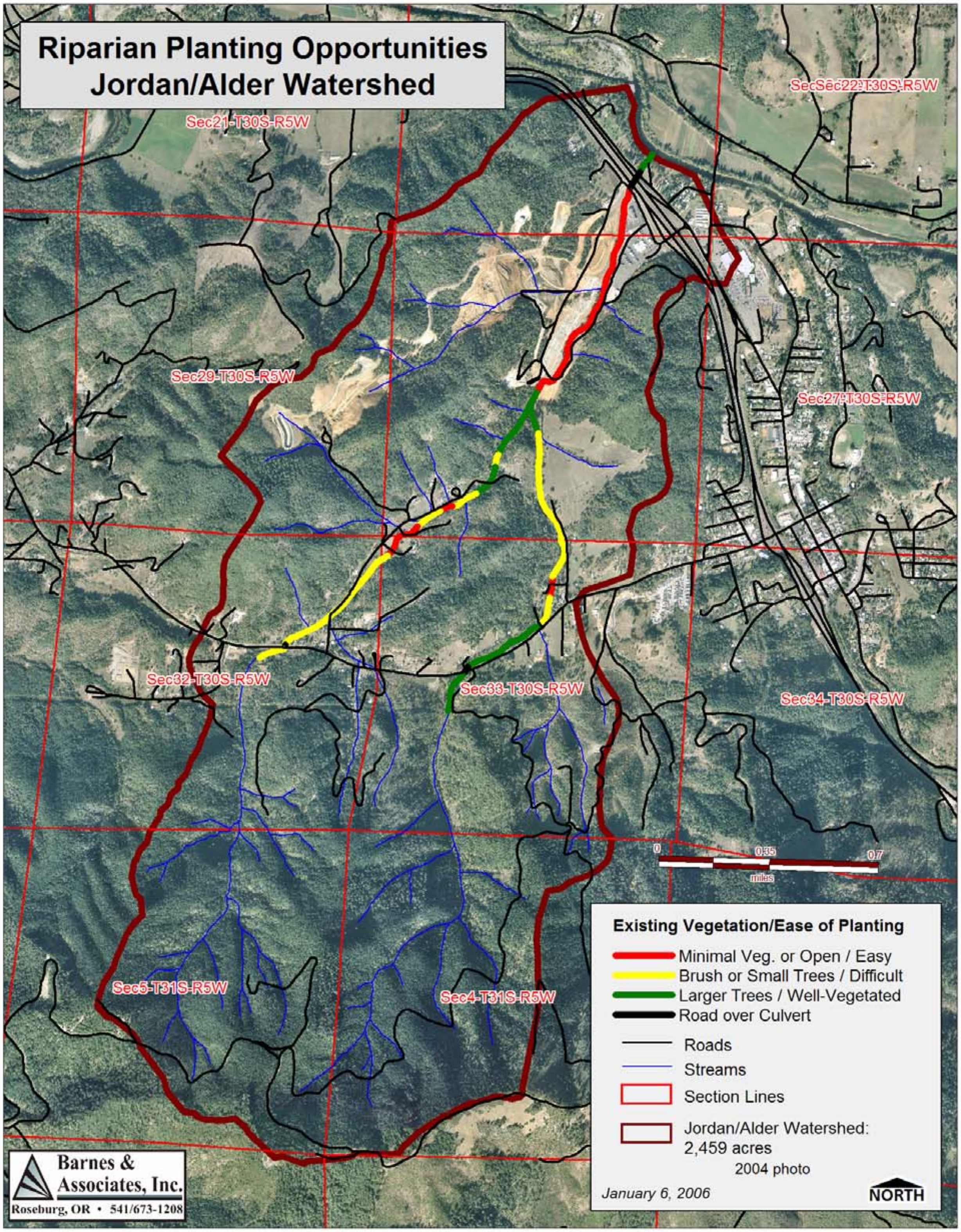

Figure 40. Riparian planting opportunities in the Jordan/Alder Watershed.

Figure 41. Mouth of Jordan Creek on November 14, 2005.

3.3.2 Wetlands

Wetlands provide many functions and benefits, including:

- Flood prevention - wetlands are able to absorb water from runoff during storms and gradually release the water that would otherwise flow quickly downstream. This function is especially important during high streamflows from rain-on-snow events.
- Water filtration - wetlands improve water quality by acting as sediment basins. Wetland vegetation is able to filter and reduce excess nutrients such as phosphorous and nitrogen.
- Ground water recharge - water that is held in wetlands can move into the subsurface soil, thus recharging the groundwater.
- Stream bank stabilization - wetlands and associated vegetation slow the movement of water and help slow erosion of stream banks.
- Fish and wildlife habitat - many species depend on wetlands for food, spawning and rearing.

According to the U.S. Fish and Wildlife Service's (USFWS) National Wetlands Inventory, there is only one area of documented wetlands within the Jordan/Alder Watershed. See Figure 42 for the location of this wetland area. This approximately ¼-acre (or smaller) wetland is classified by the USFWS as a POWFh, or a semi-permanent, diked or impounded, open water palustrine wetland. Aerial photo interpretation seems to validate the diked nature of this wetland. “Palustrine” wetlands are nontidal wetlands dominated by trees, shrubs, and emergent vegetation (vegetation with roots in water) and are generally less than 20 acres in size and two meters (approximately seven feet) in depth. “Palustrine” wetlands are often associated with small seasonal drainages and other flowing water.

While the ¼-acre POWFh wetland is the only wetland under the jurisdiction of the USFWS, there are likely other wetlands in the watershed. USFWS’s wetlands inventory does not adequately track very small wetlands, such as seeps or springs. A “wetland” need not be wet all year. Among other criteria, an area has to be inundated or saturated with water for two weeks between March 1 and October 31 in order to qualify as a wetland.

As mitigation for wetlands disturbance associated with its RV park development, the Tribe plans to create new wetlands within the Jordan/Alder Watershed. The exact locations and number of these mitigation wetlands have not yet been determined, but current plans call for two new wetlands at the top of the RV park development between the lower (freshwater) reservoir and the sewage lagoon, and one new wetland along Rod & Gun Club Road.

The current Rod & Gun Club property contains a potential wetland (which is, perhaps, an historical wetland). This “wetland” is located near culvert #2, where Jordan Creek passes under the Rod & Gun Club Road. Here, there are new wetlands possibilities on both sides of the Rod & Gun Club Road. See Figure 43 for the location of the potential wetlands and other identifying features discussed in this section. Figures 44 and 45 are images of this potential wetlands site.

Jordan Creek typically overflows every year at the point so labeled in Figure 43. Anecdotal evidence suggests that the streambed at this point has been built up with gravel and other sediment over the years since one of the twin corrugated metal pipes at culvert #2 began to collapse (Jess Wright, South Umpqua Rod & Gun Club, personal communication, October 10, 2005). The partial collapse of this culvert (Figure 24 displays an image of this collapsing culvert.) has apparently slowed down high streamflows sufficiently to allow sediment to drop out upstream of the culvert, including at the overflow point. The streambed is very shallow in this stretch of Jordan Creek, as shown in Figure 45.

The highest annual streamflows from Jordan Creek flow over the bank, onto the Rod & Gun Club’s parking area, and across Rod & Gun Club Road into the north half of the potential wetlands area. This potential wetlands area is flat, low-lying, and vegetated with willows and other hydric species. Water “stored” in this low-lying area likely supplies Jordan Creek with water deep into, and perhaps throughout, the summer.

Other wetlands creation opportunities may exist within the watershed in conjunction with other habitat restoration projects. For instance, Section 3.3.3 discusses the creation of ponds and off-channel habitat in the watershed. The periphery of any created ponds could be designed and managed to act as and serve the functions of wetlands.

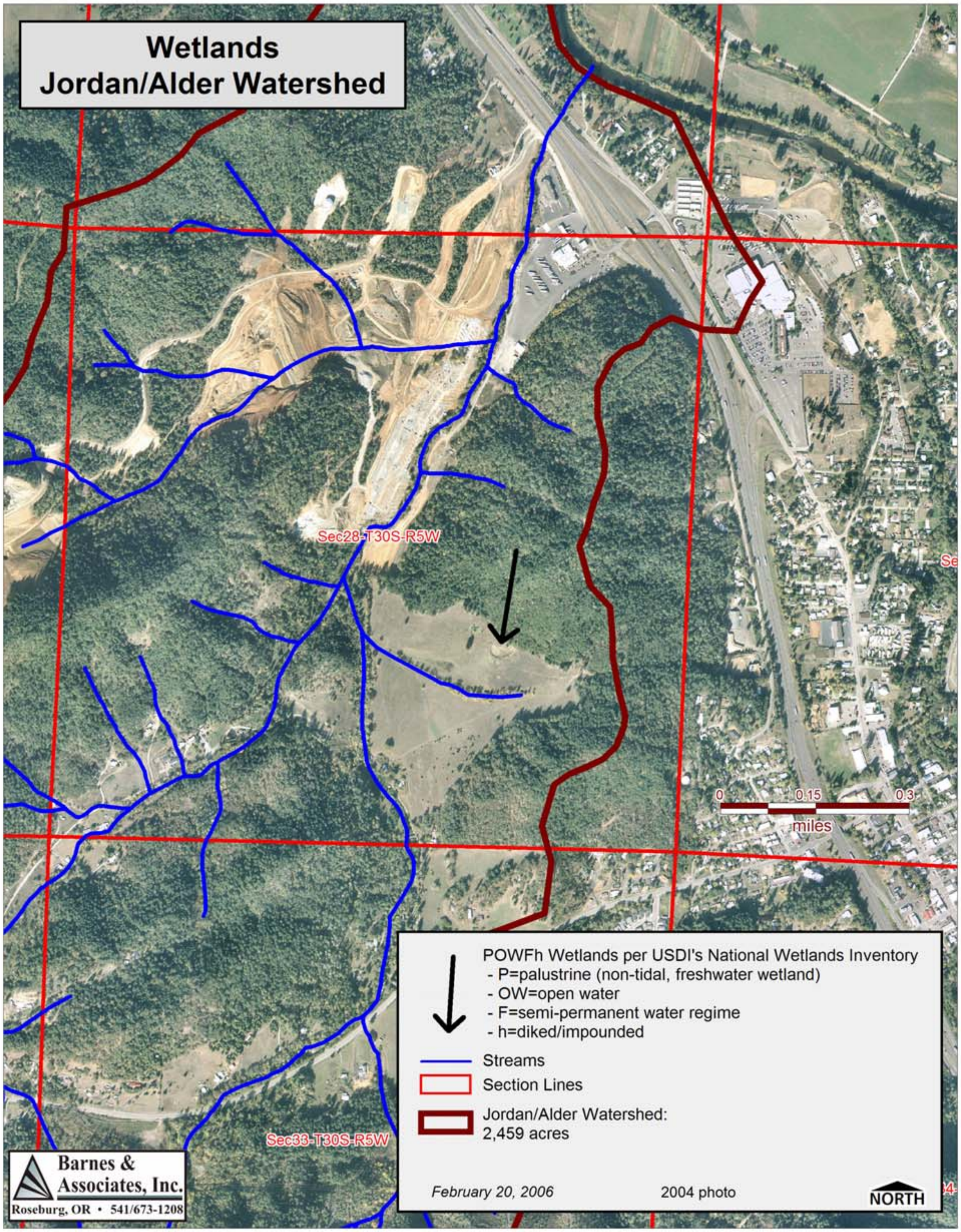

Figure 42. Wetland area in Jordan/Alder Watershed per the National Wetlands Inventory.

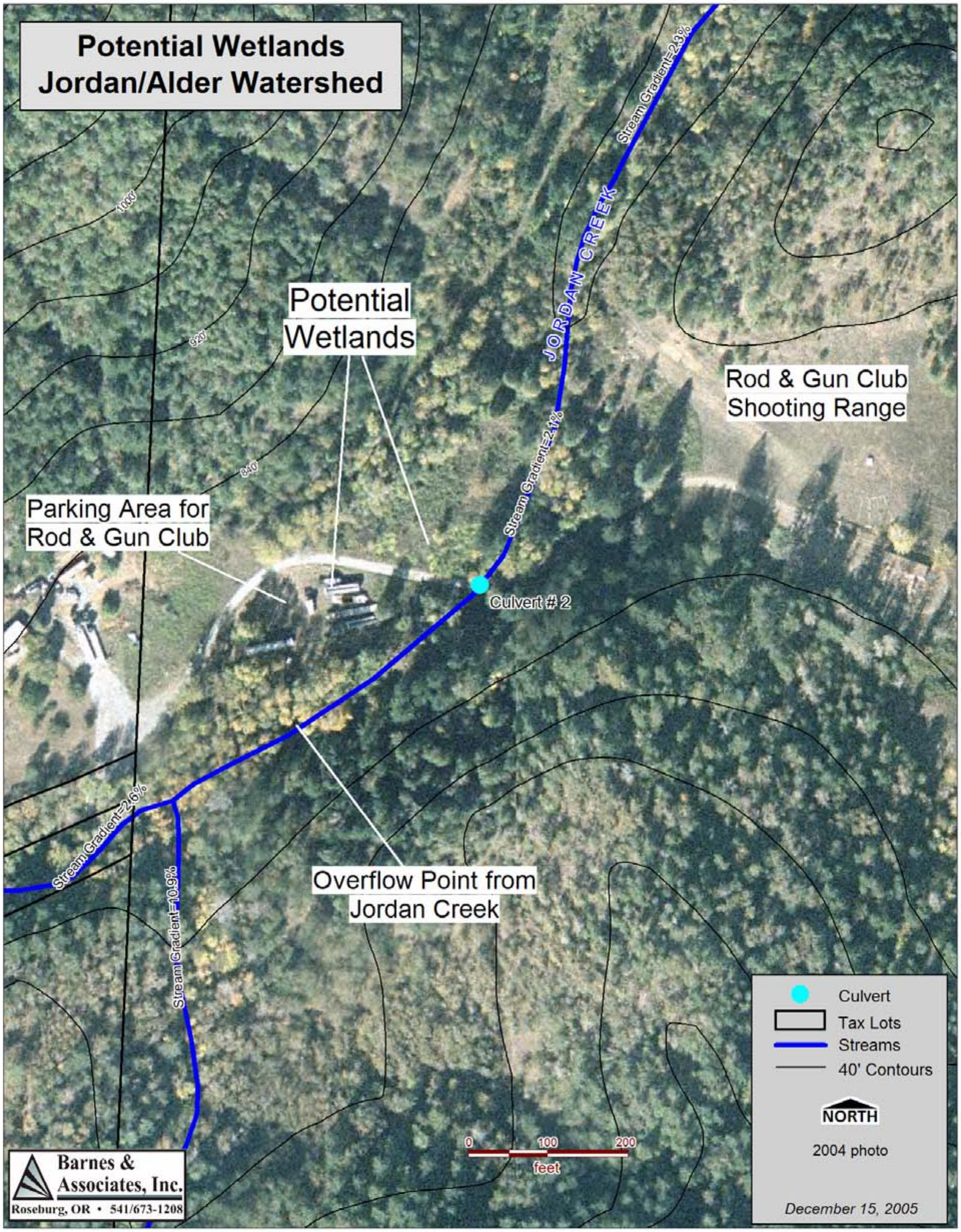

Figure 43. Potential wetlands in Jordan/Alder Watershed.

Figure 44. Current parking area/potential wetlands at Rod & Gun Club.

Figure 45. Point of Jordan Creek overflow onto Rod & Gun Club parking area.

3.3.3 Off-Channel Habitat

Off-channel habitat includes pools and alternate stream channels ("secondary" channels) that are outside the main stream channel ("primary" channel), but which are accessible to fish at all times of the year or simply during high streamflows. Off-channel pools and secondary channels provide habitat where fish can escape from high velocity winter streamflows. Pools – both off-channel and within the primary channel – provide important rearing habitat for many fish species, can be critical over-wintering habitat for juvenile salmonids, and may be the only viable habitat during low summer streamflows. Secondary channels help divert high winter streamflows and serve to reduce overall velocity.

Stream observations and measurements taken during the October 2005 stream habitat survey show there to be little off-channel habitat in the Jordan/Alder Watershed. The lack of off-channel habitat is likely a result, at least in part, of stream simplification through the years as development has endeavored to capture usable land for uses other than as fish habitat. Yet, there are areas where off-channel habitat can be restored and/or strengthened through restoration efforts.

Figure 46 shows three areas of opportunity for creating off-channel habitat in the watershed:

1. The Alder Creek side channel appears to be a secondary channel, or perhaps what was once Alder Creek's primary channel. Though this channel is likely dry during the summer months, it does carry water and maintains an attachment to the current primary Alder Creek channel during the winter months. It may be possible to develop an off-channel pool in this side channel for use as rearing and over-wintering habitat. Wetlands development may be possible adjacent to this side channel and pool. Figure 47 shows a small pool already developed in the side channel.
2. The "Nunes" rearing pool area near Jordan Creek provides an opportunity to develop an off-channel pool for rearing and over-wintering habitat. This pool area is currently an inactive pasture that captures water from road runoff and excess streamflow from an adjacent tributary to Jordan Creek. Any rearing pool created in this area could be fed by water from the Creekside RV Park's upper reservoir. Streamflows in Jordan Creek itself could also be augmented by water from the upper reservoir via this same tributary. It may be possible to develop wetlands around this pool. Figure 48 shows the potential rearing pool site as well as the augmentation stream.
3. The "Nunes" secondary channel in Tax Lot 1100, Section 28, T30S, R5W may provide an opportunity to develop a secondary channel on Jordan Creek to divert flow during high streamflows and reduce streamflow velocity during heavy winter flows. This secondary channel is the "historical channel" shown in Figure 36 and discussed in Section 3.2.3. The secondary channel could be filled with backwater created by increased hydraulic resistance in the current Jordan Creek channel.

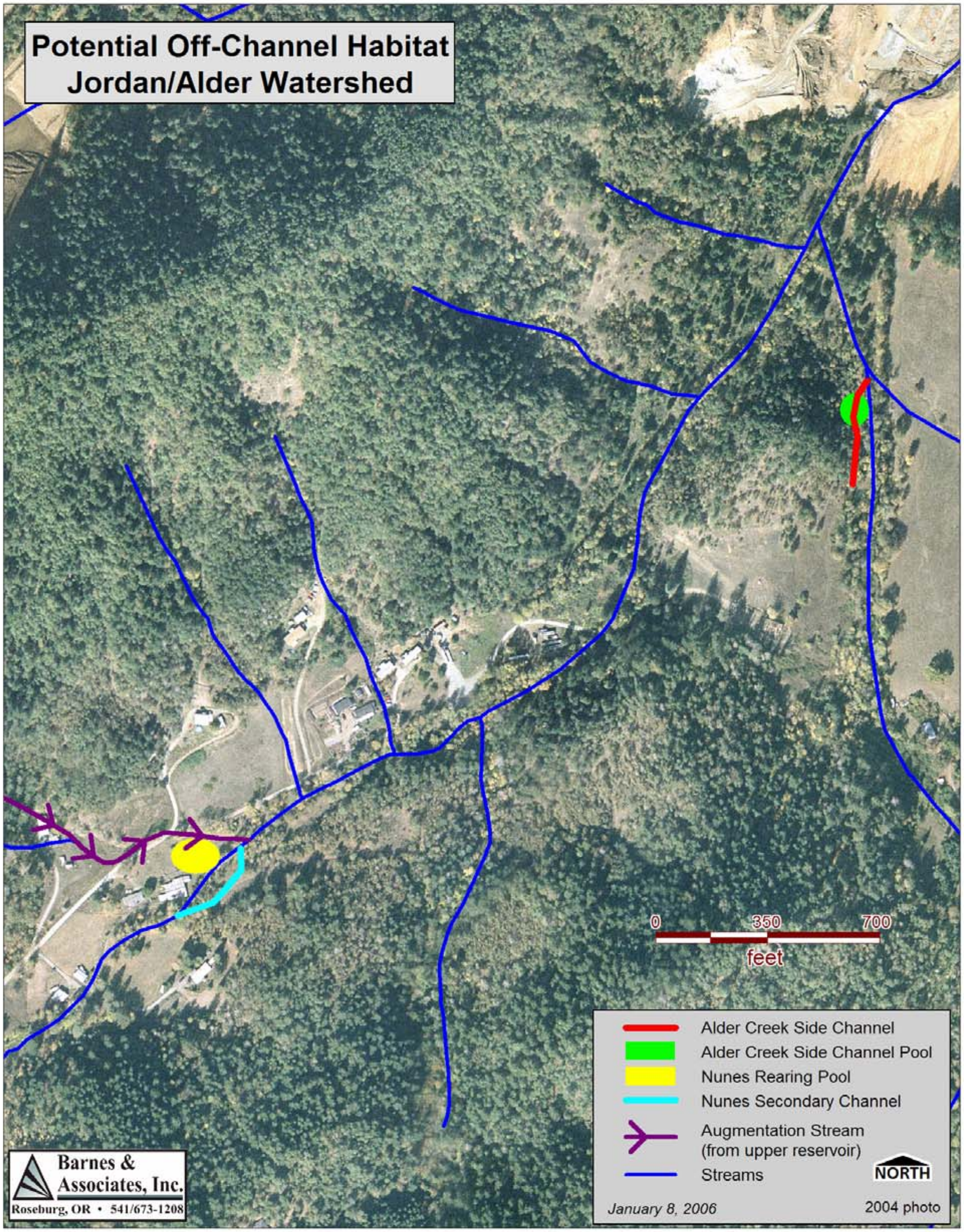

Figure 46. Potential off-channel habitat opportunities in Jordan/Alder Watershed.

Figure 47. Alder Creek side channel and pool development opportunity.

Figure 48. "Nunes" rearing pool development opportunity (background right) and augmentation stream (foreground), with Jordan Creek on left.

3.3.4 Riparian Zones and Wetlands: Key Findings and Recommendations

Riparian Zones

Key Findings:

1. While the percent riparian shade rating according to the stream habitat survey is "good" for all surveyed reaches except Jordan Creek Reach 1 – which is rated as "fair" – much of the shading is provided by blackberries and other shrubs. Shrubs are less desirable for shade than hardwood trees, while conifers – especially large diameter conifers – are more desirable than hardwoods.
2. Much of the riparian area in the Jordan/Alder Watershed can be easily accessed for riparian planting, especially in Jordan Creek Reach 1. But, establishment of desirable vegetation, such as conifers, in much of the riparian area is difficult because of dense blackberry and other brush cover.
3. The lower 150 feet of Jordan Creek serves as important resting refuge for salmonids in the South Umpqua River.
4. The Oregon Forest Practices Act appears to be protecting riparian vegetation where forestry is the primary land use, particularly in the south half of the watershed. Riparian planting is unnecessary in these areas.

Recommendations:

1. Plant a combination of native conifers, hardwoods, and shrubs in areas where there is currently little or no vegetation. In these areas, planting would be easy and provide the greatest benefit to the stream. In blackberry and shrub-dominated areas where landowners are willing participants, clear out blackberries and plant a combination of native conifers, hardwoods and shrubs.
2. Maintain existing and consider the expansion of riparian forest along the lower 150 feet of Jordan Creek to enhance its value as resting refuge for salmon.
3. Conduct education and outreach with landowners in the watershed to familiarize these stakeholders with overall watershed restoration efforts, garner support for restoration activities (including noxious weed control), and recruit sites and volunteers for specific restoration projects.
4. Encourage landowners to continue working with organizations such as Douglas Soil and Water Conservation District to control noxious weeds in the watershed.

Wetlands/Off-Channel Habitat

Key Findings:

1. There is a lack of wetlands and off-channel habitat in the Jordan/Alder Watershed.
2. Opportunities exist to enhance the effectiveness of naturally-wet areas and create off-channel habitat in the watershed.

Recommendations:

1. Acquire stream profiles and elevations along Jordan and Alder creeks in order to better design and engineer off-channel habitat and wetlands.
2. Develop the Alder Creek side channel and pool, Nunes rearing pool, and Nunes secondary channel opportunities.

3.4 Water Quality

3.4.1 Water Quality Beneficial Uses and Impairments

The Oregon Water Resources Department (OWRD) has established a list of designated beneficial uses for surface waters, including streams, rivers, ponds, and lakes. Beneficial uses are based on human, fish, and wildlife activities associated with water. This assessment focuses on the designated beneficial uses for flowing water, i.e. streams and rivers. Table 9 lists all beneficial uses for streams and rivers within the Umpqua Basin.

Table 9. Beneficial uses for surface water in the Umpqua Basin.

Beneficial Uses	
Public domestic water supply	Private domestic water supply
Industrial water supply	Irrigation
Livestock watering	Boating
Aesthetic quality	Anadromous fish passage
Commercial navigation and transportation	Resident fish and aquatic life
Salmonid fish spawning	Salmonid fish rearing
Wildlife and hunting	Fishing
Water contact recreation	Hydroelectric power

The Oregon Department of Environmental Quality (ODEQ) has established water quality standards for these designated beneficial uses. These standards determine the acceptable levels or ranges for water quality parameters, including temperature, dissolved oxygen, pH, and others. Water quality standards set by ODEQ are periodically reviewed and updated. ODEQ analyzes water quality data on streams and stream reaches throughout Oregon. Streams or reaches that are not within the standards are listed as “water quality impaired.” The list of impaired streams is called the “303(d) list,” after Section 303(d) of the 1972 Clean Water Act. For each stream on the 303(d) list, ODEQ determines the total maximum daily load (TMDL) of human-caused and natural pollutants allowable for each parameter. Streams can be de-listed once TMDL plans are complete, when monitoring shows that the stream is meeting water quality standards, or if evidence suggests that a 303(d) listing was in error.

No streams within the Jordan/Alder Watershed are listed on ODEQ’s 303(d) water quality limited lists, including both the final 2002 list and the draft 2004 integrated report (ODEQ 2005a). Further, according to ODEQ’s LASAR (Laboratory Analytical Storage and Retrieval) database, there is no publicly-available water quality data for Jordan or Alder creeks (ODEQ 2005b). If a stream in the Jordan/Alder Watershed were 303(d) listed, the listing would have been based on analytical results stored in the LASAR database.

It is important to note that the absence of a 303(d) listing and water quality data does not necessarily mean that the stream or stream segment meets water quality standards. There are many streams and stream segments that have not been monitored by ODEQ, or for which additional information is needed to make a listing determination.

3.4.2 Other Water Quality Monitoring

Water quality in Jordan Creek has been measured at three locations on the Tribe's Creekside RV Park property since June 2003, with the dual goal of monitoring water quality effects resulting from construction activities on tribal lands and providing baseline data for future restoration efforts. These data are collected weekly by Roseburg-based Land and Water Environmental Services, Inc. Water quality parameters measured include: pH, conductivity, turbidity, dissolved oxygen, temperature and salinity. A summary of these data is shown in Table 10.

The monitoring point locations were carefully chosen to provide specific information. Monitoring station #1 is the furthest upstream of the three stations, located just upstream of the RV Park project. This location was chosen to provide parameter background levels. Monitoring station #2 is located at the main water outfall from the ongoing construction project. This location was chosen to monitor the maximum impact that construction activities are having on Jordan Creek. Monitoring station #3 is near the confluence of Jordan Creek and the South Umpqua River. Station #3 was originally located just below the downstream end of the I-5 culvert in order to measure any water cooling effect from the culvert. After collecting sufficient data to determine that there seems to be a cooling effect, station #3 was moved upstream to immediately above the I-5 culvert because of measurement instrument vandalism problems. Low volume water flow measurements continue to be taken downstream of the I-5 culvert.

ODEQ has established water quality standards for numerous parameters, including temperature, dissolved oxygen, and turbidity. The standards represent optimal habitat conditions that would support viable populations of native salmonid species. Conditions outside this range would be considered less than optimal.

Stream water temperatures are related to shading from riparian vegetation, streamflow levels, and the volume of subsurface flow, among other factors. Water temperatures vary from stream to stream. Some streams, including many in southwest Oregon, are naturally warmer than the generic standards established by ODEQ.

Dissolved oxygen, or the volume of oxygen in solution, is critical for aquatic life. The quantity of oxygen dissolved in stream water is dependent on water temperature, streamflow, turbidity, and other factors. Cold water holds more oxygen than warm water. Likewise, flowing water tends to have more dissolved oxygen than stagnant water because of the mixing of air and water. Water temperatures, however, are the key: the cooler the water, the more oxygen it holds.

Turbidity is a measure of water clarity, or the amount of suspended solids (sediment) in water. The clarity of stream water is important for aquatic life because suspended particles absorb the sun's rays and warm the water. As discussed in Section 3.2.1, excessive deposits of sediments can restrict spawning habitat by filling in the spaces between gravel particles.

These and other water quality factors fluctuate with time. Stream temperature changes not only with the seasons, but from the warmth of the day to the cold at night. Water turbidity can be impacted by activities in and near streams; short-term "pulses" of turbid water can be the result, even with appropriate mitigation measures. Dissolved oxygen is dependent on stream temperature and turbidity.

As discussed above, the Tribe initiated water quality monitoring to coincide with its construction activities at the RV park. Though there may be short-term "spikes" of less-than-ideal water quality, water quality parameters are expected to improve significantly after construction is complete and planned restoration activities outlined in this assessment are implemented and their benefits realized.

Table 10. Summary of water quality monitoring data on Jordan Creek.

Parameter	Monitoring Station #1	Monitoring Station #2	Monitoring Station #3
pH			
ODEQ Standard	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5
Jordan Creek max.	8.84	8.67	8.70
Jordan Creek min.	6.37	6.25	6.16
Dissolved Oxygen (mg/L)			
ODEQ Standard	>=11.0 mg/L	>=11.0 mg/L	>=11.0 mg/L
Jordan Creek max.	10.73	10.97	11.17
Jordan Creek min.	4.97	2.78	5.95
Temperature (º F), June 1 to September 30			
ODEQ Standard	64º F	64º F	64º F
Jordan Creek max.	76º on 7/30/04	73º on 8/18/04	71º on 7/13/05
Jordan Creek min.	54º on 6/7/05	53º on 6/7/05	54º on 6/7/05
Temperature (º F), Oct. 1-May 31 (waters supporting salmon spawning, egg incubation, fry emergence)			
ODEQ Standard	55º F	55º F	55º F
Jordan Creek max.	56º on 5/14/04	60º on 10/22/03	59º on 4/27/04
Jordan Creek min.	46º on 3/3/04	46º on 3/3/04	46º on 3/3/04
Conductivity (mS/cm)			
Jordan Creek max.	0.568	0.458	0.248
Jordan Creek min.	0.00	0.101	0.103
Turbidity (NTUs)			
Jordan Creek max.	11.00	999.00	354.00
Jordan Creek min.	0.00	0.00	0.00

3.4.3 Nutrients

High nutrient levels during the warm summer months encourage the growth of algae and aquatic plants. Excessive algal and vegetative growth can result in little or no dissolved oxygen, and interfere with water contact recreation, such as swimming. Also, certain algae types produce by-products that are toxic to humans, wildlife, and livestock. Possible nutrient sources include feces and urine from domestic and wild animals, wastewater treatment plant effluent, waste from failing septic systems, and fertilizers. Livestock are also a potential source of bacteria, as discussed in Section 3.4.4.

The level of nutrients in Jordan and Alder creeks is unknown. However, livestock are known to roam along and through some of the streams in the Jordan/Alder Watershed. Some riparian areas are fenced, thus precluding or minimizing potential sedimentation, nutrient, and bacteria problems. Though the overall level of livestock grazing in the watershed is small, the water quality ramifications of that grazing are unclear. Expanding water quality monitoring efforts in the watershed would help determine the level of livestock-related water quality problems, if any.

All of the "rural residential" homes along the Canyonville-Riddle Highway, Rod & Gun Club Road, and Meyer Lane have septic systems to handle their household sewage. The condition of these septic systems and their ability to keep nutrients and bacteria out of Jordan and Alder creeks is unknown. The level of fertilization, if any, in the watershed is unknown. Potential fertilization sources in the watershed include fertilization of livestock grazing areas, lawns and gardens of the "rural residential" homes, and commercial forest stands in the upper watershed.

A possible future source of nitrates in the watershed is any water that may be directed from the Tribe's upper reservoir into Jordan Creek for streamflow augmentation purposes. Though the original source of this augmentation flow is gray water from the RV park's sewage treatment system as well as other possible origins, it is unlikely that Jordan Creek would be enriched with nitrates from this practice, as long as the augmentation flow from the upper reservoir were delivered via a vegetated channel such as a natural drainage, or passed through some other form of bio-filtration (Loran Waldron, Land and Water Environmental Services biologist, personal communication, January 13, 2006). See Sections 3.3.3 and 3.4.4 for further discussion of streamflow augmentation.

3.4.4 Bacteria

Bacteria are present in all surface water. In general, resident bacteria are not harmful to the overall aquatic environment or to most human uses. Conversely, ingestion of fecal bacteria such as *Escherichia coli* (*E. coli*) can cause serious illness or death in humans. The presence of fecal bacteria indicates a potential vector for other human diseases, such as cholera and giardiasis ("beaver fever"). Water contact recreation is the beneficial use most affected by bacteria. Private and public drinking water supplies are not affected because water filtration systems are able to remove harmful microorganisms.

There are many possible sources of *E. coli* and other fecal bacteria in water. Common sources include failing septic systems and aquatic warm-blooded animals, such as waterfowl and beaver. Upland areas with concentrated fecal waste, such as stockyards and kennels, are also bacteria sources. During rain events, high levels of bacteria may be washed down into streams from these upland bacteria sources.

All of the "rural residential" homes along the Canyonville-Riddle Highway, Rod & Gun Club Road, and Meyer Lane have septic systems to handle their household sewage. The condition of septic systems and their ability to keep bacterial pollutants out of Jordan and Alder creeks is unknown.

Sewage from the Creekside RV Park will be collected via underground pipes and temporarily stored in a 20,000-gallon septic tank in the park. Solids will be collected and appropriately disposed of as necessary – likely every five years – from this tank. Gray water from the tank will be pumped up to a sewage lagoon above the park. Here, bacteria will be biodegraded in four stages before the water is pumped into the upper reservoir. This water will be chlorinated before being used for any irrigation or streamflow augmentation purposes. It is anticipated that bacteria from the RV park's sewage will not be present in the treated water.

3.4.5 Sedimentation/Turbidity

As discussed in Section 3.2, particles of silt, sand, and organics – collectively known as "fine sediment" – are natural components of stream systems. However, excessive levels of fine sediment can be harmful to fish and fish habitat. Further, these fine sediments are easily transported downstream, so any sediment delivered to upper stream reaches can have widespread impact throughout an aquatic system.

The sediment sources identified as being of greatest concern in the Jordan Alder Watershed are road instability, slope instability, and rural road runoff. Runoff from the Creekside RV Park and its expansive area of impervious blacktop surface will also be addressed, as will possible sedimentation from steep banks along Jordan Creek as it flows through the RV park.

Road Instability. Roads are a potential source of sedimentation to streams. The closer a road is to a stream, the higher its potential to deliver sediment to that stream. Roads located on steep slopes have a greater potential of sediment delivery to downslope streams than do roads on moderate to flat slopes.

Different road surfaces have different levels of potential off-site sediment delivery. Non-surfaced roads have the greatest potential, rocked roads have moderate potential, while paved or hard surface roads have the least potential.[15] All else being equal, non-surfaced roads have greater potential to deliver sediment to streams than hard surface roads. Table 11 is a chart of surface types for three groupings of roads within the Jordan/Alder Watershed: all roads, roads

[15] Non-surfaced roads are roads that have not had an application of a separate surface material. Often referred to as "dirt" roads, these roads can include varying amounts of vegetation and rock, depending on the amount of rock in the ground under the road itself.

within 200 feet of streams, and roads within 70 feet of streams. Figures 49, 50, and 51 are maps of all the roads, roads within 200 feet of streams, and roads within 70 feet of streams, respectively.

Table 11. Surfaces of roads and locations relative to streams in Jordan/Alder Watershed.

	All Roads, Miles		***Roads Near Streams, Miles***			
Surface Type	**All Roads**	**% of Total**	**Within 200'**	**% of Total**	**Within 70'**	**% of Total**
Gravel	7.2	32%	1.4	16%	0.4	12%
Paved	5.4	24%	4.9	54%	2.0	61%
Unknown	4.3	19%	0.4	4%	0.2	6%
Non-surfaced	3.7	16%	1.3	14%	0.4	12%
Pit Run Rock	2.2	10%	1.0	11%	0.3	9%
Total	22.8	100%	9.0	100%	3.3	100%

The proportion of roads with the highest potential for sediment delivery (i.e., non-paved roads) changes significantly from the “all roads” grouping to the “roads near streams” groupings. For the entire watershed and including all roads, non-paved roads (non-surfaced, gravel, and pit run rock) represent 58% of all roads. For just those roads within 200 feet of streams, the non-paved proportion drops to 41%; for roads within 70 feet, the non-paved proportion drops to 33%. For purposes of this analysis, roads of unknown surfacing are excluded.

The relative location of some of these road surface types is worth noting. The majority of the paved road miles is concentrated on and near I-5 and includes the freeway itself, on-/off-ramps, Highway 99, and miscellaneous frontage roads. Non-surfaced roads are located primarily in the upper watershed.

Table 12 and Figure 52 are similar to Table 11 and Figure 49, respectively, but display only those roads located on hillsides of greater than 50% slope. All of the non-surfaced roads on steep slopes are located in the upper watershed. Though non-surfaced roads make up a large percentage of the roads on steep slopes, their actual number of miles is small: 1.4 miles of all roads on steep slopes, 0.6 miles of those steep slope roads within 200 feet of streams, and only 0.2 miles of those steep slope roads within 70 feet of streams. A gravel road on a steep side slope is more apt to produce sediment that ends up in a stream than a gravel road on a flat or nearly flat slope, all else being equal. Figure 53 is similar to Figure 50, but displays only those roads within 200 feet of streams and located on hillsides of greater than 50% slope.

Table 12. Surfaces of roads on steep slopes and locations relative to streams in Jordan/Alder Watershed.

	All Roads on Slopes >50%, Miles		*Roads on Slopes >50% and Near Streams, Miles*			
Surface Type	**All Roads**	**% of Total**	**Within 200'**	**% of Total**	**Within 70'**	**% of Total**
Non-surfaced	1.4	58%	0.6	55%	0.2	50%
Unknown	0.5	21%	0.2	18%	0.1	25%
Pit Run Rock	0.4	17%	0.2	18%	0.1	25%
Gravel	0.1	4%	0.1	9%	<0.1	0%
Total	2.4	100%	1.1	100%	0.4	100%

Roads in the upper watershed appear to be stable and are unlikely to deliver significant volumes of sediment to the watershed's streams, given the current amount of use these roads receive. Many of the forest stands in the upper watershed are "mid-rotation" in age, translating to low forest activity levels and minimal road use in this part of the watershed. As the forest stands on the watershed's private lands mature, it is anticipated that timber harvests and other forestry activity will increase.

Slope Instability. Slumps (slow-moving landslides) and debris flows (rapidly-moving landslides) on **s**teep, unstable hillsides have the potential to deliver massive volumes of sediment into aquatic systems. Landslides – and the sediment and large debris they deliver to streams – are natural elements of any forest environment. However, certain practices, such as poorly-planned and implemented road construction, have the potential to increase the frequency of landslides, particularly on naturally-unstable slopes. Assessment of 2004 aerial photos and on-the-ground reconnaissance reveal no evidence of recent slope instability anywhere in the watershed.

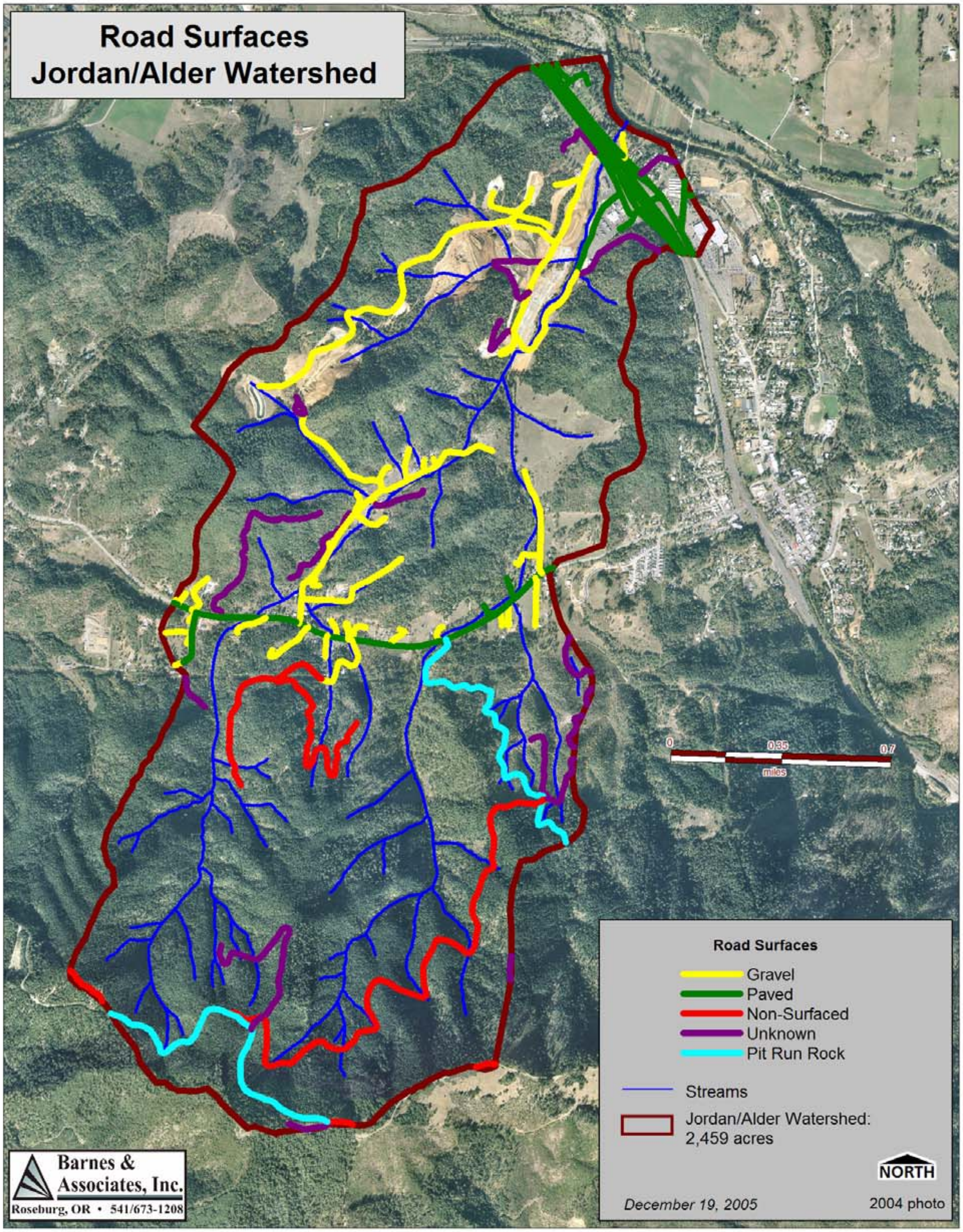

Figure 49. Surfaces of roads in the Jordan/Alder Watershed.

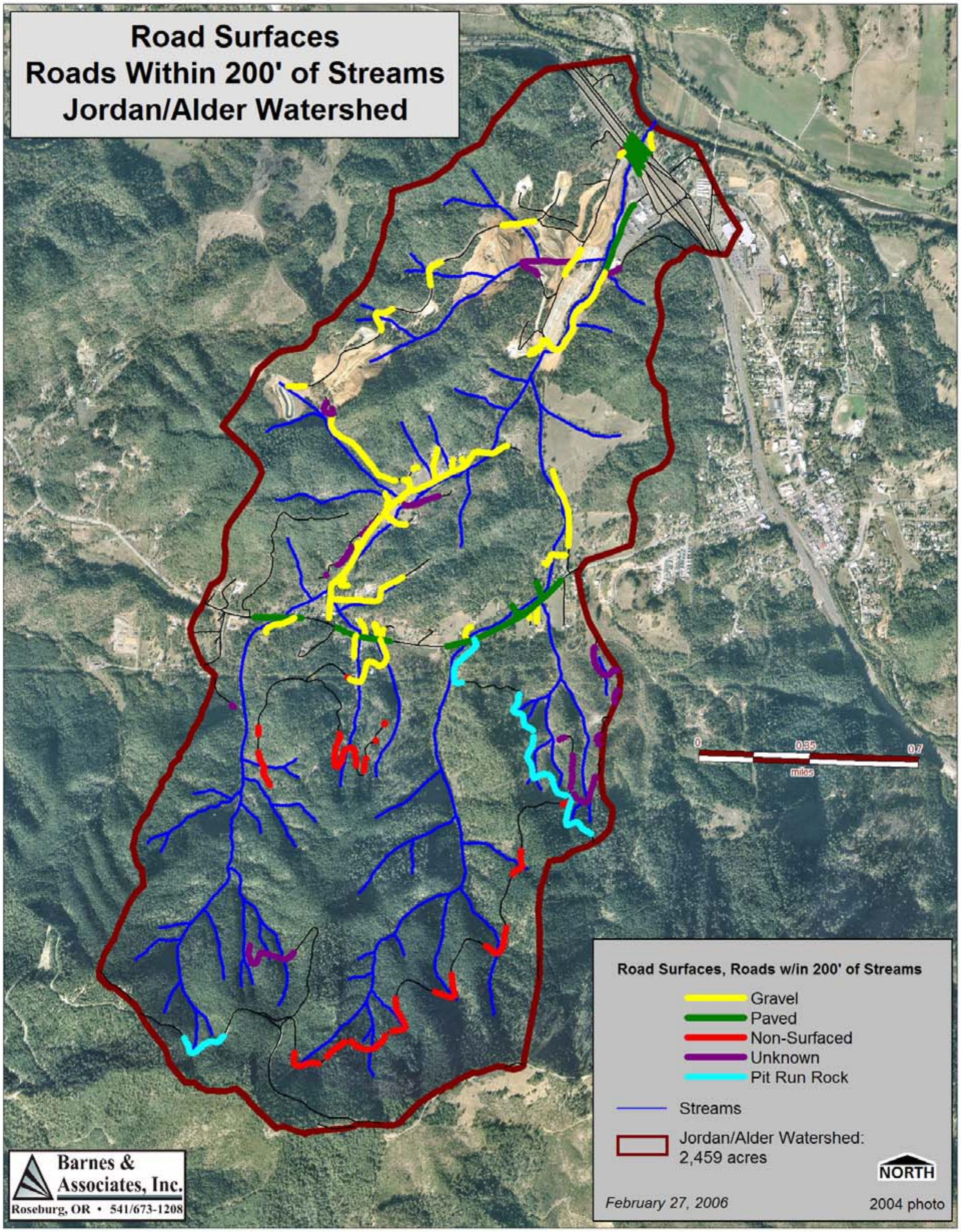

Figure 50. Surfaces of roads within 200' of streams in the Jordan/Alder Watershed.

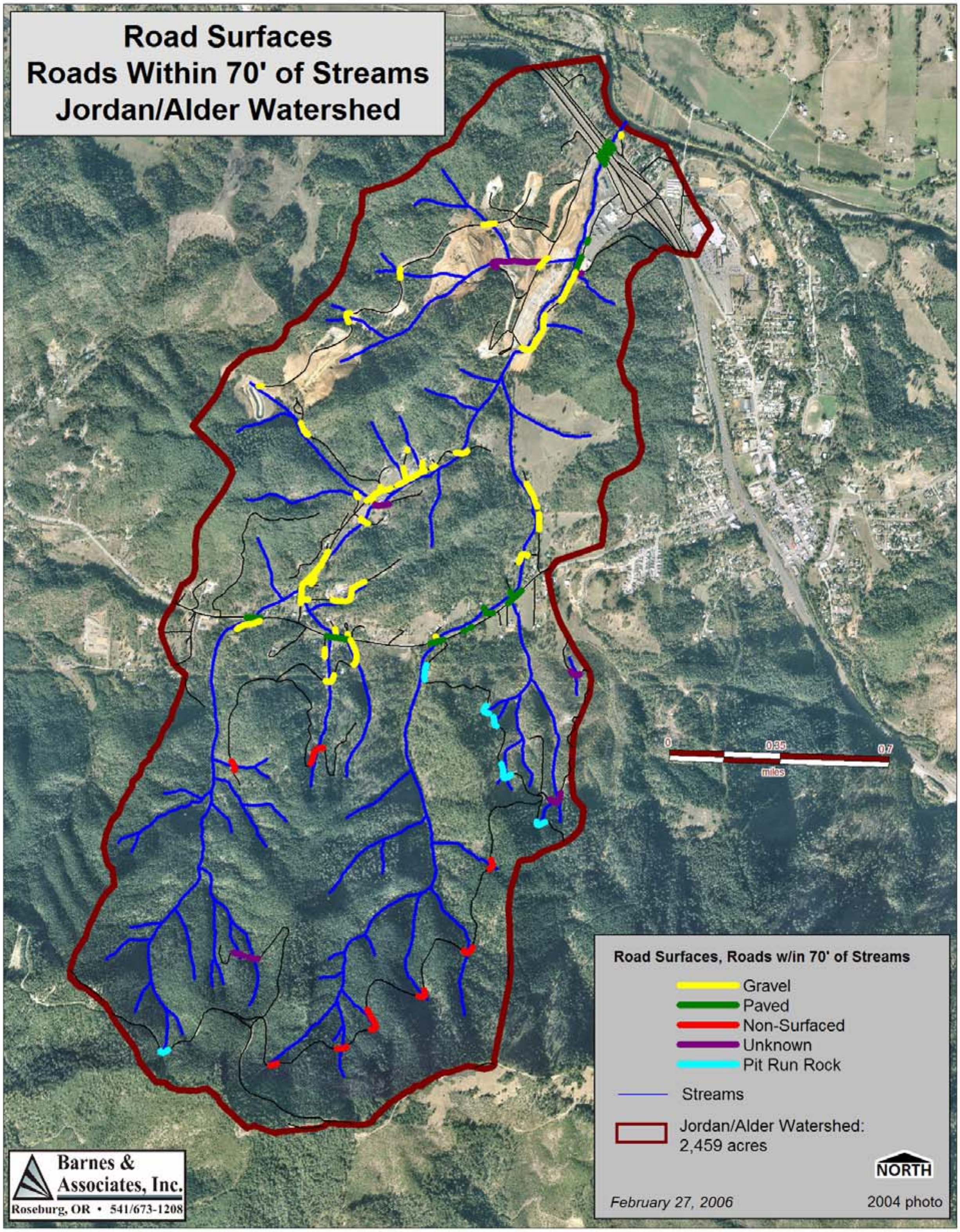

Figure 51. Surfaces of roads within 70' of streams in the Jordan/Alder Watershed.

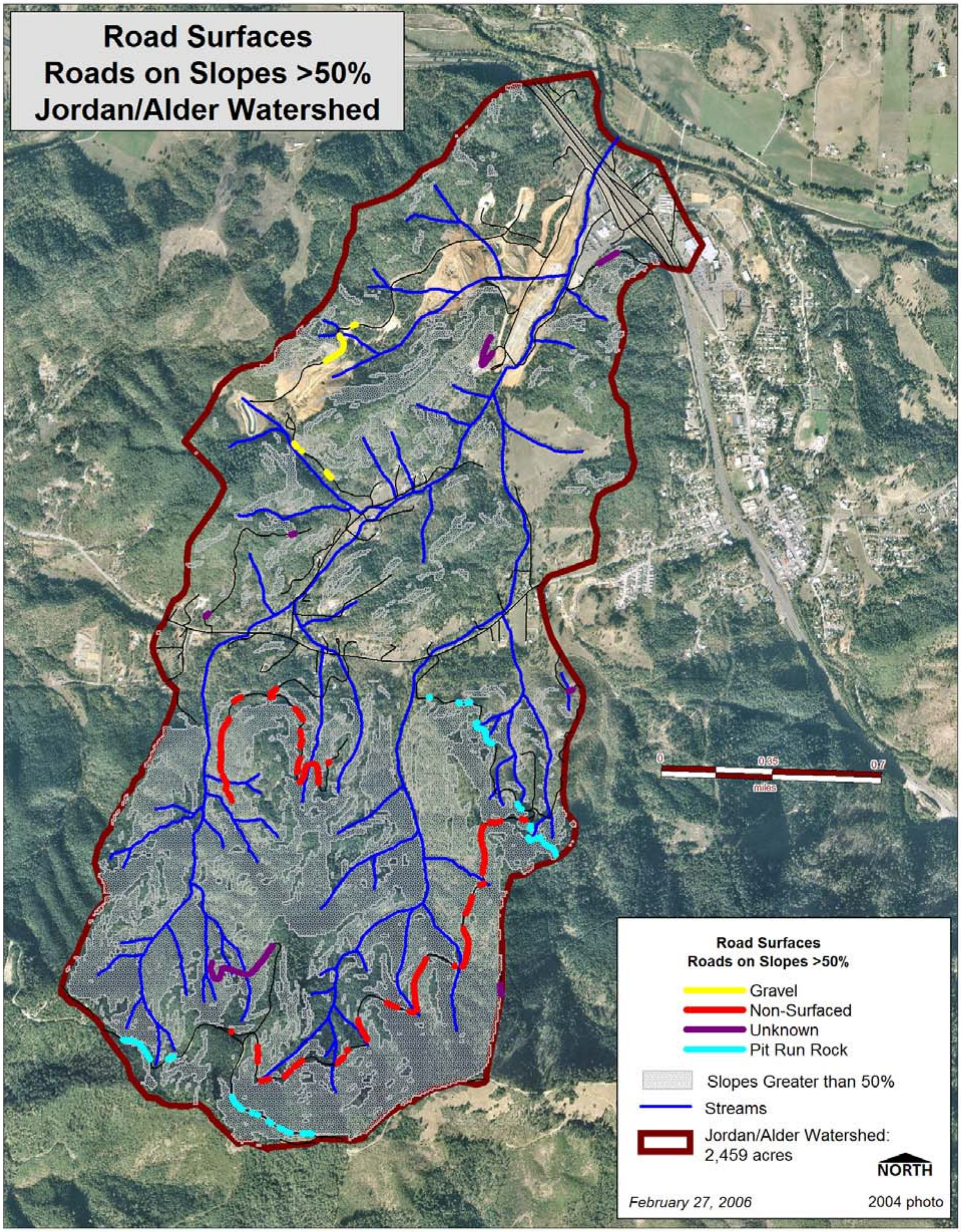

Figure 52. Surfaces of roads on steep slopes in the Jordan/Alder Watershed.

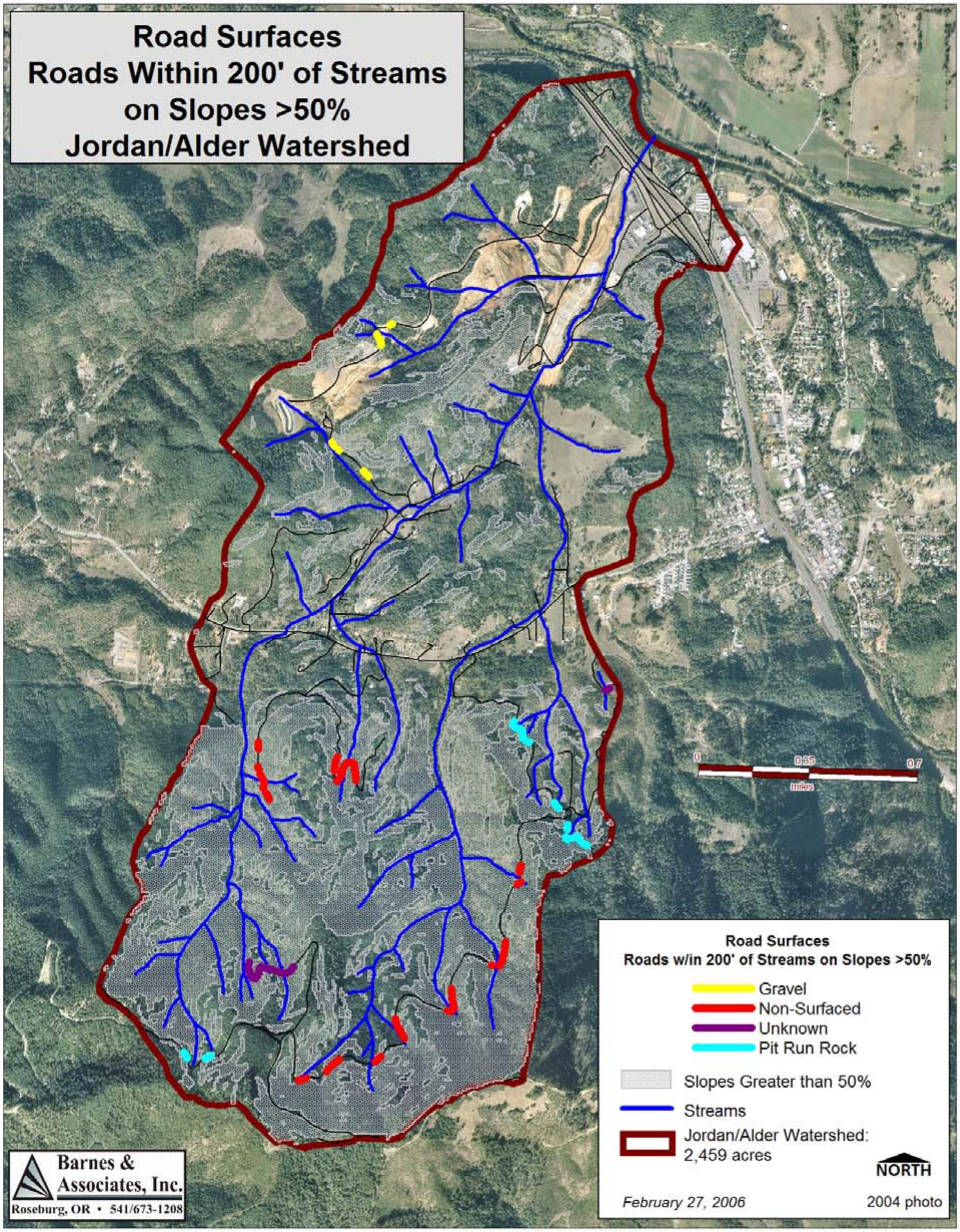

Figure 53. Surfaces of roads within 200' of streams on steep slopes in Jordan/Alder Watershed.

Rural Road Runoff. The earlier section on "Road Instability" addresses the potential sediment delivery from roads near streams. Much of the Rod & Gun Club Road is within 70 feet of Jordan Creek (see Figure 51). There are several locations along this road where the road is located at the top of a steep streambank along the creek. Figure 54 shows one such location near Tax Lot 1100, Section 28, T30S, R5W (the Nunes property). During past periods of high streamflows, the creek has eroded away the road, creating sediment immediately input to Jordan Creek.

Water flow down non-surfaced or gravel roads can create ruts, pick up fine soil particles, and deliver large quantities of sediment to streams. This potential problem increases with increasing road gradient and the length of flow down a road. Appropriate road maintenance can alleviate much of this problem, facilitating the rapid movement of water off from roads and into ditch lines where the water can be more easily managed to avoid unacceptable levels of stream sedimentation.

Figure 55 shows a gravel driveway with poor drainage. Surface runoff associated with heavy rains stays on and creates ruts in this road instead of draining off to a roadside ditch. Sediment contained in such runoff, especially on steep, non-paved roads, can be quickly delivered to a nearby stream. There are several occurrences of similar road situations in the watershed, many of which are very close to Jordan or Alder creeks.

Creekside RV Park. The impervious nature of the blacktop and concrete in the Creekside RV Park has the potential to create "flashy" stormwater delivery to Jordan Creek. Four oil/water separator tanks on the west side of the RV park may dampen some of the effects of the increased surface runoff.[16] Drains on the east side of the park flow directly into Jordan Creek.

There are steep – nearly vertical – streambanks in places along Jordan Creek, especially as it flows through the RV park. The Jordan Creek channel is incised through this part of the watershed, in part because of high velocity streamflows. These steep banks are a potential source of sediment delivery to Jordan Creek and, because of its proximity, the South Umpqua River.

[16] These oil/water separator tanks are designed to isolate petroleum products from RV park surface runoff. The tanks are roughly equally spaced along the west side of the park, accepting runoff from drains throughout the west side of the park. The tanks are located from approximately 30 to 100 feet from Jordan Creek.

Figure 54. Rod & Gun Club Road adjacent to Jordan Creek.

Figure 55. Erosion from driveway in Jordan/Alder Watershed.

3.4.6 Toxics

At least two "hard rock" gold mines were operated in the Jordan/Alder Watershed up until about 1900. These two mines – located in the western half of the upper watershed as shown on figures 2 and 11 – were known as the Gold Bluff Mine and Levens Ledge Mine. Both mines were developed mostly for gold extraction, although there was some silver recovered as well. There were several other "prospects" in the watershed, where miners evaluated mineral content in the soil for mining suitability.

A concern with old gold and silver mines is the possibility of acidic water (water of low pH) flowing out of the mines. Water coming out of mines becomes acidic when iron and other metals in the water precipitate out, freeing up hydrogen atoms which increase the acidity of the water. Signs of "acid mine drainage" include red and yellow iron oxide precipitates, off-colored vegetation along the water drainages, and dead snails and other animals in the creek beds. A primary concern of acid mine drainage is its negative impacts on downstream salmonid habitat.

According to Bryn Thoms, hydrogeologist with ODEQ (personal communication, August 30, 2005), the Gold Bluff and Levens Ledge mines have both been evaluated by ODEQ to determine the need for an assessment of toxics outflow from the mine or tailings into surface waters. The criteria for assessment include the volume of mining spoils, size of underground workings, the value of material recovered/removed from the mine, the presence of a processing mill on-site, and the presence of mercury processing on-site. Although neither mine had an on-site processing facility, both are in the proximity of the highly toxic, abandoned Formosa Mine, approximately five air miles to the southwest in an area of geology similar to that in the Jordan/Alder Watershed.

Only the Gold Bluff Mine was assessed for toxics outflow. Water coming out of the mine adit was tested by ODEQ and found to be neutral in pH. No signs of acid mine drainage were found. The Levens Ledge Mine was determined to have too little volume of mining spoils to justify assessment.

Surface runoff from the RV park may contain petroleum and other toxic products. As discussed in Section 3.4.5, it is anticipated that the four oil/water separators on the west side of the RV park will filter out petroleum products before reaching Jordan Creek. But, surface runoff from the east side of the RV park drains directly into Jordan Creek. Some toxics bind to sediment and can be washed into streams during storm events.

3.4.7 Water Quality: Key Findings and Recommendations

Water Quality Beneficial Uses and Impairments

Key Findings/Recommendations: None

Nutrients and Bacteria

Key Findings:

1. Livestock activity in and near Jordan and Alder creeks is not widespread, but could result in high nutrient and bacteria levels in localized areas.
2. Water quality impacts from fertilization and failed/failing septic systems in the watershed are unknown.
3. Sewage from the Creekside RV Park will be treated with an extensive sewage treatment system and is not anticipated to contribute to bacteria levels in the watershed.

Recommendations:

1. Exclude livestock from Jordan Creek, Alder Creek, and their primary tributaries by installing cattle-exclusion fencing along the streams.
2. Conduct education and outreach with landowners in the watershed to familiarize these stakeholders with overall watershed restoration efforts, garner support for restoration activities (including importance of properly functioning septic systems), and recruit sites and volunteers for specific restoration projects.

Sedimentation/Turbidity

Key Findings:

1. The non-paved roads along Rod & Gun Club Road and Meyer Lane appear to have the greatest potential for sediment delivery to fish-bearing streams in the watershed. The location of the Rod & Gun Club Road immediately adjacent to Jordan Creek in places is particularly problematic.
2. Those roads with the greatest overall potential for sediment delivery to streams – non-paved roads on steep slopes (greater than 50%) or near streams (closer than 200 feet) – are of relatively few miles in the watershed. These roads are located primarily in the upper watershed and appear to be stable.
3. Upland slopes in the watershed appear to be stable and of little current risk of delivering sediment to streams.
4. Steep streambanks along Jordan Creek, especially as it flows through the Creekside RV Park, have the potential to deliver uncharacteristically large volumes of sediment to Jordan Creek and the South Umpqua River.
5. Parking lot drainage off the east side of the Creekside RV Park does not flow into the system of oil/water separators on the west side of the park.

Recommendations:

1. Re-route and/or pave the segments of Rod & Gun Club Road and Meyer Lane that provide the most potential for sediment delivery to Jordan and Alder creeks.
2. Encourage landowners in the watershed to continue their effective implementation of the Oregon Forest Practices Act in order to minimize road and slope stability situations that could negatively impact Jordan and Alder creeks.
3. Cut back slope of steep streambanks along Jordan Creek where feasible so as to minimize bank sloughing and resulting sediment delivery to the stream.
4. Construct filtration swales at the outlets of surface drainage systems on the east side of the RV park to provide some filtration of water before it reaches Jordan Creek. These swales should be designed to slow the delivery of surface runoff water to Jordan Creek during periods of heavy rainfall. These swales could also provide wetlands benefits where the physical area is large enough to allow construction of larger swales with wetlands qualities.

Toxics

Key Findings:

1. An ODEQ assessment showed that there is no toxics outflow from the historical Gold Bluff mine in the upper watershed. Other mines and prospects in the watershed did not meet the size/likelihood of toxics criteria to be formally assessed.
2. Much of the drainage system in the Creekside RV Park appears capable of filtering petroleum products and other toxics from surface runoff. Unlike the west side, the east side of the park has greater potential for toxics delivery to Jordan Creek because of the absence of oil/water separators.

Recommendations:

1. Construct filtration swales at the outlets of surface drainage systems on the east side of the RV park to provide some filtration of water before it reaches Jordan Creek. These swales should be designed to slow the delivery of surface runoff water to Jordan Creek during periods of heavy rainfall. These swales could also provide wetlands benefits where the physical area is large enough to allow construction of larger swales with wetlands qualities.

3.5 Water Quantity

3.5.1 Water Use and Rights

Treated water from the City of Riddle is available to watershed residents along the Canyonville-Riddle Road. The water system for the Tribe's Creekside RV Park includes a series of wells along the South Umpqua River, an ultraviolet light treatment system, and a one million gallon water tank. Other watershed residents have private wells and/or surface water withdrawals as their water source.

According to the OWRD (OWRD 2005), registered surface water rights for the Jordan/Alder Watershed are as shown in Table 13.

Table 13. Surface water rights in Jordan/Alder Watershed.

Stream	Use	# Diversions	Cubic Feet/Sec.	% of Total
Jordan Creek	Irrigation	2	0.0400	54%
	Domestic	4	0.0345	46%
	Total	6	0.0745	100%
Alder Creek	Mining	1	3.0000	95%
	Irrigation	4	0.1220	4%
	Domestic	1	0.0100	<1%
	Domestic Expanded*	1	0.0100	<1%
	Livestock	1	0.0050	<1%
	Total	8	3.1470	100%
Combined	Mining	1	3.0000	93%
Watershed	Irrigation	6	0.1620	5%
	Domestic	5	0.0445	1%
	Domestic Expanded	1	0.0100	<1%
	Livestock	1	0.0050	<1%
	Total	14	3.2215	100%

* Domestic Expanded includes water for domestic use plus irrigation for up to ½ acre of lawn and garden.

There may be unregistered withdrawals from either or both creeks. Any such illegal withdrawals were not evaluated for this assessment.

According to Dave Williams, OWRD Watermaster for the Umpqua Basin, it is unlikely that the water rights for mining purposes are currently being exercised. The table shows that there are no in-stream water rights for either Jordan or Alder creeks.

3.5.2 Streamflow

There are no streamflow gauges on either Jordan or Alder creeks. Therefore, actual streamflow data are not available for these streams.

Low summer streamflows are a limiting factor for fisheries in the Jordan/Alder Watershed. The stream habitat surveys conducted in October 2005 found that 74% of the surveyed portion of Jordan Creek and 69% of the surveyed portion of Alder Creek were dry or mostly dry at the time of the survey.

3.5.3 Flood Potential

As discussed in Section 1.3, the TSZ for the Jordan/Alder Watershed is defined as the area above 2,000 foot in elevation. Flooding can result if heavy rains and warm temperatures occur simultaneously after snow has accumulated in the TSZ. These potential flood conditions are exacerbated when the snow is wet and dense. Figure 4 shows the TSZ for the Jordan/Alder Watershed. There are 573 acres of TSZ for the Jordan/Alder Watershed. This acreage equates to 23% of the total watershed area.

The large impervious surface of the Creekside RV Park may contribute to uncharacteristically high levels of rainfall input to Jordan Creek. Four large oil/water separator tanks on the west side of the park may dampen some of this surface runoff impact. Conversely, surface runoff from the east side of the park drains directly into Jordan Creek.

3.5.4 Water Quantity: Key Findings and Recommendations

Water Use and Rights

Key Findings:

1. There has been much water withdrawal activity over the years from both Jordan and Alder creeks. It is not clear which of the current withdrawals are registered with the OWRD and which, if any, are not.

Recommendations:

1. Investigate current surface water withdrawals to ascertain their legality. This investigation should be delayed until other restoration activities in the watershed are complete so as to not detract from their implementation.
2. Conduct education and outreach with landowners in the watershed to familiarize these stakeholders with overall watershed restoration efforts, garner support for restoration activities (including importance of efficient water usage), and recruit sites and volunteers for specific restoration projects.

Streamflow

Key Findings:

1. Summer streamflows in Jordan and Alder creeks are limiting factors for fish habitat in the watershed.

Recommendations:

1. Explore the opportunity to utilize excess water from the RV park's upper reservoir to augment streamflows in Jordan Creek.

Flood Potential

Key Findings:

1. The large impervious surface of the Creekside RV Park may contribute to uncharacteristically high levels of rainfall input to Jordan Creek.

Recommendations:

1. Construct filtration swales at the outlets of surface drainage systems on the east side of the RV park to slow the delivery of surface runoff water to Jordan Creek during periods of heavy rainfall.
2. Construct settling ponds, where physical space allows, between the outlets of the oil/water separator tanks and Jordan Creek. There may only be room for these ponds at the northernmost oil/water separator outlet.

4. Current Trends and Potential Future Conditions

This section examines current trends in land use and management that are likely to impact fish habitat and water quality in the Jordan/Alder Watershed. The potential future conditions that may result from these current trends over a 10-year timeframe are examined. The trends and future conditions for each current land use are examined separately.

4.1 Forestry

Presently, the forestry land use component occupies 70% of the Jordan/Alder Watershed's area. The watershed's proximity to I-5 and the City of Canyonville make it a likely location for further development. It is anticipated that development pressures along Canyonville-Riddle Road, Rod & Gun Club Road, Meyer Lane, and I-5 will necessitate the removal of land from forestry use and place it instead in residential or commercial uses.

Topography constraints are likely to limit development in most of the watershed's forestry use areas (Compare the forestry component in Figure 9 with the slope classes in Figure 3.). Topography is particularly constraining in the south half of the watershed, where most of the slopes are steep to very steep. It is anticipated that the current use of this part of the watershed for forestry purposes will be maintained.

Because of the mid-rotation age (midway between the previous and future harvests) of many of the forest stands, there has been little ground-disturbing activity in the south half of the watershed for many years. Activity levels on private lands are expected to increase over the next 10 to 20 years as stands reach harvest maturity. The potential for impacts to fish habitat and water quality will increase with activity levels.

The extent of the existing road network in the south half of the watershed appears inadequate to support expected levels of timber harvest. Current road construction standards and logging technologies will almost certainly demand new road construction in the watershed prior to future timber harvest operations. Therefore, renovation of existing roads and construction of new roads will likely be the first major ground-disturbing activities in this part of the watershed. It is likely that future timber harvests will include both clearcut and thinning harvests, with industrial landowners more likely to practice clearcut harvests and non-industrial owners a mix of the two.

Forestry practices on private lands in the watershed will continue to be regulated by the Oregon Forest Practices Act (FPA) through its authorized agency, the Oregon Department of Forestry (ODF). Future (and current) forest practices techniques are expected to be more progressive in terms of environmental stewardship than the typical practices of the past. The FPA has regulated forest practices in the state since its adoption in 1971. Best management practices and minimum legal requirements have been strengthened through the years as new science dictates changes.

Forest roads must now be designed to minimize the potential for road failures and the resulting stream sedimentation that can result. Appropriate practices include full bench construction of roads on steep slopes and the sizing of culverts to meet or exceed the capacity needed to pass the flow from a 50-year storm event.[17]

The FPA requires protection of streams and riparian areas during road construction, timber harvest, and other forest operations. RMA rules, including zones of protected vegetation and other requirements, require protection on fish-bearing, domestic use, and some other streams. Figure 56 shows an RMA on Alder Creek after an adjacent clearcut harvest.

Figure 56. Alder Creek riparian management area after adjacent timber harvest.

[17] Full bench construction means that the full width of the road is cut into the side of the steep side hill, as opposed to cutting a portion of the road into the side of the hill and using fill material on the downhill side for the balance of the road width.

Current FPA regulations call for the following RMA widths (slope distance on each side of the stream, starting at the high water mark) on streams in the Jordan/Alder Watershed:

- 70 feet of protection (fish-bearing streams of medium size):
  - Jordan Creek, from its mouth at the South Umpqua River upstream to just north of the south line of Section 28, T30S, R5W.
- 50 feet of protection (fish-bearing streams of small size):
  - Alder Creek, from its confluence with Jordan Creek upstream to just north of the south line of Section 33, T30S, R5W.
  - Jordan Creek, from the aforementioned end of the 70-foot RMA upstream almost to the Canyonville-Riddle Road.
- 10 feet of protection of understory vegetation for small non-fish bearing streams:
  - Many of the small tributaries to Jordan and Alder creeks.

Maps available at the Roseburg office of the ODF show more precise locations of the stream segments noted above.

Clearcut sizes are restricted to 120 acres in most cases. Wildlife leave trees (often left as “extra” trees along RMAs) and down woody debris are required to be left in clearcut units exceeding 25 acres in size.

Areas especially prone to mass failure and sedimentation of streams – referred to by the FPA as high landslide hazard locations – will have harvest restrictions where public safety is at risk from a landslide. Road construction is restricted in such landslide prone areas, too.

Forest management on BLM lands is guided by each districts’ Resource Management Plan (RMP). The Roseburg District BLM is in the process of revising its RMP, which currently does and will continue to govern the management of BLM lands in the Jordan/Alder Watershed. As discussed in Section 1.5 on land use, BLM lands within the Jordan/Alder Watershed are presently designated as “matrix” lands; i.e. these lands have multiple objectives, including providing a sustainable supply of timber, serving as a connection between forest reserve areas, and providing habitat for organisms associated with all ages of forests. BLM lands in the Jordan/Alder Watershed may or may not retain the “matrix” allocation in the revised RMP. Regardless of the allocation, BLM management guidelines require protection of streams and riparian habitat.

4.2 Commercial

Commercial use of the Jordan/Alder Watershed currently makes up 13% of the watershed area, including the lower 0.9 miles of Jordan Creek (distance includes I-5 and its frontage roads). This commercial use is comprised primarily of business endeavors of the Tribe, including the Seven Feathers Truck and Travel Center and the Creekside RV Park currently under construction. The quality of aquatic and riparian habitat in these commercial lands is critical for salmonid restoration in the watershed.

It is anticipated that many of the impacts from the construction of the RV Park, such as the movement of freshly-disturbed soil by rainfall, will dissipate over time. Vegetation establishment and growth, as well as efforts to stabilize disturbed areas of the park, are expected to bring sedimentation into near equilibrium with natural processes.

RV park and related development impacts on Jordan Creek streamflows are uncertain. While the runoff from the impervious surfaces of the park are expected to amplify streamflow fluctuations, the extent of these impacts are unknown. On the other hand, there is the potential to augment the current low to non-existent summer streamflow in Jordan Creek with treated water from the upper reservoir currently under construction above the RV park.

The Tribe recognizes the important location of its lands and the impacts – positive and negative – its management activities may have on watershed health and the future distribution of fish in the watershed. The Tribe is integrating watershed restoration along with the construction activities.

4.3 Agriculture

Presently, the agriculture land use component occupies 10% of the Jordan/Alder Watershed's area. This component is concentrated primarily on the east side of Alder Creek, with a small amount of agricultural use along Jordan Creek as well.

The bulk of the watershed's agricultural areas are on flat to rolling land. For this reason, it is possible that this agricultural component could come under development pressure. While there is little agricultural land in the watershed that directly abuts Jordan or Alder creeks, development of this land for housing could lead to impacts on fish habitat and water quality, including increased storm runoff from greater amounts of impervious surfaces, potential petroleum products and other toxics runoff, and the loss of riparian vegetation.

4.4 Residential

Residential use of the Jordan/Alder Watershed currently makes up 7% of the watershed area. As noted under "agriculture" above, it is likely that future development pressure will increase the residential component of the watershed. This increase may take the form of conversion of agricultural land to residential, or it may entail the addition of "resource management" homes on parcels otherwise managed for agriculture or forestry.

5. Action Plan

The findings of this assessment clearly demonstrate that fish passage and adequate fish habitat are obtainable for the Jordan/Alder Watershed. The key to successful projects is for landowners to work together toward common watershed restoration goals. Douglas County organizations such as the Partnership for Umpqua Rivers, Douglas Soil and Water Conservation District, and the Oregon Department of Fish and Wildlife work cooperatively with landowners to restore habitat while maintaining economic use and value. The action plan outlined below can serve as a "road map" to help landowners prioritize and work together on restoration projects. With cooperation among watershed landowners and other caring partners, the goal of returning salmon and other anadromous fish to the watershed can be realized.

The action plan is based on the key findings and recommendations identified in Section 3 – Current Conditions. The restoration work recommended herein is targeted first at the bottom end of the watershed, then proceeds upstream through the Creekside RV Park to the confluence of Jordan and Alder creeks, then upstream in each of these two individual drainages.

This prioritization reflects the immediate need to make suitable habitat available to salmonids in the lower watershed (downstream of the Jordan Creek/Alder Creek confluence) by providing for fish passage through the Jordan Creek culverts at I-5 and restoring habitat through the Creekside RV Park. This plan also reflects the practicality of conducting restoration activites in the RV park now while construction is under way.

Though actions in this plan are given priorities, lower priority actions ought not be discounted simply because higher priority actions are still outstanding. Landowner willingness to implement a "low" priority action should be encouraged, even if other actions above it are still waiting for implementation.

Table 14 below lists recommended watershed restoration actions by priority. Locations of recommended actions are listed, as are the references to the related text in Section 3.

Table 14. Action plan for salmonid restoration in the Jordan/Alder Watershed.

Priority	Action	Location	Reference
Priority 1 *– Conduct these actions first to allow for salmonid presence in watershed and restore lower mile of Jordan Creek as a foundation for upstream distribution of fish.*			
a	Long-term solution: Replace twin box culverts with a bridge as part of the reconstruction of the I-5 interchange. Short-term solution: Install full span, notched fish weirs in the south half of the twin box culverts to provide for fish passage into and utilization of upstream habitat.	Culvert #1 – Jordan Creek (I-5 culvert)	Section 3.2.2

Priority	Action	Location	Reference
b	Protect existing riparian vegetation. Expand the width of riparian vegetation by planting and ensuring establishment of riparian conifers to the outside of existing tree vegetation	Lower 150 feet of Jordan Creek at its confluence with the South Umpqua River	Section 3.3.1
c	Plant and ensure the establishment of native vegetation, including shrubs, hardwood trees, and conifer trees	Jordan Creek riparian area in Creekside RV Park	Section 3.3.1
d	Conduct stream survey to develop contours and gradient profile for planning in-stream activities	Jordan and Alder creeks from mouths up to Canyonville-Riddle Road	Section 3.2.4
e	Install in-stream structures with large boulders to slow stream velocities and accumulate gravel	Jordan Creek in Creekside RV Park	Sections 3.2.1 & 3.2.3
f	Build "roughened chute" with large boulders to facilitate fish passage	Jordan Creek between I-5 and mouth	Section 3.2.1
g	Ameliorate run-off and stream sedimentation by creating small catch ponds	Jordan Creek in Creekside RV Park where physically possible between creek and parking lot drains, including oil/water separator drains on west side and non-separator drains on east side of creek	Sections 3.4.5 & 3.4.6 & 3.5.3
h	Control potential sedimentation source by pulling back steep streambanks to a more stable slope	Jordan Creek in Creekside RV Park	Section 3.4.5
i	Conduct outreach and education for watershed stakeholders to: 1. raise awareness of watershed conditions 2. instill sense of ownership in watershed health 3. gain support for restoration activities 4. recruit labor volunteers and willing landowners for projects	Jordan/Alder Watershed	Sections 3.2.4 & 3.3.4 & 3.4.7 & 3.5.4
j	Encourage individual landowner participation in noxious weed eradication efforts		Sections 1.6 & 3.3.1
***Priority 2** – Expand potential fish distribution in watershed by removing passage barrier culverts and establishing pool and off-channel habitat "strongholds" in middle watershed.*			
a	Remove failed culverts if approved by landowners. Otherwise, replace culverts.	Culvert #4 – Jordan Creek Culvert #8 – Alder Creek	Section 3.2.2

Priority	Action	Location	Reference
b	Replace culverts with "stream simulation" culverts (bottomless culverts or embedded culvert with bottom)	Culverts #2, 3, 5, 6 – Jordan Creek Culverts #9, 10, 11, 12 – Alder Creek (Plus culvert #4 and #8 from above if not removed)	Section 3.2.2
c	Place LWD to slow streamflows and create scour pools	Above Creekside RV Park: Jordan Creek to county road, Alder Creek to culvert #12	Section 3.2.1
d	Develop off-channel habitat	Alder Creek side channel and pool Jordan Creek pool and secondary channel at Nunes	Section 3.3.3
e	Develop wetlands	Jordan Creek at culvert #2	Section 3.3.2
f	Plant and ensure the establishment of native vegetation, including shrubs, hardwood trees, and conifer trees	Jordan and Alder creeks per need identified in Figure 40	Section 3.3.1
g	Re-align roads within 70' of streams to prevent stream damage to roads and sedimentation to streams, where approved by landowners	Rod & Gun Club Road and Meyer Lane per Figure 51 as practical	Section 3.4.5
h	Surface non-hard surfaced roads to minimize sedimentation potential	Figure 51 roads as practical	Section 3.4.5
i	Improve drainage on and along roads to minimize sedimentation potential to streams	Figure 51 roads as practical	Section 3.4.5
Priority 3 *– Enhance habitat made available and restored via priority 1 and 2 actions.*			
a	Augment Jordan Creek streamflow during low summer flow periods	Discharge from upper reservoir on tribal land	Section 3.5.2
b	Assess actual surface water withdrawals vs. surface water rights. Explore opportunities for in-stream water rights.	Jordan and Alder creeks	Section 3.5.1
c	Continue current water quality monitoring. Expand monitoring efforts as possible to identify potential problems, e.g. problematic septic systems.	Jordan and Alder creeks (primarily north of Canyonville-Riddle Road)	Section 3.4
d	Monitor project effectiveness for planted riparian vegetation vigor, fish presence and distribution, and decreased sediment from road surfacing/drainage	Jordan/Alder Watershed	Section 3

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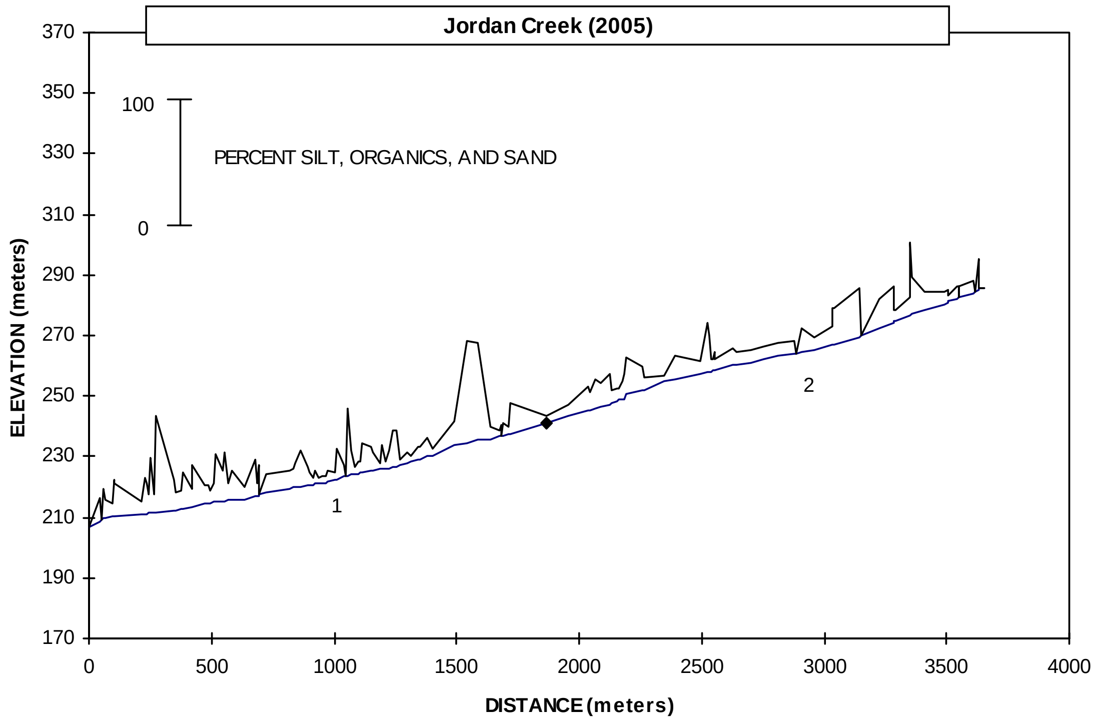
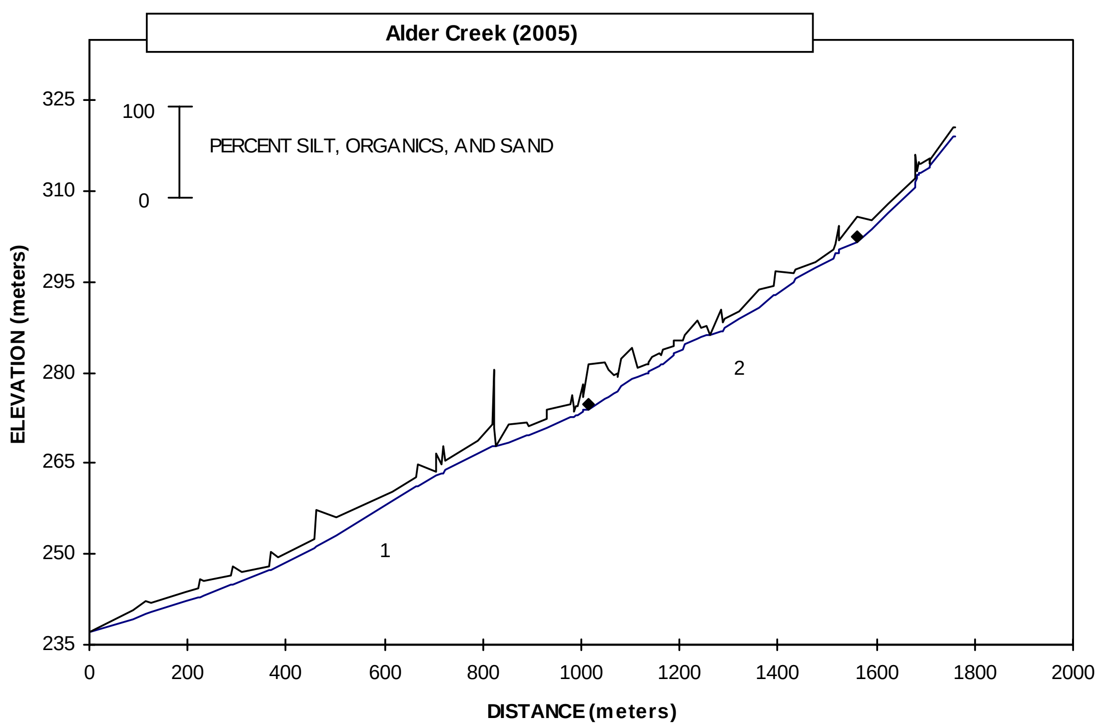
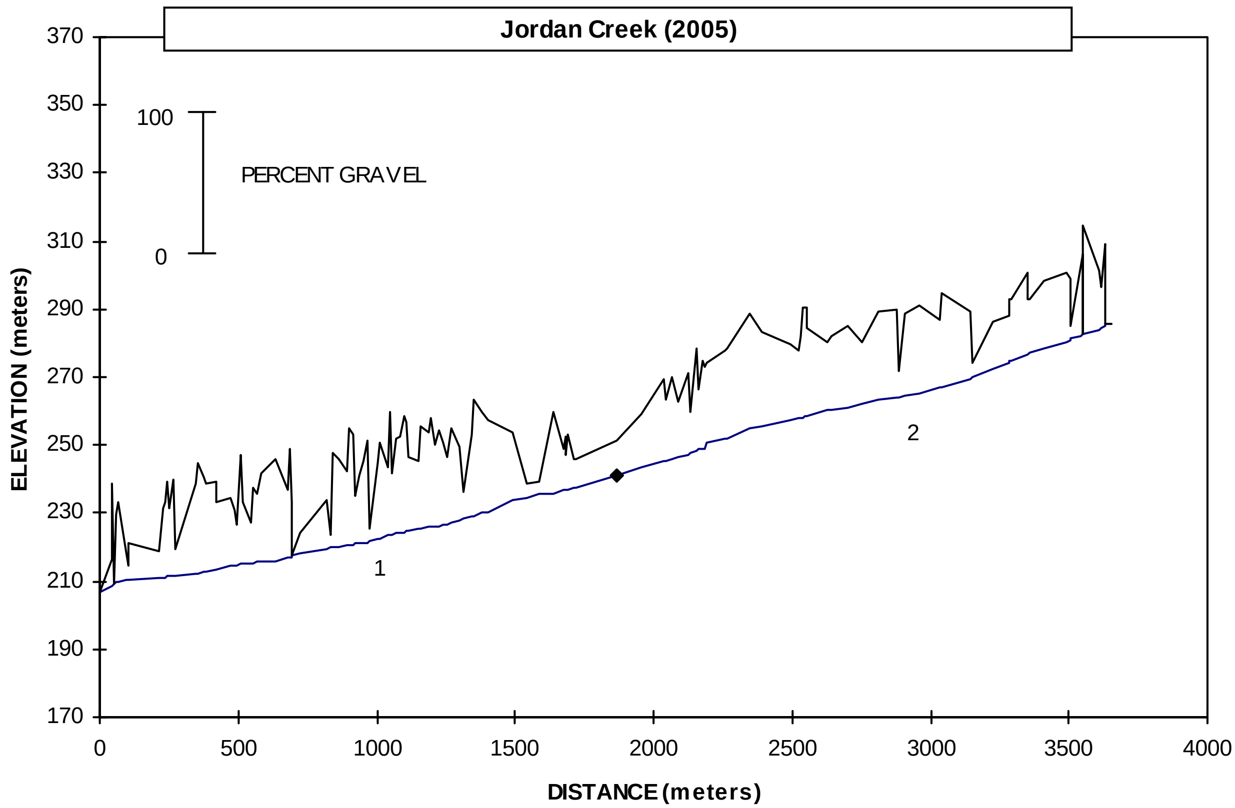
Appendices

Appendix A: Stream habitat survey results, Jordan and Alder creeks



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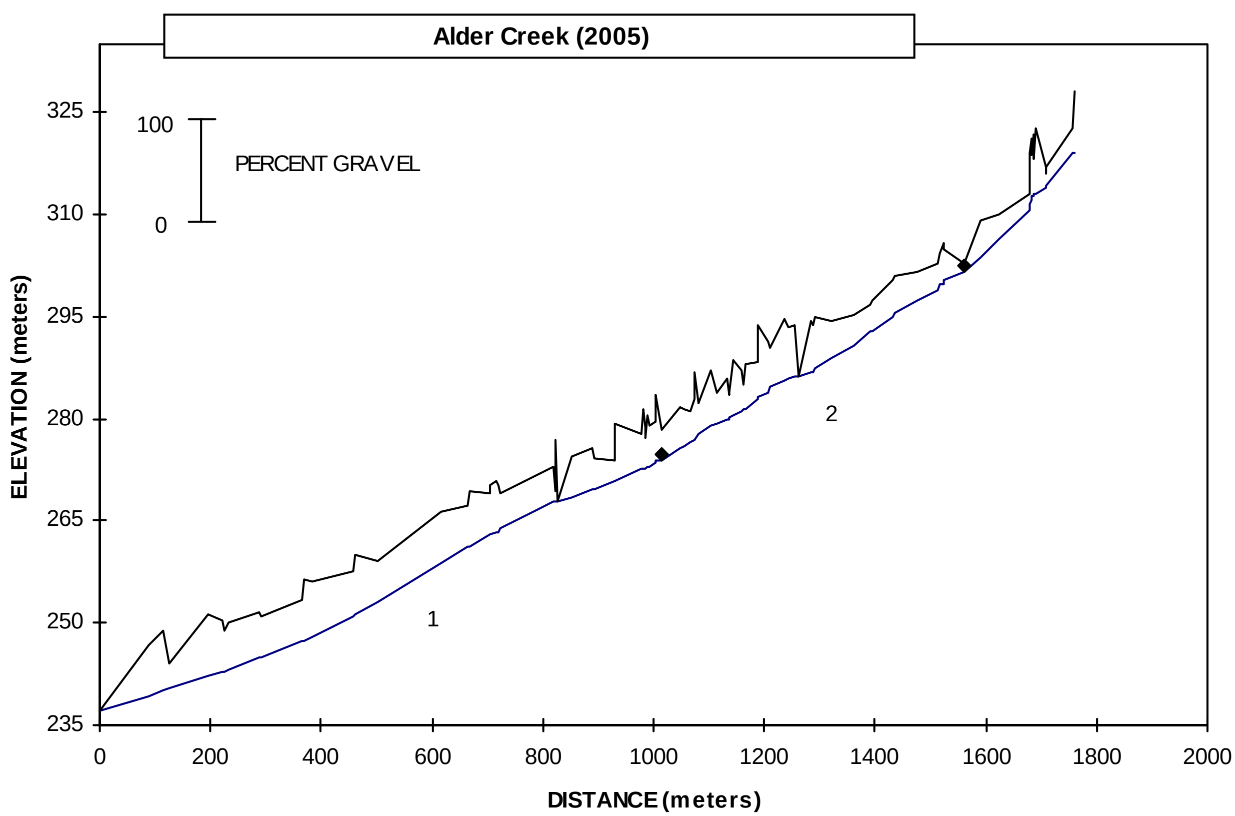
DISTANCE (meters)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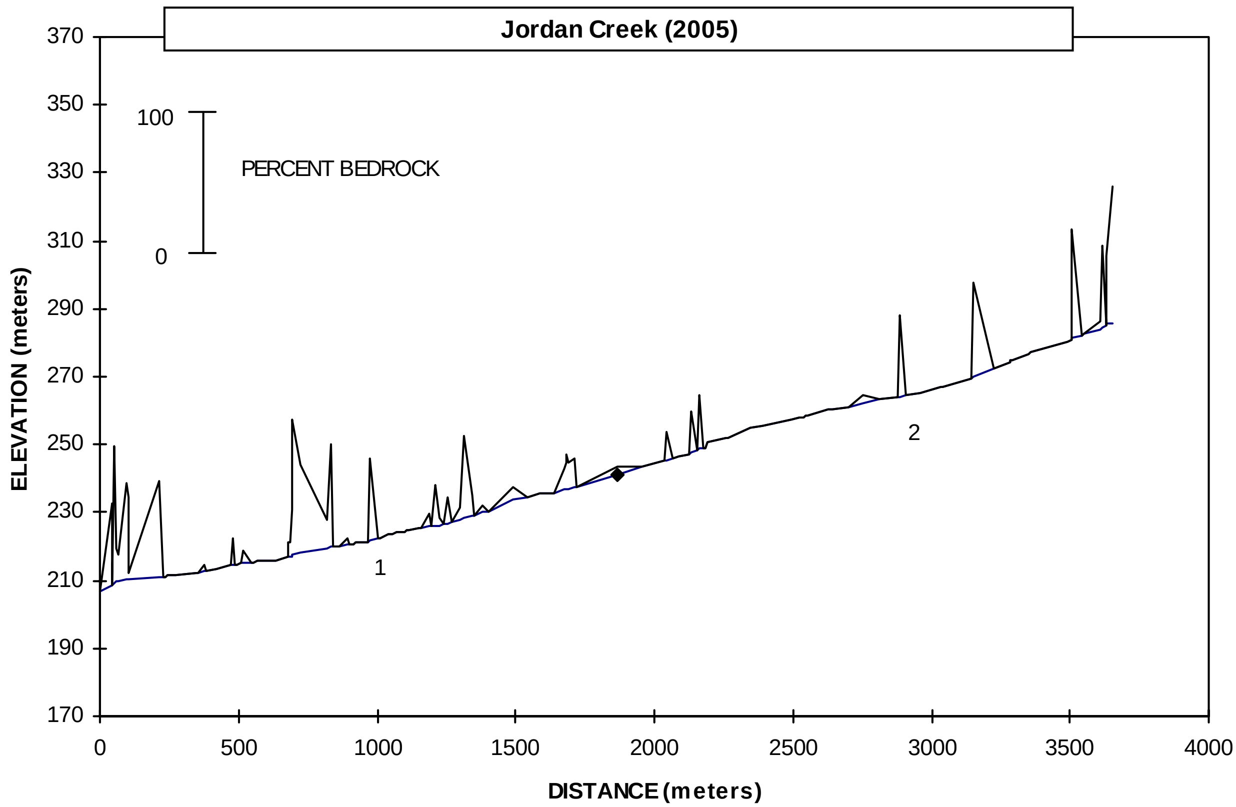
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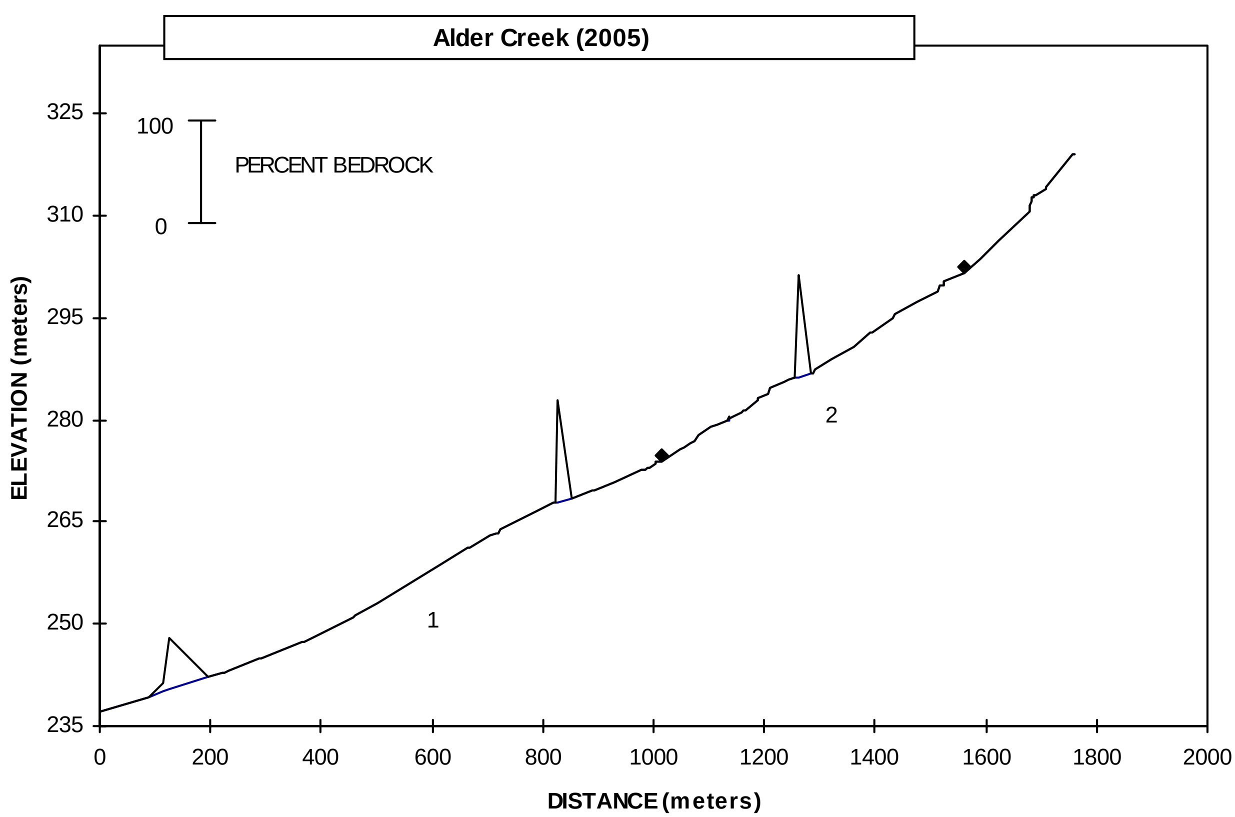
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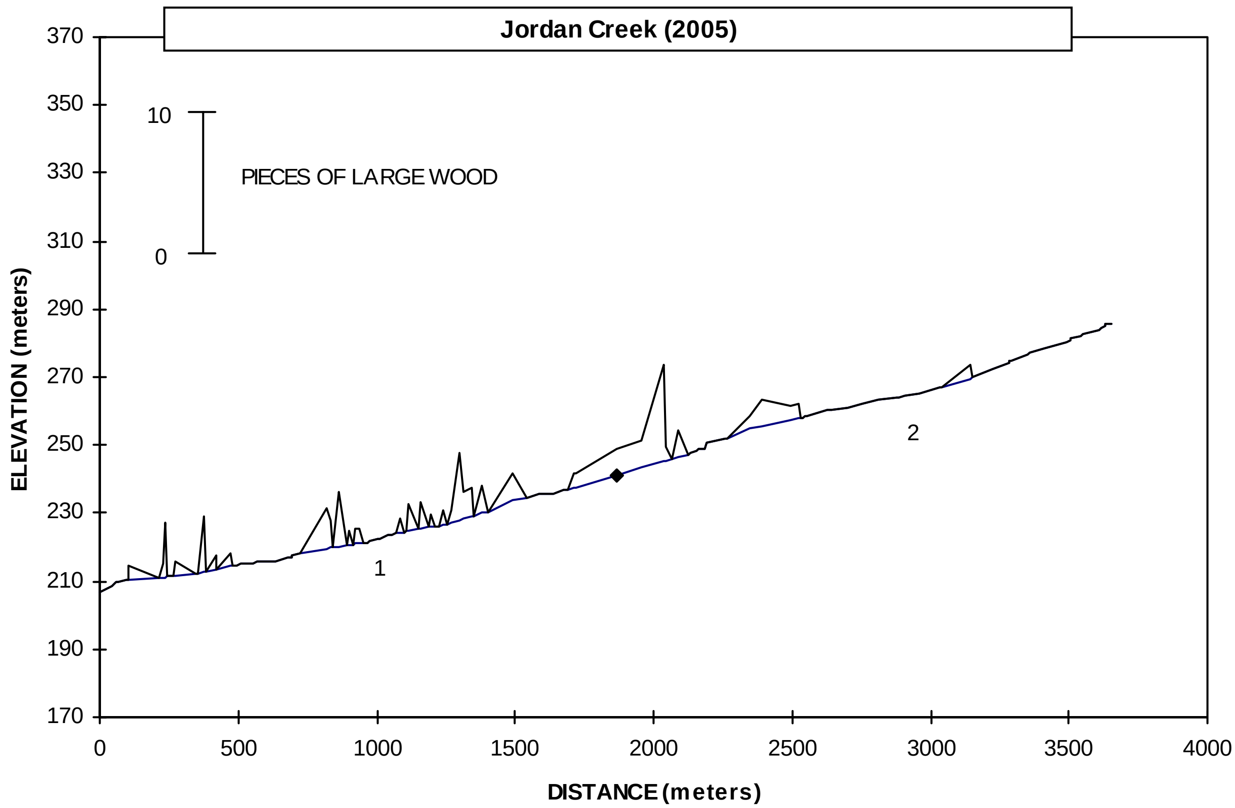
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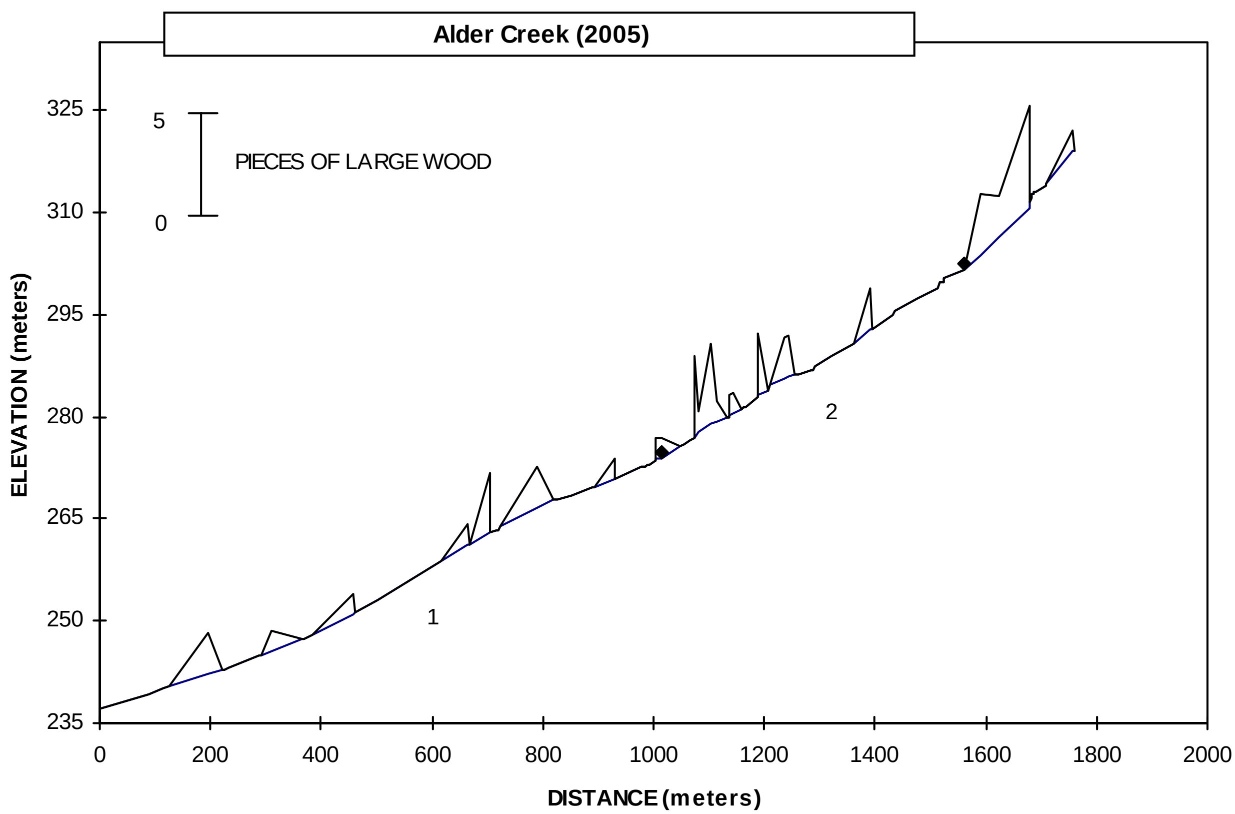
Alder Creek (2005)
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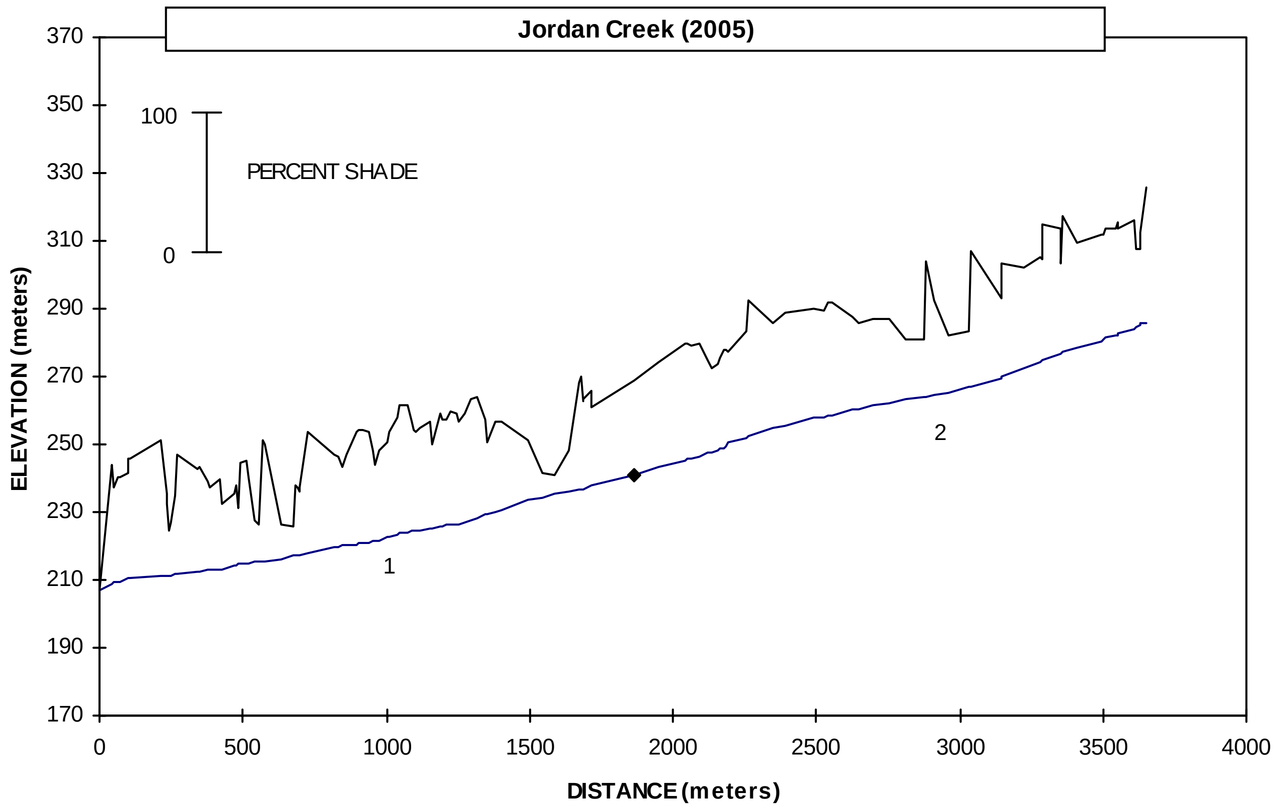
Jordan Creek (2005)
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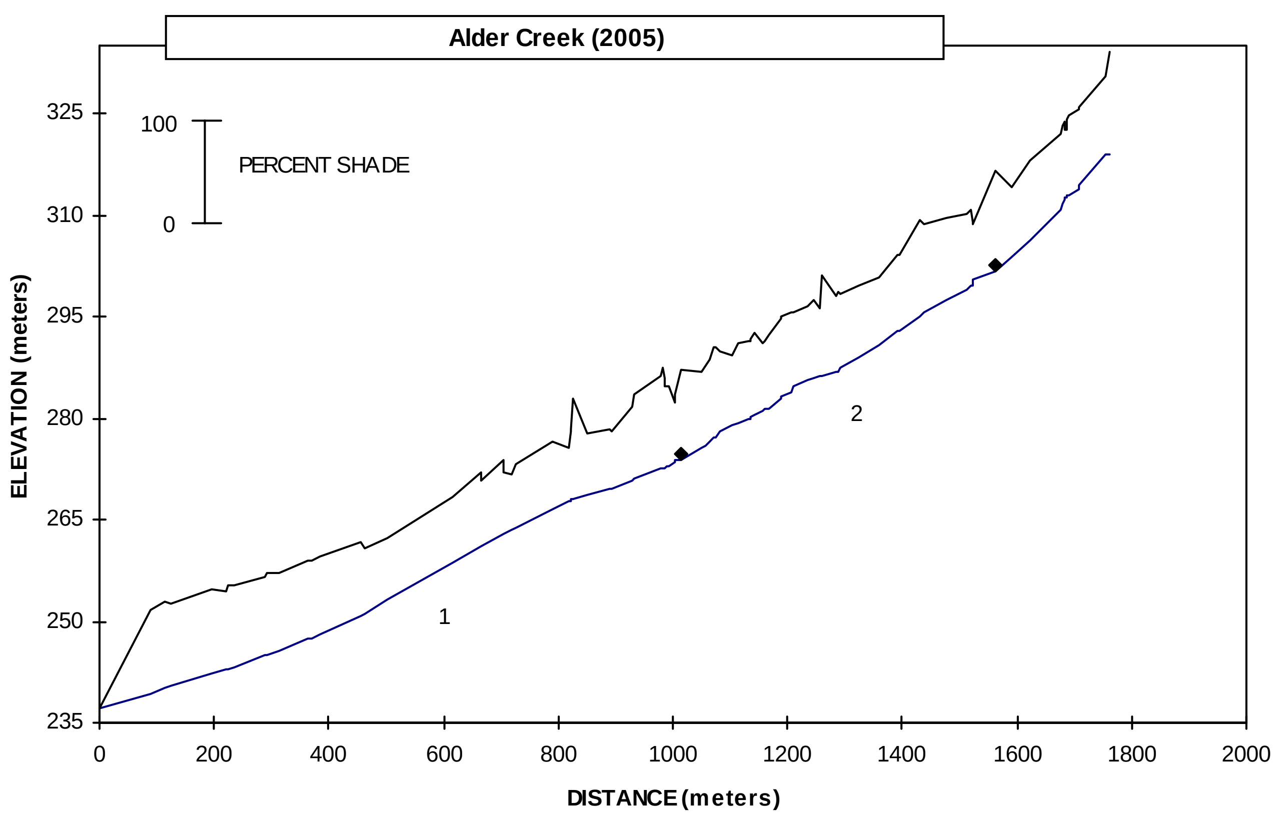
Alder Creek (2005)
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Appendix B: ODOT letter on weirs for Jordan Creek culvert at I-5

Oregon

Theodore R. Kulongoski, Governor

Department of Transportation
Transportation Building
355 Capitol St. NE
Salem, Oregon 97301

December 20, 2005

FILE CODE:

Cow Creek Band of the Umpqua Tribe
Attn: Amy Amoroso, Director of Natural Resources
2371 NE Stephens St., Ste 100
Roseburg, OR 97470

Subject: **Jordan Creek Culvert Fish Passage Enhancement Project**
Jordan Creek Watershed
Douglas County
M00375

Dear Ms. Amoroso,

Thank you for providing the Oregon Department of Transportation (ODOT) an opportunity to participate in the Jordan Creek culvert site visit on 11 November, 2005. The site visit was very informative and provided a thorough overview of the ongoing work by the Cow Creek Tribe's within the Jordan Creek Watershed.

ODOT understands and values the importance of fish passage at the Jordan Creek culvert to the Cow Creek Tribe. From the discussions that took place during our site visit in November, ODOT staff understands that the tribe may wish to pursue a culvert replacement that would provide a more cultural context and sense of connection to Jordan Creek. Because a culvert replacement would involve a larger commitment of resources, ODOT and the Cow Creek Tribe would need to work collaboratively on a long-term strategy that will meet this need. In the short-term however, ODOT is able to commit the necessary funding and supplies from our Statewide Fish Passage Program as well as staff and labor from the Office of Maintenance during the summer of 2006 to retrofit the existing culvert and provide fish passage at this culvert location.

The proposed work involves a crew of four ODOT Bridge Maintenance staff performing the culvert retrofit work during the summer of 2006. Work will need to be completed during the Oregon Department of Fish and Wildlife (ODFW) preferred in-water work window which extends from 1 July to 15 September (or as negotiated with ODFW). It is anticipated the work will take approximately 3 days to complete. The work will consist of the installation of the following items to the existing Jordan Creek culvert:

- 32-full spanning notched fish weirs (spaced 10 feet apart) inside the southernmost reinforced concrete box culvert (RCBC). This weir configuration will provide the maximum benefit for fish passage inside the culvert at a variety of flow regimes.
- 1-full spanning angle iron notched weir at the outlet end of the southernmost culvert apron. This will function to back water from the culvert apron to the first weir.

Form 734-3122 (1-03)

- 1-full spanning weir at the northern most RCBC. This will direct more water into the southern RCBC during low flow conditions.
- Bedload material (gravels and rocks) inside the culvert may need to be cleaned out to properly install the weirs.

The work to be completed will involve the use of hand-tools powered by a generator. These tools may consist of hand drills, saws, shovels, lights, etc. The high density polyethylene (plastic) weirs and can be drilled and cut to size on site. The weirs will be anchored to the concrete floor of the culvert using metal bolts and possibly some synthetic sealants to ensure a good bond to the bottom of the culvert. There may also be the need to de-water the southern culvert depending on stream flow. If this is the case, typical temporary water management techniques will be implemented (sandbag dams and pumping devices). All work will be completed in compliance with state and federal laws. ODOT's Routine Roadside Maintenance Manual will serve as our Federal Endangered Species Act permit and take authorization.

ODOT Environmental staff will monitor the installation of this culvert retrofit to ensure that it is completed correctly to meet the goals for fish passage. ODOT will also perform post-construction monitoring to assure the fish passage function of the culvert retrofit continues to provide maximum benefits for fish through time. We can share any monitoring results with the Tribe if you are interested. We are also willing to partner with the Tribe on future monitoring efforts at this culvert location. We expect that improvements to the passage of adult fish at this location will be observed at the onset of the 2006 fall rains, which is typically when adults migrate upstream in the South Umpqua River.

Please provide ODOT an update from the Tribe if this fish passage proposal is acceptable. If the Tribe has any comments or input on the project design or construction techniques, please contact us. Once we receive the Tribes concurrence ODOT will move forward with full implementation of this fish passage retrofit at Jordan Creek.

If you have any questions, please contact Greg Apke of my staff at 503-986-3518 or by email at *greg.d.apke@odot.state.or.us*.

Thank you,

Frannie Brindle

Frannie Brindle
ODOT Natural Resources Unit Manager

Copies to:
Jim Collins, ODOT Region 3 Geo-Hydro Environmental Manager
Greg Apke, ODOT Fish Passage & Aquatic Biology Program Coordinator
Hal Gard, ODOT Government to Government Tribal Liaison

Appendix C: Inspection Report from Pinnacle Engineering on Jordan Creek culvert at I-5

20808.6

PINNACLE ENGINEERING, INC.
3329 NE Stephens
Roseburg, OR 97470
(541) 440-4871
Fax: (541) 672-0677
pinnacle@pinnacleengineering.com

January 9, 2006

Cow Creek Band of Umpqua Tribe of Indians
2371 NE Stephens St.
Roseburg, OR 97470

Attn: Amy Amoroso, Natural Resources Dept.

Subject: Jordan Creek Box Culvert, Interstate Highway 5 Crossing, Revised
Project #: 20808.6

Dear Amy,

Scope

At your request, we conducted a structural integrity inspection of the Jordan Creek box culvert crossing under Interstate Highway 5 to assess its condition and likely remaining life.

Background

The box culvert is of reinforced concrete construction and is approximately 357 feet in length. The culvert is divided into two channels that flow north 27 degrees east for 308 feet then deflect slightly to the east to flow north 34 degrees east for 49 feet. The inlet openings of the culvert are each eight feet wide by six feet high. The outlet openings are also eight feet wide by six feet high.

Inspection

A visual inspection of the culvert walls and ceilings was conducted to identify potential structural distress. Digital photographs were taken for the record. Two pockets of approximately 15-inches in length and four feet apart were found at 341 and 345 feet as measured from the inlet end along the west wall approximately three and one-half feet below the ceiling. These pockets are approximately three inches deep with cracks extending to the back wall. Groundwater seepage is evident. Another pocket was located in the east channel at 311 feet from the inlet. The pocket is about two and one-half inches in diameter and three to four inches deep. Groundwater seepage is evident.

An additional inspection conducted on 6 January 2006 identified additional hairline cracking that was not observed during the initial inspection. Also, decreased flow volume revealed four additional pockets in the culvert wall(s) and floor. The largest is located two feet north of the bend in the west wall just above the spring line measuring15-inches wide by 20-inches long by 2-inches deep and exposing the wall reinforcement. The reinforcement is corroded and groundwater is seeping from behind the wall. Two four inch diameter holes, 6-inches deep, located at 276.5 and 289.7 feet from the inlet in the east wall are seeping freely.

The majority of the hairline cracks occur at 1 to 10 feet intervals along the walls and/or ceiling of each channel. The cracks are vertical, transverse to the length of the culvert and appear to be due to shrinkage of the concrete.

Three approximate 4o feet long longitudinal hairline cracks were found in the ceiling. One ceiling crack starts at 202-feet from the inlet of the west channel, and the other two are in the east channel starting at 198-feet and 251-feet from the inlet respectively. These cracks appear to be located under the highway's northbound and southbound lanes.

Recommendation

Considering the potentially serious distress, it is our recommendation that the culvert should be replaced as part of the interchange reconstruction.

We appreciate the opportunity to assist you with this project, if you have questions or need any further assistance, please do not hesitate to contact us.

Sincerely,

Pinnacle Engineering, Inc.

Nathan Reed, P.E.
Staff Engineer

Concurrence

Dave Leonard, S.E., P.E.
President

Encl.

STRUCTURAL
REGISTERED PROFESSIONAL
ENGINEER
14319
OREGON
1/10/06
MARCH 28, 1989
DAVID M. LEONARD
EXPIRES 12-31-06

COMPUTATION WORKSHEET

PINNACLE ENGINEERING, INC.

PROJECT INFORMATION

TITLE: JORDAN CREEK BOX CULVERT
JOB#: 20808.6 BY: NR
DATE: 1/9/06 SHT: 1 OF 1

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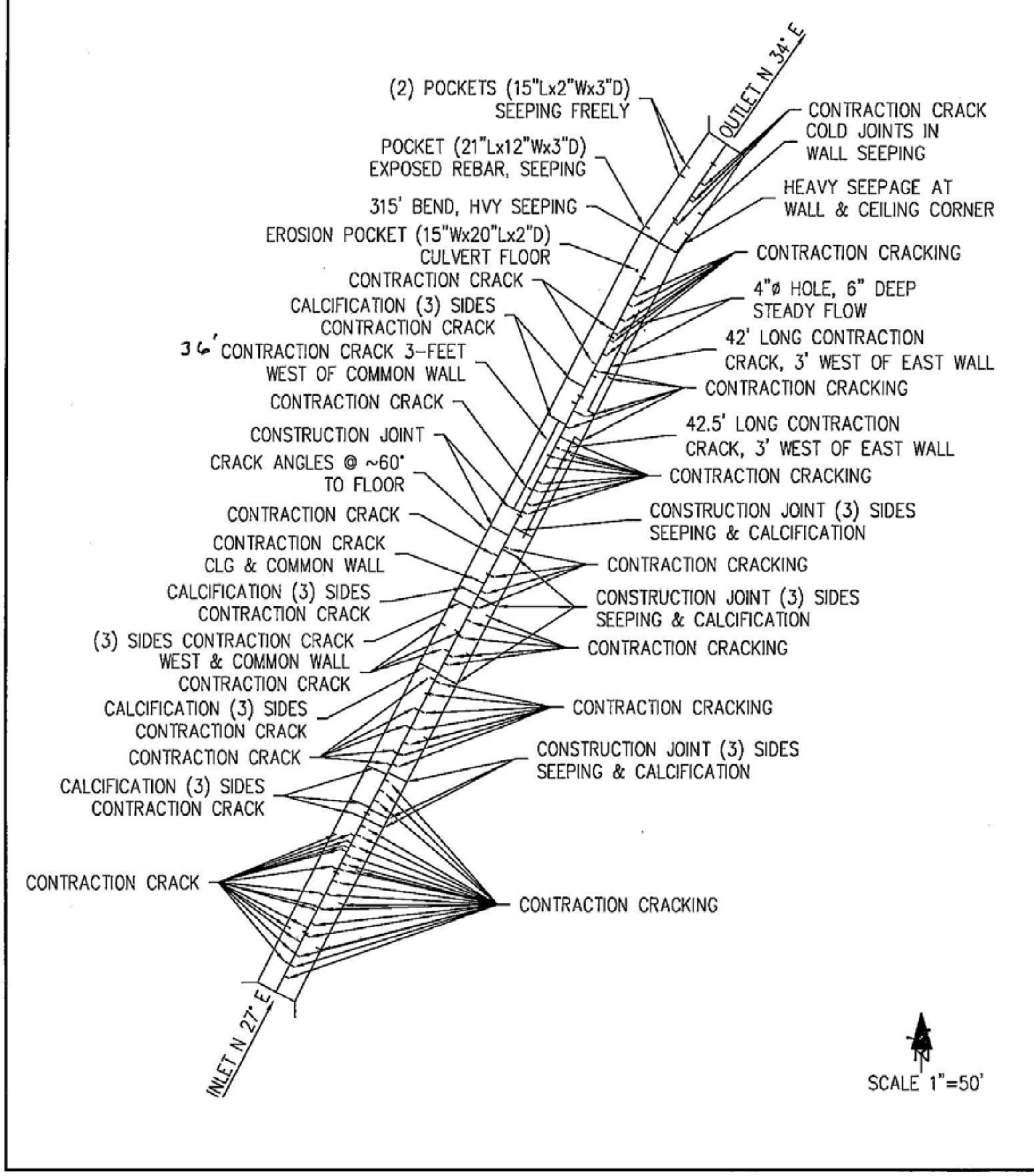

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