APPENDIX 8

RESOURCE ASSESSMENT BY SUBBASIN

The assessment area includes both the river and adjacent vegetated area (riparian zone.) Upland site descriptions include vegetative type by percentage and include public lands only. Lowland site descriptions include agricultural lands and practices where applicable. Brief descriptions of vegetation and habitat conditions are included. Table 8-1 is a condensed version of the Resource Assessment by Subbasin and is located at the end of Appendix 8.

Most Malheur basin streams are currently on the 303(d) list (see maps in Appendix 1.) Primary concerns are stream temperature, bacteria levels, algae growth (chlorophyll a), nitrate, phosphorous, and turbidity. Water quality parameters are found in Appendix 9.

Water quantity is often determined by irrigation demand and reservoir discharges.

Many streambanks lack adequate vegetation to protect against excess soil erosion. Many riparian-wetland areas were degraded by a combination of past uses and drought. Any management activity that disturbs water, soils, or vegetation can potentially degrade riparian areas. Such activities include improper livestock grazing, road construction, timber harvest, mining, irrigation, and recreation. In addition, activities that are off-site can affect riparian areas by influencing the timing and amount of over land and subsurface flow of water and movement of soils. Some past land use practices have resulted in riparian areas that 1) have inadequate vegetation to protect streambanks from erosion; 2) lack appropriate diverse vegetation that provides habitat for riparian-dependent wildlife species; 3) contain incised channels that do not allow streams to dissipate flood energy and provide water storage; and 4) provide inadequate pools and shade for aquatic species.

Riparian Trends for Stream Segments on BLM Land

	Upper Malheur miles (%)	Lower Malheur miles (%)	Bully Creek miles (%)	Willow Creek miles (%)
Up	12.1 (31.2)	42.5 (37.8)	6.5 (5.7)	7.9 (17.9)
Static	7.8 (20.2)	9.7 (8.6)	13.9 (12.2)	5.6 (12.6)
Down	0.0 (0.0)	4.0 (3.6)	36.9 (32.3)	6.8 (15.4)
Unknown	18.8 (48.6)	56.3 (50.0)	56.8 (49.8)	23.9 (54.1)
Total miles	38.7	112.5	114.1	44.2

LOWER WILLOW CREEK SUBBASIN

Lower Willow Creek includes Willow Creek below Brogan Canyon to Vale.

Functioning Condition

Willow Creek in this subbasin has been channeled to accommodate irrigation needs. This activity has removed the physical aspects of proper functioning condition.

Stream Structure

In the past, Lower Willow Creek was altered to facilitate agriculture and road construction. Portions of Willow Creek are deeply incised. In general, the majority of Lower Willow Creek is an irrigation canal.

Riparian Vegetation

Lower Willow Creek historically supported woody riparian trees and shrubs including cottonwood and willow at many sites. Today, the majority of riparian vegetation consists of herbaceous plants with, at times, remnants of woody plants.

Water Quality

The water quality in this unit is generally poor. Water temperatures consistently exceed the water temperature standard. The sediment loading is very high with inflow from agriculture activities. Results of the water samples collected by the MOWC partners and analyzed for E. *coli*, fecal coliform, nitrate, and total phosphorous at the Bureau of Reclamation Pacific Northwest Regional Lab (Reclamation lab) in Boise, Idaho are shown following page 8-3.

Water Quantity

Flows in Lower Willow Creek are affected by releases from Malheur Reservoir upstream and irrigation use. Late spring, summer, and early fall flows are much higher than natural. Winter flows are much lower than natural.

Fish

No game fish populations are consistently found in Lower Willow Creek. Non-game species include suckers, squawfish, redside shiners, and longnosed and speckled dace.

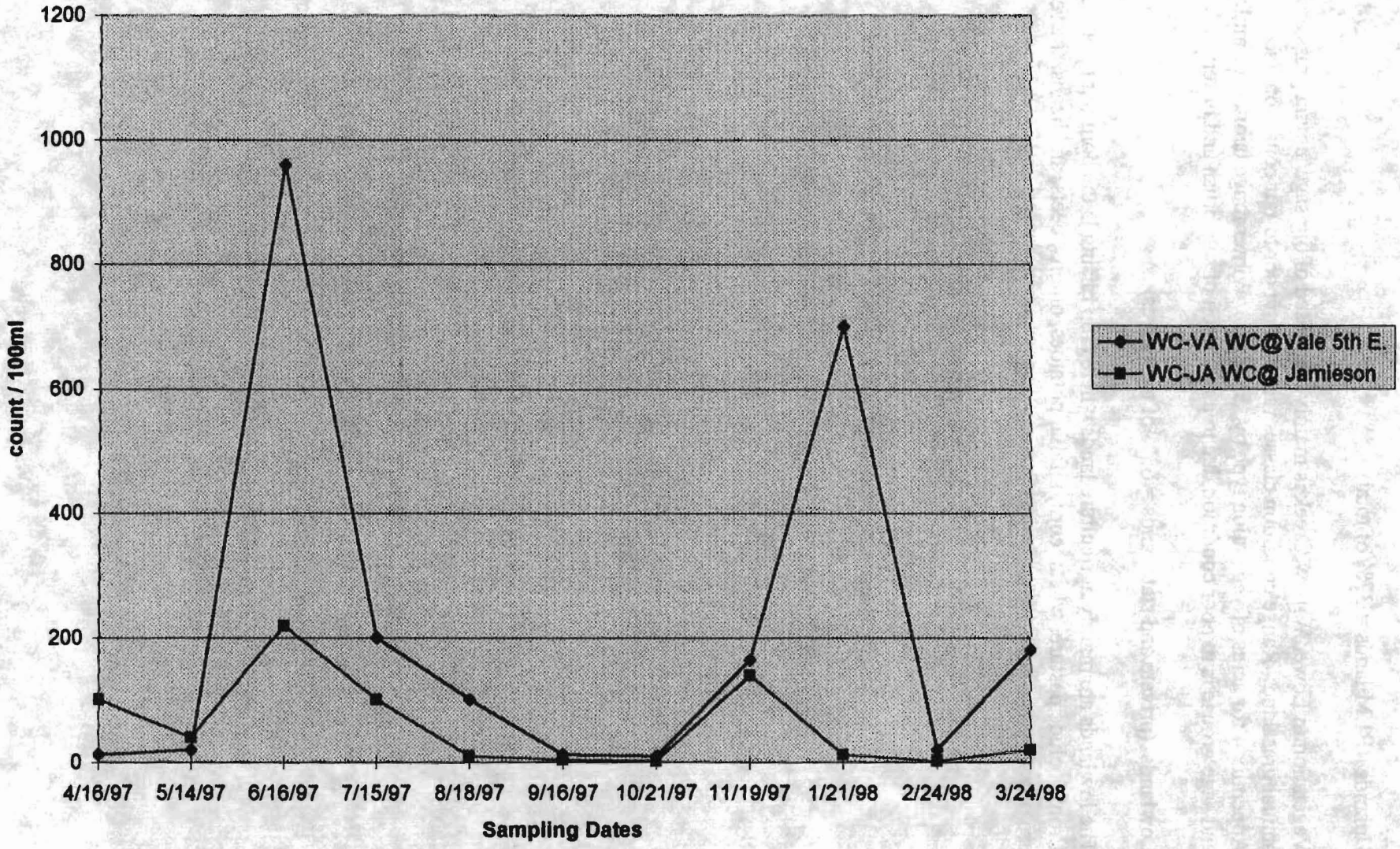
Uplands (BLM lands = 37% of total)

Vegetation in Lower Willow Creek is mainly composed of big sage/annual grass and annual grassland. Range condition classes range from poor to fair condition (see Appendix 4 for acres of vegetation type by subbasin.) Winter range habitat for mule deer and sage grouse is in poor condition due to a reduction of sagebrush and bitterbrush.

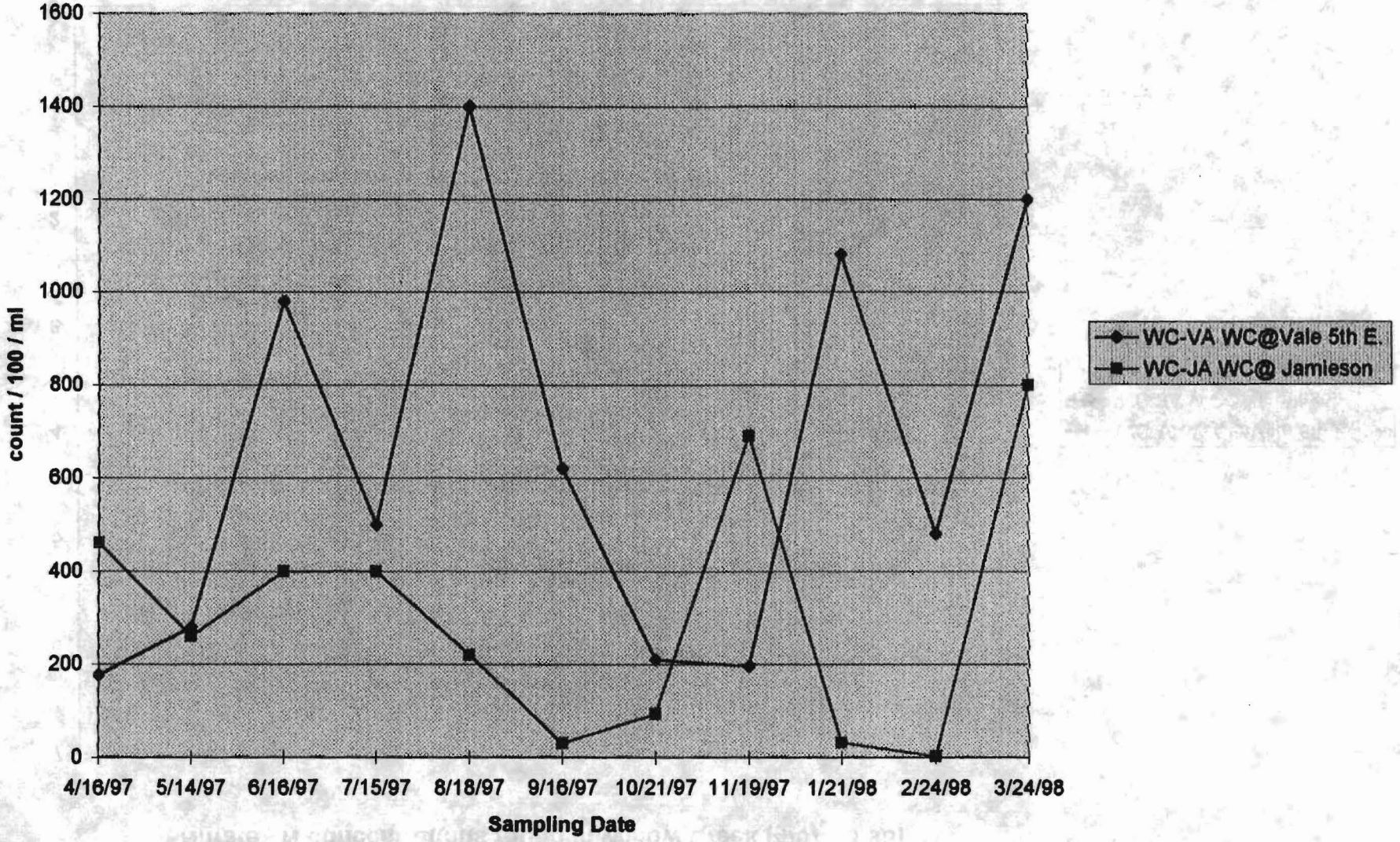
Lowlands (private and state lands = 63% of total acres)

The lowlands are mainly agriculture lands where crop raising is the dominant practice. Crops include pasture, wheat, corn, alfalfa, potatoes, onions, beets, and beans. Increasing use of valley lowlands by mule deer is occurring.

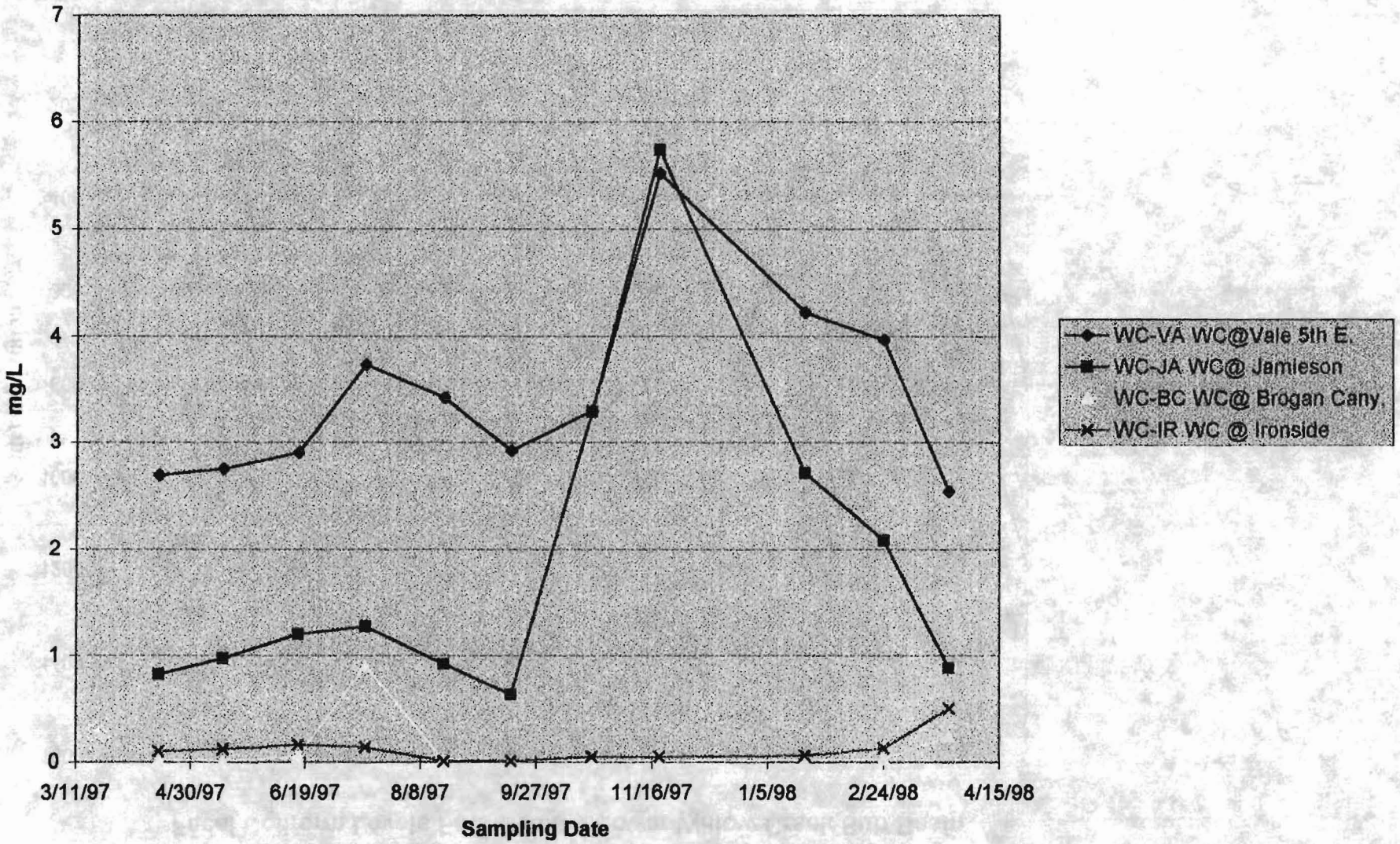
E. coli Levels Found in the Lower Willow Creek Sub Basin (1997-98)



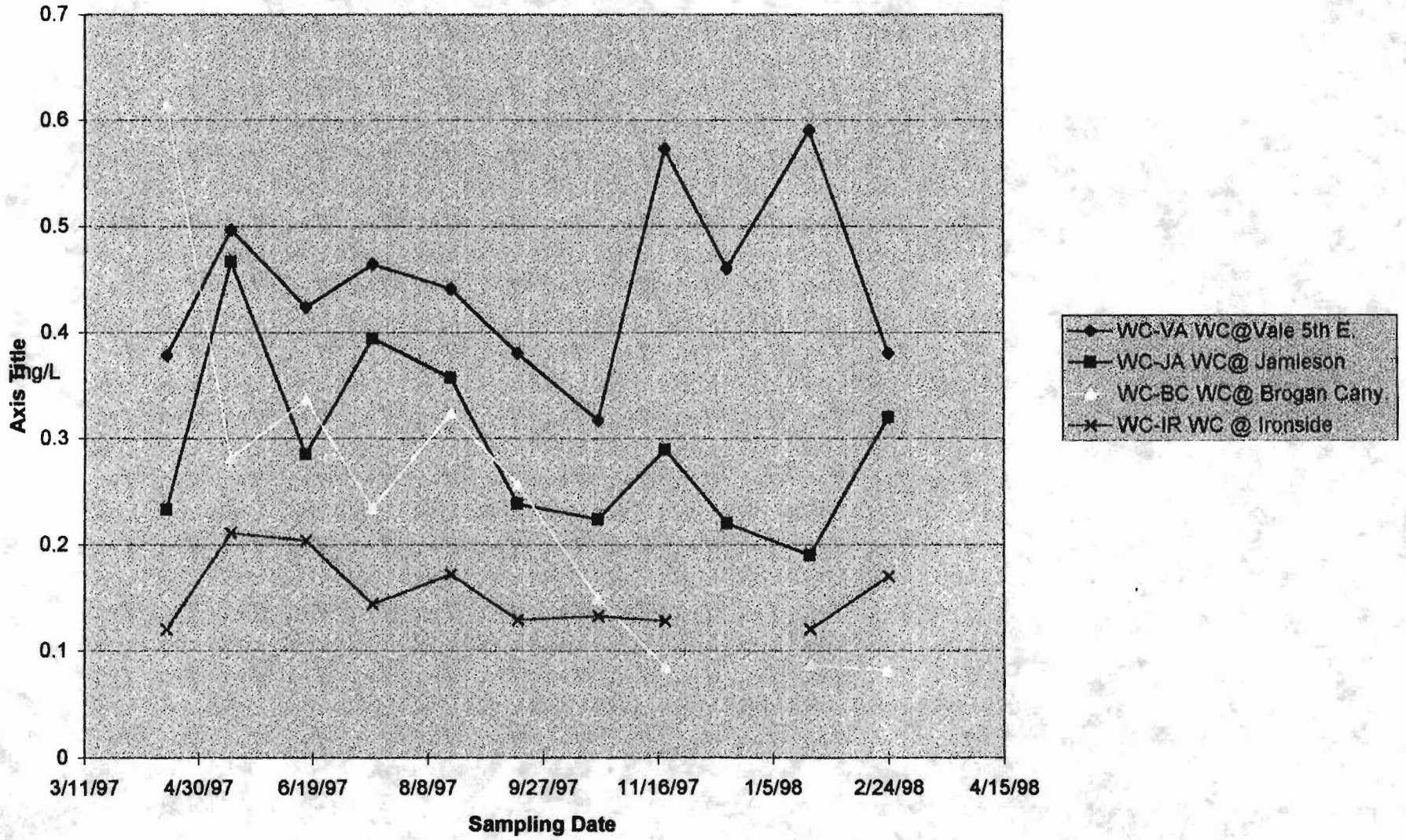
Fecal Coliform Levels Found in the Lower Willow Creek Sub Basin



Nitrate - N concentrations found in Willow Creek (4/97 - 3/98)



Total Phosphorous - P (Willow Creek)



UPPER WILLOW CREEK SUBBASIN

Upper Willow Creek extends from the confluence of Pole Creek and Willow Creek (River Mile 28) upstream to the headwaters.

Functioning Condition

Functioning condition has not yet been assessed except for two sites in Brogan Canyon. The sites were done as part of a proper functioning condition class in March 1997. Willow Creek below the chrome mine was properly functioning but at risk due to high sediment loads washed down from the mines. An ephemeral tributary several miles downstream was rated as properly functioning.

Stream Structure

Willow Creek and the lower ends of many of its tributaries have been altered to facilitate agriculture, road construction, and mining. Stream channels are incised. Streambanks are raw and actively eroding. However, much of the stream channel in Brogan Canyon is relatively intact.

Riparian Vegetation

Woody vegetation along most of Willow Creek is sparse or completely missing. Vegetation was removed in the past to facilitate agriculture. Woody vegetation along its tributaries is also sparse. The Brogan Canyon area, however, supports dense populations of willow, cottonwood trees, and other woody and herbaceous vegetation.

Water Quality

Data is lacking, and the data that does exist did not warrant 303(d) listings. Water quality is thought to be harmed by high sediment inputs. Water temperatures vary with outlet flows from Malheur Reservoir. Results of the water samples collected by the MOWC partners and analyzed for E. *coli,* fecal coliform and turbidity at the Reclamation lab are shown following page 8-5. No sample was analyzed on 8/18/97 at the Ironside site.

Water Quantity

The stream discharge in many segments of Willow Creek is altered. In some years, the channel is dry. There are many diversions upstream of the Malheur River. These diversions can de-water stream segments during the spring and summer. None of the diversions have fish screens.

Fish

The Malheur Reservoir supports the largest populations of rainbow trout in this sub-basin. It also supports populations of non-game fish including redside shiners, speckled and longnosed dace, and bridgelip and large-scale suckers. Willow Creek upstream of the reservoir supports rainbow trout, suckers, shiners, and dace in most years. Tributaries above Malheur Reservoir that supported fish populations in the past include Basin Creek, South Fork Willow Creek, Boulder Creek, Mill Boulder Creek, Fish Creek, Grouse Creek, and Alder Creek. High elevation tributaries to Willow Creek contain redband trout.

The Malheur Reservoir and the creek upstream have been chemically treated in the past. The most recent treatment occurred in the fall of 1989. Periodically the reservoir has been stocked with undesirable species such as tui chub (*Gila bicolor*), roach (*Gila spp.*), and yellow perch (*Perca flavescens.*) The treatment projects were started to return the fishery to its previous high level of productivity.

Uplands (BLM lands = 16% of total acres)

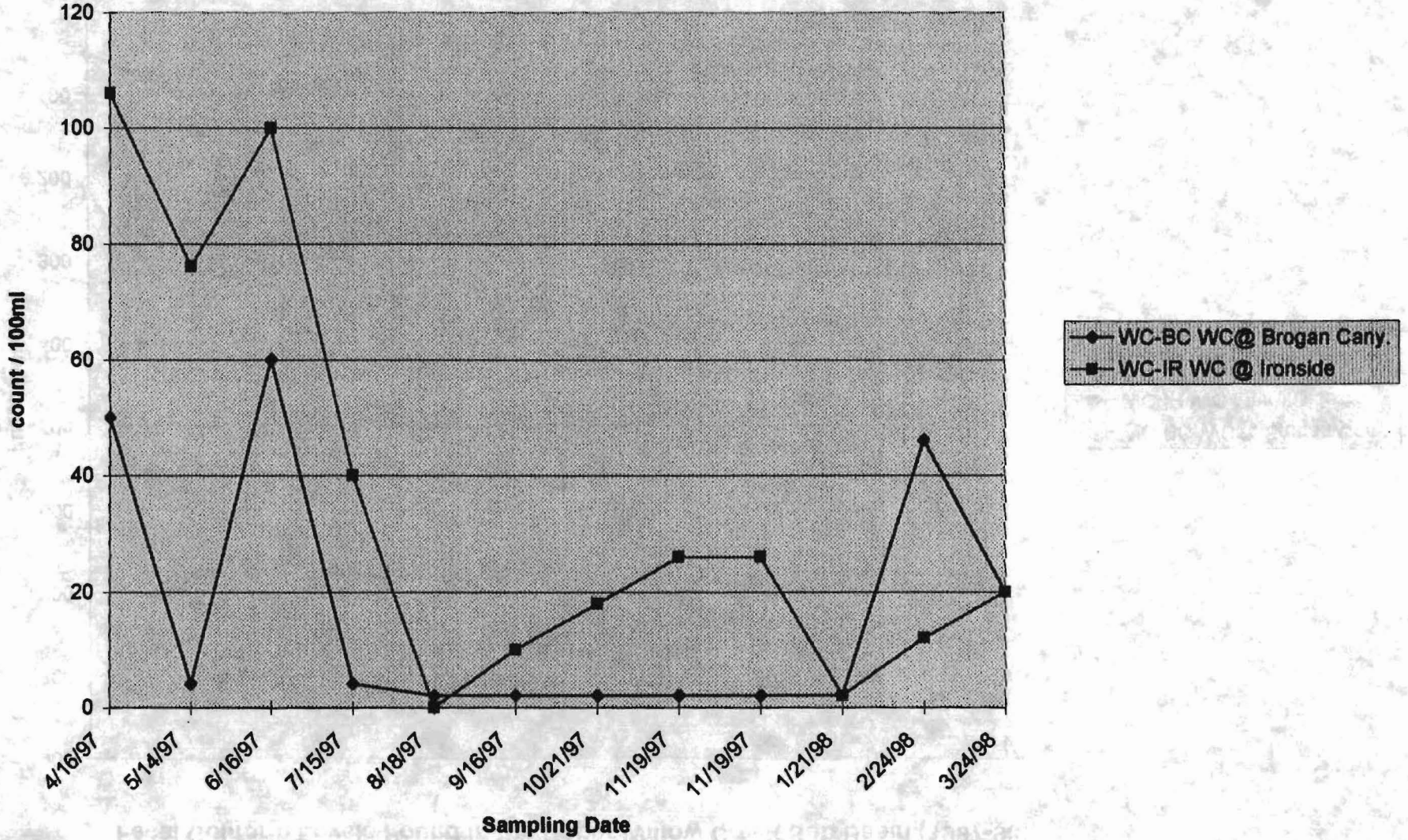
Big sage/perennial/annual grass dominate Upper Willow Creek along with colonies of forested pine/fir, juniper, and stiff sage/grass. Remaining uplands/lowlands comprising private and other ownership make up the remaining 84%. The vegetative community on the majority of private rangelands is similar to BLM uplands and the remaining irrigated valley areas, which support pasture, alfalfa, wheat, and some row-crops.

Juniper is invading sagebrush, bitterbrush, and mountain mahogany communities, and impacting pronghorn antelope and sage grouse habitats.

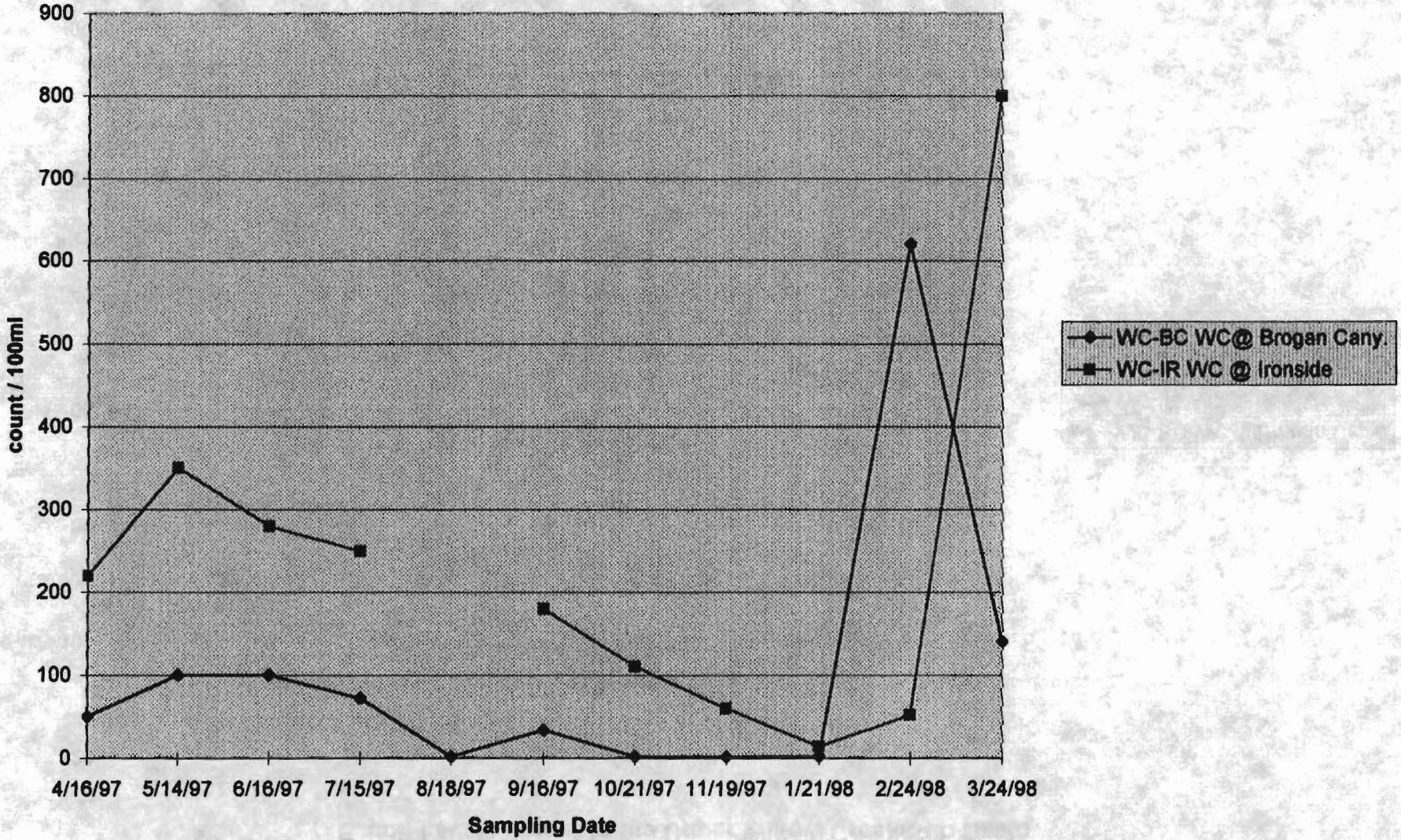
Remaining uplands (private and state lands = 84% of total acres)

The majority of private lands vegetative communities are similar to BLM uplands with irrigated areas supporting pasture, alfalfa, wheat, and some row crops.

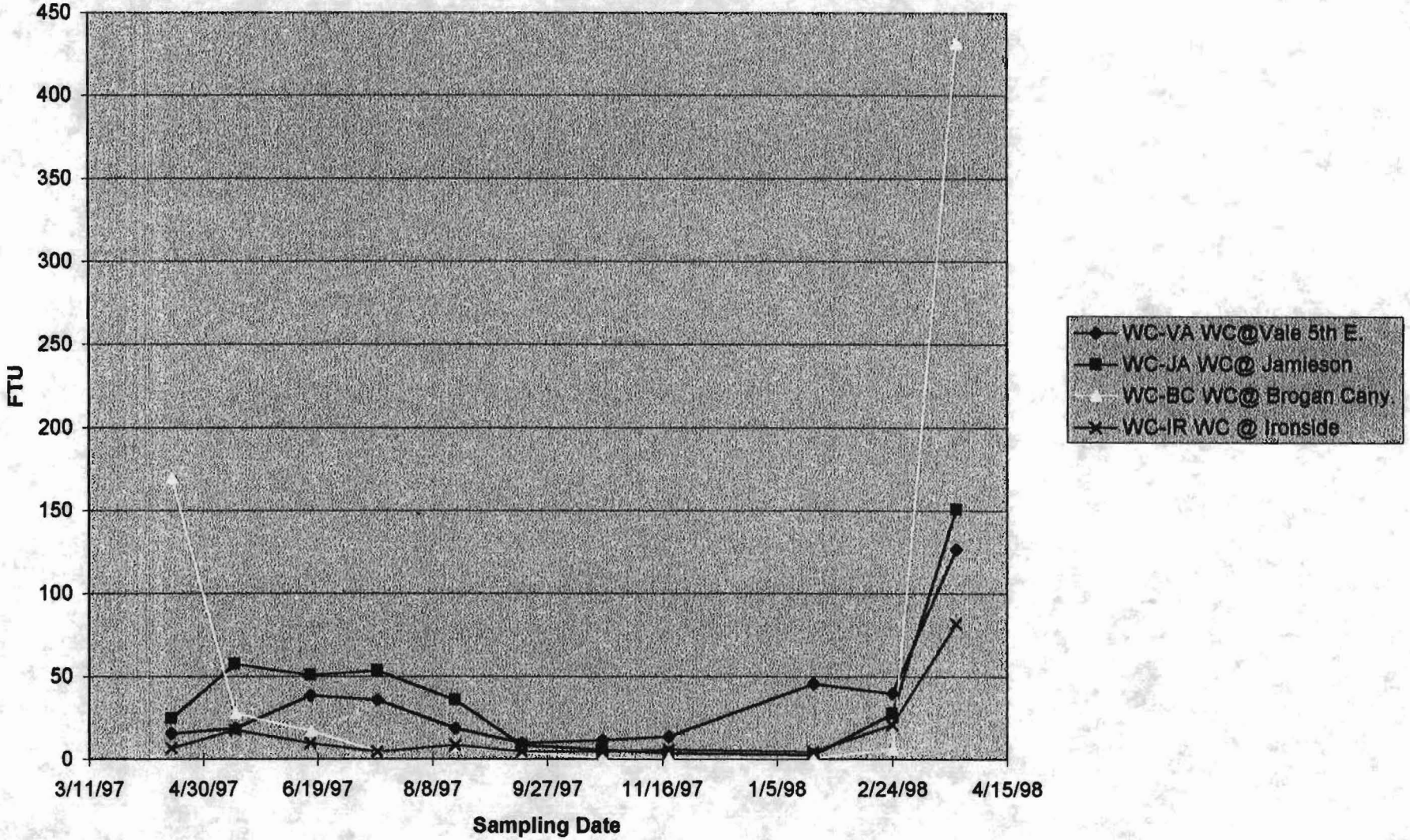
E. coli Levels Found in the Upper Willow Creek Sub Basin



Fecal Coliform Levels Found in the Upper Willow Creek Sub Basin (1997-98)



Turbidity Levels in Willow Creek



NORTH FORK MALHEUR RIVER SUBBASIN

This unit is defined by the streams that flow into the North Fork Malheur River from its mouth upstream to its headwaters.

Functioning Condition

The upper reaches are in good condition with stable streambanks of willow and alder. The lower reaches have not been assessed.

Stream Structure

The channel from its mouth upstream to the Beulah Dam (River Mile 18) flows through two natural flowing reaches and one short reach where the channel is constrained by hill slopes and road bed. Within the two natural flowing reaches, the stream channel has been altered to facilitate agriculture and road construction. Streambanks are exposed and actively eroding along much of its length. Within these two reaches, several streambank protection projects have occurred in the past.

The river from Crane Creek (River Mile 43) downstream to Beulah reservoir (River Mile 21) flows through a canyon. The channel within this reach is naturally bordered by hill slope. The river upstream of Crane Creek flows through a forested valley with a fairly flat bottom. The channel is bordered by low terraces and occasionally by a hill slope. The river channel within this reach has not been altered. Its banks in many areas are exposed and actively eroding. No streambank protection projects have been conducted upstream of the reservoir.

The tributary channels generally flow through forested valleys. Their channels are bordered by low terraces or hill slopes. The streambanks high in the basin are usually stable. The lower ends of the tributaries where channels flow across the river valley floor have exposed streambanks with active erosion occurring at many locations.

Riparian Vegetation

Woody vegetation downstream of the reservoir is sparse. Vegetation was removed to facilitate agriculture. Upstream of the reservoir, woody vegetation on the riverbank is also sparse. Tributaries upstream of Crane Creek (River Mile 43) are forested. A narrow strip of grasses and shrubs usually grows between the water and the conifers.

Water Quality

Downstream of the reservoir water quality is generally fair. Water temperatures consistently exceed water temperature standards (64 degrees F) and sediment inputs are high. Upstream of the reservoir water quality is generally fair to good. Water

temperatures in the main stem and most tributaries consistently exceed bull trout water temperatures standards (50 degrees F.) Water temperatures consistently exceed the 64 degree F standard from forest road 16 (River Mile 52) downstream. Sediment inputs are still high. Most of the water bodies in the North Fork Subbasin are listed for warm temperatures. Results of the water samples taken in 1997 below Beulah Reservoir for E. *coli* and fecal coliform are found following page 8-8.

Water Quantity

Downstream of the reservoir, flows are controlled by releases from the dam. Late spring, summer, and early fall flows are much higher than normal. Winter flows are much lower than normal. Flows for irrigation are released in surges often frustrating landowner efforts to restore riparian areas. There are several diversions between the dam and the mouth and none are screened.

Flows upstream of the reservoir are essentially unaltered. There are several diversions on the main stem upstream of the reservoir. Two of these diversions have stationary screens. Many of the water rights are for road water maintenance and stock water ponds. These rights do not substantially affect stream flows.

Fish

Most streams in this unit support fish populations. Historically, chinook salmon used the main stem for spawning and then upstream as far as Elk Creek (River Mile 50) for juvenile rearing. Steelhead are believed to have used the same areas (Environmental Survey Report Pertaining to Salmon and Steelhead in Certain Rivers of Eastern Oregon, Oregon Fish Commission, June 1960.)

Downstream of the reservoir there is a population of stocked hatchery rainbow trout and large populations of non-game fish. Upstream of the reservoir there are populations of redband trout, bull trout, and whitefish. All three populations are known to use Beulah Reservoir in the winter. The trout migrate upstream and spawn in the tributaries. Bull trout are known to spawn in Swamp, Little Crane, Sheep, and Elk creeks. They also spawn in the upper main stem. Redband spawn throughout the basin in most perennial streams. Whitefish are believed to use the main stem for spawning.

The river upstream also supports large populations of non-game fish. The following species are commonly found in the basin: mottled sculpin, redside shiners, speckled and longnose dace, and bridgelip and large-scale suckers. The mottled sculpin (Cottus bairdi spp.) is an Oregon-listed sensitive species. The river and some of its tributaries as far upstream as Crane Creek have been chemically treated in the past.

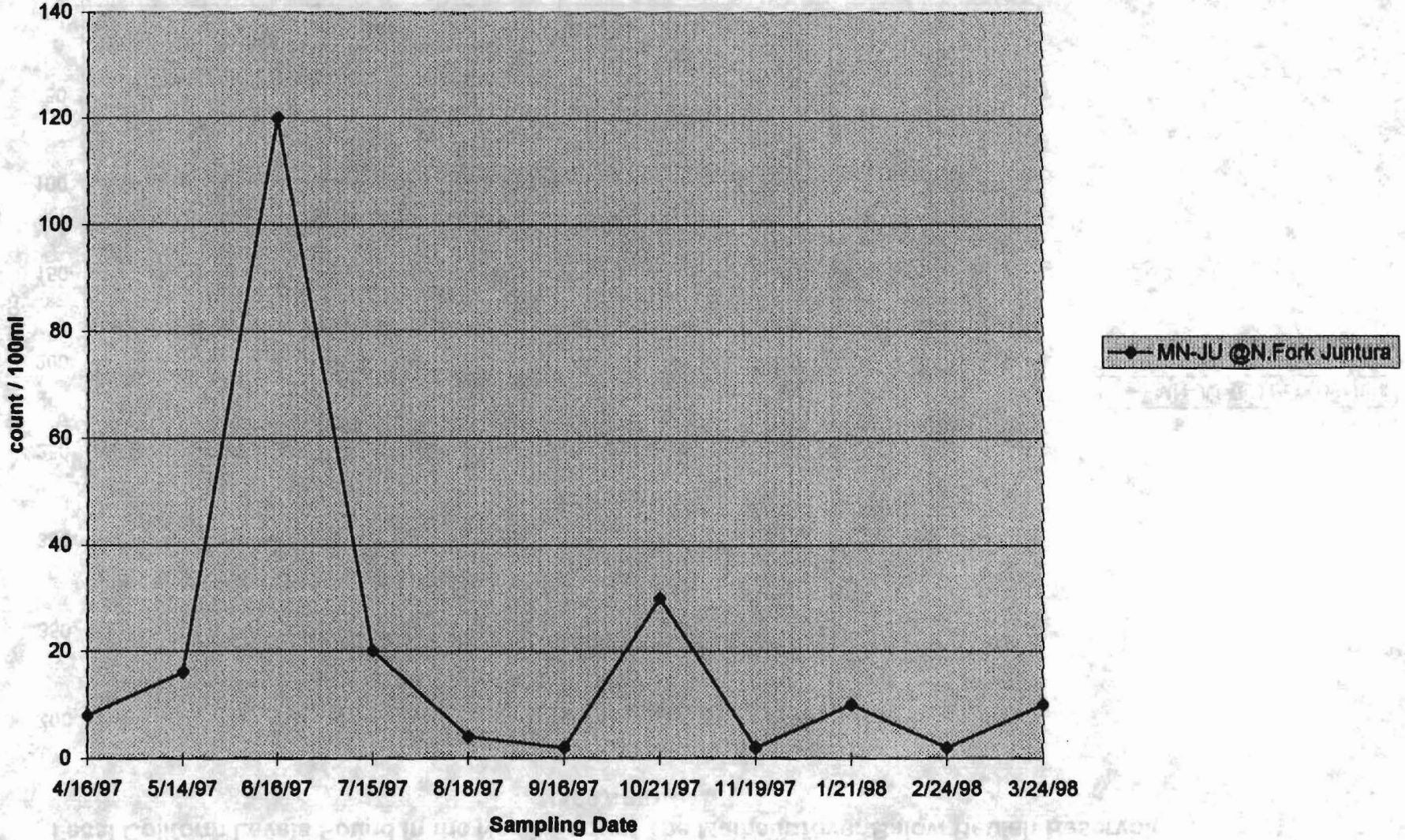
Uplands (BLM lands = 37% of total acres and Forest Service = 37%)

Major plant composition consists of big sage/perennial grass and big sage/annual grass. Scattered colonies of native perennial grass, forested pine/fir, juniper, and mountain shrubs add to the vegetation community. Upland range condition is in the poor-fair-good category, with higher elevations mainly good. Management activities including cover reduction and road construction have reduced habitat effectiveness of forested habitats for deer and elk.

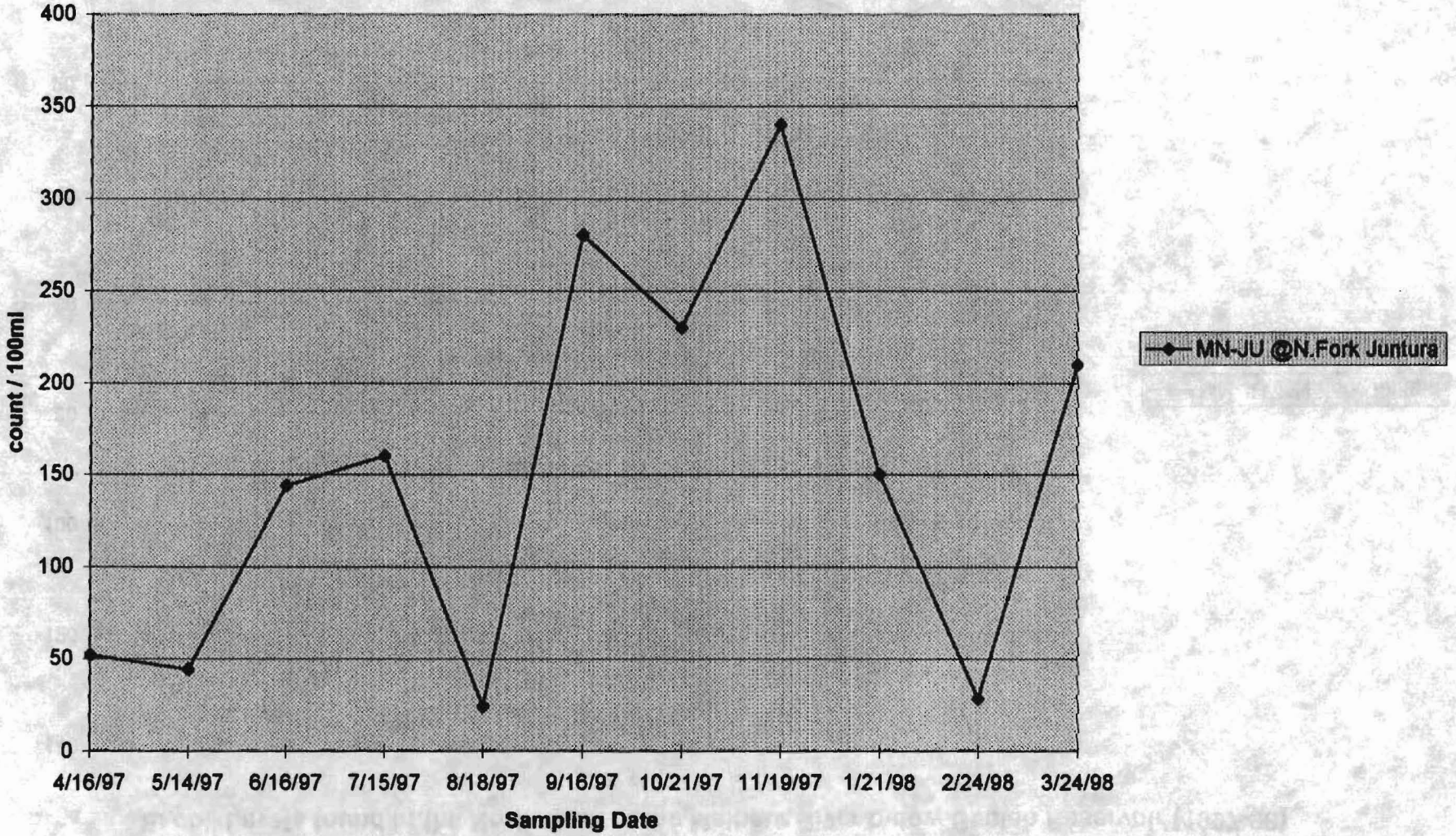
Remaining Uplands and Lowlands (private and state lands = 26% of total acres)

There is no data available.

E. coli Levels found in the North Fork of the Malheur River below Beulah Reservoir (1997-98)



Fecal Coliform Levels Found in the North Fork of The Malheur River Below Beulah Reservoir (1997-98)



MIDDLE FORK SUBBASIN

This area includes the Middle Fork Malheur River and its tributaries from Warm Springs Dam upstream to the headwaters in Logan Valley.

Functioning Condition

Upper reaches are in fair condition. Some down cutting and erosion of streambanks has occurred, especially above Warm Springs Reservoir.

Stream Structure

From the Drewsey Valley downstream to Warm Springs Reservoir, the river flows through an area with little access. The channel is naturally constrained by hill slope and low terraces. Some agriculture has occurred along this reach but it is believed to have had little effect on the channel.

In Drewsey Valley, the river flows through a relatively wide, flat area. The channel here is naturally bordered by hill slope and low terraces. The channel has been altered to facilitate agriculture and to a lesser degree, road construction. Much of the channel is incised. The streambanks are exposed and actively eroding. Several streambank protection projects have occurred in the past. The stream just above Drewsey flows through a canyon.

Upstream of the canyon the tributaries flow through Logan Valley where they are unconstrained. The stream channels have been altered to facilitate agriculture. Many of the streambanks are exposed and actively eroding. Most of the tributaries upstream of Logan Valley flow through forested valleys where the channel is bordered by hill slope. Most of the banks are relatively stable.

Riparian Vegetation

Woody vegetation from the Drewsey Valley area downstream is almost non-existent. Upstream of Drewsey Valley, woody vegetation is much more common. In the Logan Valley area, most of the woody vegetation has been removed to facilitate agriculture. Above Logan Valley, a fair amount of woody vegetation is still present alongside streams.

Water Quality

Water quality downstream of Drewsey Valley is below DEQ standards. Water temperatures commonly exceed water temperature standards, and sediment loading is high. Above Drewsey Valley, water quality improves. Temperatures still commonly exceed standards, but sediment loading is reduced. The water temperatures in the headwater streams in Logan Valley are very cold, below bull trout standards (50 degrees

F.) Downstream, the water warms very quickly. The water temperature in the four streams at US Forest Service (USFS) Road 16 consistently exceed the bull trout standard. The primary 303(d) concern is warm temperatures. Results of two water samples taken in 1997 one between Warm Springs Reservoir and Riverside and the other above Warm Springs Reservoir are following page 8-10.

Water Quantity

From Drewsey Valley downstream to the reservoir, summer flows are altered by many diversions in the Drewsey Valley. No diversions are screened. Above Drewsey Valley, summer flows are altered by the many diversions in the Logan Valley area.

Fish

Historically, this area also supported populations of chinook salmon and steelhead. They are believed to have used streams in the Logan Valley for spawning and juvenile rearing. Today, this area supports the most diverse group of fish populations in the basin. Native redband trout are found in most of the basin. Bull trout and brook trout are found in the Logan Valley streams. Hatchery rainbow trout have been stocked into Logan Valley streams, the Drewsey Valley area, and into the Warm Springs Reservoir. The stocking program in the Logan Valley area was discontinued in 1992.

Warm Springs Reservoir supports several species of warm water fish including largemouth and smallmouth bass, white and black crappie, bluegill, brown bullhead, channel catfish, and yellow perch. Several private reservoirs supported populations of warm water fish in the past.

This area also supports large populations of non-game fish. The following species are commonly found in the basin: mottled sculpin, redside shiners, speckled and longnose dace, and bridgelip and large-scale suckers. The streams in Logan Valley from USFS Road 16 downstream to and including the reservoir have been chemically treated in the past.

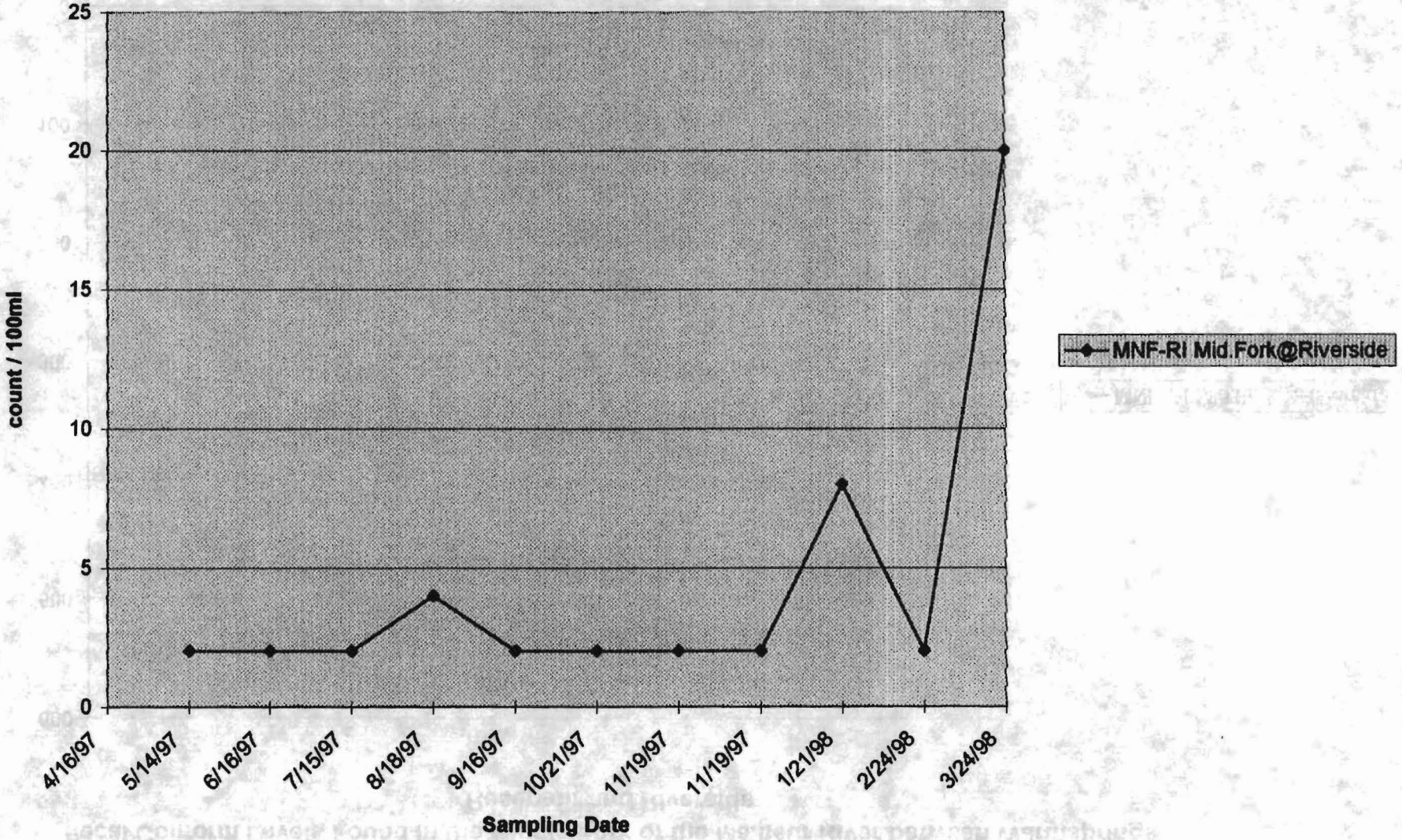
Uplands (BLM lands = 41% of total acres and Forest Service = 36%)

Major vegetative communities consisting of big sage/perennial grass with juniper and scattered colonies of forest pine/fir are in fair to good condition. Habitat conditions for big game and upland game birds are also in fair condition. Continued encroachment of juniper into upland shrub communities has reduced habitat quality for sage grouse and pronghorn antelope.

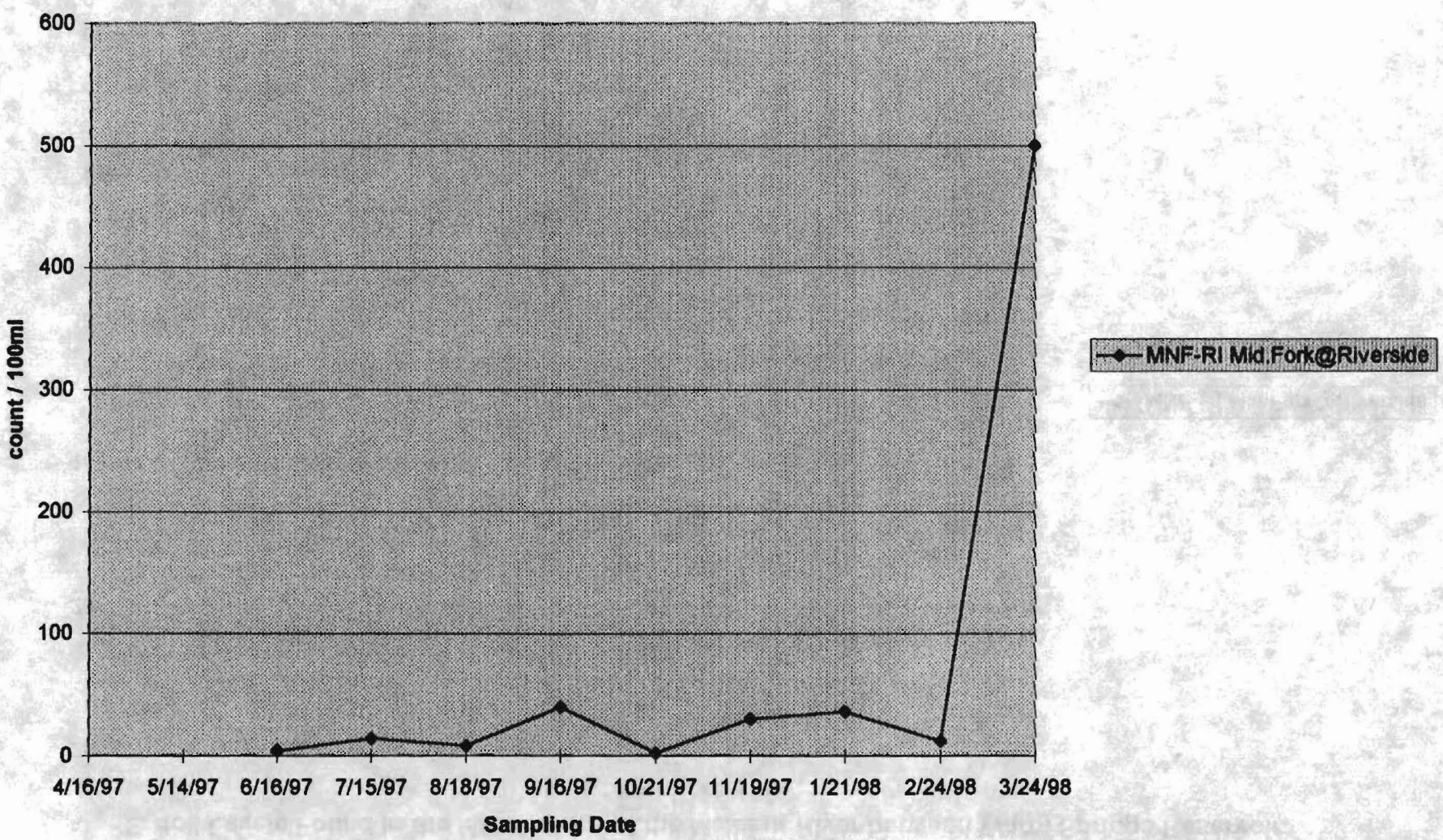
Remaining Uplands and Lowlands (private and state lands = 23% of total acres)

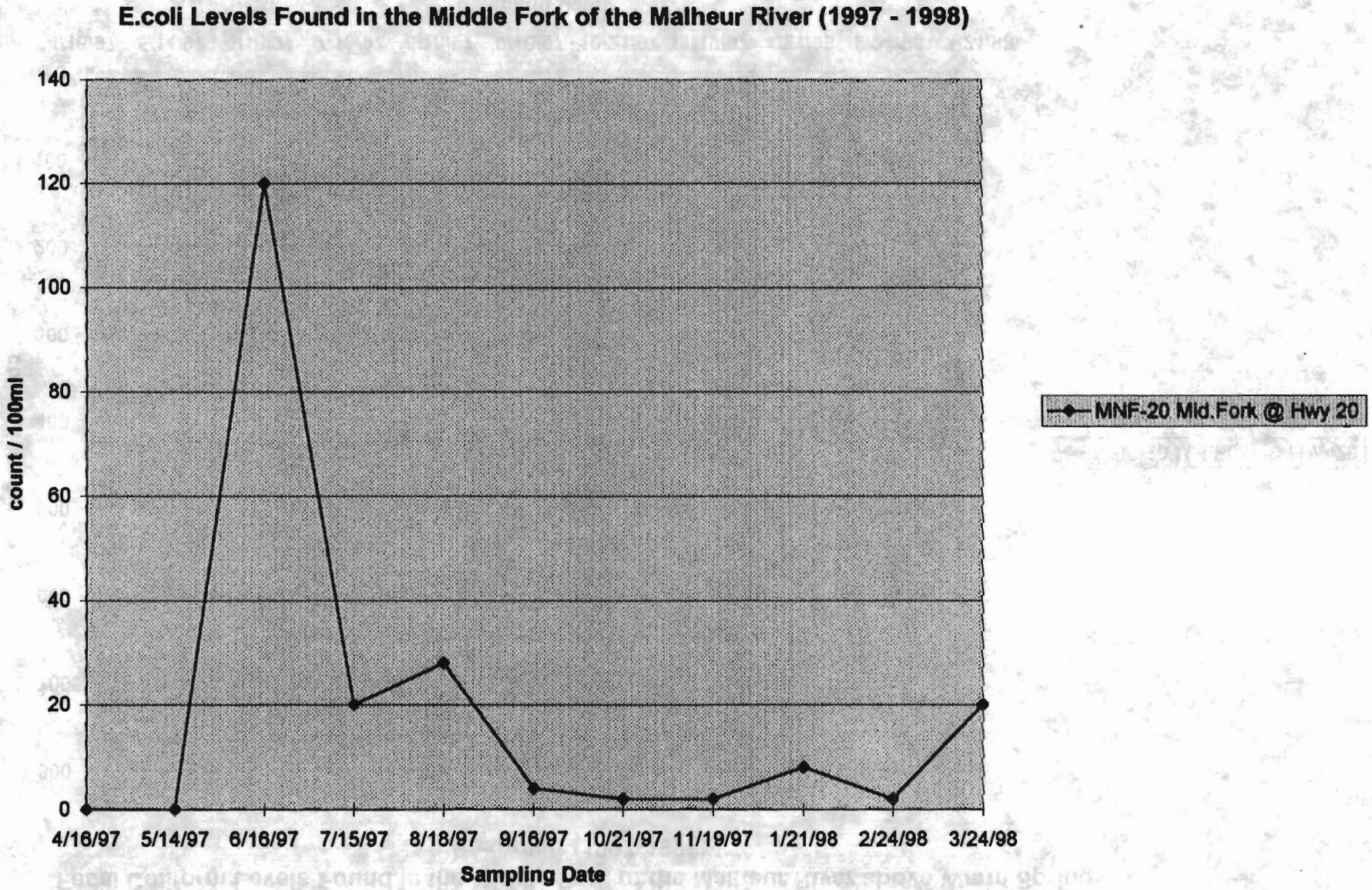
The rangelands are in poor to good condition with the majority in fair condition.

E. coli Levels Found in the Middle Fork of the Malheur River between Warm Springs Reservoir and Riverside

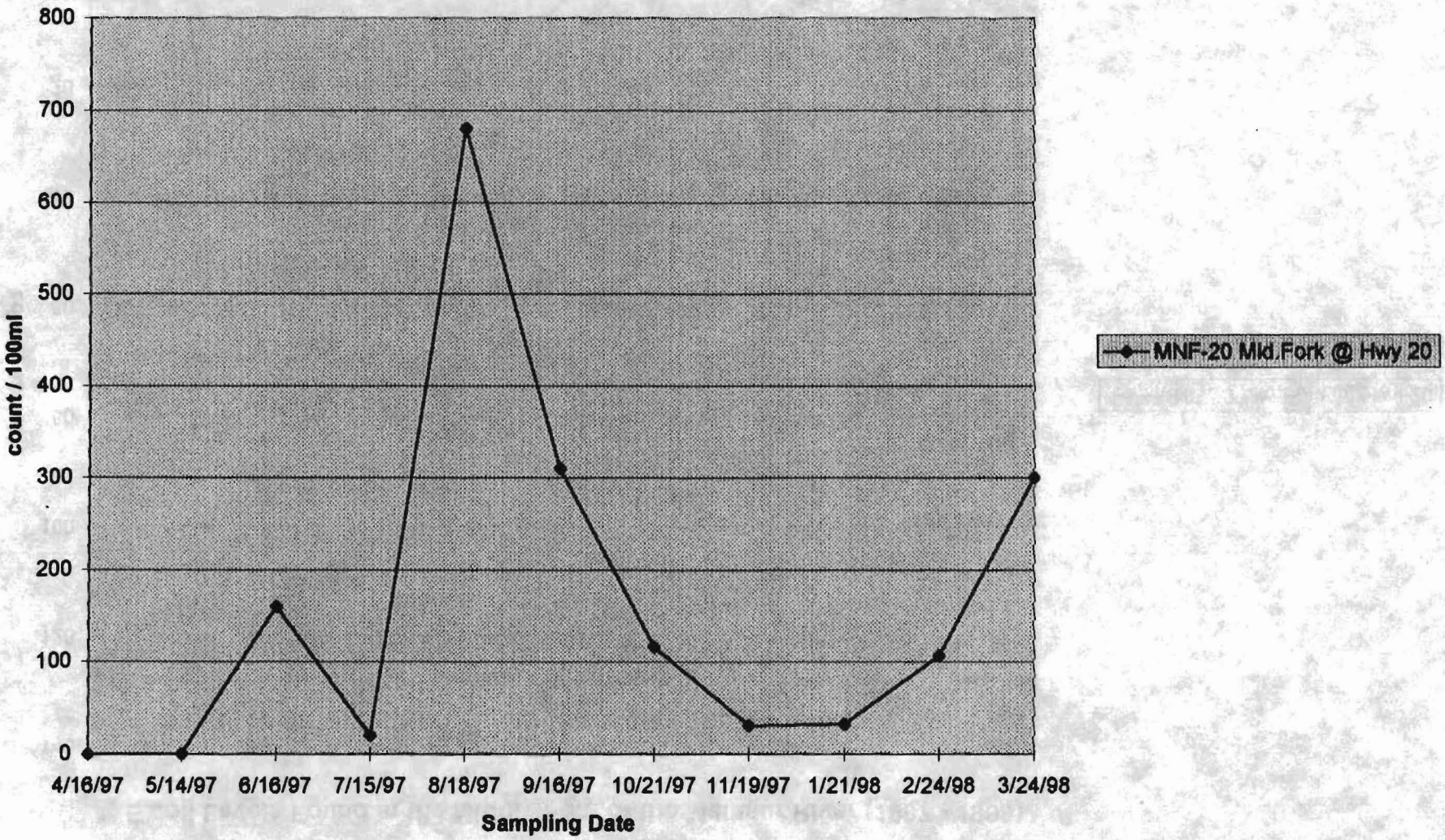


Fecal Coliform Levels Found in the Middle Fork of the Malheur River between Warmsprings Reservoir and Riverside




E.coli Levels Found in the Middle Fork of the Malheur River (1997 - 1998)
140
120
100
80
60
40
20
0
count / 100ml
4/16/97
5/14/97
6/16/97
7/15/97
8/18/97
9/16/97
10/21/97
11/19/97
1/21/98
2/24/98
3/24/98
Sampling Date
MNF-20 Mid.Fork @ Hwy 20

Fecal Coliform Levels Found in the Middle Fork of the Malheur River above Warm Springs Reservoir (1997-1998)



MAIN MALHEUR AND SOUTH FORK SUBBASINS

The streams in this area include the entire South Fork Malheur River and its tributaries from its confluence with the Middle Fork above Riverside (River Mile 119) upstream to its headwaters near Crane and Anderson Valley. The South Fork Malheur River is the historic outlet for the Malheur Lakes basin. This area also includes the 54-mile stretch of the Malheur from Namorf to Warm Springs Dam (lowest 4 miles of Middle Fork and uppermost 50 miles of the main stem Malheur) and from Namorf to Ontario.

Functioning Condition

Functioning condition has been assessed only where Harper Bridge crosses the Malheur River (December 1996 class with Wayne Elmore.) It was rated as functioning at risk due to channelization, sediment from upstream, and a riparian zone that had lost a good portion of its vegetation. The latter was corrected by the landowner (a fence was built adjacent to the river.) The South Fork above Riverside has intermittent flows. A dry, rocky substrate includes physical attributes that are low for PFC. From Riverside to above Juntura has good functioning condition with stable flows, shrubs, and herbaceous vegetation along streambanks.

Stream Structure

In the past, the Malheur River was altered to facilitate agriculture, highway, and railroad construction. Many sites along the riverbank are vertical and actively eroding. In the Harper and Little Valley areas, portions of the streambanks are unstable and landowners lose a significant amount of soil annually. The lower end of Cottonwood Creek was also altered to facilitate agriculture. Today, the active channel is extremely wide and under high water conditions, it is susceptible to erosion. From Harper to Ontario, there are stable reaches through canyon and hill country and fragile reaches through agriculture areas. Heavy agricultural use of water and surrounding leveled land occurs from above Vale to Ontario.

South Fork--The main stem channel is generally bordered by low terraces and hill slopes. It has been altered to facilitate agriculture, railroads, and road construction.

Middle Fork--Downstream of Warm Springs Reservoir, the Middle Fork flows through a canyon where it is naturally bordered by hill slopes. The channel was further constrained by an abandoned railroad bed. There are several wide flood plain terraces in the canyon that have been farmed. The channel is incised along much of its length. Many streambanks are exposed and actively eroding.

Stream Structure (continued)

Malheur River--The main stem channel is naturally confined by hill slopes over much of its length. The construction of the state highway and the railroad has confined the channel even more. Several bank stabilization projects completed within this basin have helped to confine and/or alter the channel. The tributary channels are also confined by hill slopes. There has been channel alteration in several tributaries for road construction and other activities. The main stem channel is incised over portions of its length. Many of its banks in agriculture areas are vertical and erode during spring runoff and intense summer storm events.

Riparian Vegetation

Woody vegetation on the main Malheur from Namorf to Harper consists of scattered stands of willow and cottonwood. From Juntura to Namorf, the main Malheur contains herbaceous and woody riparian vegetation. Tributary riparian vegetation is somewhat similar to the main stem. Willows can be found near the headwaters but the remainder of the channels contains scattered stands of woody plants with open areas between them.

Remnants of cottonwood and willow stands can be seen along the rivers and throughout the valley. Today, the riparian vegetation is restricted to thin ribbons of woody plants usually consisting of cottonwood trees and willows along the streams.

Water Quality

South Fork--Water quality in the main stem is poor. Water temperatures are warm and sediment loading is high. The South Fork is on the 303(d) list for bacteria.

Middle Fork--The Middle Fork in this basin is on the 303(d) list for bacteria.

Malheur River--The water quality within this area varies with flow amounts and seasons. Water temperatures throughout the main stem consistently exceed DEQ's 64 degree standard. Sediment loading is high during spring runoff and local storm events. The main stem is on the 303(d) list for bacteria and chlorophyll a. Results of the water samples taken in 1997 and 1998 for E. *coli,* fecal coliform, nitrate, total phosphorous and turbidity concentrations are shown following page 8-15.

Water Quantity

The flows in the Malheur River are affected by reservoirs upstream of this subbasin. Late spring, summer, and early fall flows in these streams are much higher than natural. Winter flows are much lower than natural.

South Fork--Natural flows in the main stem are very low. There are many diversions in this area, and many segments dry up in the summer. Most of the tributaries are ephemeral near their confluence with the main stem.

Middle Fork and Main Malheur (Namorf to North of Riverside)--The main stems are considered altered flow reaches. Flows within this reach are controlled by Warm Springs and Beulah Reservoirs. Late spring, summer, and early fall flows are much higher than normal. Tributary flows are less altered than the main stem flows. Many of the tributaries have numerous small stock ponds in their headwater areas. The amount of storage in these ponds is small.

Fish

Historically, the Malheur River within this subbasin was used by chinook salmon and steelhead as a migration route to headwater streams. It is not known if they used this section of the Malheur River for spawning and juvenile rearing.

Cottonwood Creek, a tributary of the Malheur River south of Harper, is the only tributary that sustains fish populations on a year round basis. One small population of redband trout exists in the headwaters of Cottonwood Creek. Hatchery rainbow trout have occasionally been found in this drainage. They may have escaped from upstream reservoirs. They do not survive long within this area. Small populations of channel catfish and smallmouth bass are consistently found in the Malheur River. Channel catfish and smallmouth bass may move upstream from the Snake River or they may escape from Warm Springs or Bully Creek Reservoirs.

Large populations of common carp and bridgelip and large-scale suckers are consistently found in the Malheur River. It also supports populations of squawfish, redside shiners, and longnosed and speckled dace that flourish in numbers at times.

South Fork--The main stem South Fork was stocked in the past with hatchery rainbow trout. This practice was discontinued during the drought due to poor water quality, quantity, and access problems. Several tributaries support small populations of native redband trout which may, on occasion, flush into the main stem. The main stem and tributaries support populations of non-game fish. The species may include redside shiners, speckled and longnose dace, and bridgelip and large-scale suckers. These populations can be very abundant during periods of high precipitation.

Fish (continued)

Middle Fork--The main stem downstream of Warm Springs Reservoir has been chemically treated in the past.

Malheur River (Namorf to Riverside)--Historically, the Malheur River within this reach was used by chinook and steelhead as a migration route to the headwater streams. It is not known if they used this section of the river for spawning and juvenile rearing. The main stem within this unit supports a population of hatchery rainbow trout. These fish are stocked annually from Gold Creek upstream to Riverside. It also supports a small population of native redband trout that annually flush out of the tributaries. The main stem also supports large populations of non-game fish. The species include bridgelip and large-scale suckers, squawfish, common carp (introduced), redside shiner, and speckled and longnose dace. Smallmouth bass were introduced into the main stem near Gold Creek in the late 1980's, but they do not appear to have established themselves. This reach of the main stem has been chemically treated several times in the past. The target species included bridgelip suckers, squawfish and carp. Hunter Creek, Squaw Creek, Calf Creek, Pole Creek, Black Canyon Creek, and Hog Creek all support small populations of redband trout. They also support populations of non-game fish, which includes suckers, shiners and dace.

Uplands--Main Malheur (BLM lands = 76% of total acres)

Big sage/perennial grass dominates this subbasin along with communities of native perennial grass. Scattered colonies of rabbitbrush, mountain shrubs, juniper and salt desert shrubs complete the community. Low elevation vegetation condition is poor to fair. Higher elevations support areas of fair to excellent conditions. Generally, winter range for mule deer is in poor condition due to the reduction of the shrub component. Wildfires and historic livestock grazing management practices have decreased the quality and quantity of available forage and cover. Juniper expansion into sagebrush, bitterbrush, and mountain mahogany communities has reduced available habitat for sage grouse and pronghorn antelope.

Lowlands--Main Malheur (private and state lands = 24% of total acres)

Agricultural crops dominate lowland valley areas where crops such as alfalfa, wheat, pasture, corn, potatoes, onions, beets, and beans are raised. Clean farming practices associated with intensive agriculture have decreased the quantity and quality of winter cover and food available to pheasant and quail.

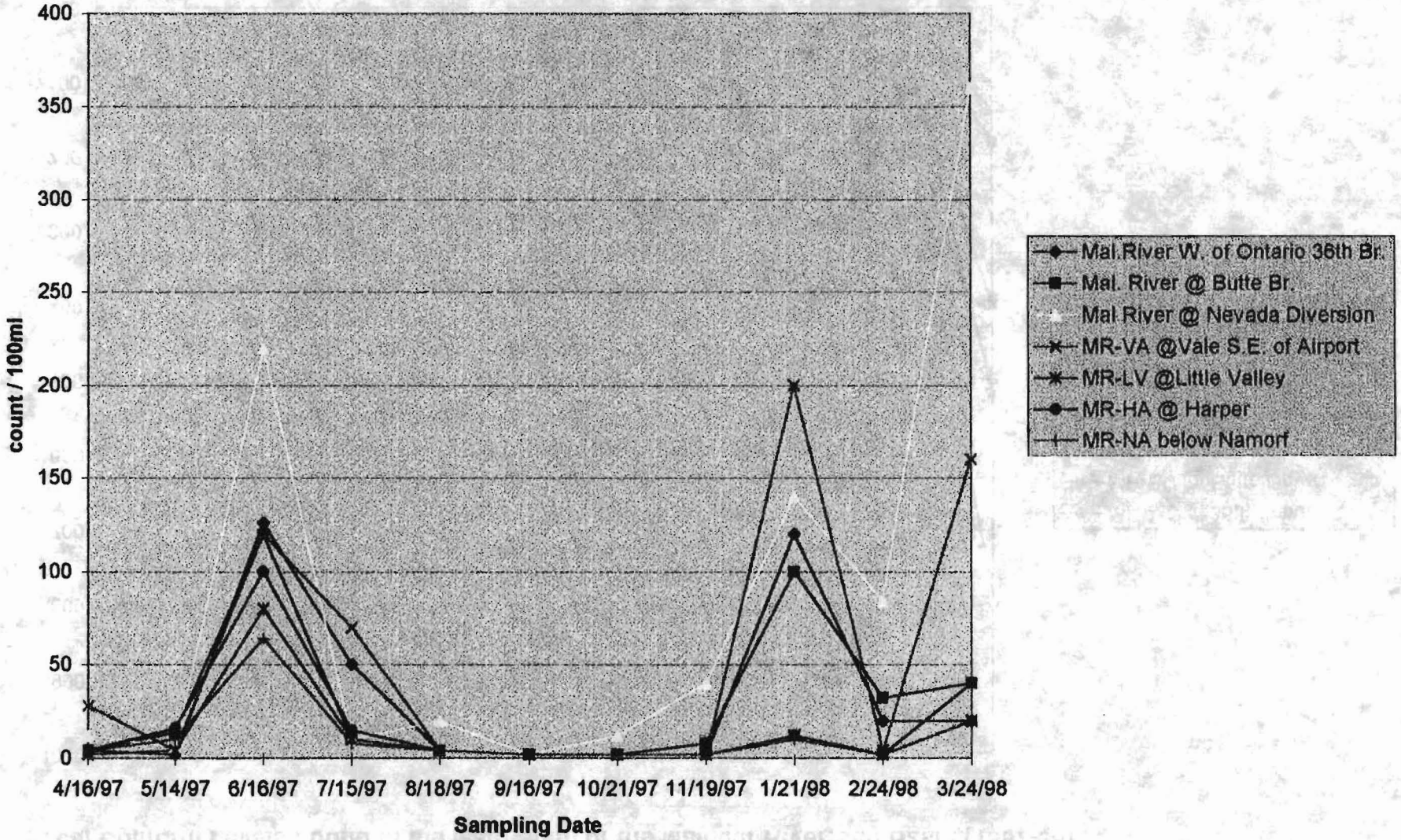
Uplands--South Fork (BLM lands = 42% of total acres)

Big and low sagebrush with perennial grasses comprises the major vegetation types in this subbasin. Juniper, mahogany, bitterbrush and salt desert shrubs are also present. Vegetation conditions range from fair to good. Expansion of juniper into the shrub/grass communities has reduced the amount and quality of winter range for mule deer and summer range for sage grouse and pronghorn antelope.

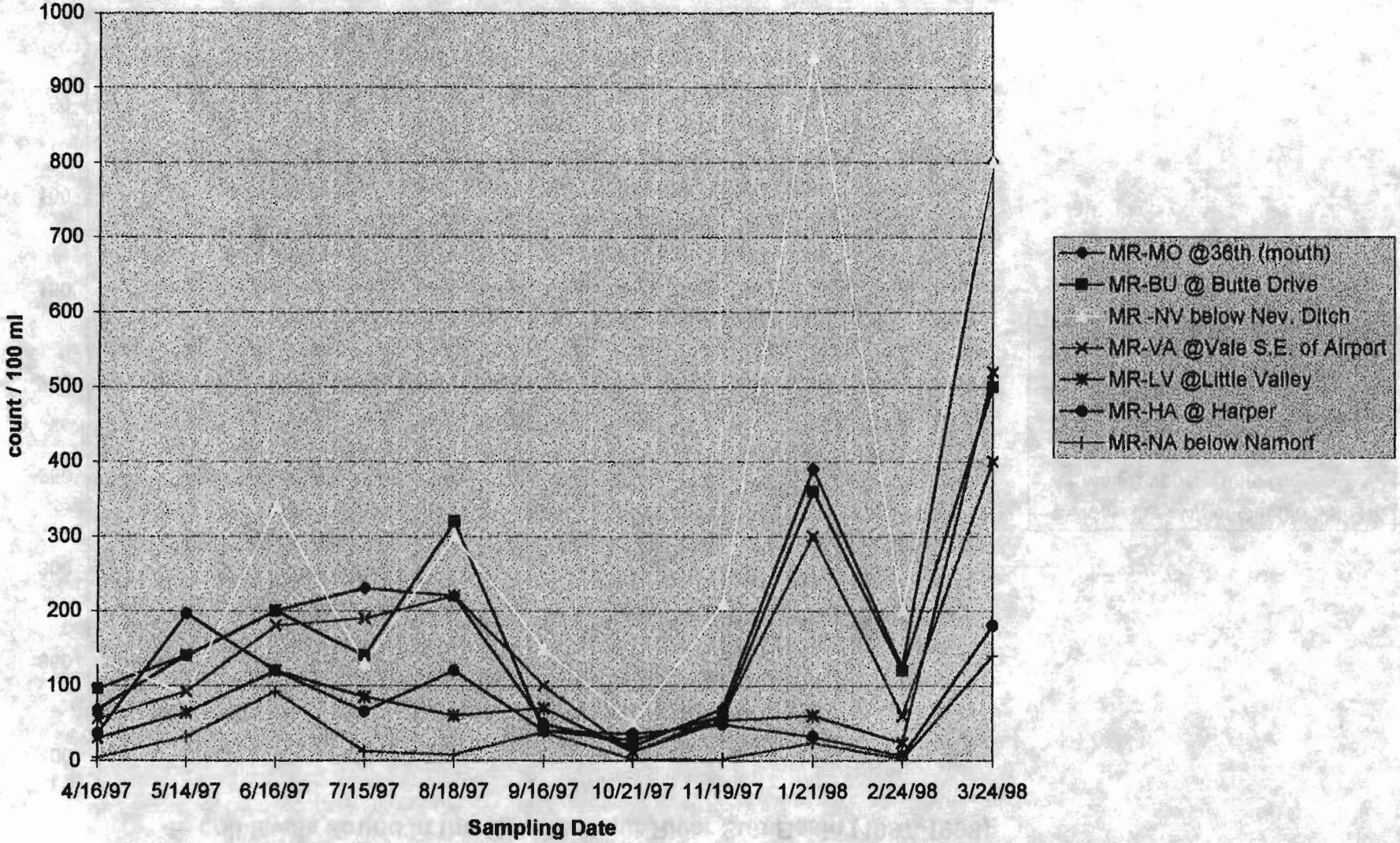
Lowlands--South Fork (private and state lands = 58% of total acres)

There is no data available.

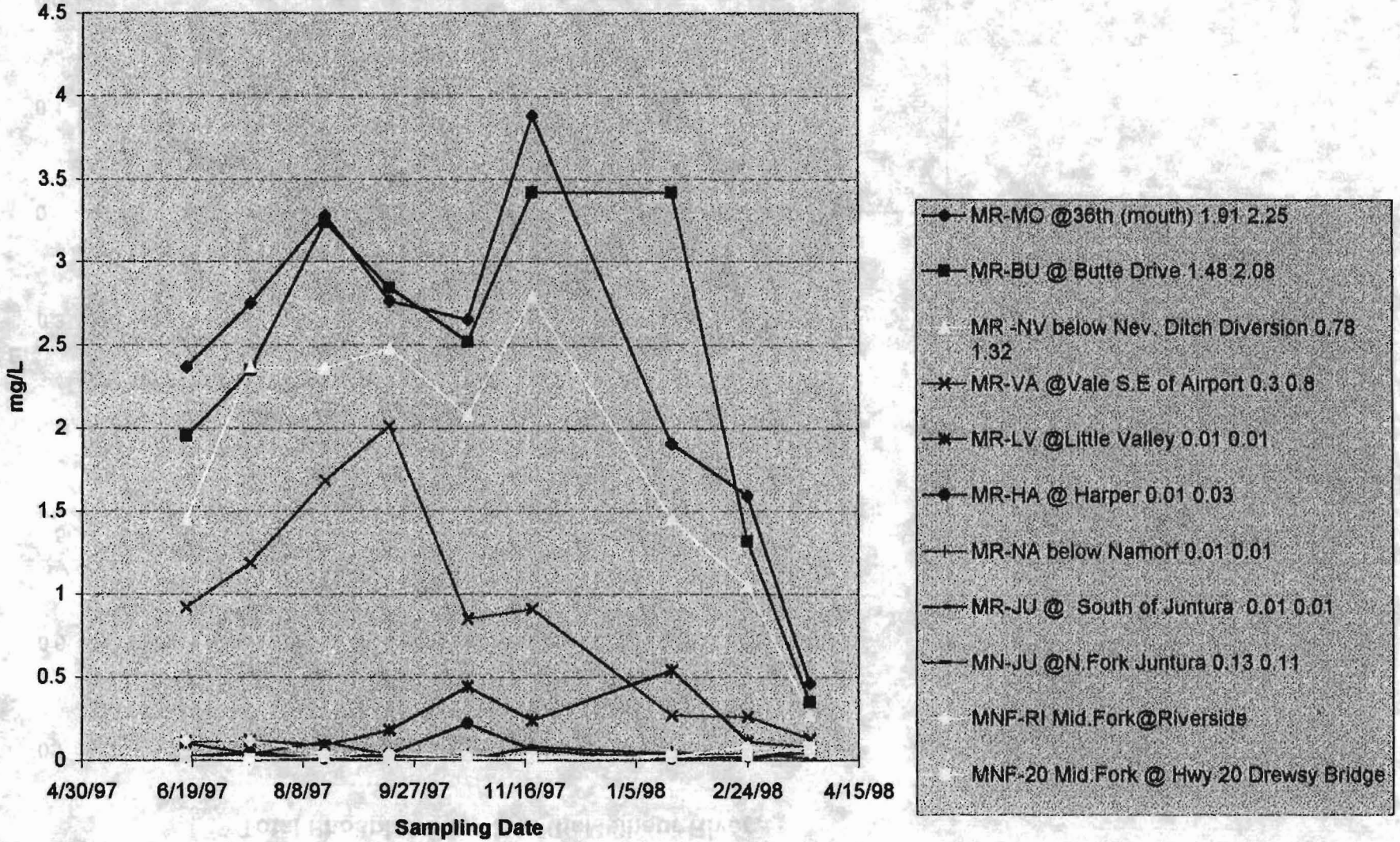
E. coli levels Found in the Main Malheur River Sub Basin (1997-1998)



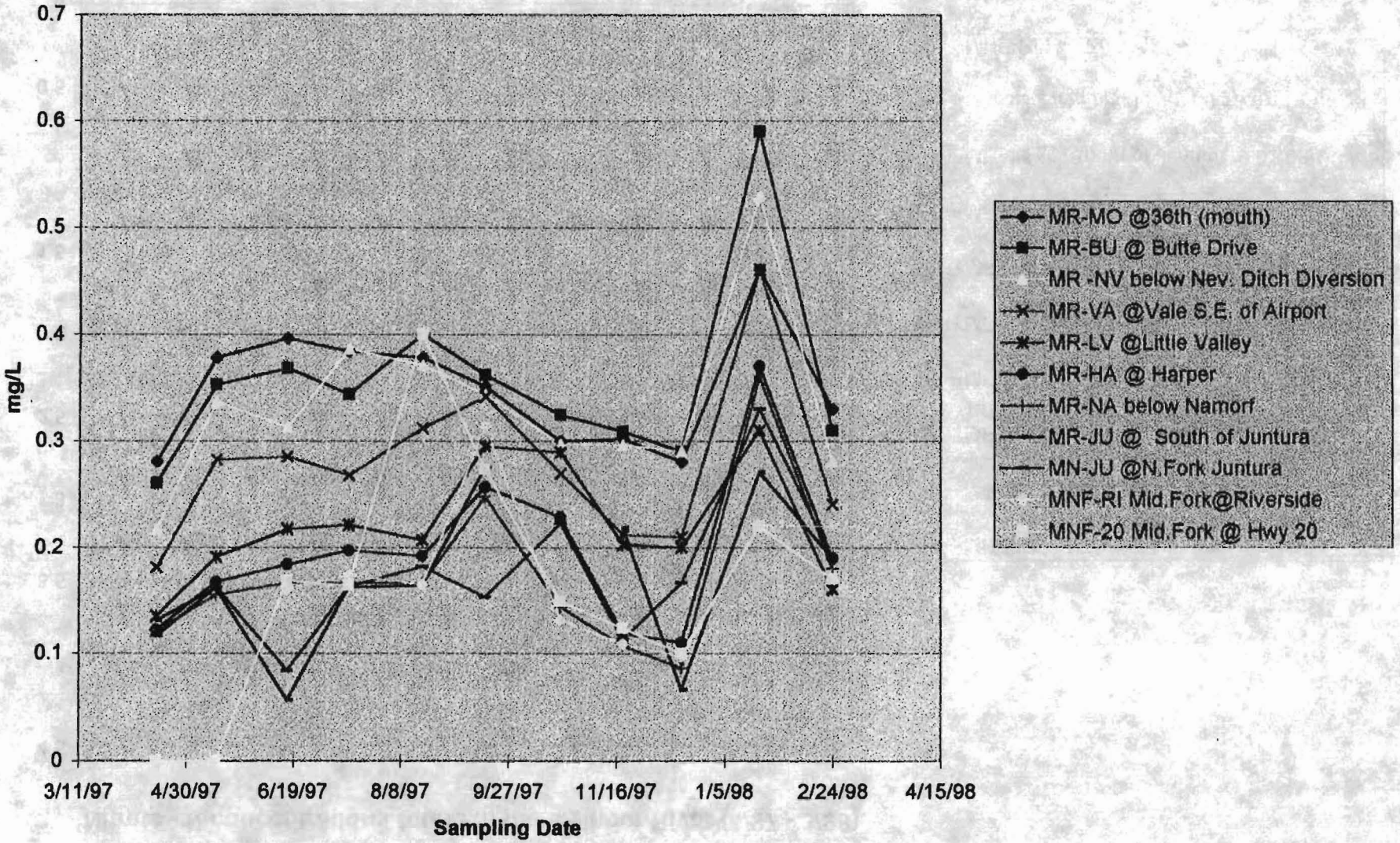
Fecal Coliform Levels Found in the Main Stem of the Malheur River Sub Basin (1997-98)



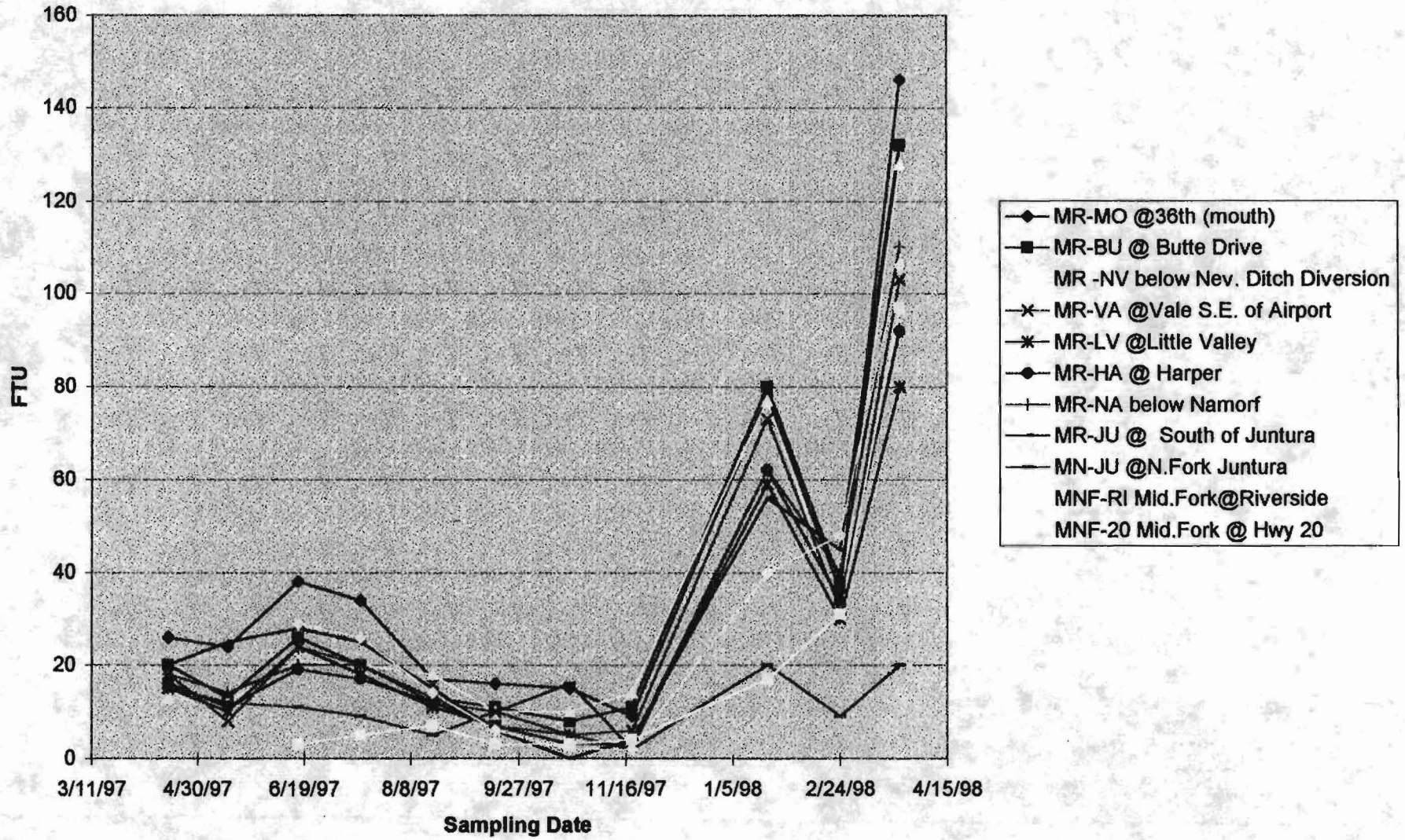
Nitrate - N concentrations found in the Malheur River (4/97 - 3/98)



Total Phosphorous - P in theMalheur River



Turbidity (Malheur River)



BULLY CREEK SUBBASIN

This area includes Bully Creek Reservoir and all tributaries draining into Bully Creek including Indian Creek, Cottonwood Creek, and Clover Creek. The town of Westfall is located roughly in the center of the subbasin.

Functioning Condition

The functioning condition is poor to fair over most of Clover Creek, Bully Creek, Indian and Cottonwood Creeks due to a reduction of riparian vegetation, channel degradation, and down cutting of streambanks.

Stream Structure

Most of the streams above Westfall contain a dendritic (tree-like branching) drainage pattern in the upper half of each watershed. Downstream, the patterns become linear. The creeks and streams below Westfall are linear along most of their length. In the upper watersheds, high runoffs from snowmelt or thunderstorms often cause short-duration but high peak flows. Under the same runoff conditions, linear drainage patterns tend to have lower peak flows but for longer periods than dendritic patterns. Each flow pattern affects stream channels differently, depending upon gradient of the terrain, streambank, and vegetation condition, soil parent material, and the time and season of runoff. In the past, portions of Bully Creek were altered to facilitate agriculture. There is substantial streambank erosion, channel degradation and down cutting.

Riparian Vegetation

Improper season of use, poor distribution, and overstocking of livestock have led to long-term downward trends in streambank stability and riparian vegetation. The population increase of the resident elk herd is also impacting aspen regeneration to an unknown degree. Higher gradient streams with deep soils in Upper Bully Creek and Clover Creek have experienced severe down cutting. Some portions of Clover Creek are beginning to show a static to upward trend.

Water Quality

Sedimentation, water temperature, and E. *coli* levels are problems in Upper and Lower Bully Creek and Clover Creek. E. *coli* is less of a problem in Indian Creek. Sedimentation and temperature are concerns in Indian Creek and Upper Cottonwood Creek. Temperatures tend to be higher at lower elevations due to lower flows, less gradient, and reduced shading of stream channels. Natural thermal springs are present in lower reaches of Upper Bully Creek.

Results of water samples taken in 1997 and 1998 for E. *coli,* fecal coliform, nitrate and turbidity are shown following page 8-17.

Water Quantity

Rapid spring runoff, poor infiltration, and loss of formerly perennial springs and stream segments are common occurrences throughout the entire subbasin.

Fish

Inland redband trout and hatchery rainbow trout are the only game fish species in the reaches above Bully Creek Reservoir. Hatchery rainbow trout are stocked into several small reservoirs in the headwater areas. Current levels of redband trout upstream of Bully Creek Reservoir are low as a result of the 1987-1994 drought and less than optimal habitat conditions. The current summer distribution of redband trout is limited to the headwater areas of the basin and is very fragmented. Distribution during fall, winter, and spring is less fragmented because flows and temperatures allow the fish to use more of the stream corridor. Hatchery rainbow trout are annually stocked into four ponds in the upper basin (South Cottonwood, Peavine, Pence Springs, and Allotment #3 Reservoirs) when water conditions permit.

Bully Creek Reservoir is a popular fishing site. The six species of non-game fish historically native to the basin include bridgelip sucker, redside shiner, speckeled and longnose dace, squawfish, and mottled sculpin. All the non-game species are still found in the area except the mottled sculpin.

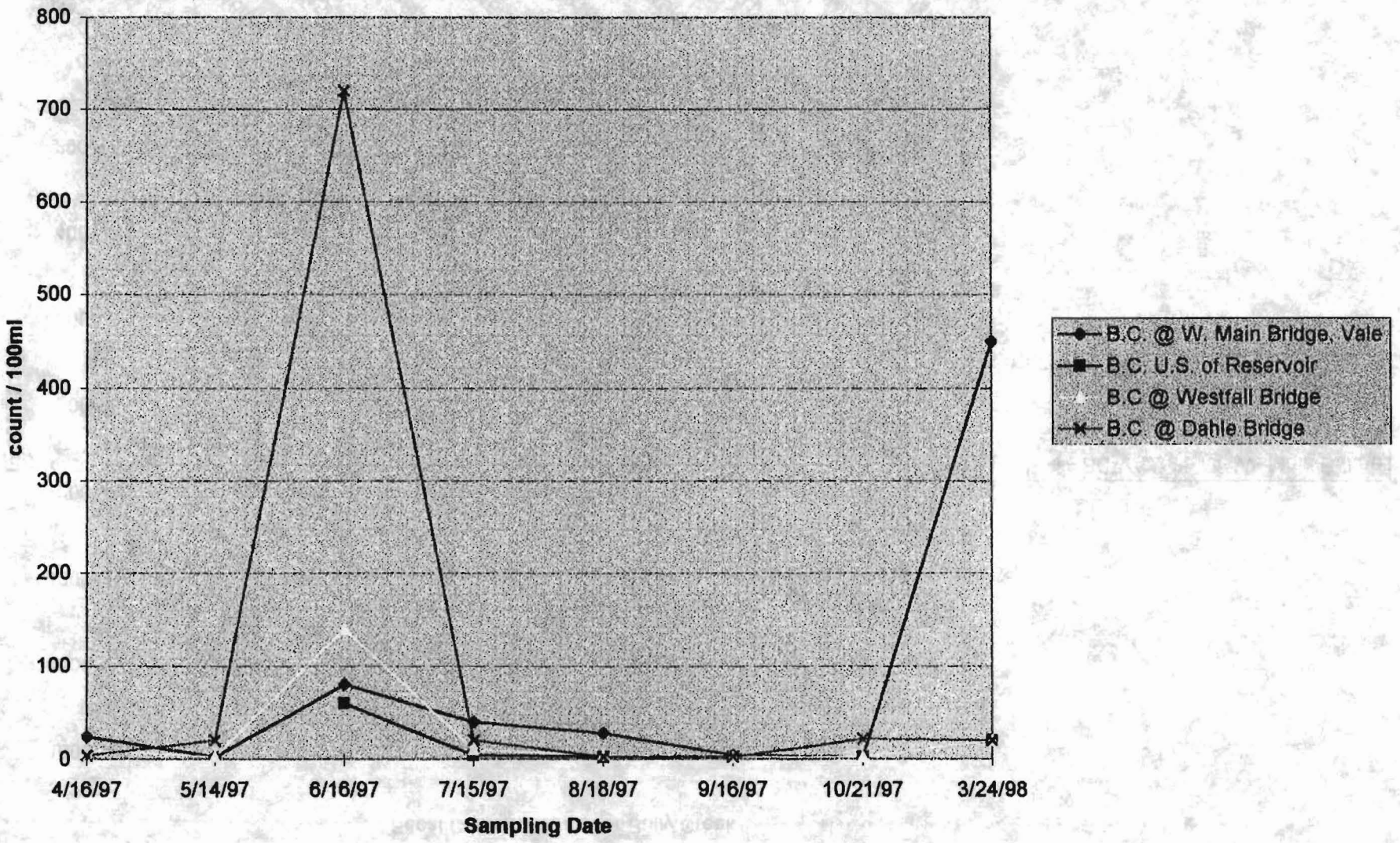
Uplands (BLM lands = 65% of total acres)

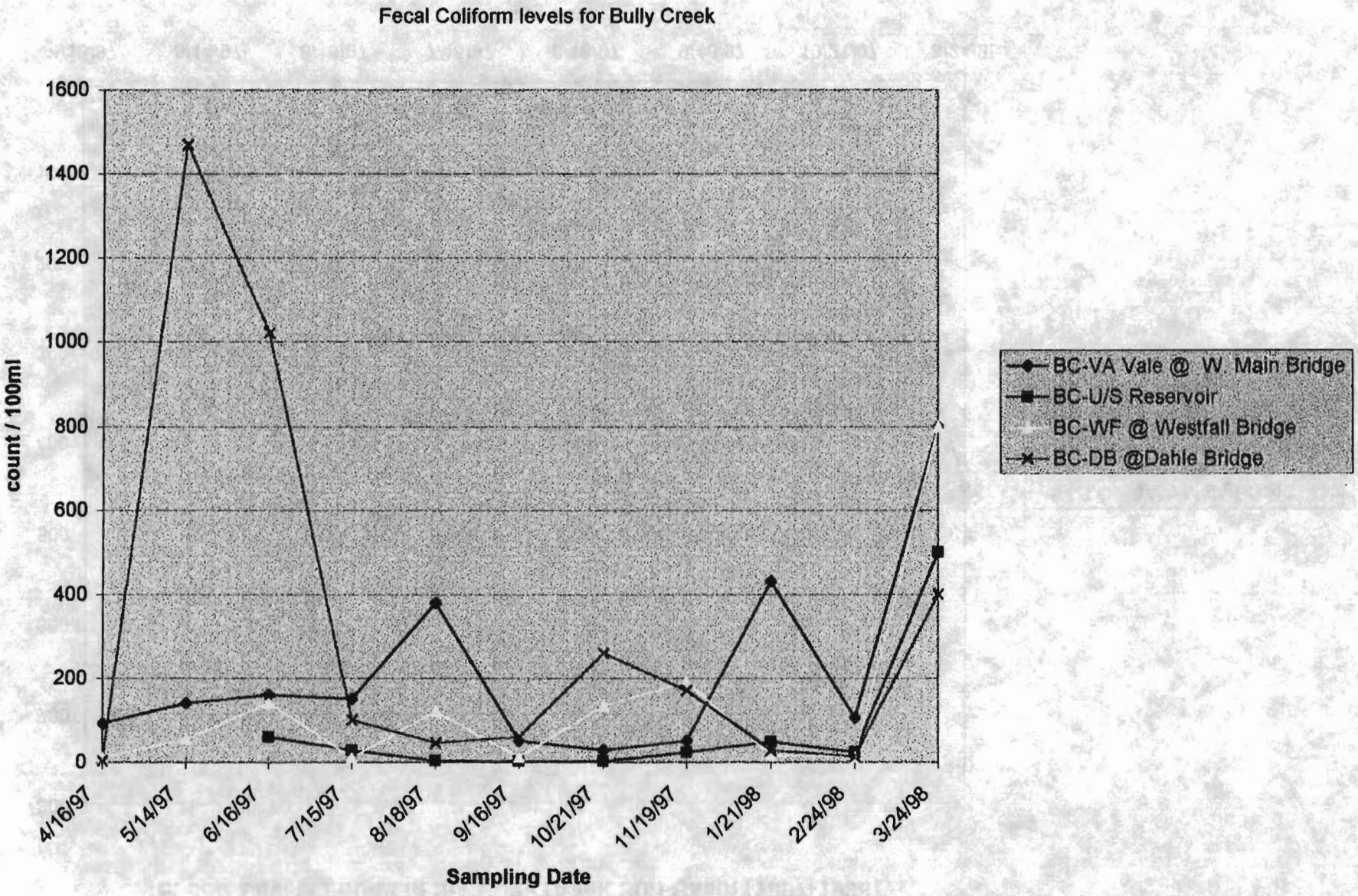
Big sage and annual /perennial grass dominate the vegetation community. Stiff sage and rabbitbrush with scattered occurrences of bitterbrush, mountain mahogany, and juniper complete the vegetation profile. Vegetation conditions can range from poor to fair to good with remnant stands of perennial grasses in Clover Creek and Upper Bully Creek. Overall, Upper and Lower Bully Creek and Clover Creek are in better condition than Indian Creek and Upper Cottonwood Creek. However, all of the watersheds have some severe problems in the lower elevations. Historic overstocking of livestock, improper season of use, and poor distribution have led to a loss of native perennial grasses in many areas. Juniper is expanding into sagebrush, bitterbrush, and mountain mahogany communities.

Lowlands (private and state lands = 35 % of total acres)

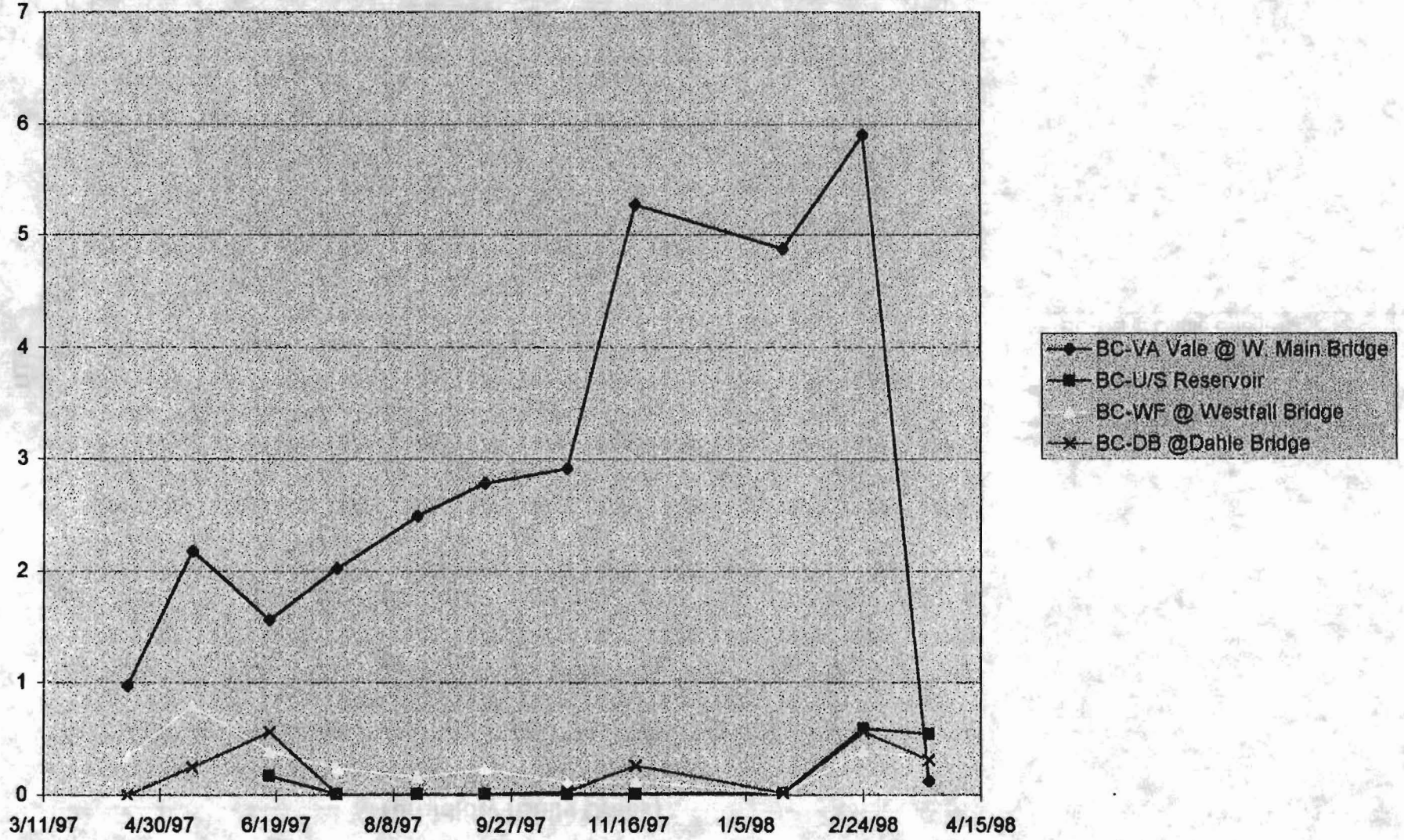
Agriculture crops include pasture, alfalfa hay, wheat, and row-crops. Generally lowland range is in poor to fair condition with many noxious weeds invading. Whitetop and perennial pepperweed are dominating many sites in the agriculture and lowland range areas.

E. coli Levels Found in the Bully Creek Sub Basin (1997-1998)




Fecal Coliform levels for Bully Creek
count / 100ml
1600
1400
1200
1000
800
600
400
200
0
4/16/97
5/14/97
6/16/97
7/15/97
8/18/97
9/16/97
10/21/97
11/19/97
1/21/98
2/24/98
3/24/98
Sampling Date
BC-VA Vale @ W. Main Bridge
BC-U/S Reservoir
BC-WF @ Westfall Bridge
BC-DB @Dahle Bridge

Nitrate - N concentrations found in Bully Creek (4/97 - 3/98)



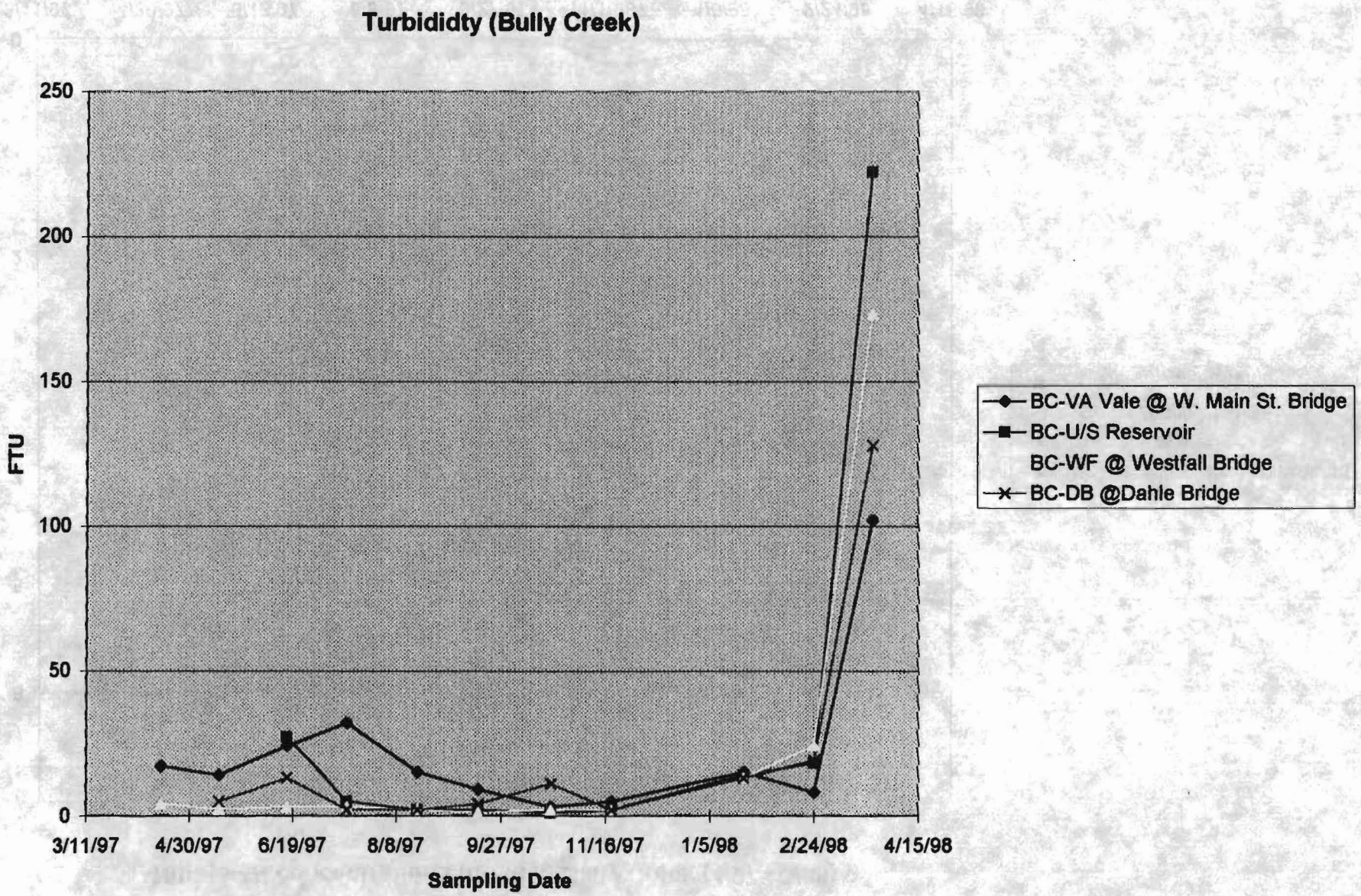

Turbididty (Bully Creek)
250
200
150
100
50
0
FTU
3/11/97
4/30/97
6/19/97
8/8/97
9/27/97
11/16/97
1/5/98
2/24/98
4/15/98
Sampling Date
BC-VA Vale @ W. Main St. Bridge
BC-U/S Reservoir
BC-WF @ Westfall Bridge
BC-DB @Dahle Bridge

TABLE 8-1 RESOURCE ASSESSMENT BY SUB-BASIN

	LOWER WILLOW CREEK	UPPER WILLOW CREEK	NORTH FORK	MIDDLE FORK	MAIN MALHEUR & SOUTH FORK	BULLY CREEK
Functioning Condition	Channeling of Willow Creek below Brogan for irrigation has removed the physical aspects of PFC	Fair to good on upper reaches , poor to fair between Ironside and Malheur Reservoir; High sediment loads below old chrome mine	Good condition on upper reaches; stable banks with willow & alder	Upper reaches in fair condition; Some downcutting and erosion of streambanks, Esp. above Warmsprings Reservoir	Portions of Malheur River from Juntura to Namorf in fair to good condition; Intermittent flows above Riverside; Dry at times, rocky, physical attributes low for PFC rating; Riverside to above Juntura, good condition, stable flows, shrubs and herbaceous vegetation along stream bank; Wide stream reaches with canyon walls, satisfactory PFC except temperature	Poor to fair PFC in both upper & lower reaches; Dahle Bridge, streambank erosion, channel degradation & downcutting occurring due to loss of riparian shrub/tree component; Problem reaches include hi-temperatures & hi-spring fecal coliform counts
Stream Structure	Channeling of Willow Creek to facilitate irrigation, road and railroad construction; Channels deeply incised on many stream-river reaches with high erodable banks; Malheur River from Harper to Ontario stable reaches through canyon & hill country; Heavy Agr. use above Vale & from Vale to Ontario	Portion of Willow Creek channeled for irrigation & road construction; Incised stream channels, active erosion, poor bank stability over much of Willow Creek drainage; Reach through Brogan Canyon stable	Upper reaches of North Fork not altered, but has active bank erosion in places; High tributary streams have stable banks; Lower reaches contain more impacted streambanks with active erosion	Tributaries above Logan Valley with mostly stable banks; Lower tributaries experiencing bank erosion; Drewsey Valley channeling to accommodate irrigation & roads; Eroding stream banks; Drewsey Valley to Warm Springs Reservoir, channel fairly stable	Main Malheur from Juntura to Namorf fairly stable banks with herbaceous and woody riparian vegetation; South Fork channeled for irrigation, roads & railroad; Intermittent flows; Malheur River from Harper to Ontario stable reaches through canyon & hill country; Heavy Agr. use Vale to Ontario	Upper reaches Bully Creek in poor to fair condition due to agricultural influence; Streambank erosion & channel degradation occurring; Cottonwood creek, uplands experiencing sedimentation from runoff

TABLE 8-1 RESOURCE ASSESSMENT BY SUB-BASIN

	LOWER WILLOW CREEK	UPPER WILLOW CREEK	NORTH FORK	MIDDLE FORK	MAIN MALHEUR & SOUTH FORK	BULLY CREEK
Riparian Vegetation	Willow Creek below Brogan is channeled for irrigation, & has varying amounts of herbaceous & woody vegetation	Little woody riparian vegetation exists along Upper Willow Creek, mainly herbaceous plants make up the riparian zone; Agriculture use/livestock grazing has influenced much of the streams vegetative components	Upper reaches & tributaries contain willow & alder with stable banks; Riparian vegetation generally lacking on lower portion of North Fork of Malheur River; Herbaceous plants comprise a large portion of the vegetative component; Valley floor streambanks are experiencing sloughing and erosion	Above Logan Valley woody riparian vegetation is present in fair to good condition; In the Logan Valley area, riparian vegetation removed to facilitate agriculture; Drewsey Valley riparian vegetation downstream to Warmsprings Reservoir is lacking	Woody riparian vegetation generally lacking above the South Fork due to intermittent flows; Middle Fork from Riverside to Juntura contains areas of herbaceous plants; Cottonwoods re-occurring in headwater areas, along with willows; Main Malheur from Namorf to Harper contains herbaceous & woody riparian vegetation, considering rivers width; Between Harper & Ontario riparian vegetation varies due to past & present agriculture influence, generally rated poor to fair	Upper reaches of Bully Creek experiencing reduction of aspen & willow, and an invasion of juniper/sagebrush; In lower reaches native riparian vegetation has been replaced by annuals and bluegrass; Agriculture activities have also impacted riparian zones in lower reaches of the basin

TABLE 8-1 RESOURCE ASSESSMENT BY SUB-BASIN

	LOWER WILLOW CREEK	UPPER WILLOW CREEK	NORTH FORK	MIDDLE FORK	MAIN MALHEUR & SOUTH FORK	BULLY CREEK
Water Quality	Generally poor due to high temperatures & fecal coliform levels	Fair to good readings on fecal coliform & E-coli counts; Water temperatures may be a problem	Fair to good above Beulah Reservoir; Water temperatures exceed Bull Trout standards (50 degrees F); Fair below Beulah Reservoir, sediments and temp high	Fair to good above Drewsey Valley; Logan Valley headwater streams cold temperatures (below 50 degrees F); Downstream temperatures warm quickly; Below Drewsey Valley, water quality poor, hi-temps & sediment	South Fork poor quality due to hi-temps, sediment & bacteria; Middle Fork on list for bacteria; Malheur River in better condition, still exceeds water temps, sediment loads & bacteria	Upper Bully Creek, sediment, E-coli & temperatures exceed standards; Temperatures higher in lower elevations due to low flows & reduced riparian vegetation; Thermal springs present in lower Bully Creek, plus re-cycling of water for irrigation increases fecal coliform levels
Water Quantity	Flows affected by upstream reservoirs; Higher steady flows, spring through fall, with low winter flows	Fluctuating flows in upper Willow Creek; Some years dry; Below Malheur Reservoir, more consistent flows	Below Beulah Reservoir, flows controlled by release from dam; Late spring, summer flows higher than normal; Winter flows lower than normal; Upstream of reservoir, stream flows unaltered	Drewsey Valley downstream to Warmsprings Reservoir, summer flows altered by diversions; Above Drewsey Valley, summer flows altered by diversions in Logan Valley	South Fork Malheur River, intermittent flows with many diversions; Middle Fork & main Malheur River from Riverside to Namorf, flos controlled by Warm Springs & Beulah Reservoirs-late spring, summer and fall flows higher than normal; winter flows lower than normal; Tributary flows less altered; Many headwater tributaries contain stock ponds, with low storage capacity	Upper drainage's experience rapid spring runoff, dry up quickly; Bully Creek runs water yearlong; Indian Creek higher reaches dry by early summer, with minimum flows in lower reaches

TABLE 8-1 RESOURCE ASSESSMENT BY SUB-BASIN

	LOWER WILLOW CREEK	UPPER WILLOW CREEK	NORTH FORK	MIDDLE FORK	MAIN MALHEUR & SOUTH FORK	BULLY CREEK
Fish	No game fish populations are consistently found in Willow Creek; Populations of suckers, squawfish shiners and dace can be found at times	Malheur Reservoir supports large population of Rainbow Trout; Willow Creek above reservoir contains Rainbow Trout, suckers, shiners & dace. Upper tributaries to Willow Creek contain Redband Trout	Below Beulah Reservoir, population of stocked hatchery Rainbow Trout, & non-game fish; Above Beulah Reservoir populations of Redband & Bull Trout, & whitefish; Bull Trout spawn in Swamp, Little Crane, Sheep & Elk Creeks; These drainage's also contain large populations of sculpin, shiners, dace & suckers; Beulah Reservoir itself contains Bull Trout, Rainbow & Redband Trout, and a complement of non-game fish	Redband Trout found basin-wide, Bull & Brook Trout found in Logan Valley streams; Hatchery Rainbow Trout stocked in Logan Valley streams; Warm Springs Reservoir supports Large & Smallmouth Bass, Yellow Perch, Rainbow Trout, bluegill, crappie, Bullhead & Channel Catfish, & a normal assemblage of non-game species	South Fork Malheur: Tributaries support native Redband Trout; Main stem Malheur occasionally contain Redband Trout & non-game fish including shiners, dace & suckers; Middle Fork Malheur below Warmsprings Reservoir contains fish from reservoir & non-game fish, including suckers, squawfish, shiners & dace; Main Malheur supports hatchery Rainbow Trout, Redband Trout & non-game species; Cottonwood Creek headwaters contains Redband Trout; Malheur River has Channel Catfish, Smallmouth Bass, carp, suckers, squawfish, shiners & dace	Bully Creek, above Bully Creek Reservoir has limited numbers of Rainbow & Redband Trout; Bully Creek Reservoir contains crappie, Large & smallmouth Bass, Yellow perch, carp, and a few trout from Bully Creek; Non-game fish found in basin include suckers, shiners, dace, squawfish & the Mottled sculpin (present status uncertain);

TABLE 8-1 RESOURCE ASSESSMENT BY SUB-BASIN

	LOWER WILLOW CREEK	UPPER WILLOW CREEK	NORTH FORK MALHEUR	MIDDLE FORK MALHEUR	MAIN MALHEUR & SOUTH FORK	BULLY CREEK
Lowland-upland vegetation Condition	Lowlands mainly agriculture crops, Uplands rangeland poor to fair condition preponderence of sagebrush, condition data lacking in majority of sub-basin	Data lacking over most of this sub-basin Uplands contain Big-sage/annual grasses and forested pine/fir	Lowlands-data lacking, Uplands-contain Big-Sage and perennial grass with scattered colonies of native grass-forested pine/fir and juniper poor-fair-good condition classes with higher elevations mainly good	lower elevations range from poor to good condition, with the majority in fair condition; Upper elevations in fair to good condition, Big sage/perennial grass with scattered colonies of forest/pine/fir	Agriculture crops in valley bottems, Juntura to Namorf low elevations-poor to fair condition; Uplands fair to good to excellent condition with sagebrush and perennial grasses dominating	Lowlands poor to fair condition, many noxious weeds invading; Uplands mixed bag of poor-fair-good condition range with remanant stands of perennial grasses in Clover Creek & Upper Bully Creek; Juniper-Sagebrush increasing

TABLE 8-1 RESOURCE ASSESSMENT BY SUB-BASIN

	LOWER WILLOW CREEK	UPPER WILLOW CREEK	NORTH FORK	MIDDLE FORK	MAIN MALHEUR & SOUTH FORK	BULLY CREEK
Wildlife Habitat	Mule deer and sage grouse habitat in poor condition. Much of mule deer winter range has lost shrub component (sagebrush and bitterbrush) due to wildfire. Mule deer now winter more on agricultural lands in the valley, which causes increased damage. Pronghorn habitat quality varies, but is generally in fair condition. Pheasant and quail habitat quality varies, but is generally in poor condition. Clean farming practices associated with intensive agriculture have decreased the amount and quality of winter cover for these species, and lack of winter cover is the largest limiting factor to annual population abundance.	Continuing juniper expansion into sagebrush, bitterbrush and mountain mahogany communities is a serious concern, especially for sage grouse and pronghorn. There appears to be a lack of regeneration of mountain mahogany and bitterbrush stands.	Upland habitats for big game and upland gamebirds are generally in fair condition, however timber management activities (cover reduction and road construction) have reduced habitat effectiveness of forested habitats for deer and elk. Continuing juniper expansion and encroachment into sagebrush, bitterbrush, and mountain mahogany communities is a serious concern, especially for sage grouse and pronghorn. There appears to be a lack of regeneration of mountain mahogany and bitterbrush stands.	Upland habitats for big game and upland gamebirds are generally in fair condition, however timber management activities (cover reduction and road construction) have reduced the habitat effectiveness of forested habitats for deer and elk. Continuing juniper expansion and encroachment into sagebrush, bitterbrush, and mountain mahogany communities is a serious concern, especially for sage grouse and pronghorn. There appears to be a lack of regeneration of mountain mahogany and bitterbrush stands.	Mule deer winter range generally in poor condition due to loss of shrub component from range treatments, wildfire, and historic livestock grazing. There has also been some loss of summer range to wildfire. Juniper expansion into sagebrush, bitterbrush, and mountain mahogany communities is a serious problem, especially for sage grouse and pronghorn. There appears to be a lack of regeneration of mountain mahogany and bitterbrush stands.	Upland habitats for big game and upland gamebirds are generally in fair condition. Continuing juniper expansion into sagebrush, bitterbrush and mountain mahogany communities is a serious problem, especially for sage grouse and pronghorn. There appears to be a lack of regeneration of mountain mahogany and bitterbrush stands.

APPENDIX 9

WATER QUALITY PARAMETERS FOR WHICH MALHEUR BASIN IS ON 303(d) LIST

BACTERIA (E. *coli*, fecal coliform)

Beneficial Use

Water contact recreation

Standard

A 30-day log mean of 126 E. *coli* organisms per 100mL based on a minimum of five samples. No single sample shall exceed 406 E. *coli* organisms per 100mL. Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, shellfish propagation, or otherwise injurious to public health shall not be allowed.

Time

Summer—June 1 through September 30
Fall, Winter, Spring—October 1 through May 31

Data Requirements

Data has been collected since October 1985. Earlier data will be considered on a case-by-case basis. A minimum of five representative data points available per site collected on separate days for the season of interest.

Comment

This standard replaced the following fecal coliform standard as of January 11, 1996. Fecal coliform data was used to develop the 303(d) list as it was the most commonly measured indicator of this bacteria group. Future listings will be based on E. *coli* data as new data becomes available.

CHLOROPHYLL A

Beneficial Use

Water contact recreation, aesthetics, fishing, water supply, and livestock watering

Standard

0.015mg/l (to identify waterbodies where phytoplankton may impair the recognized beneficial use)

Criteria

3-month average chlorophyll a value exceeds standard

Time

Summer—June 1 through September 30

CHOLORPHYLL A (continued)

Data requirements

Data collected since October 1985. Earlier data will be considered on a case-by-case basis. A minimum of five representative data points available per site collected on separate days during peak algal growing season (typically summer.)

TEMPERATURE

Beneficial Use

Resident fish and aquatic life, salmonid fish spawning and rearing

Standard

A 7-day moving average of the daily maximum shall not exceed the following values unless specifically allowed under a DEQ-approved basin surface water temperature management plan.

General standard--64 degrees (17.8 degrees C)

Waters that support bull trout—50 degrees (10 degrees C)

Water Quality Limited Criteria

7-day average of the daily maximum exceeds the appropriate standard listed above. In cases where data was not collected as 7-day average, samples greater than 25 percent (and a minimum of at least two exceedences) of the samples exceed the standard based on multi-year monitoring programs that collect representative samples on separate days for the season of concern and time of day of concern (typically mid-to-late afternoon.)

TOXICS

Beneficial Use

Resident fish and aquatic life

Standard

Levels of toxic substances shall not exceed the criteria established by EPA

Criteria

EPA standard is violated more than 10 percent of the time and for a minimum of two values and the chemical is found in sediments at levels that can be expected to violate the standards.

Data requirements

Data are limited. Evaluation will based on the DEQ's best professional judgement. Listings will generally be based on at least two samples.

TURBIDITY

Beneficial Use

Resident fish and aquatic life, water supply, and aesthetics

Standard

No more than 10 percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activities.

Water Quality Limiting

A systematic or persistent increase (greater than 10 percent) in turbidity due to an operation activity that occurs on a persistent basis (e.g. dam release or irrigation return)

Data requirements

Data collected since October 1985 on a frequent enough basis (daily) to establish a relationship between water quality and a turbidity causing activity.

APPENDIX 10

GLOSSARY

Aquifer -- A geologic layer of permeable rock, sand, or gravel bearing water. The source of ground water for wells.

Area of Critical Environmental Concern (ACEC) -- Lands administered by BLM where special management attention is needed to protect important historic, cultural, or scenic values, fish and wildlife resource, or other natural systems or processes; to prevent irreparable damage; or to protect life and provide safety from natural hazards.

Base Flow – That part of stream flow that is not attributable to direct runoff from precipitation or melting snow, primarily sustained by groundwater discharge into the stream. See also stream flow.

Basin – A watershed and/or landscape where slopes and drainages flow toward a common area.

Biochemical oxygen demand (BOD) – The amount of oxygen needed for biological decomposition and chemical oxidation of sediments.

Bureau (BLM) sensitive species – Those which the State of Oregon is concerned about; the BLM treats these as if they were candidate species.

Candidate Species – those plants and animals included in Federal Register "Notices of Review" that are being considered by the US Fish and Wildlife Service for listing as threatened or endangered. BLM policy for candidate species is to not allow actions which would cause it to become listed as threatened or endangered.

- Category 1 Species are those for which there is substantial information to support proposing the species for listing as threatened or endangered; listing proposals are either being prepared or have been delayed by higher priority listing work.
- Category 2 Species are those for which there is information to indicate that listing is possibly appropriate and additional information is being collected.

Canopy cover – The leafy crown of trees or large shrubs that rises above low growing forbs, grasses, and water.

Channelization – The straightening and smoothing of river channels, frequently for flood control, sometimes accompanied by paving or bank armoring.

Cultural Resources – Any definite location of past human activity identifiable through field survey, historical documentation, or oral evidence; includes archaeological sites, structures or places, and places of tradition cultural or religious importance to specified groups whether or not represented by physical remains.

Discharge – Volume of water flowing past a reference point per unit of time (E.g., cubic feet per seconds, cfs.)

Dissolved oxygen (DO) concentration – The amount of oxygen dissolved in water, measured in milligrams per liter (mg/L.)

Diversion – In water rights, altering natural water flow in a drainage. It includes such actions as collecting water in a reservoir before it reaches a main stream channel, pumping from the stream, and damming the stream itself.

Ecology – The study of the interactions of living things and their environment.

Ecosystem – An interdependent community of plants and animals interacting with one another and with the chemical and physical factors making up their environment.

Endangered species – When a species faces possible extinction through all, or a significant portion of, its range. The predominant cause is loss of habitat.

Enhancement – Improving a system or habitat.

Environmental impact – The positive and negative effect of any action upon a given area or resource.

Ephemeral stream – A stream that flows only a short time (days of weeks) in direct response to rain storms.

Erosion – The movement of soil by water and wind and frost.

Filter strip – A strip or area of vegetation for removing sediment, organic material, and other pollutants from run-off and wastewater.

Flood plain – Flat areas bordering streams that are subject to flooding.

Forage plants – Plants used as food y domestic livestock and wildlife.

Forbs – A broad-leafed herb that is not a grass, sedge, or rush.

Geographic Information System (GIS) – A computer application for capturing, displaying, and analyzing spatial data and its related attributes.

Grazing System – The specific way in which the amount and timing of grazing is planned for a given area.

Groundwater – Water which occurs below the surface of the land.

Groundwater recharge – Replenishment of water removed or otherwise drained from an underground aquifer.

Gully – A channel, concentrated in a narrow area, formed by surface water eroding the soil. Depths can range from a few feet to as much as 100 feet.

Habitat – The specific area or environment in which a plant or animal lives and which provides all of the basic requirements for life for that organism.

Herbaceous vegetation – Having little or no woody material, such as grasses and forbs.

Herbivore – A plant-eating animal.

Hydrology – The study of relationships between water and the geologic environment.

Impact – A spatial or temporal change in the environment caused by human activity.

Impair – To diminish in value or quality.

Incised – Streambed cut where the streambed is eroding (Cutting) downward and backward (upstream.)

Indigenous – species that naturally originated, resided at, or utilized a given site since a baseline period or date.

Infiltration – The entry of water into the soil from any direction; see also percolation.

Lacustrine – Related to or growing in lakes.

Listed species – Any species of fish, wildlife or plant which has been determined to be endangered or threatened under Section 4 of the Endangered Species Act. It is any plant or animal which is in danger of extinction throughout all or a significant part of its range. Listed species are found in 50 CFR (Code of Federal Regulations) 17.11-17.12

Mesic – Characterized by a moderate amount of moisture; about 7-12" of annual precipitation.

Monitoring and Evaluation – Schedule sampling of selected environmental and biological variables and analysis of data to evaluate the progress and effectiveness of actions in meeting resource management objectives.

Mulch – Any substance that is spread or allowed to remain on the soil surface to decrease the erosion effects of raindrop impact, water runoff, or wind.

Native – Species that have originated naturally in a particular region.

Natural processes – Those physical, chemical, and biological processes that normally function in nature without adjustment or interference from human activity.

Nitrogen – A common, necessary elemental nutrient that in excess concentrations can cause environmental problems. Excess concentrations can come from fertilizers, septic systems, and animal wastes. Nitrogen dissolves in rainfall or irrigation water and leaches to the groundwater.

Nonpoint source pollution – Water pollution from dispersed and uncontrolled sources (such as surface runoff from rainstorms.)

Noxious weed – A plant specified by law as being especially undesirable, troublesome, and difficult to control.

Nutrients – That portion of any element or compound in the soil that can be readily absorbed and assimilated to nourish growing plants.

Off-highway vehicle – A motorized track or wheel vehicle designed for cross-country travel over natural terrain.

Organic matter – Residue of plant or animal origin.

PAM – (Polyacrylamide) Dissolved in irrigation water PAM greatly reduces furrow irrigation-induced soil losses. PAM also increases soil wettability and liquid limit and increases water-stable aggregation in soils.

Particulates – Minute particles suspended in a medium (water.)

Pasture – A subdivision of an allotment capable of being grazed by livestock independently from the rest of the allotment.

Percolation – Downward movement of water through soil.

Perennial – Occurs throughout a year.

PFC – see Proper Functioning Condition

pH – The symbol used to indicate an "acid" or "alkaline" condition, the relative concentration of hydrogen ions. A pH of 7 indicates neutrality, less than 7 is acid, and greater than 7 is alkaline.

Phosphorus – A common nutrient that in excess concentrations can cause problems in the environment. Phosphorus attaches to soil particles via chemical attraction. When soil erosion occurs and sediment enters water bodies, the phosphorous is carried with it.

Point source pollution – A source of pollutants from a single point of conveyance such as a pipe. For example, the discharge from a sewage treatment plant or a factory is a point source of pollution.

Pollutant – A harmful chemical or waste material discharged into the environment. Persistent pollutants are those that do no chemically break down (degrade), causing potential long-term toxicity to the environment.

Pollution – Impairment of land, air, or water quality by agricultural, domestic, or industrial waste to a degree having an adverse affect on beneficial uses or the facilities that serve such beneficial uses.

Population – Total number of individuals of the same species inhabiting a specified area.

Proper Functioning Condition (PFC) – "Riparian-wetland areas with adequate vegetation, landform, or large woody debris present to dissipate stream energy associated with high waterflows, thereby reducing erosions and improving water quality; filter sediment, capture bedload, and aid flood plain development; improve flood-water retention and ground-water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other sue; and support greater biodiversity. The functioning condition of riparian-wetland areas is a result of interaction among geology, soil, water, and vegetation."

Reach – A section of river between two specific points or possessing some common characteristic(s).

Research Natural Area (RNA) – An area which is as near a natural condition as possible, which exemplifies typical or unique vegetation and associated biotic, soil, geologic, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for scientific and educational purposes.

Resource conservation district – An autonomous unit of local government formed under state law by local vote and governed by an unpaid board of directors. Its purpose is to provide local direction for Federal and State governments to protect the soil, water and other natural resources of the district.

Resource management plan (RMP) – A land use plan that establishes coordinated land use allocations for all resource and support activities for a specific land area within a BLM district. It establishes objectives and constraints for each resource and support activity and provides data for consideration in program planning.

Restore – To bring back to the original condition, or to put back in place something that was lost. Ecological restoration is closely associated to the term's rehabilitation, recovery, and reclamation.

Rill erosion – The development of numerous minute closely-spaced channels resulting from the uneven removal of surface soil by running water that is concentrated in streamlets of sufficient discharge and velocity to generate cutting power.

Riparian – Plant community succession naturally occurring along the bank of a natural freshwater waterway such as a river, stream, or creek. Riparian zones support diverse and abundant terrestrial wildlife species, protect streambanks and adjacent land from erosion, and contribute significantly to aquatic communities by providing shade, cover from predators, nutrients, a buffer from nearby land use activities, and a filter for overland soil erosion.

Runoff – Water from rain, melted snow, or agricultural or landscape irrigation that flows over the land surface.

Salmonid – any species of a genus of Pacific Ocean fishes that can breed in rivers and stream tributary to the North Pacific. A fish in the salmon or trout family.

Scenic quality – The relative worth of a landscape from a visual point-of-view.

Sediment – Soils, mud, sand, silt, clay, and other particles transported from outside a stream system, or generated by erosion in the stream, that settle on the bottom of waterways.

Sediment load –Accumulation of soil fines in the stream water profile and streambeds.

Sediment pond – A basin constructed to collect and store sediment.

Sensitive habitat – Habitat, such as riparian corridors or wetlands, that exhibits rapid response to environmental changes.

Seral stage – The vegetative stage of a plant community capable of perpetuation under the prevailing climatic and edaphic conditions.

Sheet erosion – The removal of thin layers of surface material more or less evenly from an extensive area of gently sloping land, by broad continuous sheets of running water rather than by streams flowing in well-defined channels.

Soil – The loose upper layer of the earth in which plants grow; made up of inorganic material, organic material, air, and water.

Soil erosion – Detachment and movement of soil or rock by water, wind, ice, or gravity.

Special status species – Plant or animal species falling in any of the following categories: threatened; endangered; proposed threatened or endangered; candidate; state listed; Bureau (BLM) sensitive; and Bureau (BLM) assessment.

Species – Individuals that are of the same kind or likeness that are able t interbreed and produce viable young.

Species of Concern – Those species about which the State of Oregon is concerned. These are termed by the BLM as Bureau sensitive; the BLM treats these species as if they were candidates.

Stakeholder – A resident of a watershed or someone who has an interest in it (such as land management, administrative, or other responsibilities.) Stakeholders include (among others) private individuals, businesses, local, State, and Federal government agencies, special interest groups, wildlife, and fisheries.

State listed species – Plant or animal species listed by the State of Oregon as threatened or endangered pursuant to ORS (Oregon Revised Statutes) 496.004, ORS 498.026, or ORS 564.040.

Steppe – An extensive grassland area in arid regions of extreme temperature range and Loess soil.

Stilling basin -- A collection basin that slows the velocity of water to settle out particulates.

Straw mulch – The incorporation of straw into the soil profile to capture water and stabilize the soil.

Stream degradation – A lowering of the elevation of streambeds and flood plains by erosional removal of alluvium; may be caused when upstream sources of sediment are blocked, or if instream flows increase above historic levels.

Stream flow – Volume of water carried by a stream. Stream flow has two major components: runoff and baseflow.

Stream stabilization – The coordination of hydraulics, hydrology, physics, biology, and geology to establish a stable stream system in equilibrium with the natural forces acting on and in the stream.

Substrate – inorganic material that forms the bottom of a stream.

Threatened Species – A species is threatened when, although not presently at risk of extinction, in the absence of special protection and management efforts it is likely to become endangered in the foreseeable future.

Total dissolved solids (TDS) – The amount of dissolved material is water.

Transect – A line between two points of a study area along which data is collected.

Turbidity – Degree to which light penetration is blocked because water is muddy or cloudy.

Water table – Upper level of a saturated zone in an aquifer below the soil surface.

Watershed – An area or region drained by or contributing water to a stream, lake, or other body of water.

Wetlands – Transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Two major types of concern locally are seasonal wetlands inundated by winter and spring rainfall and flooding, and tidal wetlands flooded daily by ocean tides.

Woody vegetation – Having woody material such as willow, aspen, or shrubs.

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