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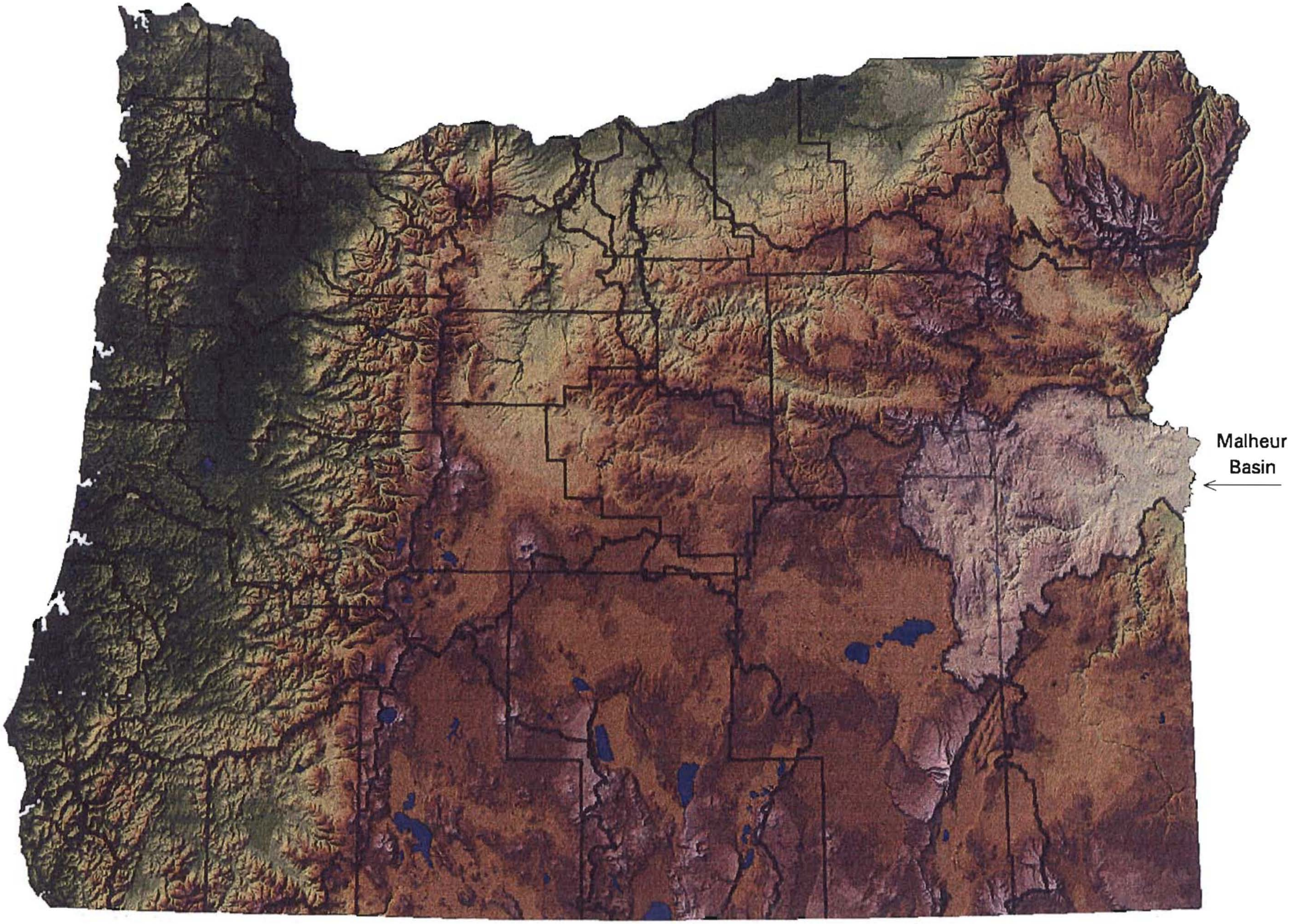
MALHEUR BASIN WATERSHED ASSESSMENT

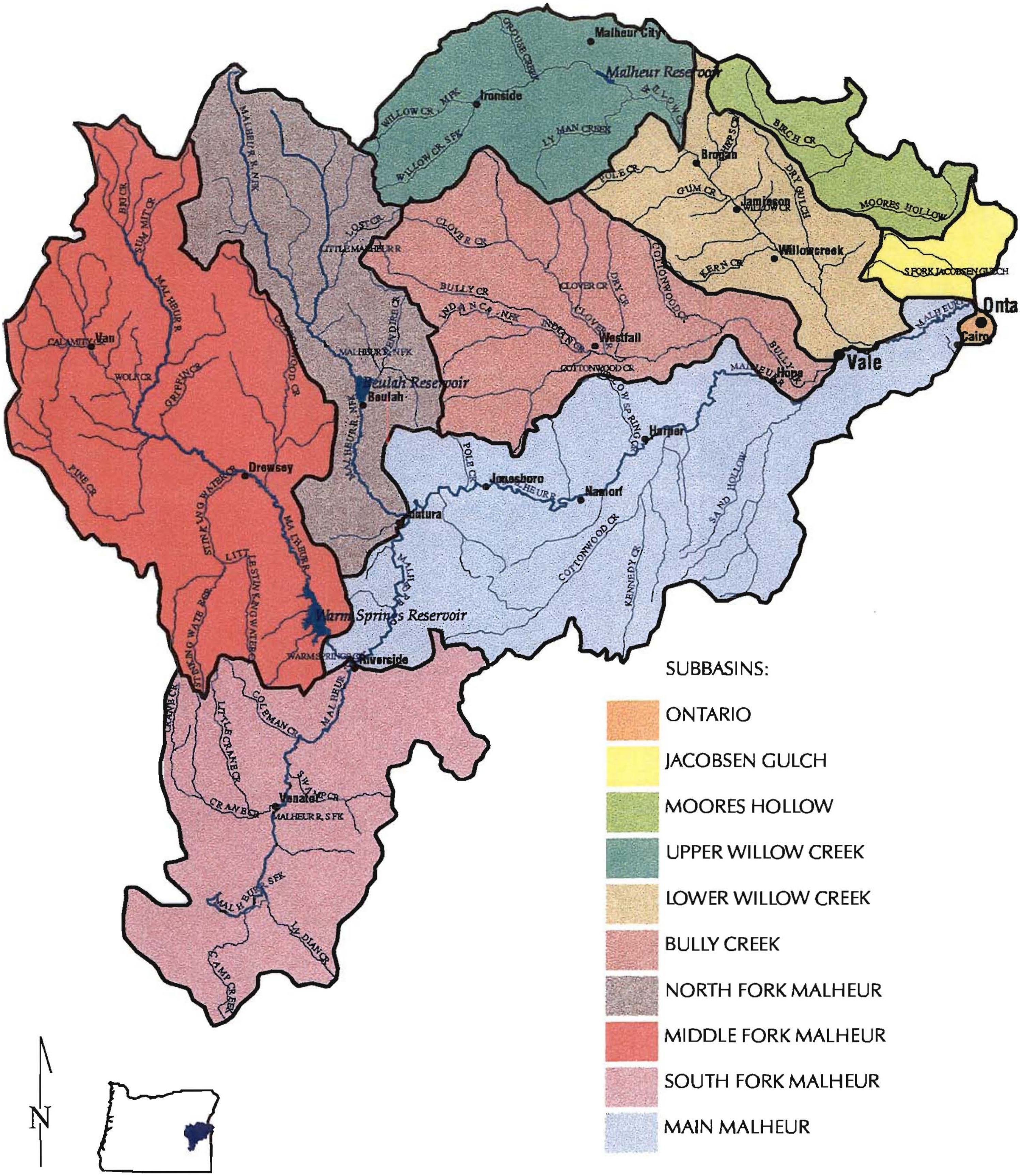
Prepared by
Malheur-Owyhee Watershed Council

September 1998

Malheur Drainage Basin



Malheur Basin Watersheds



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CHAPTER 1

INTRODUCTION

The Malheur Watershed Action Plan was developed in response to initial listings of many of the Malheur basin's rivers and streams by Oregon Department of Environmental Quality (DEQ.) The Malheur-Owyhee Watershed Council (MOWC) and local landowners have concerns that the basin's physical and biological attributes are not compatible with DEQ's standards, especially the basins failure to meet temperature standards. Choosing to take a proactive approach, the MOWC held public meetings to address water quality issues with eventual de-listing as the goal.

The watershed plan addresses many of the physical, biological, and geological aspects of the basin including a condition assessment. This plan emphasizes local remedies in the form of landowner participation in practices to reduce/eliminate those elements that degrade water quality in croplands and rangelands.

The MOWC members and technical advisory committee are committed to carrying out the plan. Implementation of the plan will provide a holistic approach to accomplishment of the goals and objectives over public and private ownership. The plan strategy is flexible and will be updated as new information and practices are developed and funding is secured. A monitoring section is included to measure effectiveness of the implementation procedures.

The companion volume for this Watershed Action Plan, the appendix, contains material that is related to the subjects and issues presented here, but in a more technical manner. A glossary is included in the appendix.

MALHEUR-OWYHEE WATERSHED COUNCIL

The Malheur County Water Resources Committee was appointed by the Malheur County Court in 1989. Its purpose was to provide the County Court with local input on water issues and to write a groundwater management plan. However, as resource issues changed, the original function was expanded to include soil and water issues on a watershed/ecosystem basis. The Water Resources Committee and the County Court decided that one, broad-based organization could cover both the Malheur and Owyhee watersheds. Thus, the Malheur-Owyhee Watershed Council was formed in August 1995.

The MOWC consists of a cross section of 20-25 people from various backgrounds, representing the interests of agricultural producers, industries, and organizations; urban residents and small business owners; environmental groups; irrigation districts; cities of Vale and Ontario; Malheur County; Bureau of Reclamation; Idaho Power; Treasure Valley Community College, and the Burns-Paiute Tribe.

The technical advisory committee consists of representatives from environmental groups, irrigation districts, Malheur County Soil and Water Conservation District, Oregon State University Extension and Experiment Station, Malheur County Weed Control, Environmental Health and Economic Development, Governor's Watershed Enhancement Board, and state and federal agencies. The state agencies represented on this committee include Oregon Department of Fish and Wildlife, Oregon Department of Environment Quality, Oregon Department of Transportation, Oregon State Police, and Oregon Water Resource Department. The federal agencies represented include Bureau of Land Management, Natural Resources Conservation Service, Farm Service Agency, US Forest Service, and Bureau of Reclamation.

The members of the MOWC have set as our mission and goal the implementation of this long-range plan for the public and private lands within the Malheur Basin. The following is an explanation of the council's direction:

Vision

The Malheur watershed will provide adequate, clean water for all desirable uses. Streams and rangelands will function properly. Wildlife, fish, livestock, and crops will flourish. The agricultural economy will thrive at sustainable levels. Improvements in land and water conservation will be documented. Both residents and non-watershed residents will know about and support local enhancement efforts. People will work together constructively to fulfill watershed objectives.

Mission

To lead the effort to conserve, protect, and enhance all watershed resources for optimum economic and environmental benefits within the Malheur watershed.

Goals

- Improve communication among affected private individuals, interested citizens and representatives of local, state and federal agencies;
- Establish a framework for coordination, cooperation, and citizen involvement;
- Provide a forum for resolving problems and conflicts related to the council's mission;
- Develop an integrated, comprehensive watershed management program which includes an action plan to achieve and maintain watershed health;
- Provide ongoing program evaluation during implementation; and
- Promote ongoing monitoring of the health of the Malheur watershed.

CHAPTER 2

MALHEUR RIVER BASIN

LOCATION

The Malheur River basin lies in east-central Oregon. The drainage area covers 4,610 square miles, with about 63 percent in Malheur County, 27 percent in Harney County, and small areas in Grant and Baker counties (see Oregon Drainage Basin map following page 3.) The Malheur River is 190 miles long. Its headwaters are in the Strawberry Range at an elevation of about 7000 feet. The Middle Fork flows southeasterly for 65 miles, where it turns directly north for 19 miles to a junction with the North Fork at Juntura, it then flows northeasterly to its confluence with the Snake River at Ontario.

The principle tributaries are the North Fork starting at Baker County heading south toward Beulah Reservoir and on to Juntura, the Middle Fork (described above), and the South Fork originating above Venator in Anderson Valley country (Harney County) flowing north-northeast where it joins the Middle Fork near Riverside below Warm Spring Reservoir. The main stem of the Malheur River flows from Juntura to Ontario (see Malheur Basin Watershed map following page 3.)

There are very few natural lakes of significant size in the basin. There are a number of reservoirs, including Warm Springs, 4400 acres; Agency Valley (Beulah), 1900 acres; Malheur (Willow Creek), 1240 acres; and Bully Creek, 985 acres.

CLIMATE

The climate is semi-arid with hot, dry summers and cold winters. Summer high temperatures average between 85-95° and winter high temperatures average in the 20's. Precipitation averages 8 to 40 inches annually, depending on location and elevation. Most precipitation occurs during the winter as snow and this mountain snowpack is an important source of water for irrigation, fish, wildlife, livestock, domestic, and other uses. Snowpack usually melts by April at elevations below 6000 feet but stays until mid-June at higher elevations. Localized flooding often follows spring snowmelt.

Generally, the last spring frost occurs by May 30 and the first fall frost by September 2. The frost-free period varies from 157 days at lower elevations to 74 days at higher elevations. Nighttime frost may occur during any month of the year. Precipitation is primarily in the form of frontal storms in spring, winter, and fall with short thunderstorms in summer. Irrigation is critical in the agricultural areas due to low rainfall and high evaporation rate.

TOPOGRAPHY/GEOLOGY

Most of the basin consists of gently sloping plateau uplands separated by river canyons or valleys resulting from block faulting and weathering of volcanic ashes, basalts, and sediments. Elevations range from around 2000 feet near the Malheur's confluence with the Snake River to mountainous plateaus above 5000 feet and isolated peaks above 6000 feet. The highest point is Graham Mountain in the Blue Mountains (8570 feet.) Three main geographic divisions occur in the Malheur basin: (1) low elevation terraces and flood plains in the irrigated eastern part, (2) grass-shrub uplands comprising the majority of the basin, and (3) forested uplands in the northwestern portion. These generally correspond to the Snake River Plain, Basin and Range, and Blue Mountain Provinces.

The low-elevation terraces and flood plains that run parallel to the Snake River and extend up the valleys of the Malheur River and Willow Creek make up an important agricultural area. These irrigated areas are under intensive agricultural production and are used to raise sugar beets, onions, potatoes, corn, mint, grain, alfalfa seed, vegetable seed, and hay. The grass-shrub uplands consist mainly of rolling, hilly terrain underlain by old sediments and volcanic deposits. The forested uplands are located in the northwest corner of the basin. Open ponderosa pine stands predominate. The primary uses of this area are summer range, timber production, and wildlife habitat.

SOILS

Soils in the semi-arid basin areas are generally young, thin, and poorly developed. Chemical and biological soil-building processes proceed slowly in this environment. Because soil recovery processes are slow, disruption of soils can lead to long-term changes in ecological condition and productivity.

Flood plain soils include the well-drained Jett, Powder, Bully, Feltham, Garbutt, and unnamed (Mc) and (Gi) series. Jett, Powder, and (Gi) soils are moderately dark, neutral, and medium textured. Bully soils, formed in alluvium from diatomaceous sources, are light colored, have a low bulk density, and are easily eroded. (Mc) soils are light colored, clayey soils high in alkali that are formed on fans derived from uplands of lacustrine sediments. Coarse-textured Feltham soils and medium-textured Garbutt soils occur near the Snake River. The Stanfield, Umapine, (Ki), and (Sm) series are alkali soils with impeded drainage. (Ki) and (Sm) are darker colored and fine textured. Stanfield soils have a cemented pan within 40 inches of the surface. Flooding may occasionally occur in some areas but is not a major hazard in this basin. Some of the alkali soils have been reclaimed while other areas are still in greasewood.

Uplands of the Malheur basin consist mainly of rolling, hilly, grass-shrub covered terrain underlain by old lacustrine sedimentary formations of Tertiary age and Tertiary to Recent age lava flows. A thin surface mantle of wind-born loess is present in places and narrow alluvial lands may also occur along streams. The soils are light colored, low in organic matter, and generally calcareous. At higher elevations above 3500 feet, soils are generally somewhat darker.

The northwest part of the basin is forested. Soils of the Klicker series underlain by basalt and andesite occupy the forested areas. They are stony, moderately deep, slightly acidic, and fine loamy soils. Hall Ranch, Rock Creek, and Hankins soils also occur. Logan Valley and Crane Prairie are high badins with gravel terraces occupied by shallow (Bg) soils with cemented hardpans. Forested areas are used for summer range and timber production and are important for deer and elk habitat. Some hay is produced by flooding the meadow basins.

For more information on soils refer to Appendix 2.

WATER RESOURCES

The Malheur basin consists of the Malheur drainage and the small tributaries on the Oregon Slope that drain directly into the Snake between Ontario and Farewell Bend. Due to low rainfall, many tributaries run intermittently. The basin includes four major reservoirs and many diversions. The South Fork is not dammed. The Middle Fork is dammed by Warm Springs Dam just above the confluence of the South and Middle Forks. The North Fork is dammed 18 miles above its confluence with the Malheur at Juntura. Namorf Dam diverts a major portion from the Malheur downstream of Juntura during the irrigation season. Bully Creek is dammed 14 miles above its confluence with the Malheur. Willow Creek is dammed 41 miles above its confluence with the Malheur at Vale. Irrigation companies and private individuals divert water throughout the Basin for irrigation.

The Malheur River system can be categorized into three separate zones: (1) the upper zone, above the reservoirs, (2) a middle zone, below the reservoirs to the irrigation diversion dam, and (3) a lower zone, from the diversion dam to the mouth.

The flow in the upper zone above the reservoirs is controlled by natural climatic cycles resulting in high spring flows and low summer flows. Flows on the Middle Fork at Drewsey range from 12,000 cfs at peak flood stage to zero during dry years. On the North Fork above Beulah Reservoir, flows range from 4,000 cfs to 8.5 cfs.

The flow in the middle zone, from Beulah and Warm Springs Reservoirs to the Vale-Oregon Canal Diversion at Namorf, is manipulated according to irrigation water demand in the lower agricultural valley during the irrigation season. During the winter months, however, the flows are greatly reduced due to water being stored in reservoirs for the following irrigation season. Winter flows are limited to leakage from the reservoir, natural springs, and flows from the South Fork. During the spring, water is released from the reservoir in accordance with the rate of snowmelt and inflow into the reservoir. During the irrigation season, water released from Beulah Dam averages between 75 and 300 cfs.

The lower zone, from Namorf to the mouth, is characterized by several irrigation diversion dams including the Gellerman-Froman Diversion, J-H Diversion, and Nevada Diversion Dam. Also, the lower zone is a mixing zone for irrigation return from several drain canals and from Bully Creek and Willow Creek. The summer flows vary according to irrigation water demand, amount of water diverted into the various canals, and amount of return flow.

Willow Creek is a major tributary to the Malheur River and enters it just east of Vale. From the mouth up to Brogan, Willow Creek has been straightened to facilitate farming. The natural channel has been eliminated and the present creek serves as an important drainage and irrigation canal for farmland in the area. Willow Creek between Brogan and Malheur Reservoir has been placer mined and dredged for gold and silver in the past. The flow in this reach of the river is controlled by water released from Malheur Reservoir. Above the reservoir, water flow is controlled by natural cycles and irrigation demand.

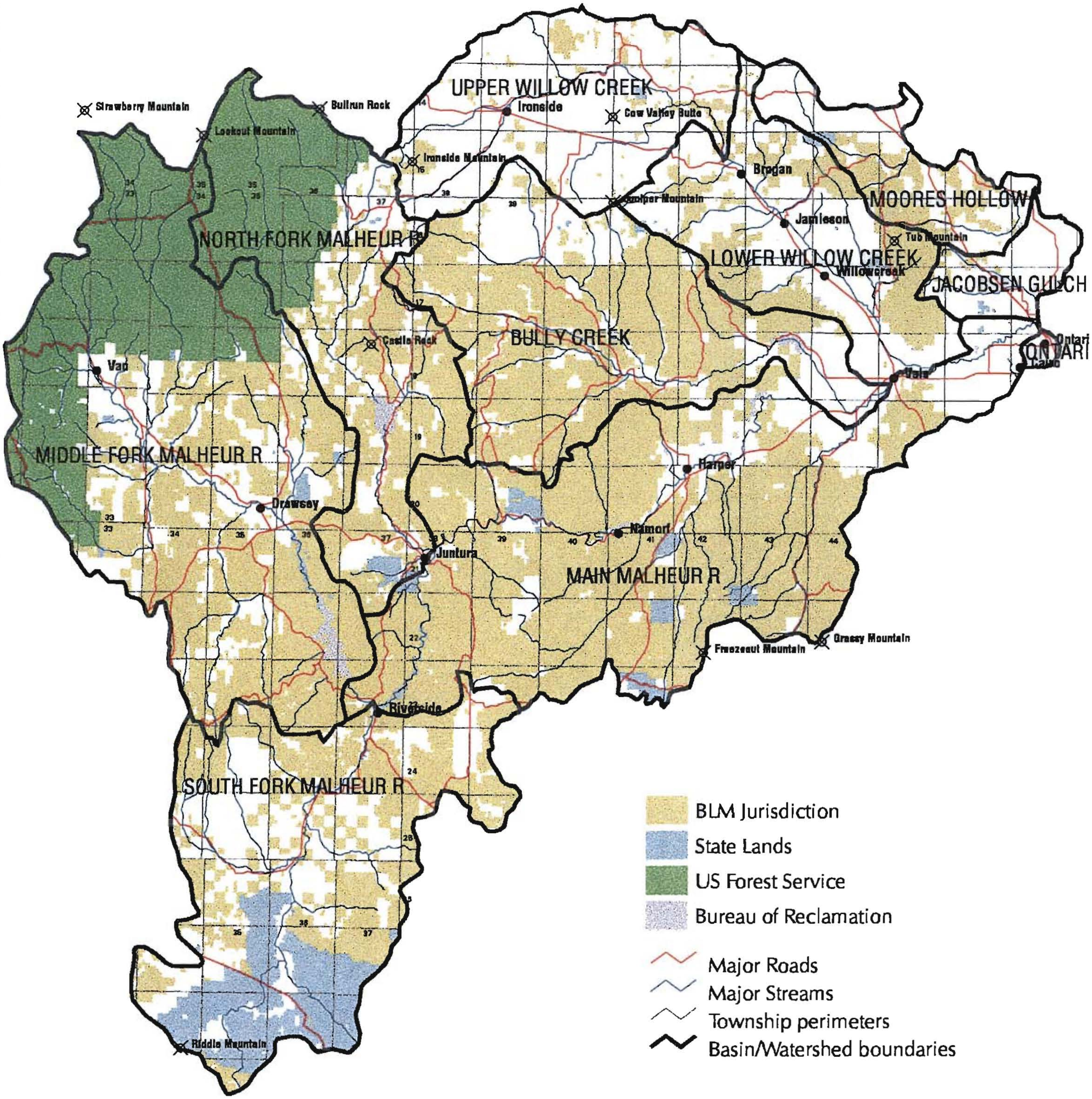
Bully Creek is the other major tributary to the Malheur River and enters the river west of Vale. Bully Creek, like Willow Creek, has been straightened from the mouth up to Bully Creek Reservoir. Above the reservoir, water flow is controlled by natural cycles and irrigation demand.

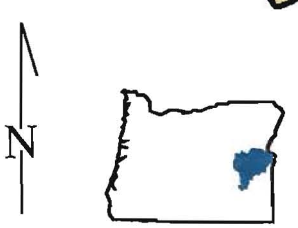
Three major water-bearing aquifers are located in the lower basin: Quaternary Sands and Gravel Aquifer, Upland Gravel Aquifer and the Glens Ferry Formation. More information on these aquifers may be found in Appendix 3.

SUBBASINS

This plan covers the Malheur basin, which consists of the Malheur drainage and Moore's Hollow/Jacobsen Gulch. The MOWC chose to work on the Malheur before tackling the Owyhee because it is a smaller watershed, only one state is involved, and more information is known about its resource condition. To facilitate the work, the MOWC divided the basin into 10 subbasins (see Malheur Basin Watershed map following page 6.) The criteria used to establish the subbasins include similarity of issues, watershed boundaries, and location of cultural/social centers.

Malheur Basin Watersheds





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The following table summarizes each subbasin's total acres, Bureau of Land Management (BLM) acres, and stream miles. The data are estimates compiled from BLM's Geographic Information Systems (GIS) and US Geological Survey (USGS) data. Data and maps for the Malheur National Forest in Harney, Grant, and Baker Counties are located in Appendix 7.

Table 2-1

Malheur Subbasins

Subbasin	BLM Acres	Total Acres	Stream Miles
North Fork	130,370	352,077	681
Middle Fork	279,375	684,025	1,429
South Fork	188,743	451,257	982
Main Malheur	497,855	654,394	1,722
Upper Willow Creek	23,651	258,077	594
Lower Willow Creek	85,231	245,907	555
Bully Creek	251,505	384,609	992
Moore's Hollow	32,294	107,896	197
Jacobsen Gulch	3,546	54,483	132
Ontario Watershed	1	5,594	4

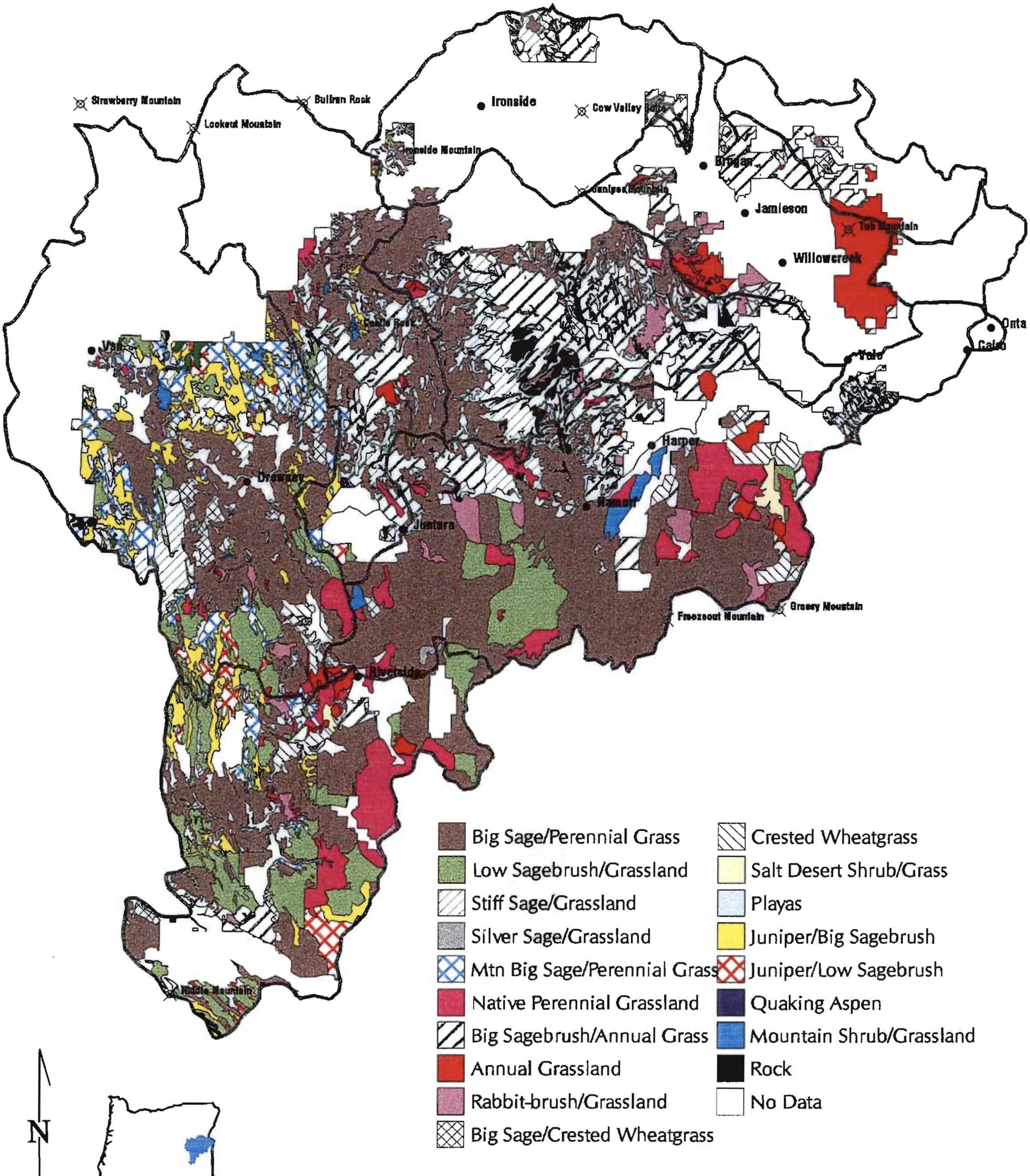
VEGETATION RESOURCES

Typical vegetation communities include basin, mountain and Wyoming big sagebrush, rabbitbrush, bitterbrush, and low sagebrush. Although this area is often called high desert, steppe is a more appropriate term based on the appreciable cover of perennial grasses.

Vegetative inventories have, to date, covered approximately two-thirds of the Malheur basin (see Vegetative Type by Sub-Basin map following page 7.) Inventories by BLM have, through GIS capability, improved data capturing and usefulness for management practices. Malheur National Forest data was not available for this document.

Vegetation condition class inventories completed in the Burns BLM District were accomplished fairly recently (1990's) and were carried out on a site-specific format. The inventories in the Vale BLM District covered broader areas and are much older surveys. A Malheur Basin Range Condition map is following page 7. No data is available for most of the northern portions of the basin. Differences in past inventory methods and applicability to current resource issues and concerns have resulted in varying condition class assessments. When compared with wildlife habitat condition assessment, obvious differences are apparent.

VEGETATION TYPE BY SUB-BASIN



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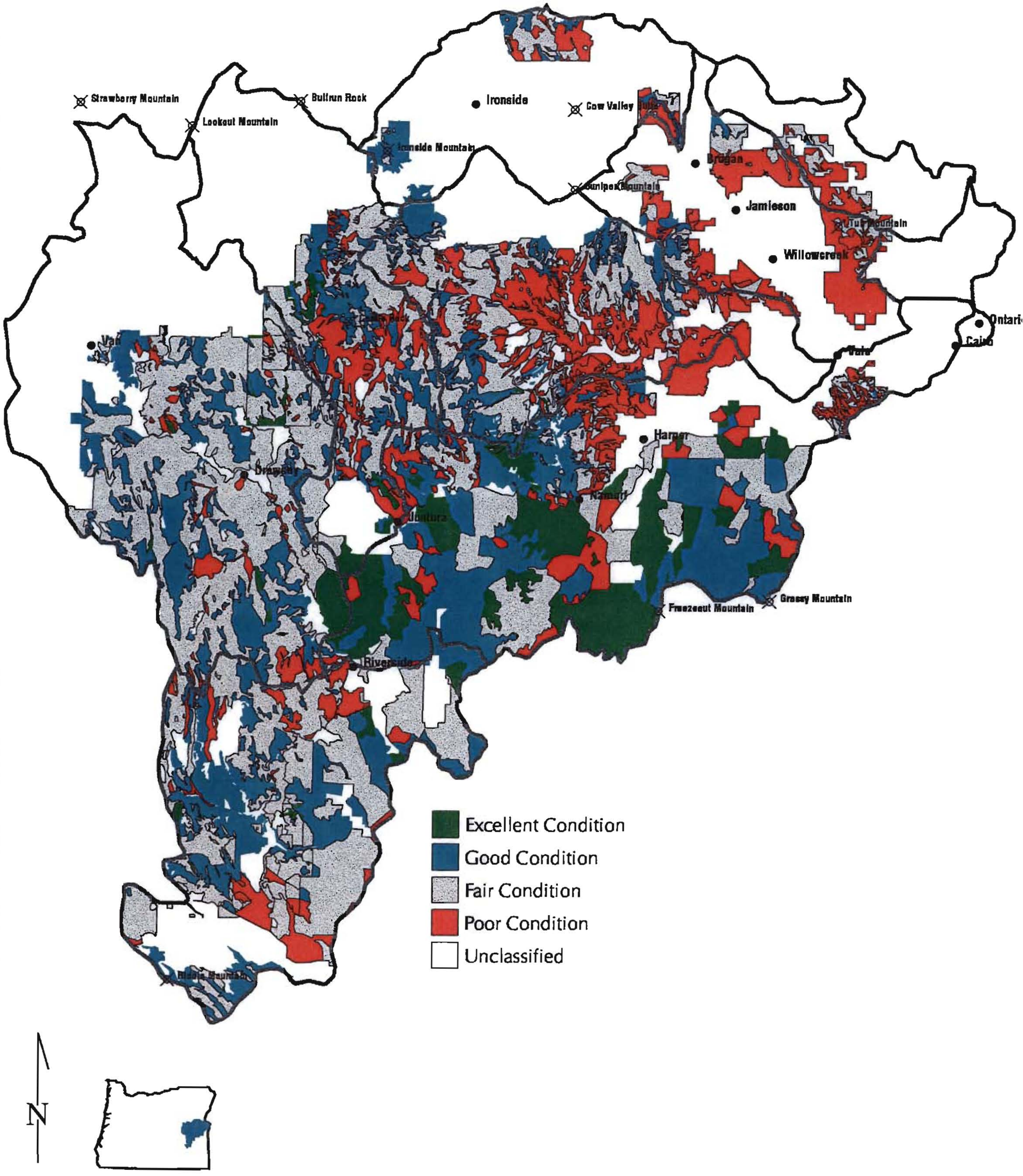
Malheur Basin Range Condition



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Sagebrush and native bunchgrass communities at higher elevations dominate the Malheur basin. Big sagebrush/bunchgrass communities are the most widespread types in southeastern Oregon. Sagebrush/annual grass communities are common at lower elevations. Perennial grasslands do not form a major climax vegetation type, although, they do dominate for long periods following fire due to the reduction of overstory canopy and subsequent release.

Vegetative changes due to a combination of drought, past grazing practices, and fire have occurred within the Malheur basin. These changes have allowed invading species such as cheatgrass and western juniper to establish a firm foothold in many areas. Cheatgrass has thoroughly invaded the basin; it is a highly competitive weed and has forever changed the vegetation. There is no known control, and the decline in native grasses and forbs is irreversible. (Dr. Clint Shock, Oregon State University, 1998 personal communication)

Vegetation communities with a tree overstory of Douglas fir, ponderosa pine, western juniper, aspen, or mountain mahogany are present on moister sites at higher elevations, generally on north slopes. Associated understory shrubs include bitterbrush, chokecherry, bittercherry, serviceberry, snowberry, deerbrush, and squaw current. Grasses and forbs complete the upland community and include bluebunch wheatgrass, Idaho fescue, sandbergs bluegrass, bottlebrush squirreltail, lupine, penstemon, and larkspur.

Aspen are present in riparian areas and at other sites with deep soils and adequate soil moisture. Mountain mahogany form pure stands at high elevations and inclusions in the boundary between juniper and ponderosa pine in the Blue Mountains.

More information on the vegetative communities in the basin can be found in Appendix 4.

NOXIOUS WEEDS

In Oregon, noxious weeds have become so thoroughly established and are spreading so rapidly that they have been declared a menace to public welfare. (ORS 570.505) Vale District has a 5-year Integrated Weed Control Plan that identifies objectives and priorities for weed control. Noxious weeds are present in large enough numbers to be a serious problem in many portions of the Malheur basin. All segments of the Malheur River and its tributaries are contaminated with noxious weeds. More detailed information by subbasin can be found in Chapter 4 and Appendix 8 .

SPECIAL STATUS SPECIES

The only threatened or endangered wildlife species found within the Malheur basin are the bald eagle and peregrine falcon. The bald eagle winters along the Malheur River corridor and associated reservoirs. The American peregrine falcon is believed to make occasional use of the Malheur River corridor. (ODFW, personal communication, 1998) Other species that are candidates for federal and state listing are found in Appendix 5.

The bull trout has been recently listed as a federal threatened species. The redband trout may be proposed for federal listing in other watersheds within the state.

There are no known threatened or endangered plant species in the Malheur basin. There are, however, a significant number of BLM bureau sensitive species (formerly designated by the US Fish and Wildlife Service as Category 1 and 2 species.) These species can be found in Table 4-2 of Appendix 4.

RECREATION

Under a provision of the Federal Land and Water Conservation Fund Act of 1965, state governments must develop and maintain a Statewide Comprehensive Outdoor Recreation Plan (SCORP.) Produced approximately every five years, Oregon's most recent SCORP is the Oregon Outdoor Recreation Plan, 1994-1999. The pilot for regional plans in the state is the Southeastern Oregon Comprehensive Outdoor Recreation Plan which encompasses Malheur, Harney, and Lake Counties.

Public surveys indicate that the most popular/desired activities included sightseeing, driving for pleasure, boat and bank fishing, hunting/shooting, non-pool swimming, nature study, tent and recreation vehicle camping, and motorized and non-motorized boating. Horseback trail riding and cross-country skiing were also highly desired activities, while other activities indicated were off-road vehicle driving, bicycle touring and trail riding, downhill skiing, and mountain climbing.

In the Malheur Resource Area, recreation on BLM-managed lands is focused around Castle Rock. Recreation activities include camping, picnicking, bicycling, hiking, caving, horseback riding, sightseeing, hunting, shooting, fishing, rockhounding, boating, swimming, and driving off-highway vehicles. Six developed and undeveloped recreation sites (camp sites and Oregon Trail sites) receive 7,500 visits annually.

In BLM's Three Rivers Resource Area, favored recreational activities in the Malheur basin include road bicycling and off-highway vehicle driving and camping. The Desert Trail, also located in the Three Rivers Resource Area, is a long-distance trail similar in concept to the Pacific Crest Trail in the Cascades.

Wildlife viewing demands are predicted to increase in the future. Because it is more difficult to count the number of participants, it is not considered as popular as hunting in terms of recreation but many enjoy looking for and seeing wildlife in their natural habitat.

More in-depth data on fishing and hunting in the Malheur basin is available in Appendix 6.

CHAPTER 3

LEGISLATIVE MANDATES

FEDERAL CLEAN WATER ACT

The Federal Clean Water Act (CWA) (1972) requires each state to determine water quality (identify beneficial uses for each water body; designate parameters to monitor for each beneficial use; and establish a standard for each parameter), to report findings to Congress every two years, and to correct water quality problems. Section 303(d) of the CWA requires each state to develop a list of water bodies that do not meet the standards designed to protect the most sensitive beneficial use. Water bodies that do not meet standards are placed on the 303(d) water quality limited list. The CWA also requires each state to develop a strategy and Total Maximum Daily Load (TMDL) requirement to reduce pollution on each water body on the 303(d) list. A TMDL refers to the total amount of a pollutant a stream can accept and still support beneficial uses. In Oregon, the Department of Environmental Quality (DEQ) has the responsibility for determining beneficial uses, standards, and whether beneficial uses are being supported. DEQ also has the authority to develop a strategy and TMDL's for point and nonpoint source pollution.

OREGON'S 303(d) LISTING PROCESS

In general, rivers and streams are listed for their entire length (mouth to headwaters) unless there is information available to divide them into segments. More information can be found in Appendix 1.

Those parameters that are listed for the Malheur Basin as sub-standard are as follows: water temperature, bacteria, toxics, dissolved oxygen, chlorophyll a, and flow modification. Generally, waters that exceeded the standard by more than 10 percent were considered for inclusion in the 1994/96 303(d) list. For the final listing, the past 10 years of data (1985-1995) were evaluated using the most recent standards.

As a rule of thumb, it would take similar data to get off the list as it took to get on the list. For example, if the listing were based on two successive years of a standard not being met, the DEQ would look for at least two successive years of data indicating that the standard is being met.

The following are the rationale for not listing:

1. Standards being met
2. Natural conditions
3. Faulty data for original listing
4. TMDL approved by the Environmental Protection Agency (EPA)

WATER QUALITY MANAGEMENT PLANS THAT FUNCTION AS NONPOINT SOURCE TMDL's

The CWA requires states to establish TMDL's according to a priority ranking for 303(d) listed rivers.

The TMDL concept originally applied to point sources and is difficult to apply to nonpoint sources. Therefore, the State of Oregon developed the concept of "nonpoint source TMDL's" now more accurately called "Water Quality Management Plans (WQMP's) that Function as Nonpoint Source TMDL's." DEQ established the guidelines for writing these in July 1997. Plan components include condition assessment, goals and objectives, proposed activities, timeline, monitoring, and maintenance of effort over time.

Because of Senate Bill 1010, the Oregon Department of Agriculture (ODA) will work with local management agencies, such as Soil and Water Conservation Districts (SWCDs) and watershed councils, to reduce agricultural nonpoint source pollution for streams on the 303(d) list. The resulting WQMP's need to be approved by ODA, DEQ, and EPA.

CHAPTER 4

RESOURCE CONDITION/ASSESSMENT

Resource assessment in this context means an evaluation of existing and potential resource conditions in the Malheur basin. This basin includes landforms from valley agriculture cropland to high elevation forested headwaters. This assessment also speaks to restoration methods.

The MOWC is committed to the ridgetop-to-ridgetop concept of watershed health. Because riparian areas frequently include only 3 percent of the land area of a watershed, we constantly strive to "remember the uplands" (John Buckhouse, Oregon State University Rangeland Department.) The concept of "properly functioning condition" has been embraced by the MOWC because it links the stream condition to upland condition.

The first MOWC goal echoes the PFC philosophy that water must be captured, stored, and released in a beneficial manner. Therefore, our condition assessment includes both land and water resources.

SOILS (UPLANDS)

Historically, uplands soils and drainage channels eroded due to uncontrolled land use practices, prolonged drought, and catastrophic storms. Ephemeral drainages (those running during spring runoff and intense summer storms) were deeply incised by gully erosion more than 30 years ago. Some localized erosion caused by concentrated uses still occurs. The effects of lost soil productivity are evidenced by changes in vegetation composition and lowered water tables. Past and current land use management practices have reduced erosion and begun the healing process. These practices include proper stocking rates for livestock, with rest-rotation of grazing; improved design of roads; selective logging; rehabilitation of unneeded surface disturbance; restriction of vehicles to roads and trails; rehabilitation of mined areas; and control of concentrated recreational activities.

SOILS (LOWLANDS)

Historical agriculture practices have contributed to excessive loss of topsoil and major sediment flows into the Snake River system. Improved tillage, irrigation, and harvest practices have reduced lowland soil and sediment loads in the drainage waterways. Recent practices of land leveling, straw mulching, PAM, filter strips, sediment ponds and incorporation of sprinkler and drip irrigation in place of surface flood irrigation have been successful in retaining cropland topsoil.

WILDLIFE

Wildlife populations reflect habitat conditions. Some of the major sagebrush winter ranges are in poor condition due to a combination of drought and wildfire which has affected the ability of the land to sustain the numbers of deer observed in the 1960's. Poor upland condition has increased the amount of deer use and damage to private agriculture.

Although their numbers have declined substantially over the last 40 to 50 years, viable populations of sage grouse are distributed throughout the sagebrush habitats of the basin. The reasons for their decline include sagebrush eradication, poor grazing management, wildfire, juniper encroachment, and drought. Sage grouse depend on the sagebrush community for their survival throughout most of the year, and residual grass and forbs have been shown to be a significant diet factor and important attribute to nesting and brood rearing success (Klebenow 1967.) These biological needs create a potential for conflict between sage grouse habitat needs and improper land management.

Abundance of ring-necked pheasants and valley quail has declined substantially in the last 35 years due mainly to changes in agricultural practices (elimination of cover), crop type, and conversion of native bottomland habitat to intensive agriculture. Winter habitat is also considered to be a limiting factor for both species. In many cases, the only remaining habitat is along irrigation canals, river reaches, and on the fringes of the valley where conversion to agriculture has not been feasible.

VEGETATION

Appropriate vegetation is the key to capturing water on rangelands. It is also the key to a sustainable agricultural economy. Changes in the natural fire cycle, drought and improper land management practices are the generally accepted causes of inappropriate vegetation. Shrub and annual grasslands, where past occurrences have caused cheatgrass, medusahead rye and other annuals to replace perennial bunchgrass, cover much of the rangeland.

Generally, higher elevation vegetation is in fair to good condition with encroachment of juniper occurring in many subbasins. Past use by livestock coupled with the present increase in elk populations is impacting these communities with a resulting downward trend in condition. Invasion of noxious weeds is occurring in the upper reaches of many watershed areas.

Lower elevation vegetation is generally in poor to fair condition with increasing replacement of perennial grasses by annuals and invasion of juniper and noxious weeds. Tap-rooted plants such as sagebrush are the dominant vegetation with an inadequate understory of grasses and forbs. Controlled burns, seedings, and improved livestock management are effective ways to restore native diversity.

Conversion of sagebrush/grassland to juniper woodland influences many ecological processes. Tree, shrub, grass, and forb species are displaced as juniper density increases. (Burkhardt, J. Wayne, 1976, Causes of Juniper Invasion in SW Idaho.)

Wildlife species that depend on grasses and forbs are also displaced. Reduced vegetative cover increases soil erosion and sediment production. Juniper canopies intercept precipitation and their roots make nearly complete use of soil moisture in all layers of soil. Therefore, soil moisture is reduced for ground-water recharge.

NOXIOUS WEEDS

Higher elevation ranges in the Malheur basin have been relatively noxious weed free in the past. However, colonies of whitetop are presently gaining a foothold in many areas. Perennial pepperweed is a major threat along the South and Middle Forks; Scotch thistle poses a danger to the Middle and North Forks; and Russian knapweed occurs on the North Fork and the adjacent wetlands.

Along the middle portion of the Malheur from Juntura to Harper, Scotch thistle and water hemlock are increasing and present real threats of further expansion. Whitetop has become established on many range sites from Juntura to Riverside.

Medusahead rye is commonly found in lower elevation clay soils and has infested many such sites along the South Main forks of the Malheur.

The Bully Creek segment is contaminated by Russian knapweed along Indian Creek to Dahle bridge (over 60 acres.) Scotch thistle infests Bully Creek from its headwaters all the way to its mouth at Vale, including the edges of Bully Creek Reservoir. Whitetop also infests thousands of valuable acres of rangeland in this watershed.

The Willow Creek segment is heavily infested with whitetop around Ironside while Scotch thistle grows along the county roads. Scotch thistle is just starting to move off the roads and into the rangeland. Scotch thistle infests Willow Creek from Malheur Reservoir all the way downstream to Vale where it joins the Malheur River. Leafy spurge also contaminates Willow Creek from Basin Creek to the diversion dam for the Brogan Ditch. Scotch thistle also infests the land around Pole Creek Reservoir.

The lower portion of the Malheur River is heavily infested with noxious weeds. Perennial pepperweed has taken over most riparian zones while whitetop marks the high water level. Scotch thistle, Canada thistle, water hemlock, bull thistle, and some Russian knapweed compete with native vegetation. Scotch thistle infests most ditches and adjacent rangeland.

A partial listing of common and noxious weeds occurring in the Malheur and Harney basins are in Table 4-1.

Table 4-1

Common/Noxious Weeds in Malheur and Harney Basins

Russian knapweed	Centaurea repens
Whitetop	Cardaria draba
Perennial pepperwood	Lepidium latifolium
Spotted knapweed	Centaurea maculosa
Diffuse knapweed	Centaurea diffusa
Yellow starthistle	Centaurea solstitialis
Rush skeletonweed	Chondrilla juncea
Canada thistle	Cirsium arvense
Bull thistle	Cirsium vulgare
Scotch Thistle	Onopordum acanthium
Leafy spurge	Euphorbia esula
Halogeton	Halogeton glomeratus
Puncturevine	Tribulus terrestris
Dodder	Cuscuta sp.
Musk thistle	Carduus nutans
Dalmatian toadflax	Linaria genistifolia
Yellow toadflax	Linaria vulgaris
Mediterranean sage	Salvia aethiopis L.
Medusahead	Taeniatherum caput-medusae

RIPARIAN

In upper reaches, bluegrasses and annual grasses have replaced much of the native grasses. Native riparian shrubs and trees have been overused by both livestock and wildlife and are in poor condition. Many drainages have experienced invasion by juniper and sagebrush due to, in many cases, lowering of the water table. Reduction of riparian native streamside vegetation has caused widespread loss of the hydrological function. Accompanying this is an increase in runoff and introduction of high turbidity flows with increased downstream temperatures. Recently efforts have been made to protect valuable reaches of upland riparian habitats, such as fencing and improved grazing systems.

Water diversions and reintroduction of irrigation outflows from agriculture have modified the lower reaches of many streams to accommodate agriculture.

FIRE

Fire is a natural part of the ecosystem and the major natural agent of disturbance in the uplands. Native grasslands/steppe plant communities are fire-adapted but management practices have changed plant communities to those that often favor more destructive fires that can cause long-lasting damage to stream habitat. Conversely, prescribed burns can be used as a tool to re-invigorate native upland plant communities.

Alterations in natural fire regimes have greatly influenced the distribution, composition, and structure of rangeland and forest vegetation. In many locations, the frequency of fire has decreased because of fire suppression activities and removal of fine burnable fuels (grasses) by grazing. Changes resulting from decreased fire frequency include encroachment of conifers, including ponderosa pine and Douglas-fir into non-forested areas; increased tree density in former savanna-like stands of juniper and ponderosa pine; and increased density or coverage of big sagebrush and other tap-rooted shrubs with an accompanying loss of understory herbaceous vegetation (BLM Planning Documents, 1987). In contrast, fire frequency has increased in drier locations where exotic annual grasses such as cheatgrass have become established. These changes in fire regime have caused greater homogeneity of many landscapes. A Malheur Basin Wildfire History map follows page 16.

Sagebrush/bunchgrass communities were maintained historically with periodic wildfires as often as every 20-100 years depending on sagebrush type and density of fine fuels. Many sites currently support more wood species than were present prior to settlement. This is due to the reduction of fine fuels capable of supporting fire and fire suppression during the past 100 years.

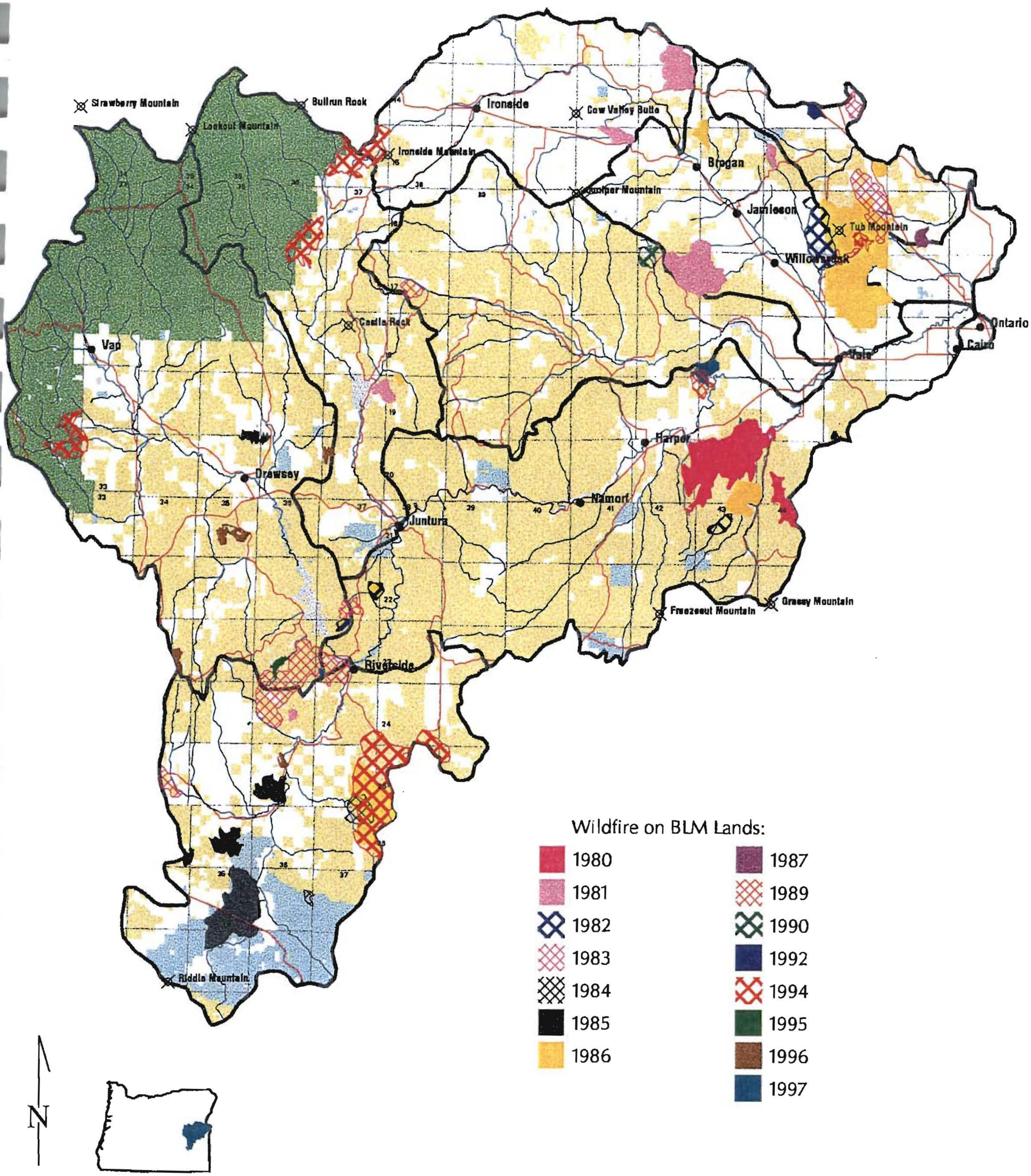
Many species of native grasses respond well to burning and may not need to be replanted. Whenever a seeding is initiated as part of a range rehabilitation project on public land, livestock grazing is excluded from the seeded area for at least two full years.

Western juniper is controlled by wildfire. Historically, it had been restricted to rockier areas where fires did not burn. Juniper has expanded its range 3 to 10 fold over the past 100 years and continues to increase in distribution and density. Juniper is expanding into open meadows, grasslands, sagebrush steppe, aspen groves, riparian areas, and forest lands. This invasion is generally attributed to increased fire intervals since settlement of the region.

LIVESTOCK

Gold rushes, mining in southwestern Idaho, and immigration along the Oregon Trail brought settlers into the region. Horses were needed for transportation; cattle and sheep were needed for food. Locally, heavy stocking of domestic livestock probably began with the discovery of gold in 1863. By 1875, cattle, sheep, and horses occupied the grazing land of the basin. Cattle herds expanded in the latter decades of the 1800's as the

Malheur Basin Wildfire History



0 1 2 3 4 5 6
MILES
Scale: 1 inch = 12.6 miles

US Dept. of the INTERIOR
Bureau of Land Management
Burns District, Oregon
Map prepared 1/27/98, Pam Keller, malfire.aml

railroads were extended. By the turn of the century, rangeland deterioration was probably severe adjacent to areas of settlement at Vale, Harper, Westfall, Brogan, and other settlements along the Malheur River. Land adjacent to these settlements was often grazed year-round including the spring growing season. In addition, historical trailing routes to shipping points at Burns, Riverside, Juntura, Harper, and Vale were used heavily by large numbers of animals.

Higher elevation rangelands were only available for summer use and then only where adequate water was available. Because of the additional livestock management required to make use of these areas, the intensity of livestock use and resulting impacts were often less than in areas closer to settlements. Many areas remained unavailable to livestock use due to lack of water or limited accessibility.

The impacts of historical livestock grazing were thus concentrated at low elevations where temperatures were hottest, rainfall the least, and the dry season the longest. In these areas, native vegetation communities were replaced with introduced annuals and weedy species. Today, these areas continue to have the greatest need for reestablishment of perennial vegetation though they are the most difficult to rehabilitate.

Range improvements to enhance livestock distribution patterns were minimal prior to 1962. Additionally, grazing systems beyond the stipulation of allotment boundaries and authorized dates of grazing were not in place before 1962. Beginning in the mid-1960's, seasonal grazing systems were established to maintain or improve the vegetation under the authorization of the Taylor Grazing Act.

A special appropriations bill passed in 1962 funded the Vale Project, a large-scale program of land treatments to rehabilitate rangeland resources. Through the end of the Vale Project in 1973, brush control treatments covered 506,570 acres and seedings were implemented on 267,193 acres. Additionally, 1,994 miles of fence were built, 583 reservoirs built, 440 springs developed, 28 wells drilled, 463 miles of pipeline laid (including 537 troughs), and 360 cattleguards installed.

Vegetation treatment projects completed since passage of the 1978 Public Rangelands Improvement Act have brought the total area on which brush controls have been implemented within the planning area to 678,976 acres. Seedings have been established on 393,424 acres.

GROUNDWATER

Well-monitoring studies by state and federal agencies have detected nitrate and Dacthal di-acid contamination in the shallow aquifer within the Lower Willow Creek and irrigated portion of the main Malheur subbasin. This area of the Malheur basin was designated a Groundwater Management Area in 1989 by Oregon DEQ for nitrate and Dacthal di-acid levels. Nitrate found in the groundwater is believed to be strongly influenced by agricultural fertilization. Dacthal di-acid is a herbicide commonly used in onions.

Although nitrates were detected in the majority of the wells, only some of the wells were above EPA maximum contamination level for drinking water (10 mg/l for nitrate-nitrogen.) The highest levels of nitrate contamination occurred in the vicinity of the Cairo, Vale, Annex, and Nyssa areas. Dacthal di-acid levels range from no detection to several hundred parts per billion. A lifetime health advisory level of 4000 parts per billion [micrograms per liter (ug/l)] has been established by the EPA for Dacthal and its breakdown products.

Groundwater moves an estimated 0.4 mile per year in the Cairo Junction area. Therefore, it may take over 11 years for water in the Cairo Junction area to discharge. Other estimates have indicated it will take 20 years for the groundwater to move from the upper reaches of the aquifer to the lower discharge areas.

The contamination of nitrates and Dacthal di-acid is believed to have occurred over decades of irrigation. Through improved practices such as irrigation water and nutrient management, the shallow aquifer has started showing declines in nitrate and Dacthal di-acid levels. Due to the slow movement of the groundwater in the shallow aquifer, it will take decades to realize the full benefit of improved agronomic practices.

SURFACE WATER

Cropland drainage systems in the Vale/Ontario/Nyssa/Adrian area route irrigation discharge waters back to the Malheur and Snake Rivers. These return flows are, at times, significantly high in chemical residues and sediment. Pastures and confined animal feeding operations contribute nutrients and bacteria into drainage systems and eventually waterways (rivers and streams.) Local storm events and spring runoff from snowmelt accelerate this process. Recent efforts at incorporating Best Management Practices have improved surface water quality and reduced soil and chemical pollution. All agriculture areas need to adopt these practices, which include irrigation systems, land leveling, filter strips, berms, straw mulching, introduction of PAM, and sediment basins.

Rangeland water management is a priority issue. Desirable upland native vegetation functions as a water trap and filter, where rain and snowmelt is captured and incorporated into the sub-surface soil layers. Any reduction of native vegetation or replacement by undesirable species affects water infiltration rates into the sub-soil where surface runoff may supersede infiltration. Results will vary according to slope, exposure, vegetation, and sub-surface material, but reduced infiltration rates will diminish the aquifer water storage and resultant amounts and duration of downstream flows in affected waterways. Deep tap-rooted plants such as juniper, that have expanded into many native communities, extract water that might otherwise help recharge ground water and sustain summer flows within important trout streams.

Many riparian waterways in the basin have experienced a loss of streambank vegetation due to excessive use by herbivores. This loss can result in accelerated bank erosion, lowered water tables, higher stream temperatures and invasion by more drought tolerant vegetation. These sites constitute a significant loss of an essential component of the range ecosystem. The original character and functioning ability of streams are changed through the simple mechanics of hydrology, where past management has altered the streams ability to store and filter runoff.

Incorporation of surface water into the sub-surface aquifer to provide recharge has, in the past, been one of the major contributor to stream flows. With the advent of irrigation and development of reservoirs, water capture and use has greatly affected seasonal stream flow over much of the Malheur Basin. Areas such as the Middle Fork of the Malheur River provide opportunities to replenish the groundwater aquifer by utilizing early spring runoff flows.

Storm water events contribute large flows into Ontario's sewer system. Runoff from adjacent agricultural areas can, at times, find it's way into the city sewers. All flows that enter the city's storm sewers eventually reach the Snake River untreated. Additional information on Ontario's water treatment facilities can be found in Appendix 6.

CHAPTER 5

CRITICAL ISSUES

Basinwide habitat concerns include nonpoint source pollution, degraded riparian areas, altered stream flow patterns, unscreened diversions, and reservoir conditions.

In the Malheur basin, surface water quality ranges from excellent in the headwaters to poor in the lower basin. The majority of water quality problems in the basin result from nonpoint and point source pollution associated with land-use practices and the Malheur basin's inherent physical geology. Eroding croplands and streambanks associated with irrigation and storm events, conditions of uplands, and noxious weed invasion are but a few of the symptoms. Increased levels of phosphates, nitrates, and bacteria in surface water along with high water temperatures have placed many of the waterways in the basin on the 303(d) list. Listing of the Oregon bull trout as a federally threatened species and redband trout as an Oregon sensitive species has elevated concerns for many reaches of the main river system and headwater areas.

One of the major concerns of the MOWC is that the Oregon DEQ has set standards that are not related to the environment (climate, geology, and biology) of the basin. The physical and biological realities of the Malheur basin are in apparent contradiction with DEQ's numeric water quality standards. The extent that it will be feasible to improve current water quality through responsible management is not completely known and can only be determined during the implementation of the action plan.

The vast majority of the surface area of Malheur County receives from 8 to 15 inches of annual precipitation and has evapotranspiration in the range of 50 to 60 inches over a similar twelve month period. Many years the precipitation is so low there is very little runoff or ground-water recharge over most of the basin. With very little natural recharge of the water table, streams become ephemeral during the annual summer drought. With repeated low rainfall years, streams and stream segments cease to flow due to natural processes and water quality standards are violated. (Dr. Clint Schock, OSU, 1998 personal communication)

Summer heat loads are often considerable, with daytime high temperatures surpassing 100° and nighttime lows in the 60's and 70's. The solar heat load naturally heats shallow, ephemeral, or intermittent streams to temperatures outside any temperature range currently considered in DEQ standards. High water temperatures will occur even with successful restoration and maintenance of riparian vegetation and streams restored to "proper functioning condition" (PFC).

With low natural flows accompanied with high environmental heat loads, other stream water quality standards will be violated; dissolved solids and other contaminants become concentrated, dissolved oxygen is lost from water, and algae can proliferate. (Dr Clint Shock, OSU, 1998 personal communication)

Recommendations for site-specific beneficial uses were made in the 1981 Final Report of the Malheur County Nonpoint Source Water Quality Management Planning Program. The report recommended that the highest water quality standards should be maintained in the headwater areas above the reservoirs to protect the fish population and water-contact recreation. Standards similar to the headwaters were also recommended for areas below the reservoirs and for areas with moderate irrigation usage. In intensely irrigated areas, higher levels of certain parameters should be allowed to reflect the major use of the water. Sediment and fecal coliform are two major problems in the basin, however, nitrate and total phosphorus also affect water quality parameters.

Much of the irrigation water is used and reused many times. This process directly affects its quality. As a result, state water quality standards are inappropriate for the lower Malheur basin. According to the 1981 final report, meeting these standards isn't even possible as long as the water is used for intensive agriculture. Irrigation and warm water fisheries are the beneficial uses that need to be addressed.

A nonpoint source problem inventory was published in "Oregon's Statewide Assessment of Nonpoint Source Problems," in August 1978, by the DEQ. The criteria they used were sedimentation, streambank erosion, high temperatures, nuisance algae, excessive debris, and water withdrawal. The most severe problems were assessed in Bully Creek and Malheur River below Hog Creek. The next severe area was Willow Creek. Moderately severe areas included Malheur River above Hog Creek and Willow Creek above the Malheur reservoir. The moderate areas were identified as Cottonwood Creek to the Malheur River, Bully Creek, Cottonwood Creek Fork, and Clover Fork.

The Malheur basin has many demands for its water. The basin has also experienced heavy human use over much of its expanse. It is not surprising, therefore, that many watershed issues have been identified by various stakeholders.

Last year, the MOWC held public meetings in Drewsey, Juntura, Harper, Ironside, and, Willowcreek to gather information on regional concerns. Presentations were also given to Ontario and Nyssa service groups and agriculture groups. All these activities helped the MOWC identify and evaluate the most pressing watershed issues and then to determine which ones to address initially.

Despite the diversity of the participants at the public meetings and presentations, very similar issues resulted. These issues centered on water quality and quantity, condition of streamside vegetation, noxious weeds, urban runoff, cropland soil erosion, and upland condition. The following is a summation of those concerns and a list of issues:

1. Concern over proper functioning condition of streams
2. Cropland erosion on irrigated farmland
3. 303(d) listing in the Malheur basin
4. Rangeland condition and trend
5. Noxious weed problems in the Malheur basin
6. Water issues on the upper Middle Fork Malheur River
7. Urban pollution and runoff

The above-described issues were developed into goals for the Malheur basin. They were selected as the best possible approach to addressing watershed problems and are summarized in the following goals, objectives, and necessary actions.

CHAPTER 6

GOALS, OBJECTIVES, AND NECESSARY ACTIONS

This assessment and action plan is a cooperative plan with the landowners, Soil and Water Conservation District (SWCD), involved agencies, and interested public groups and individuals.

The Malheur-Owyhee Watershed Council proposed the following goals for the plan:

- Achieve Proper Functioning Condition (PFC) in streams and waterways in the Malheur basin
- Reduce soil loss from croplands
- Remove streams/waterways from the 303(d) list
- Improve rangeland condition
- Control noxious weeds
- Resolve Drewsey (Middle Fork Malheur River) water issues
- Meet standards for urban (Ontario Storm Water Master Plan) runoff

The following discussion of the goals is in a general basinwide format.

Goal 1 **Achieve PFC's in Streams and Waterways in the Malheur Basin**

Generally, many of the lower elevation waterways are "functioning at risk." Exposed streambanks and past channeling of drainages are contributing to increased sediment loads. Many areas have experienced reductions of woody and herbaceous vegetation with the accompanying invasion of weedy annuals and more drought tolerant species such as rabbitbrush, sagebrush, and juniper.

Objective

1. Increase the percentage of desirable streamside herbaceous and woody riparian vegetation by 20 percent or to site potential over 10 years.

2. Reduce the stream temperatures to optimum potential in 10 years. In areas where agricultural channel development has occurred, provide upstream "best management practices" (BMP's) to enhance water quality.

3. Improve streambank stabilization/profile by 10 percent over 20 years.

4. Reduce downstream silt loads by 15 percent over 10 years.

Necessary Action

1. Create a riparian/landowner task force to work with SWCD, BLM, MOWC, Natural Resources Conservation Service (NRCS), Oregon Department of Fish and Wildlife (ODFW), and others to address specific problem areas.

2. Establish condition and trend transects in targeted drainages.

3. Incorporate livestock grazing systems tailored to improve riparian systems. Design grazing systems that provide deferred use, exclusion, or periodic rest periods for important riparian communities.

4. Locate key sites along waterways for plantings of willows and other woody and herbaceous species.

5. Establish additional sediment monitoring sites on designated streams and waterways and/or existing temperature measurement sites.

Goal 2 **Reduce Soil Loss From Croplands**

Past practices of flood irrigation have contributed to the loss of topsoil and increased sediment loading in drainage ways and tributaries to and including the Snake River. This has occurred particularly where row crop farming requires increased amounts of water.

Objective

1. Initiate BMP's to reduce cropland soil loss by 15 percent in 10 years.

2. Incorporate new irrigation methods to improve efficiency and reduce overland water flow contributing to soil movement by 20 percent in 10 years.

Necessary Action

1. Incorporate straw mulch, Pam, and other water absorbent materials into the soil to improve water retention and reduce soil loss.

2. Establish drip and sprinkler irrigation systems where practical to decrease flood irrigation, reduce soil loss, and concentrate available water for crop use.

3. Plant filter strips on lower portions of fields where runoff water enters drain ditches to trap sediment.

4. Create sediment ponds and construct wetlands and filtration sites where water leaving fields can accumulate to deposit sediment. Periodically, remove pond sediment and recycle into fields.

Goal 3 **Remove Streams/Waterways From 303(d) List**

The 1972 Federal Clean Water Act in section 303(d) requires each state to identify those waters for which existing pollution controls are not stringent enough to achieve that state's water quality standards. Many forks of the Malheur, including portions of the main fork, are on the 303(d) list.

Objective

1. Maintain or improve water quality levels for TMDL's not to exceed 10 percent above standards outlined in section 307(d) in the 1972 Clean Water Act.
2. Maintain and/or improve bacteria (Esherichoa Coli) levels within standards of a 30-day log mean of 120 Esherichoa Coli (E. *coli*) organisms per 100 ml based on a minimum of 5 samples. No single sample shall exceed 406 E. *coli* per 100 ml.
3. Maintain or improve natural lakes, reservoirs, and rivers at 0.015 mg/liter for chlorophyll a.
4. Maintain or improve waters supporting salmonoid spawning habitat to between 6-11 mg/liter dissolved oxygen.
5. Reduce sediment loads to comply with the biotic condition index of 76 percent or better.
6. Maintain/improve waters containing resident fish spawning and rearing habitat to be as cool as is biologically and physically feasible for the site.
7. Determine if DEQ's temperature standard of 64° for redband and rainbow trout and 50° for Oregon bull trout is biologically and physically feasible in representative streams.

Necessary Action

1. Utilize the objectives and necessary actions of achieving the PFC in streams and waterways in the basin to improve TMDL levels and 303(d) water quality levels.

2. Set goals for overstory riparian cover in stream/river reaches where shading is an essential and effective means of lowering water temperatures for trout habitat. Identify sites (stream reaches) and implement actions with landowners.

3. Create ponding and resting sites along stream reaches (where desirable) to improve the physical and biological integrity for bull and redband trout.

4. Use existing water monitoring sites at key locations and establish additional sites to measure and analyze water quality levels.

5. Identify all confined animal feeding operations (CAFO's) and work with landowners to implement BMP's and incorporate water pollution control facilities.

6. Expand public outreach information and involvement opportunities on water quality problems. Encourage efforts to achieve public health partnerships for safe water that optimize the removal of water pollutants and pathogens. Coordinate through Oregon State DEQ and Federal EPA agencies.

Goal 4 **Improve Rangeland Condition**

Open rangeland use by livestock before the passage of the Taylor Grazing Act contributed to the loss of native perennial grasses in many of the lower elevation areas. With the implementation of the Vale Project, range improvement projects such as fencing, seeding, and water developments were instrumental in restoring native upland perennial grass sites. But many perennial range areas had already established a dominance of annual grasses and forbs. In some areas, continued improper livestock management has led to a further increase in annuals and invasion by noxious weeds.

Objective

1. Maintain the percent frequency of key species of perennial grasses and forbs (bluebunch wheatgrass, Idaho fescue, and other desired grasses and forbs) at levels consistent with mid to late seral stages (to be determined through BLM, landowners, SWCD, and MOWC.)

2. Increase the percent frequency of bluebunch wheatgrass, Idaho fescue, and other desirable grasses and forbs at levels consistent with mid to late seral stages at site specific locations (to be determined through BLM, landowners, SWCD, and MOWC.)

3. Increase litter accumulation by 10 percent over 20 years on upland slopes and terraces to reduce overland soil loss and increase organic material incorporation into the upper soil profile.

4. Improve upland brush/tree communities by increasing the level of recruitment of young age class shrubs/trees by 15 percent over 20 years.

Necessary Action

1. Carry out range improvement activities such as Juniper removal, seedings, water developments, and fencing (to increase the herbaceous vegetative component and reduce impacts from grazing herbivores) with local landowners, agencies, and public groups and individuals.

2. Establish livestock grazing systems (including rest rotation and deferred) based on the phenological requirements of the key perennial forage plants.

3. Increase the production levels of herbaceous/wood plants in upland brush communities.

4. On annual range where vegetation rehabilitation and seedings are not an option, manage for annual grasses.

5. Establish monitoring sites (nested frequency plots) to increase trend-monitoring capability and determine present levels (percent frequency) of key herbaceous forage species at locations to be determined with BLM, landowners, SWCD, and MOWC.

6. Establish upland brush/tree community monitoring sites (line intercept and density) to measure condition and trend at locations to be determined with BLM, landowners, SWCD, and MOWC.

Goal 5 **Control Noxious Weeds**

Infestations of noxious weeds have been on the increase in southeastern Oregon. A Weed Management Area has been designated in Malheur County and a Weed Management Board has been appointed by the County Court. Six target invader species need to be managed before they become widespread. These species are leafy spurge, yellow star thistle, rush skeletonweed, and spotted, diffuse and Russian knapweed. Additional infestations of scotch thistle, Russian thistle, and whitetop occur basinwide. These weed infestations threaten thousands of acres of valuable rangeland and irrigated farmland.

Objective

1. Inventory target species weed infestations within the Malheur County Weed Management Area by 1999 and begin control efforts immediately (1998.)

2. Eradicate 80 percent of target weeds within 15 years.

3. Eradicate 80 percent of associated noxious weeds within 15 years.

4. Rehabilitate treated areas to full productivity within 20 years.

Necessary Action

1. Cooperate with Malheur County Weed Control, landowners, interested parties and agencies (Oregon State University Extension Service, BLM, MOWC, Oregon Department of Fish and Wildlife, Oregon Department of Agriculture, and SWCD) to map and treat affected areas.

2. Through the Weed Management Area Steering Committee and landowners, develop an interagency system to inventory and monitor progress of treatment of noxious weeds.

3. Re-seed treated areas (with the assistance of cooperating landowners and other agencies) to perennial grasses and forbs/shrubs that are competitive with noxious weeds.

4. Cooperate with the Oregon Department of Agriculture (ODA) in the research and introduction of biological control agents for noxious weeds.

5. Develop local and outside funding support through public education programs and contributions from private landowners, agencies, and agricultural busninesses. Continue applications for additional grant funding to carry the program through to completion.

Goal 6 **Resolve Drewsey (Middle Fork Malheur River) Water Issues**

Drewsey irrigators have requested the right to receive more water for early non-structural water storage to saturate the soil profile and provide late season flows. Subsurface flows improve water quality, reduce soil erosion, filter pollutants, reduce stream water temperature, and moderate extreme stream flows. Early water spreading contributes to these subsurface flows.

Objective

1. Improve the functioning ability of the Middle Fork Malheur River by increasing late season flows by 20 percent and reducing peak flow volume by 25 percent.

2. Reduce Middle Fork Malheur River streambank erosion by 10 percent over 10 years and lower water temperatures on Upper Middle Fork Malheur River by 10 percent over 5 years.

3. Improve waterfowl habitat in Logan Valley by 15 percent over 5 years and downstream fish habitat by 10 percent over 5 years.

Necessary Action

1. Increase non-structural storage of peak flows through early spring diversions on the Upper Middle Fork Malheur River.

2. Apply to the Attorney General for an early season beneficial-use permit on the Middle Fork via the Oregon Department of Water Resources.

3. Establish monitoring stations for late season flow analysis and temperatures.

4. Monitor changes in riparian/wetland communities for wildlife and fish habitat.

Goal 7 **Meet Standards for Urban (Ontario Storm Water Plan) Runoff**

Within the Ontario and surrounding "area of impact", runoff from irrigation ditches and urban sources (parking facilities, industrial sites, roadways) contribute sediment and oil/gas pollutants into the drainage systems. Major obstacles include the lack of sufficient facilities to handle the increasing population growth and agriculture/urban activities.

Objective

1. Provide overall management of the Ontario urban area of impact to address the increase in population growth and impacts from adjacent irrigation within 5 years.

2. Identify all discharge sources contributing to the area of impact and provide the technical and biological means to accommodate and treat this discharge within 5 years.

3. Reduce petroleum pollutants from urban runoff by 60 percent in 10 years.

4. Reduce sediment transfer from irrigation ditches into the Ontario drainage system by 80 percent in 10 years.

5. Increase public awareness of anti-pollution practices by 50 percent over 5 years.

Necessary Action

1. Prepare a management plan for the Ontario urban and adjacent agriculture areas to address collection and disposal of stormwater runoff, urban and agriculture runoff, and water treatment.

2. Inventory and monitor all agriculture discharge sites that contribute to Ontario's existing drainage systems. Work with landowners to incorporate agriculture best management practices to reduce/eliminate sediment flows from adjacent sites.

3. Test urban grease traps and local petroleum sources in industrial locations to determine functioning ability and past contribution to pollution control.

4. Evaluate catch basins (1400) and oil/water separators as to efficiency and effectiveness in reducing sediment/pollution flows through Ontario's drainage system.

5. Construct new regional water detention/stilling basins to trap and settle out fines and particulates in conjunction with new drainage system developments.

6. Integrate new drainage systems into existing urban and impact area sites including floodwater zones, construction and housing zones, and agriculture zones.

CHAPTER 7

MONITORING PLAN

Monitoring and evaluating the progress of achieving the stated goals provides a regulation and guidance system for the plan. After evaluation is completed, adjustments can be made to improve both the plan and the process used to implement it. The following resources, procedures, and practices will be monitored on a periodic basis:

- Water, water quality, and nutrient levels in waterways;
- PFC of streams and waterways within the basin;
- Upland range condition;
- Soil loss from croplands and cropland practices;
- Grazing practices and grazing systems incorporated for improvement of range/riparian areas;
- Noxious weed programs;
- Ground-water recharge in the basin; and
- Urban runoff.

WATER QUALITY

A. Continue the water quality assessment program to identify point and non-point source pollution discharge to track total maximum daily loads as identified under the objectives of meeting Goal 3--Remove Streams and Waterways from 303(d) List.

B. Locate additional sample sites in each subbasin of the Malheur River as necessary to assess water quality integrity.

C. Through the monitoring program, assess threats to local sources of public use water and drinking water.

PROPER FUNCTIONING CONDITION

Monitor the physical attributes of a water drainage system including the condition of riparian vegetation in terms of holding streambanks together, filtering sediment, dissipating energy flow, and allowing the physical hydrology of a stream to function properly.

A. Streams and waterways will be prioritized for reaches where PFC is in question and monitored for condition and trend. All major waterways and trout rearing waters and feeder streams will be targeted in all seven major subbasins. Limiting factors will be determined on a site basis not on a comparable basis.

B. Measurements of PFC will include:
- Stream width-depth ratio
- Streambank stability
- Flow measurement
- Continuous temperature recording
- Riparian surveys/evaluation
- Pebble counts in trout streams
- Macroinvertebrate counts in trout waters
- Photography of representative reaches

UPLAND RANGE CONDITION

Upland range condition includes amounts of herbaceous ground cover, litter, trees and shrubs that all contribute organic material to the soil surface layer and soil profile and help to intercept rainfall and snowmelt. Overland sheet erosion is one of the major contributors of silt loads in drainages and waterways. Adequate amounts of vegetative cover and litter resists soil movement and overland sheet/rill erosion. Practices developed to improve range condition and trend (including riparian habitat) will be monitored for suitability and results.

A. Monitoring sites are described in Chapter 6-Goal 4 Improve Rangeland Condition-Necessary Actions number 5 and 6. Utilize nested frequency plots to measure trend on herbaceous plants (grasses/forbs) and line intercept/density methods to measure condition and trend of upland brush/tree communities.

B. On upland slopes and terraces, monitor litter accumulation on targeted representative sites using a plot or band measurement.

C. Monitor livestock grazing systems (private and BLM) in all subbasins where past and present livestock use has detrimentally impacted range resources. Identify priority areas and work with landowners to incorporate needed changes where necessary. With landowner, evaluate progress of new grazing systems toward improving upland range sites and riparian reach lengths. Analyze data from upland perennial condition and trend monitoring sites to make adjustments to grazing systems as necessary. Determine riparian site potential and compare, through monitoring, apparent trend. Expand monitoring reach lengths on new sites as needed to evaluate total impacts from grazing systems.

CROPLAND SOIL LOSS

Increased production of row crops in the Snake River Valley (Ontario, Vale, Nyssa, and Adrian areas) has introduced massive amounts of nitrogen fertilizer into the subsoil. Surface flood irrigation has over the years increased to accommodate water requirements of onions, beets, and potatoes. Surface soil loss due to flood irrigation has contributed tons of silt into the Malheur and Snake River drainages and tributaries.

A. Monitor Best Management Practices sites for reduction of overland soil movement and nitrate levels. Use established well monitoring sites and selected field test sites in the Snake River Valley.

B. Work with landowners to incorporate monitoring stations at selected sites to integrate program coverage of important valley locations. These sites would include both field and river locations. Work with landowners to evaluate via a joint assessment new watering practices such as drip and sprinkler irrigation.

C. Establish a monitoring committee to oversee monitoring efforts and make recommendations for changes, and/or incorporate additional acreages/sites.

NOXIOUS WEEDS

A noxious weed control program will be monitored to track control efforts and record outbreaks or locations of any new infestations.

A. Through the Weed Management Area Steering Committee and cooperators, establish an interagency system of inventory and monitor progress of treatment efforts.

B. Monitor efforts of weed control contractors and have them work closely with the Weed Management Steering Committee.

C. Complete an annual progress report including monitoring sites and maps of treated areas/sites.

GROUND-WATER RECHARGE

Recharge amounts will be monitored to assess initial early season flow amounts (cfs) and changes to downstream water quality and quantity.

A. Record early flow amounts to determine levels required to affect downstream changes.

B. Monitor at key locations downstream flow amounts and temperatures during the summer/fall water use season.

C. Evaluate waterfowl habitat sites in Logan Valley and monitor for habitat changes over time.

URBAN RUNOFF

Upon completion of the Ontario Storm Water Master Plan specific sites with the area of impact will be monitored to record progress and identify problem areas.

A. Monitor impact of summer storms on all major drainages.

B. Identify and monitor watersheds that concentrate and discharge stormwater into natural drainways, ditches, or manmade drainages in the area of impact. Monitor for flow ad sediment/pollution amounts.

C. Monitor installed catch basins and/or filtering systems for overall project impact on retention/filtering runoff.

D. Investigate selected key sites for water purity and flow amount entering the Snake River system.

E. Coordinate all monitoring efforts with the MOWC and local irrigation districts.

DRAFT

MALHEUR BASIN WATERSHED

ACTION PLAN & ASSESSMENT

APPENDICES

August 20, 1998

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MAPS

TABLES