March 20, 2014

[redacted]

Joelle Gore
Acting Chief, Coastal Programs Division (N/ORM3)
Office of Ocean and Coastal Resource Management
NOS, NOAA, 1305 East-West Highway
Silver Spring, Maryland, 20910

Delivered via e-mail to: joelle.gore@noaa.gov

RE: NOAA, EPA seek public comment on proposal to disapprove Oregon's Coastal Nonpoint Pollution Program

Thank you for accepting these comments on behalf of [redacted], a non-profit organization whose mission is to protect and restore water quality and fish populations in the Rogue River Basin and adjacent coastal watersheds.

[redacted], our parent organization, the Klamath-Siskiyou Wildlands Center, and our more than 3,000 members use and enjoy the Rogue River, its tributaries and the land encompassed within the Rogue basin.

We request that these comments be submitted into the record for EPA and NOAA's proposed disapproval of Oregon's Coastal Nonpoint Pollution Program.

Rogue Basin designated beneficial uses and concerns

The Coastal Zone Act Reauthorization Amendments (CZARA) applies to all watersheds in Oregon's North Coast, Mid- Coast, and South Coast Basins and the entirety of the Umpqua and Rogue River Basins. The designated beneficial uses to be protected within the Rogue include Public Domestic Water Supply, Private Domestic Water Supply, Industrial Water Supply, Irrigation, Livestock Watering, Fish & Aquatic Life (including Core Cold-Water Habitat and Salmon & Trout Rearing & Migration), Wildlife & Hunting, Fishing, Boating, Water Contact Recreation, Aesthetic Quality, Hydro Power and Commercial Navigation and Transportation.

[redacted] is concerned about the impacts of non-point source pollution primarily as it affects public and private drinking water supplies, fish & aquatic life, wildlife & hunting, fishing, boating, water contact recreation, aesthetic quality and commercial navigation & transportation. In short, the public's right to swim, drink and fish safely in our watershed and others within the Oregon coastal zone.

In particular we are concerned about the impacts of polluted runoff from currently defined non-point sources that are a product of timber harvest, agriculture and urban development. Specifically how those sources currently raise stream temperatures, and pollute our waterways with bacteria, turbidity and sediment. Furthermore the ways these

[redacted]
Subject: **FW: Horses and cows in Antelope Creek**
Date: March 12, 2008 4:17:22 PM PDT
[redacted]

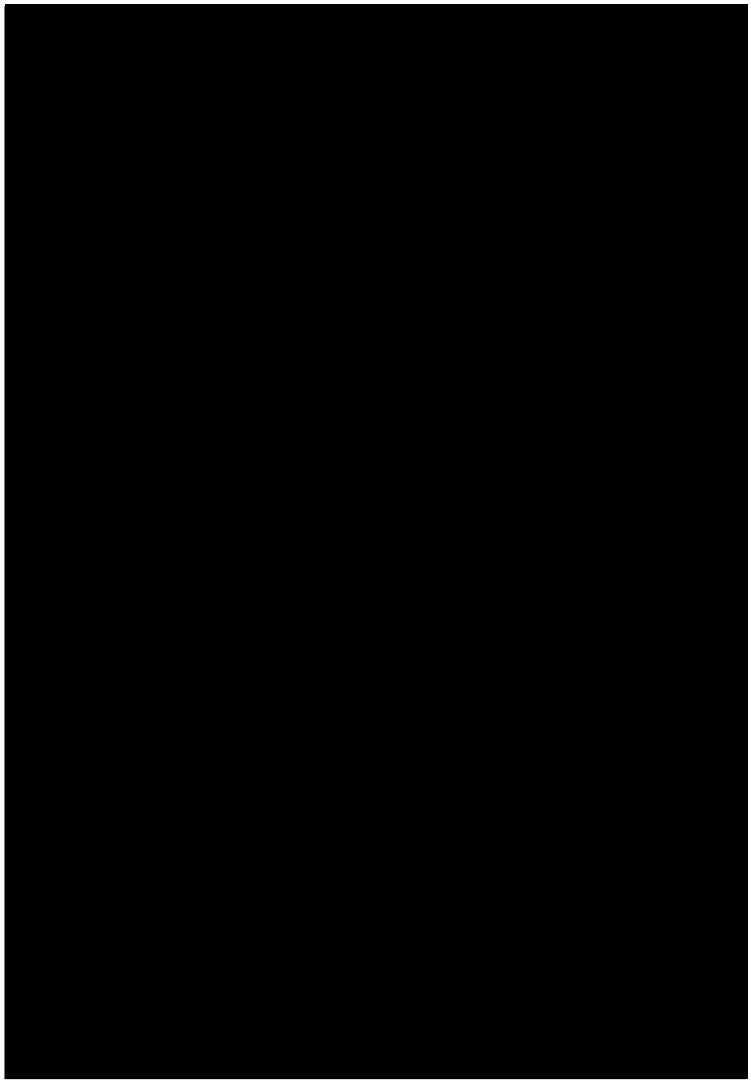
I asked for more specific information regarding the location (address and/or tax lot number). I should have time to drive by these complaints either tomorrow or Friday when I'm in the area both days.

[redacted]

------ Forwarded Message
From: [redacted]
Date: Wed, 12 Mar 2008 14:30:02 -0700
To: [redacted]
Subject: Horses and cows in Antelope Creek

[redacted] I would like to report a location where several horses and cows enter Antelope Creek. The location is on Bigham Brown Rd south of the bridge that crosses Antelope Creek (map 40E-15A). Additionally this location has an irrigation canal that flows on the east side of Bigham Brown that over flows down the hill during the summer and I assume washes cow and horse patties etc into the creek (grass is green to the creek).

[redacted]



[redacted]

Subject: **FW: Horses and cows in Antelope Creek**
Date: March 20, 2008 3:08:15 PM PDT
[redacted]

1 Attachment, 269 KB Save ▾ Slideshow

[redacted], here is the address of the Antelope Creek complaint and a photo.

[redacted]

--

[redacted]

------ Forwarded Message
From: [redacted]
Date: Wed, 19 Mar 2008 15:39:34 -0700
To: [redacted]
Subject: RE: Horses and cows in Antelope Creek

[redacted]

[redacted]
Sent: Monday, March 17, 2008 7:31 PM
To: [redacted]
Subject: Re: Horses and cows in Antelope Creek

[redacted] my boss has told me that until I get an address for the site, I can't do

any follow-up on this. Sorry about that. Could you send me an address? Thanks.

PS. I'm not sure what "map 40E-15A" references.

[redacted]

--

[redacted]

On 3/12/08 1:30 PM, [redacted]

> Eric, I would like to report a location where several horses and cows enter Antelope Creek. The location is on Bigham Brown Rd south of the bridge that crosses Antelope Creek (map 40E-15A). Additionally this location has an irrigation canal that flows on the east side of Bigham Brown that over flows down the hill during the summer and I assume washes cow and horse patties etc into the creek (grass is green to the creek).
>
> [redacted]
>
> [redacted]

Agriculture Water Quality Management Program
Compliance Investigation Reporting Form

Water Quality Management Area: Inland Rogue

Date/time complaint received: March 12, 2008

Complainant contact information: Maynard Flohaug, Rogue Valley Sewer Services, 541-664-6300

ODA investigator: Ken Diebel and Eric Nusbaum

Others present at meeting: Russ Cagle

Date/time of investigation: June 5, 2008 at approximately 6:30 PM

Name and contact information of person in-charge who gave permission to enter premises:
Russ Cagle
622 Bigham-Brown Rd, Eagle Point, OR 97524
541-830-0086 (h)

Owner of property under investigation:
Paulette Cagle

Site address/phone number:
622 Bigham-Brown Rd.
Eagle Point, OR 97524
541-830-0086 (h)
541-826-2111 x 3427(work – VA facility)

Latitude & Longitude (decimal degrees)
42.4369 -122.8021

Mailing address:
Same

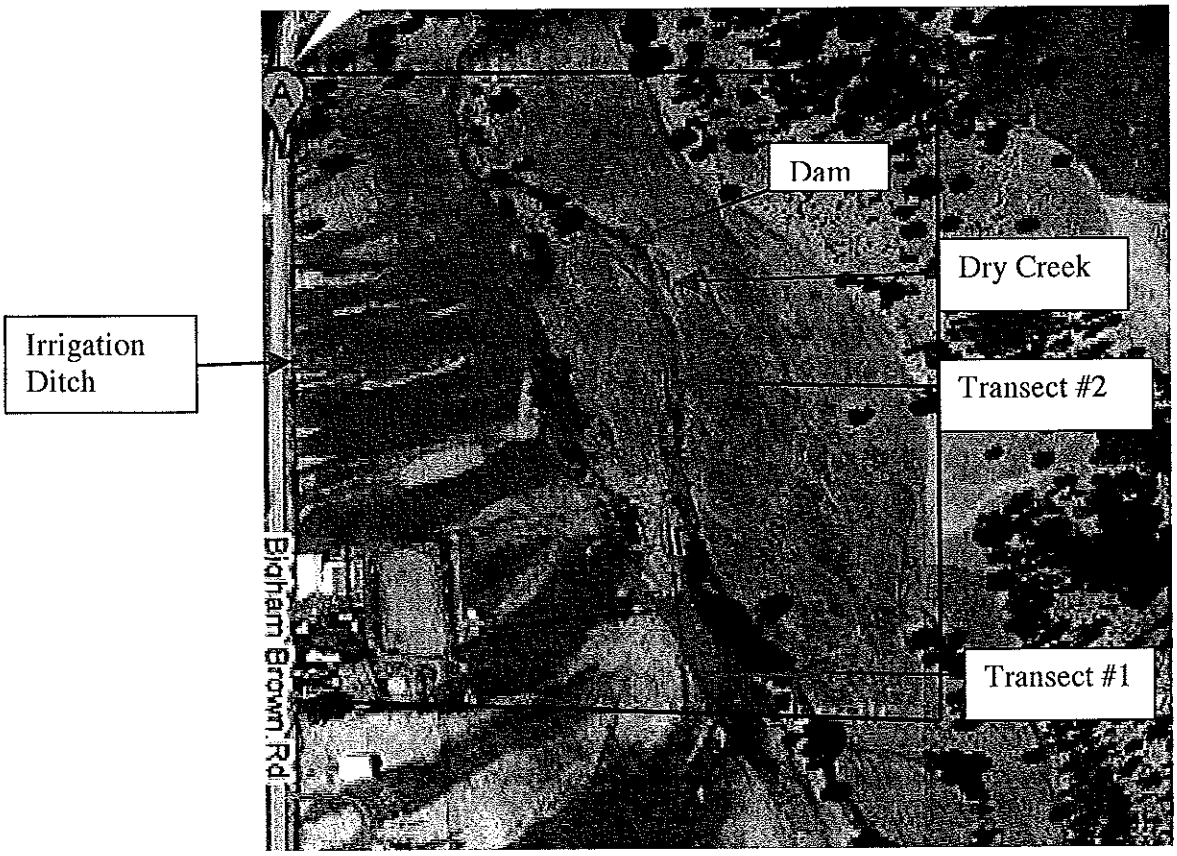
Purpose of investigation:
Complaint of horses in Antelope Creek and damage to streambanks and riparian vegetation.

Facility description:
This property has 12 horses and 3-4 cow-calf pairs in the field/pasture. There were also two stallions kept in separate paddocks. There are about 40 acres total.

Management Area Rules (insert or summarize)

OAR 603-095-1440 (2) States "Riparian Vegetation Destruction. Agricultural management of riparian areas shall not impede the development of adequate riparian vegetation to control water pollution.
(a) Effective four years after rule adoption[1], vegetation and streambank conditions in riparian areas shall not result in the following:
(A) Sloughing of streambanks due to management practices which result in sediment entering a stream beyond what would be expected; or
(B) Destabilized streambanks beyond what would be expected in that specific hydrologic regime; or
(C) Damage to riparian vegetation that degrades its proper function and the vegetative recovery that is reasonably necessary to withstand a 25-year high flow event; or
(D) Absence of seasonally appropriate regeneration and recruitment, according to site capability.
(b) This condition is not intended to prohibit riparian grazing where it can be done while managing for proper functioning riparian condition."

Site drawing:



[1] Inland Rogue Rules were adopted in 2001

Activity log:

3/12/08 - Received complaint.

3/20/08 - Enough information received to make a complete complaint
Eric Nusbaum started process to contact landowner. Determining the landowner and getting a response was difficult

4/15/08 In effort make contact with the landowner, Tom Straughan and Mike Powers of ODA, and Randy White, Jackson SWCD, dropped by the Cagle residence at 11:30 AM after a site visit to a different property in the county. Paulette Cagle was not home. Mr. Straughn spoke with Ms. Cagle's mother, who gave him Mr. Cagle's work phone number. From the road, we could see a large pasture (maybe 40-50 acres) with the creek flowing through it. A road across the creek with a culvert was installed in approximately the center of the property. The culvert is apparently undersized or plugged and is backing up the creek with water flooding the pasture. There are some cross fences that look to be in disrepair. There were about 15-20 horses and 5-6 cows in the pasture. There are few trees or shrubs along the creek other than blackberry bushes.

6/5/08 Site visit

Documentation methods:

Photos, two riparian transects.

Summary of findings:

On 6/5/08 at approximately 6:30 pm, Ken Diebel and Eric Nusbaum arrived at the Cagel property. Russ Cagle granted us permission to go on the property. His wife was sick. Mr. Cagle accompanied KD and EN down to the creek. Mr. Cagle said the property was about 40 acres and Dry Creek runs the length of the property roughly bisecting the middle and runs north to south. His wife had purchased the property in 1991.

We observed about 12 horses, 3-4 cow calf pairs, and one bull in the main pasture. There were two stallions in separate paddocks. Mr. Cagle said the animals were out in the pasture year round and had access to the creek at all times.

Mr. Cagle stated that he had a contractor put a small earthen dam in the center of the creek. The backed up water is used for irrigation. The water hits the dam and flows around it out into the pasture creating a boggy area on the west side of the creek. The Cagles also flood irrigate the pasture from a ditch that runs along the west side of the property.

The pasture vegetation consists mainly of buttercup, foxtail, cheat grass, knapweed, star thistle, and many other weedy forbs.

We explained to Mr. Cagle that we were here to document conditions on the property by photos and riparian transects. KD explained that each basin in the state had an

agricultural water quality plan and a set of rules. Each area's rules differ but each has an anti-pollution provision and a riparian protection rule. KD explained the importance of riparian vegetation. EN explained the Inland Rogue Plan and Rules and pointed out its irrigation return flow rule. EN recommended that the Cagles contact the SWCD for advice on pasture management.

KD and EN conducted two riparian transects. We began Transect One at the far south end of the property on the west side of the creek. We were able to sample 43 steps of the transect when we encountered an impenetrable clump of blackberry. We shifted to the left and continued the transect for 50 more steps. We visually estimated the cover from outside the clump. The clump was uniform. The understory was blackberry and rose, another layer of tall willow, and an over story of ash. We counted 66 points of bare ground, 50 were under the blackberry, rose, and willow clump. The rest of the groundlayer consisted of 17 points of cheat grass, 9 of forbs (a variety of weed species) and one rock. There were 6 points of blackberry in the shrub layer and 11 points of ash in the tree layer.

Transect Number	**Ground/herb Layer - # steps in each cover type**				**Shrub Layer - # steps with shrub layer**		**Tree Layer - # steps with tree layer**	
1	Bare Ground	66 (71%)	Grass	17 (18%)	Shrubs		Trees	
	Litter		Forb	9 (10%)	Blackberry	6 (6%)	Ash	61 (66%)
	Rock	1 (1%)	Rush		Blackberry/rose/ willow	50 (54%)		
	Gravel		Sedge					
	Water							

* 50 steps under dense thicket of shrubs and trees.

Our second transect began where the slack water began roughly 200 yards downstream of the end of transect one. We noted dead willows and roses (death was most likely due to drowning by the backed up water.) This transect consisted of 26% bare ground, 47% grass (mostly cheat grass), and 27% forbs. There were 8 steps of shrub layer consisting of blackberry.

Transect Number	**Ground/herb Layer - # steps in each cover type**				**Shrub Layer - # steps with shrub layer**		**Tree Layer - # steps with tree layer**	
2	Bare Ground	27 (26%)	Grass	49 (47%)	Shrubs		Trees	
	Litter		Forb	28 (27%)	blackberry	8 (8%)		
	Rock		Rush					
	Gravel		Sedge					
	Water							

The Jackson County soil survey maps the soils on this riparian area to be an Albin silty clay loam. The description of this soil series is as follows:

- pH is near neutral,
- No restrictive layer,
- Moderate infiltration,
- Occasional flooding,
- Depth to water table is usually 122 cm.

The NRCS' potential natural community listed in the soil survey is a nearly even distribution of the following species:

- Blackberry (invasive),
- Sumac,
- Willow,
- Snowberry,
- Oregon grape,
- Service berry,
- Oregon ash,
- Black cottonwood,
- Oregon white oak,
- Klamath plum.

This is the appropriate riparian vegetation for this site.

Bank Conditions:
We noted livestock had trampled several areas along Dry Creek. This was particularly evident in and around the outflow of the in-stream dam, and at the south end of the property near the beginning of Transect #1. These are areas where the animals went to drink or crossed the creek to get to the pasture on the other side.

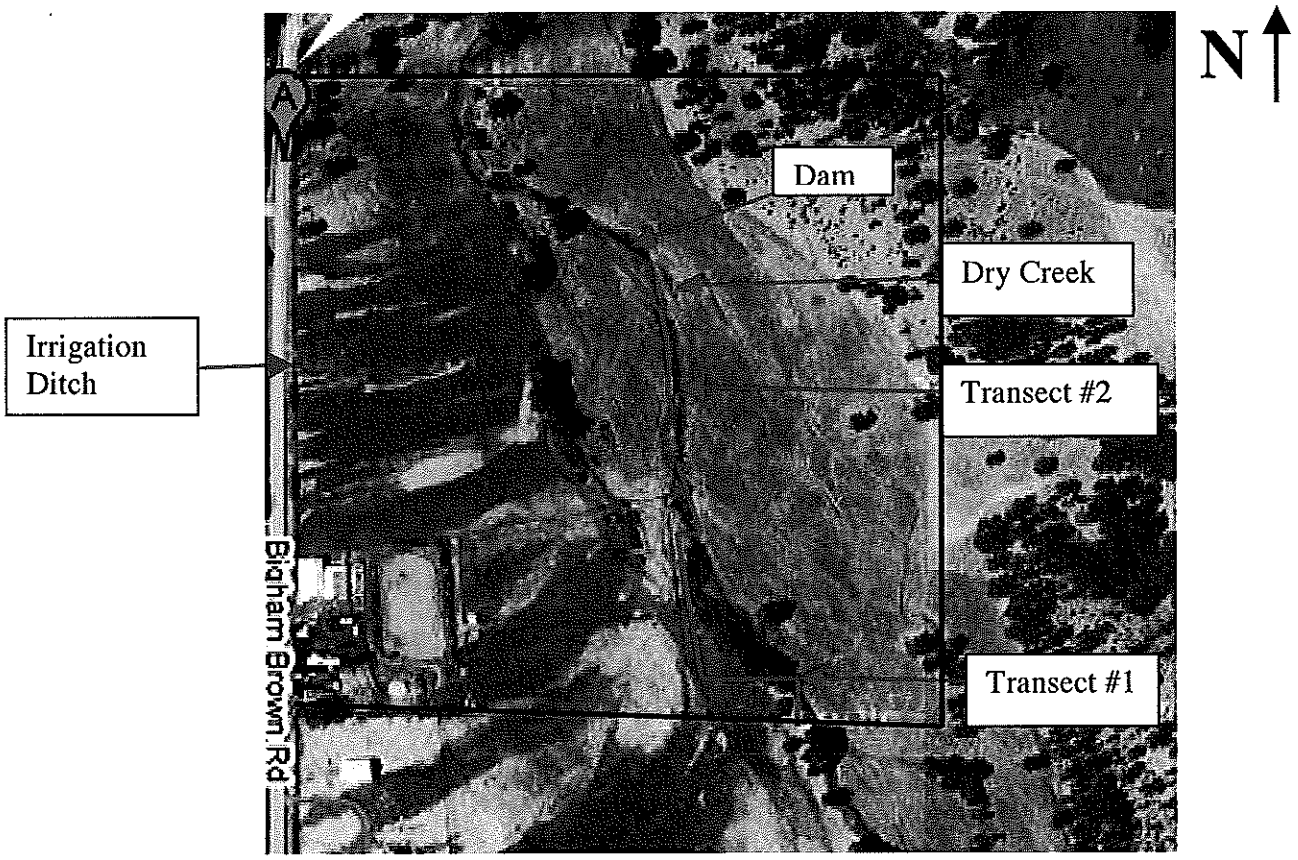
Recommendations discussed with landowner/operator:
Staff recommended contacting local SWCD for advice on pasture management and weed control.

Additional recommendations to include in correspondence:

Actions taken:
EN notified Water Resources and DSL about the in-stream dam.
Letter of Warning sent July 11, 2008

Follow-up activities:

Site drawing:



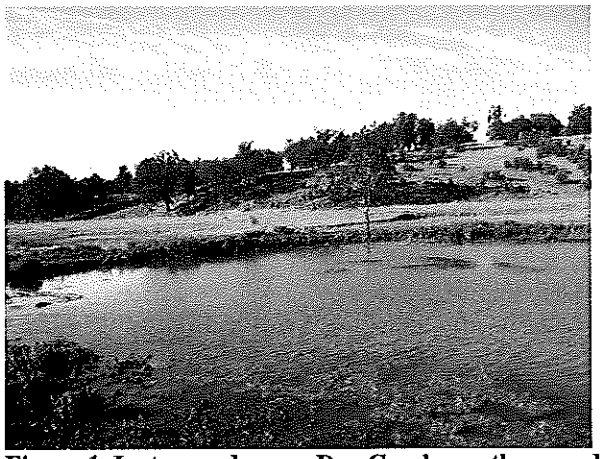


Figure 1. Instream dam on Dry Creek, northern end of property.

Photographer: Eric Nusbaum, ODA
Date: 6/5/08

Figure 2. Water outflow around instream dam on Dry Creek. Facing north, northern end of property.

Figure 3. Dead willows at the beginning of ponded water from instream dam. Middle of Transect #2. Facing south and east.

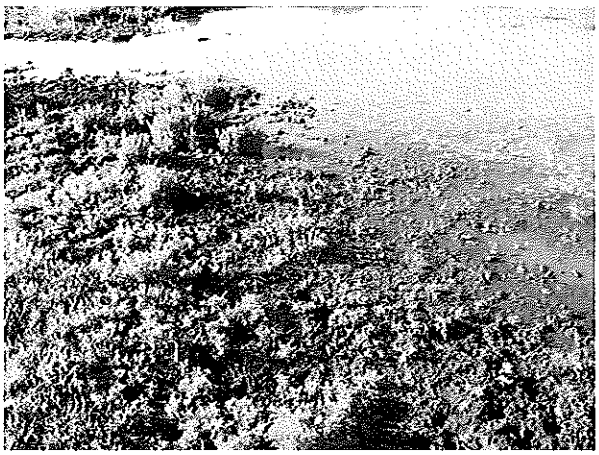


Figure 4. Bank conditions along Dry Creek near instream dam. Livestock damage. End of Transect #2.

Figure 5. Bank conditions at the beginning of Transect #1. Livestock crossing. Southern end of property facing north east.

Figure 6. Grazed woody riparian vegetation: Transect 1. Southern end of property

Figure 7. Large clump of riparian vegetation near the middle of Transect #1 southern end of property.

Figure 8. Livestock grazing below instream dam, north end of property.

Figure 9. Dry Creek streamside vegetation conditions near the middle of Transect #2, middle of property facing east.

Oregon
Theodore R. Kulongoski, Governor

Department of Agriculture
635 Capitol Street NE
Salem, OR 97301-2532

July 11, 2008

Russ Cagle
622 Bigham-Brown Rd
Eagle Point, OR 97524

Dear Mr. Cagle:

On June 6, 2008, Eric Nusbaum and Ken Diebel of the Oregon Department of Agriculture (department), met with you at your property to investigate a complaint about livestock in the creek and damaged stream banks.

Department staff documented a lack of appropriate streamside vegetation along the majority of Dry Creek within your property due to livestock grazing. Agricultural water quality rules adopted for your area state: "Agricultural management of riparian areas shall not impede the development of adequate riparian vegetation to control water pollution." (OAR 603-095-1440(2)(a)). Conditions on your property violate this water quality rule.

While landowners must prevent and control water pollution, you may choose the practices that work best for your operation. Department staff discussed several management options to improve your streamside vegetation. These include:

- Rotational grazing
- Planting appropriate woody species
- Fencing the stream to exclude livestock
- Providing water for livestock away from the stream

As staff discussed with you, Mr. Randy White with the Jackson Soil and Water Conservation District in Medford can provide information about their horse management workshops and the landowner incentive program. You may contact Mr. White at (541) 734-3143.

Mr. Nusbaum will contact you to set up a follow-up site visit after October 1, 2008. The department appreciates your efforts to protect water quality. If you have any further questions on the matter please contact Mr. Nusbaum at (503) 510-8930.

Sincerely,

Ray Jaindl, Administrator
Natural Resources Division
PH (503) 986-4713,
FX (503) 986-4730

cc: Randy White, Jackson Soil and Water Conservation District
Ken Diebel, Oregon Department of Agriculture (La Grande)
Eric Nusbaum, Oregon Department of Agriculture (Eugene)

Oregon
Theodore R. Kulongoski, Governor

Department of Agriculture
635 Capitol Street NE
Salem, OR 97301-2532

February 2, 2009

Paulette Cagle
622 Bigham-Brown Rd
Eagle Point, OR 97524

Dear Ms. Cagle:

On January 21,2009, Ken Diebel of the Oregon Department of Agriculture (Department), met with you at your property to follow up on a June 5, 2008 investigation concerning damaged stream banks and poor streamside vegetation. Department staff documented a lack of appropriate streamside vegetation along the majority of Dry Creek within your property due to livestock grazing in June. Conditions documented in January show no improvement. The streamside vegetation on Dry Creek must show improvement over time to comply with agricultural water quality rules.

Agricultural water quality rules adopted for your area state: "Agricultural management of riparian areas shall not impede the development of adequate riparian vegetation to control water pollution." (OAR 603-095-1440(2)(a)). Conditions on your property continue to violate this water quality rule.

While landowners must prevent and control water pollution, you may choose the practices that work best for your operation. Department staff discussed several management options to improve your streamside vegetation. These include:

- Rotational grazing
- Planting appropriate woody species
- Fencing the stream to exclude livestock
- Providing water for livestock away from the stream

As staff discussed with you, Mr. Randy White with the Jackson Soil and Water Conservation District in Medford can provide information about their horse management workshops and the landowner incentive program. You may contact Mr. White at (541) 734-3143.

Department staff will contact you to set up a follow-up site visit after June 1, 2009 to determine if you have taken sufficient actions to achieve compliance with agricultural water quality laws. Compliance enforcement, in addition to this Letter of Warning, may be necessary if you do not take sufficient action to establish adequate streamside vegetation. If you have any further questions on the matter, please contact Mr. Diebel at (541) 562-5129 ext. 27.

Sincerely,

Ray Jaindl, Administrator
Natural Resources Division
PH (503) 986-4713,
FX (503) 986-4730

cc: Randy White, Jackson Soil and Water Conservation District
Encs.

AGRICULTURE WATER QUALITY MANAGEMENT PROGRAM
COMPLIANCE INVESTIGATION REPORTING FORM
CI3

Water Quality Management Area: Inland Rogue

Date/time complaint received: March 12, 2008

Complainant contact information: Maynard Flohaug, Rogue Valley Sewer Services, 541-664-6300

ODA investigator: Eric Nusbaum

Others present at meeting: Russ Cagle

Date/time of investigation: January 22, 2010 10:03 AM

Name and contact information of person in-charge who gave permission to enter premises:

Russ Cagle
622 Bigham-Brown Rd
Eagle Point, OR 97524
541-830-0086 (h)

Owner of property under investigation:

Paulette Cagle

Site address/phone number:

622 Bigham-Brown Rd.
Eagle Point, OR 97524
541-830-0086 (h)
541-826-2111 x 3427(work – VA facility)

Latitude & Longitude (decimal degrees)

42.4369 -122.8021

Mailing address:

Same

Township, Range, Section, Tax Lot

T 36S R. 01W, S. 15, TL #300

Purpose of investigation:

Follow up to 1/21/09 site visit.

Facility description:

This property has 11 horses and 6 cows and 2 calves in the field/pasture. There are about 40 acres total.

Management Area Rules (insert or summarize)

OAR 603-095-1440 (2) States "Riparian Vegetation Destruction. Agricultural management of riparian areas shall not impede the development of adequate riparian vegetation to control water pollution.
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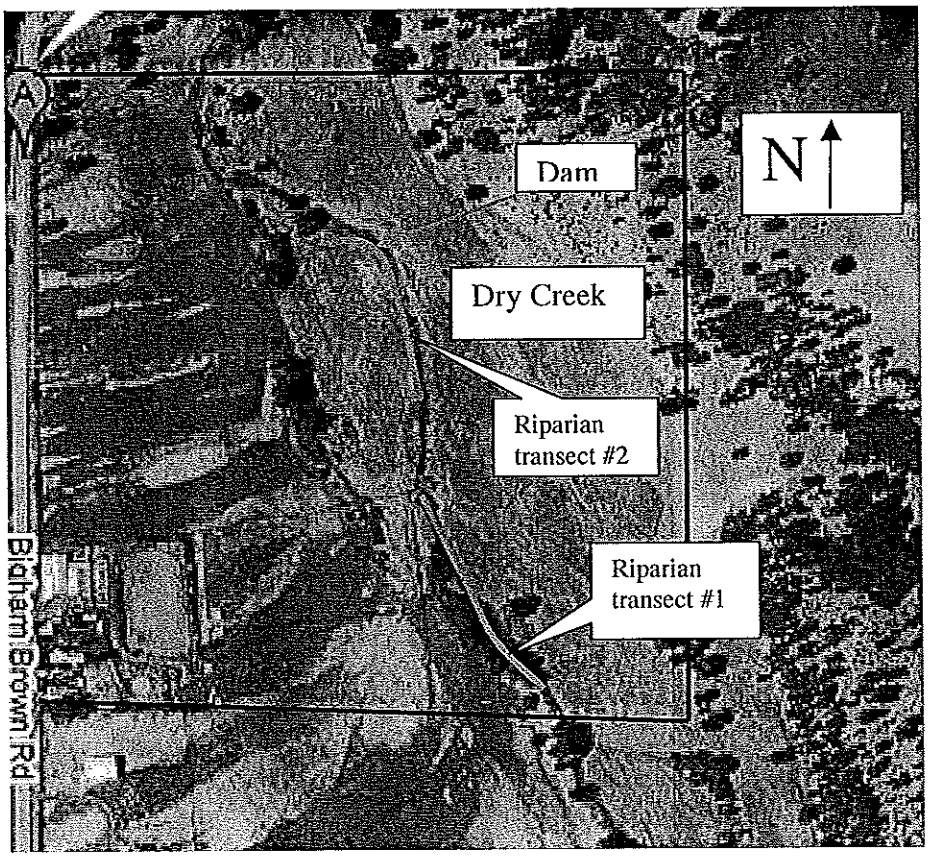


[1] Inland Rogue Rules were adopted in 2001

Activity log:

3/12/08 - Received complaint.

3/20/08 - Enough information received to make a complete complaint. Eric Nusbaum started process to contact landowner. Determining the landowner and getting a response was difficult.

4/15/08 In an effort make contact with the landowner, Tom Straughan and Mike Powers of ODA, and Randy White, Jackson SWCD, dropped by the Cagle residence at 11:30 AM after a site visit to a different property in the county. Paulette Cagle was not home. Mr. Straughn spoke with Ms. Cagle's mother, who gave him Mr. Cagle's work phone number. From the road, we could see a large pasture (maybe 40-50 acres) with the creek flowing through it. A road across the creek with a culvert was installed in approximately the center of the property. The culvert is apparently undersized or plugged and is backing up the creek with water flooding the pasture. There are some cross fences that look to be in disrepair. There were about 15-20 horses and 5-6 cows in the pasture. There are few trees or shrubs along the creek, other than blackberry bushes.

6/5/08 Site visit.

1/21/09 Follow up site visit.

10/9/09 Meeting between Cagles and Jackson SWCD to discuss need to have a farm plan and progress on meeting water quality rules.

1/22/10 Follow-up site visit.

2/3/10 EN met with Jackson SWCD to discuss landowner applying for assistance grant for permanent fencing.

2/26/10 EN talked to Mrs. Cagle about status of Jackson SWCD Landowner Assistance grant application.

3/3/10 Received signed grant application to Jackson Landowner Assistance Program for fencing via fax.

Documentation methods:

Photos, notes, two riparian transects.

Summary of findings:

Eric Nusbaum (EN) met Russ Cagle at the house at 10:03 am. He gave permission for EN to enter the property. Mr. Cagle explained that he had installed an electric rope fence along the creek but that the livestock often knocked it down. Mr. Cagle believed the bull was the most likely culprit and that the bull had been slaughtered several weeks ago. EN observed that the rope was absent although the posts were in the ground along the creek.

Mr. Cagle explained that the rope was up until two days ago until the livestock had again knocked it down.

EN took two transects at the same location as the original transects in 2008. Transect #2 corresponded with the sole transect taken by Ken Diebel in 2009 (See site diagram for location). The transects consisted of 100 steps each and were approximately 450 feet long. The transects and comparison with previous transects are listed below in the table. EN could not identify the grass because of winter dormancy and the fact that it had been grazed down to nearly ground level. EN was not able to identify any forb species due to winter dormancy. Shrubs were predominantly blackberries with some additional unidentifiable winter dormant or dead species present.

	June 2008		Jan 2009		Jan 2010	
Transect	#1	#2	#1	#2	#1	#2
Ground Layer	%	%	%	%	%	%
Bare ground	71	26	n/a	58	64	75
Rock	1		n/a	1		
Litter			n/a	1	2	
Grass	18	47	n/a	29	34	25
Forb	10	27	n/a	11		
Shrub Layer	54	8	n/a	14	42	6
Tree Layer	66		n/a	0	21	0

The Jackson County soil survey maps the soils on this riparian area to be an Albin silty clay loam. The description of this soil series is as follows:

- pH is near neutral,
- No restrictive layer,
- Moderate infiltration,
- Occasional flooding,
- Depth to water table is usually 122 cm.

The NRCS' potential natural community listed in the soil survey is a nearly even distribution of the following species:

- Blackberry (invasive),
- Sumac,
- Willow,
- Snowberry,
- Oregon grape,
- Service berry,
- Oregon ash,
- Black cottonwood,
- Oregon white oak,
- Klamath plum.

This is the appropriate riparian vegetation for this site.

Bank Conditions:
Livestock had trampled several areas along Dry Creek. This was particularly evident in and around the outflow of the in-stream dam, and at the south end of the property. These are areas where the animals went to drink or crossed the creek to get to the

pasture on the other side. This trampling accounted for much of the bare ground noted in the riparian transect. Some of the bare ground was ankle to knee-deep mud.

Pasture Conditions:
The pasture vegetation surrounding the riparian area was heavily grazed, and had a large percentage of bare and muddy ground.

Recommendations discussed with landowner/operator:

EN explained to Mr. Cagle that the electric rope fence was not adequate to keep livestock out of the riparian area and that a different fencing system was needed to exclude the livestock, if that was his preferred management strategy, to comply with the agriculture water quality rules. The electric rope system has been shown to be repeatedly knocked down by his livestock and would take significant maintenance to keep using. EN acknowledged the financial challenges incurred with building a permanent fence, but encouraged Mr. and Mrs. Cagle to apply for grant funding through the Jackson SWCD. Mr. Nusbaum also encouraged Mr. and Mrs. Cagle to enroll in the Jackson SWCD pasture management classes and develop a pasture management plan.

Additional recommendations to include in correspondence:

None

Actions taken:

Recommend a LOW be sent with follow up after June 1st.

Follow-up activities:

EN contacted the Jackson SWCD to help facilitate the landowner's application to the Jackson SWCD Landowner Assistance Program. EN also called Paulette Cagle, the landowner, to ensure that she was in contact with the SWCD and that a site visit by the SWCD was scheduled to complete the grant application. Site visits were made by the SWCD in late February and early March to collect data, prepare the grant application and obtain signatures. A signed application was delivered to the SWCD on March 3rd with a copy sent to EN. A decision on the grant application is expected at the end of April. It is EN's understanding that construction of the fence will begin immediately afterwards with completion expected by the end of May.

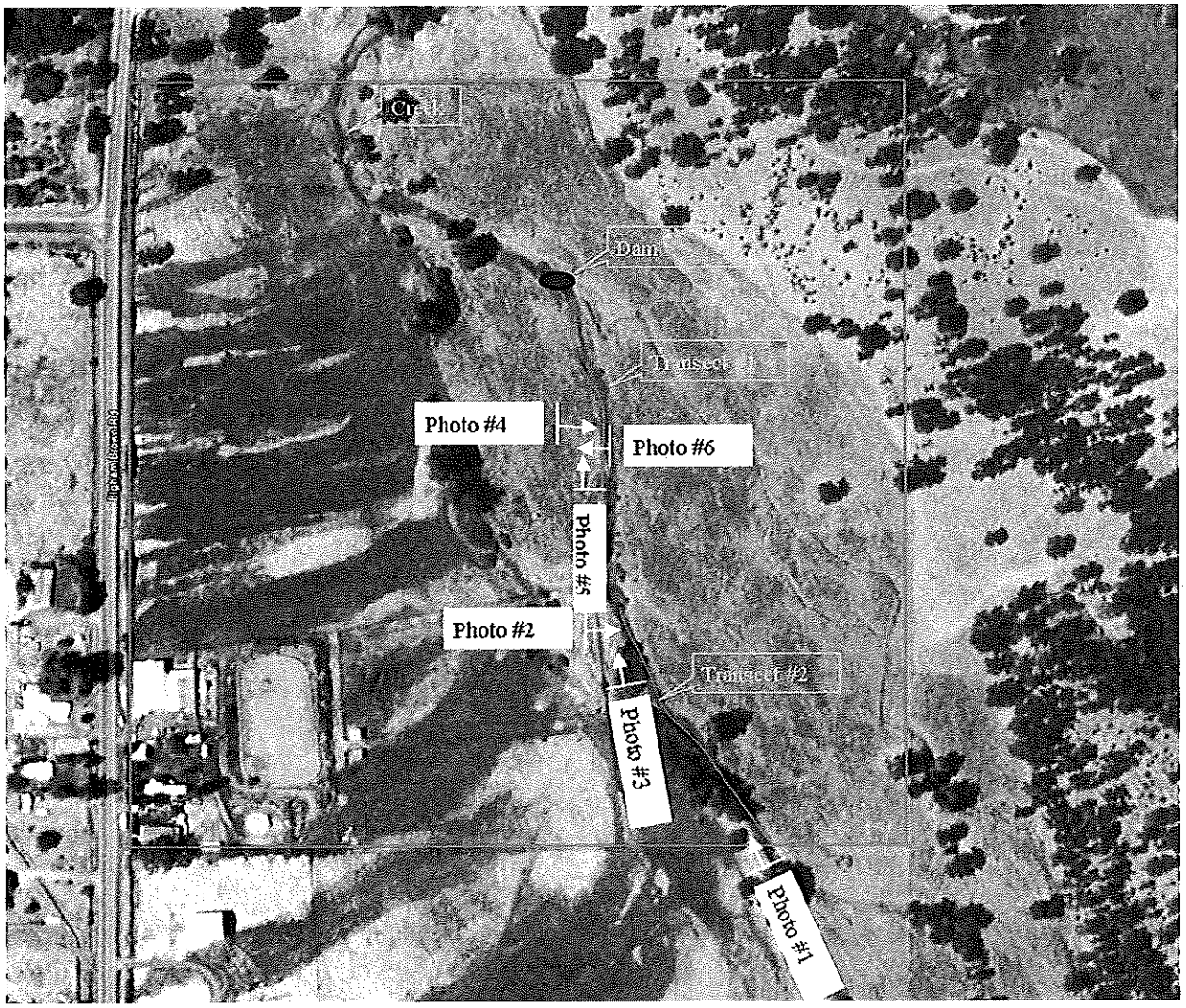


Photo Point Site Diagram

All photos taken by Eric Nusbaum

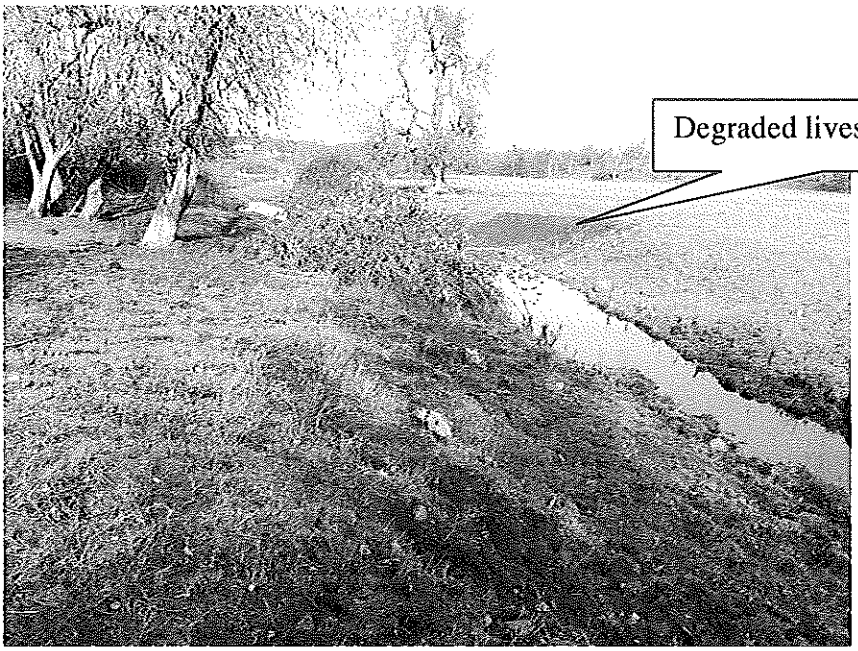


Photo #1: Looking north, downstream at upstream portion of riparian transect #1.

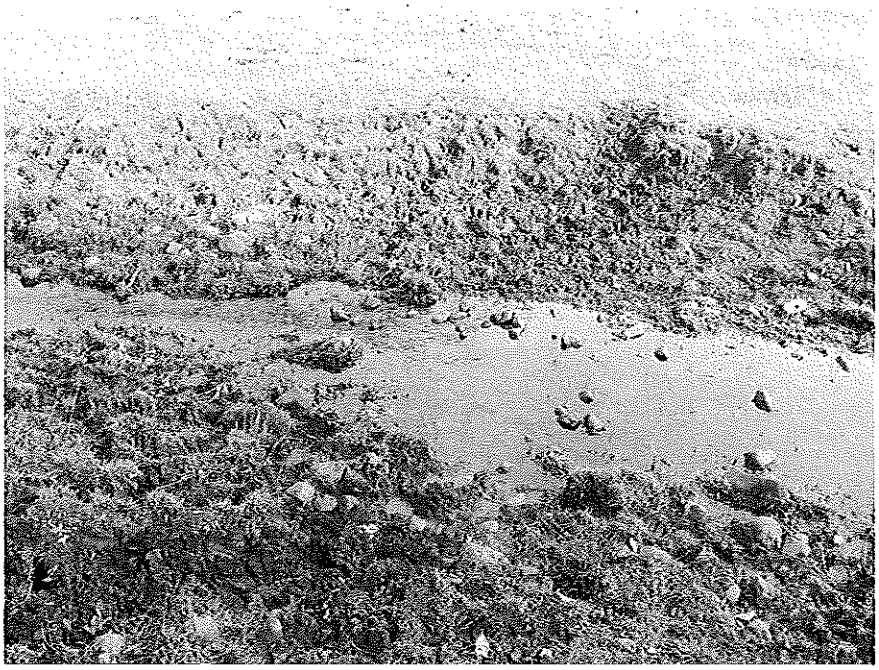


Photo #2: Looking at livestock access and crossing point in middle of transect #1.

Photo #3: End of transect #1 showing lack of vegetation on both sides of creek.

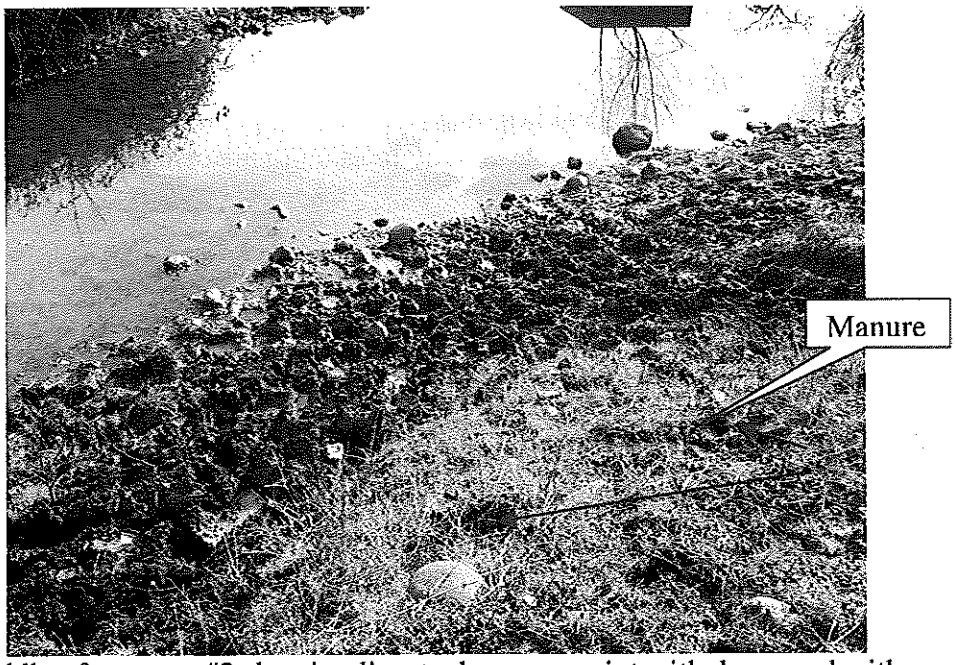


Photo #4: Middle of transect #2 showing livestock access point with deep mud with manure on embankment.

Photo #5: Looking downstream of creek along transect #2 showing lack of vegetation and degraded streamside due to livestock access.

Photo #6: Looking away from creek, NNW, at t-posts that had held electric rope. Landowner stated electric rope was coiled at end of line of t-posts after the rope had been knocked down by livestock.

Oregon
Theodore R. Kulongoski, Governor

Department of Agriculture
635 Capitol Street NE
Salem, OR 97301-2532

April 5, 2010

Paulette Cagle
622 Bigham-Brown Rd
Eagle Point, OR 97524

Dear Mrs. Cagle:

Thank you for meeting with Eric Nusbaum from the Oregon Department of Agriculture (Department) on January 22, 2010, to follow up on a water quality complaint received in June 2008 associated with your farm on Bigham-Brown Road.

Department staff documented a lack of appropriate streamside vegetation along the majority of Dry Creek within your property due to livestock grazing. Conditions, also documented in June 2008 and January 2009, have shown no improvement. Vegetation data indicate that conditions are actually worsening. The streamside vegetation on Dry Creek must show improvement to comply with agricultural water quality rules.

Based on these findings, your property remains in violation of agricultural water quality regulations in the Inland Rogue Water Quality Management Area. (OAR 603-095-1400(2))

The Department understands that you are taking the following measures to prevent pollution:

- Maintaining the temporary electric rope fence along Dry Creek, monitoring it so you restore it immediately if it is damaged or knocked to the ground.
- Applying for a Jackson Soil and Water Conservation District (SWCD) Land Owner Assistance grant to build a permanent livestock exclusion fence.

It is the Department's understanding that you will receive notice of a grant decision in early May 2010, and that you plan to begin construction of the fence immediately thereafter, with completion expected by the end of that month.

The Department will contact you after June 1, 2010, to arrange a follow-up visit and determine compliance. If you have any questions regarding this matter, please contact Eric Nusbaum at 541-846-6424. Thank you for working with the Jackson SWCD to improve riparian conditions.

Sincerely,

Ray Jaindl

Ray Jaindl, Administrator
Natural Resources Division
PH (503) 986-4700
FX (503) 986-4730

c: Jackson SWCD

AGRICULTURE WATER QUALITY MANAGEMENT PROGRAM
COMPLIANCE INVESTIGATION REPORTING FORM
CI4

Water Quality Management Area: Inland Rogue

Date/time complaint received: March 12, 2008

Complainant contact information: Maynard Flohaug, Rogue Valley Sewer Services, 541-664-6300

ODA investigator: Eric Nusbaum

Others present at meeting: Paulette Cagle

Date/time of investigation: August 2, 2010 5:30PM

Name and contact information of person in-charge who gave permission to enter premises:
Paulette Cagle
622 Bigham-Brown Rd
Eagle Point, OR 97524
541-830-0086 (h)

Owner of property under investigation:
Paulette Cagle

Site address/phone number:
622 Bigham-Brown Rd.
Eagle Point, OR 97524
541-830-0086 (h)
541-826-2111 x 3427(work – VA facility)

Latitude & Longitude (decimal degrees)
42.4369 -122.8021

Mailing address:
Same

Township, Range, Section, Tax Lot
T 36S R. 01W, S. 15, TL #300

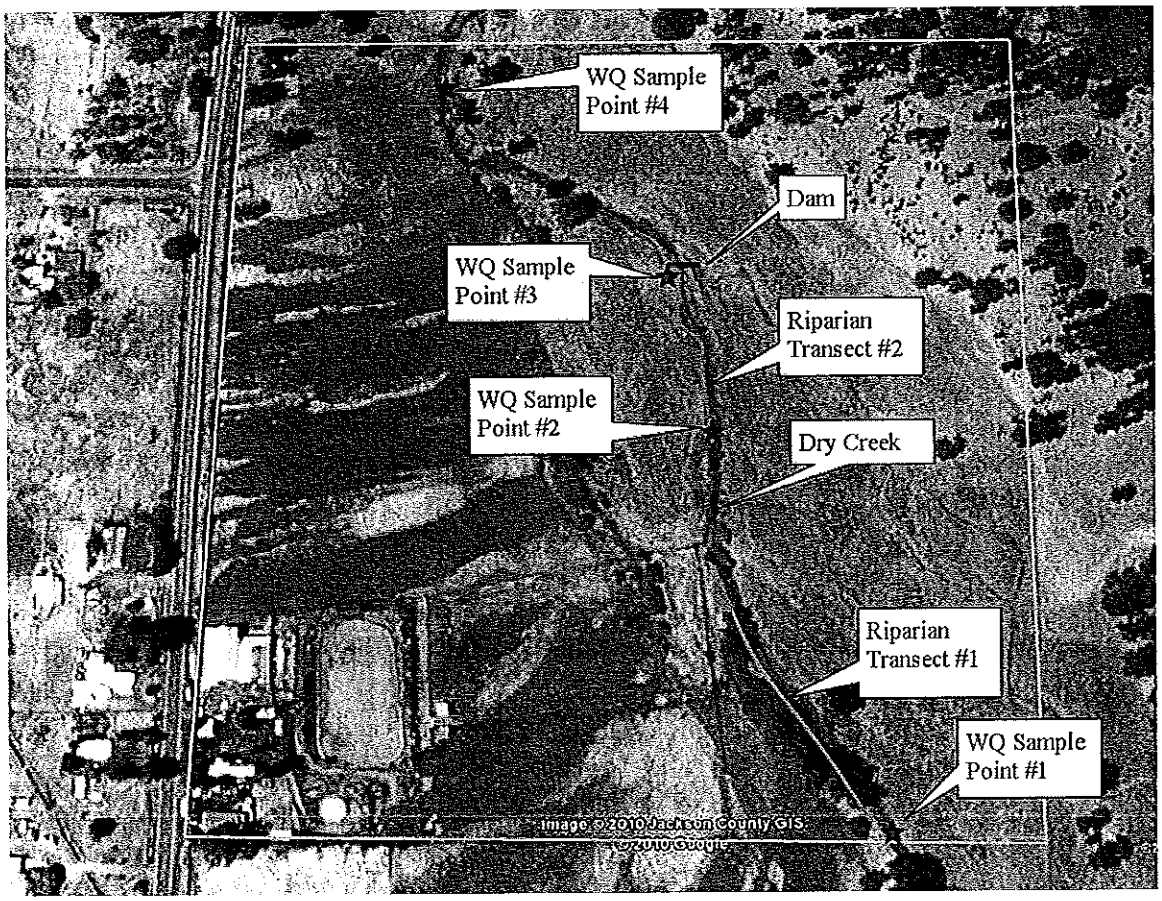
Purpose of investigation:
Follow up to 1/22/10 site visit.

Facility description:
This property has 11 horses, 2 colts and 7 cows in the field/pasture. There are about 40 acres total.

Management Area Rules (insert or summarize)

OAR 603-095-1440 (2) States "Riparian Vegetation Destruction. Agricultural management of riparian areas shall not impede the development of adequate riparian vegetation to control water pollution.
(a) Effective four years after rule adoption[1], vegetation and streambank conditions in riparian areas shall not result in the following:
(A) Sloughing of streambanks due to management practices which result in sediment entering a stream beyond what would be expected; or
(B) Destabilized streambanks beyond what would be expected in that specific hydrologic regime; or
(C) Damage to riparian vegetation that degrades its proper function and the vegetative recovery that is reasonably necessary to withstand a 25-year high flow event; or
(D) Absence of seasonally appropriate regeneration and recruitment, according to site capability.
(b) This condition is not intended to prohibit riparian grazing where it can be done while managing for proper functioning riparian condition."
(4) Excessive Nutrient Introductions
(a) Effective on rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

Site drawing:



[1] Inland Rogue Rules were adopted in 2001

Activity log:

3/12/08 - Received complaint.

3/20/08 - Enough information received to make a complete complaint. Eric Nusbaum started process to contact landowner. Determining the landowner and getting a response was difficult.

4/15/08 In an effort make contact with the landowner, Tom Straughan and Mike Powers of ODA, and Randy White, Jackson SWCD, dropped by the Cagle residence at 11:30 AM after a site visit to a different property in the county. Paulette Cagle was not home. Mr. Straughn spoke with Ms. Cagle's mother, who gave him Mr. Cagle's work phone number. From the road, we could see a large pasture (maybe 40-50 acres) with the creek flowing through it. A road across the creek with a culvert was installed in approximately the center of the property. The culvert is apparently undersized or plugged and is backing up the creek with water flooding the pasture. There are some cross fences that look to be in disrepair. There were about 15-20 horses and 5-6 cows in the pasture. There are few trees or shrubs along the creek, other than blackberry bushes.

6/5/08 Site visit.

1/21/09 Follow up site visit.

10/9/09 Meeting between Cagles and Jackson SWCD to discuss need to have a farm plan and progress on meeting water quality rules.

1/22/10 Follow-up site visit.

2/3/10 EN met with Jackson SWCD to discuss landowner applying for assistance grant for permanent fencing.

2/26/10 EN talked to Mrs. Cagle about status of Jackson SWCD Landowner Assistance grant application.

3/3/10 Received signed grant application to Jackson Landowner Assistance Program for fencing via fax.

6/29/10 EN left message at both home and work numbers to set up site visit after July 16th. Mrs. Cagle returned call and site visit scheduled for July 26th.

7/12/10 Mrs. Cagle left message while EN on vacation requesting one-week delay in site visit due to financial difficulties in purchasing fencing material.

7/22/10 EN left message to reschedule to August 2nd.

8/2/10 Follow-up site visit.

Documentation methods:

Photos, notes, two riparian transects and water samples for *E. coli* analysis.

Summary of findings (observations):

Eric Nusbaum (EN) met Mrs. Cagle at the house at 5:30pm. She gave permission for EN to enter the property. Mrs. Cagle explained that she and her husband had installed the corner posts for the fencing, but not wire. They were waiting for the cement to dry and expected to have the fence completed the following weekend (August 7-8). Mrs. Cagle said that their livestock would not be allowed on the opposite bank of the creek until fencing can be purchased and installed on the opposite side. Mrs. Cagle also stated that she had bought a stock tank for off-stream watering, but had not begun to use it yet.

EN took two transects at the same location as the original transects in 2008. Transect #2 corresponded with the sole transect taken by Ken Diebel in 2009 (See site diagram for location). The transects consisted of 100 steps each and were approximately 450 feet long. The transects and comparison with previous transects are shown in Table 1. Most of the grasses were dead or dormant. Forbs were mostly mayweed chamomile, thistle with unidentifiable dead or dormant species. Shrubs were predominantly blackberries and wild rose. Litter was primarily dried manure and dead vegetation.

The Jackson County soil survey maps the soils on this riparian area to be an Albin silty clay loam. The description of this soil series is as follows:

- pH is near neutral,
- No restrictive layer,
- Moderate infiltration,
- Occasional flooding,
- Depth to water table is usually 122 cm.

Table 1: Riparian Transects

	June 2008		Jan 2009		Jan 2010		Aug 2010	
Transect	#1	#2	#1	#2	#1	#2	#1	#2
Ground Layer	%	%	%	%	%	%	%	%
Bare ground	71	26	n/a	58	64	75	48	27
Rock	1		n/a	1				1
Litter			n/a	1	2		15	17
Grass	18	47	n/a	29	34	25	32	44
Forb	10	27	n/a	11			5	11
Shrub Layer	54	8	n/a	14	42	6	41	21
Tree Layer	66		n/a	0	21	0	30	0

The NRCS' potential natural community listed in the soil survey is a nearly even distribution of the following species:

- Blackberry (invasive),
- Sumac,
- Willow,
- Snowberry,
- Oregon grape,
- Service berry,
- Oregon ash,
- Black cottonwood,
- Oregon white oak,
- Klamath plum.

This is the appropriate riparian vegetation for this site.

Bank Conditions:
Livestock had trampled several areas along Dry Creek. This was particularly evident at the south end of the property. These are areas where the animals went to drink or crossed the creek to get to the pasture on the other side. There were occasional areas of streambank erosion.

Pasture Conditions:
The pasture vegetation surrounding the riparian area was heavily grazed, and had a large percentage of bare ground. Most of the grass was dead or dormant. Little irrigation of the pastures had occurred during the summer.

Water Quality Sampling:
EN took water quality samples at four locations along Dry Creek. Samples were taken at the upstream property line (#1), at the beginning of slack water due to the dam (#2), just before the creek passes around the dam (#3), and within 20 feet of the downstream fence line (#4). Oregon Department of Environmental Quality (DEQ) standard for *E. coli* is 406 MPN/100 mL. Samples were taken to Neilson Labs in Medford, Oregon within 16 hours. Samples were taken in bottles supplied by Neilson Labs and placed on ice in an ice chest. Additional ice was added during the return to the office and in the morning before driving to the lab. The ice chest was stored overnight in the ODA office. Sampling results are shown in Table 2.

***Table 2. E. coli* Results**

Site #:	MPN/100 mL	Site Description
#1	727.0	Upstream property line at south end of property
#2	1986.3	Beginning of slack water above dam
#3	>2419.6	Just before water exits dam
#4	344.8	20 feet above downstream property line

E. coli was most likely introduced to Dry Creek, during the summer, through direct contact of livestock which would deposit fecal matter in the creek while drinking or crossing the creek to reach pasture on the opposite side. Additional *E. coli* may have been introduced through overland flow of flood irrigation water carrying fecal matter into the creek.

Determination:
Due to continued access to Dry Creek by the landowner's livestock, management of the riparian area impedes the development of adequate riparian vegetation to control water pollution.

Testing for *E. coli* shows an introduction of bacteria into waters of the state in excess of Oregon DEQ standards.

EN recommends a Notice of Noncompliance because agricultural activities conducted by Mrs. Cagle along Dry Creek do not allow the growth and maintenance of riparian vegetation.

Recommendations discussed with landowner/operator:

EN discussed the need to complete the fence and install the off-stream watering device as soon as possible.

Additional recommendations to include in correspondence:

Do not graze the far side of the creek until an appropriate fence is constructed that permanently excludes the livestock from the riparian area.

Actions taken:

Follow-up activities:

Cagle CI4
Photo Documentation

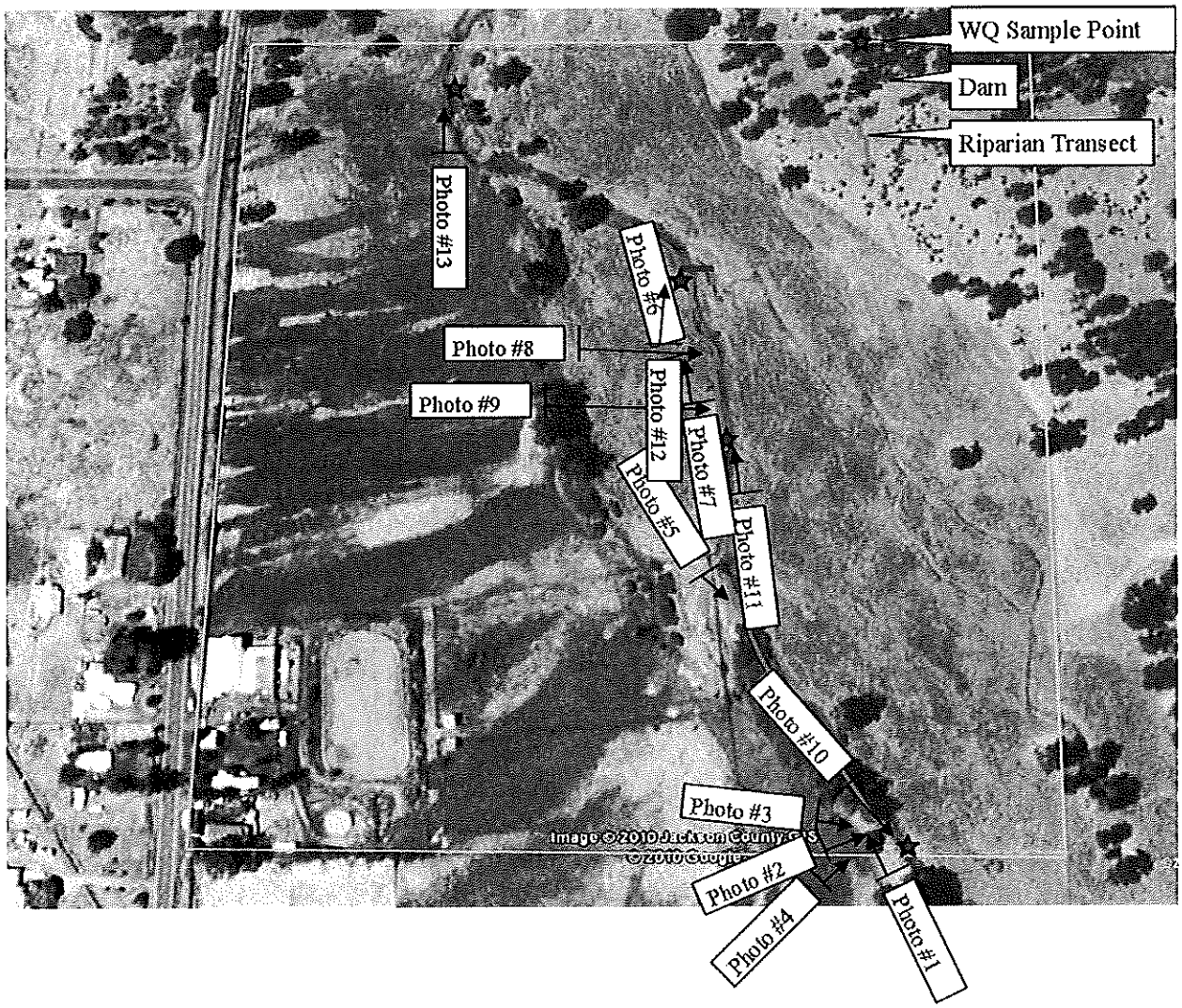


Photo Point Site Diagram

Photo #1: Looking west, downstream, at beginning of riparian transect #1 showing state of riparian vegetation. Vegetation on top of streambank is highly grazed grass/weeds with no additional understory vegetation except for occasional patches of blackberries.

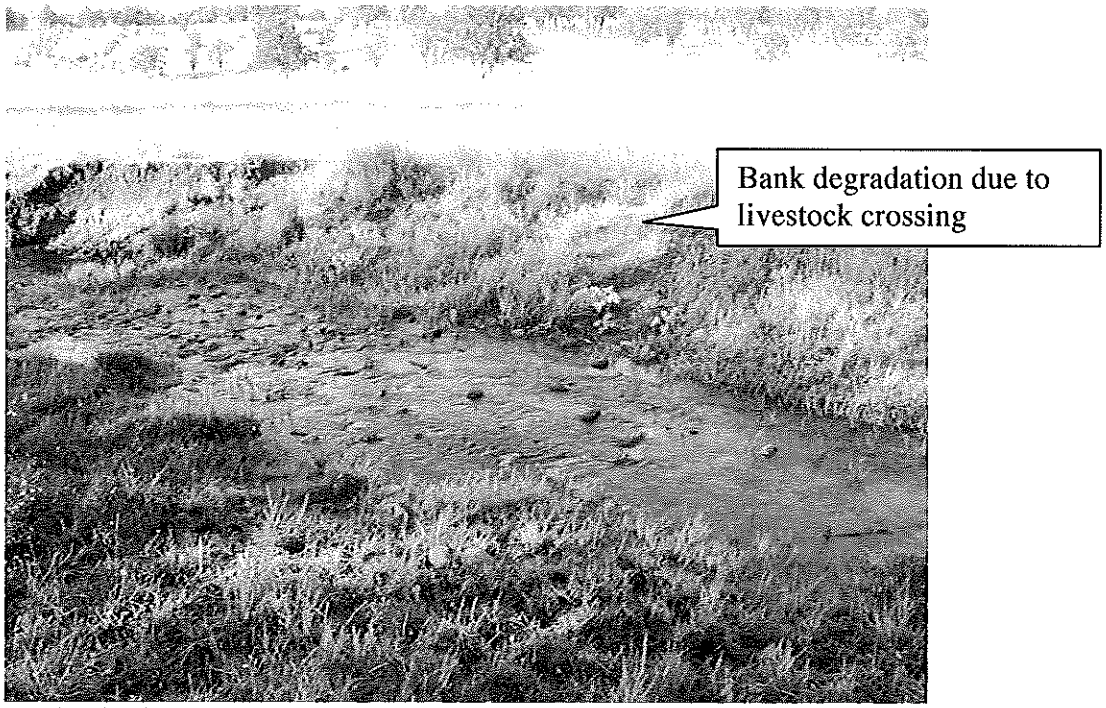


Photo #2: Near beginning of riparian transect #1 showing degradation due to livestock crossing. Livestock have grazed and trampled streamside vegetation creating eroding bare ground or highly grazed grass with little other vegetation.

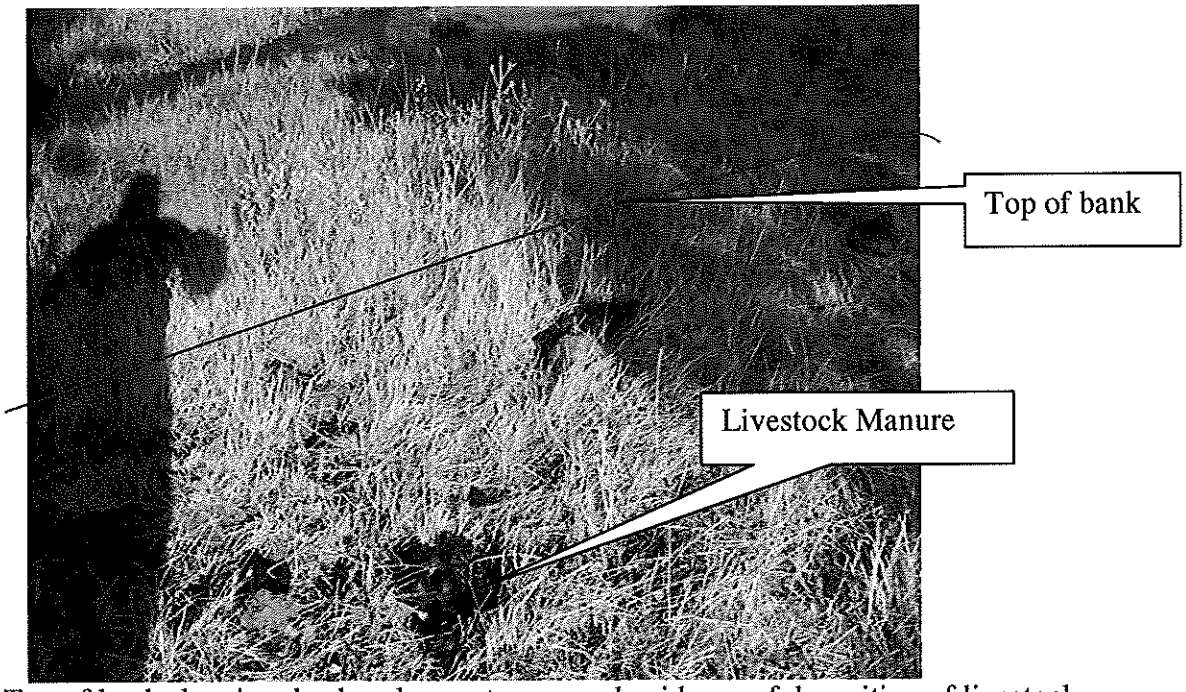


Photo #3: Top of bank showing dead or dormant grass and evidence of deposition of livestock manure. Note lack of any vegetation besides grazed grass/weeds and that green grass in channel is also grazed.

Photo #4: Near beginning of riparian transect #1 showing livestock crossing and lack of riparian vegetation. NRCS soil survey and nearby intact riparian areas show that wild roses, service berries, willow and ash trees, and a variety of forbs should be growing in this riparian area.

Photo #5: Looking eastward and upstream at end of riparian transect #1 showing riparian area with both vegetation and no vegetation.

Photo #6: Looking east and upstream near middle of transect #2 showing lack of riparian vegetation. Unfinished fence is also shown.

Photo #7: Near middle of riparian transect #2 looking westward and downstream showing lack of riparian vegetation. Dam is also shown.

Photo #8: Typical remaining riparian vegetation along riparian transect #2 showing dead or dormant grass and noxious weeds.

Photo #9: Dry creek near beginning of slack water above dam showing algae growth.

Photo #10: Dry Creek at upstream fence line where water quality sample #1 was taken.

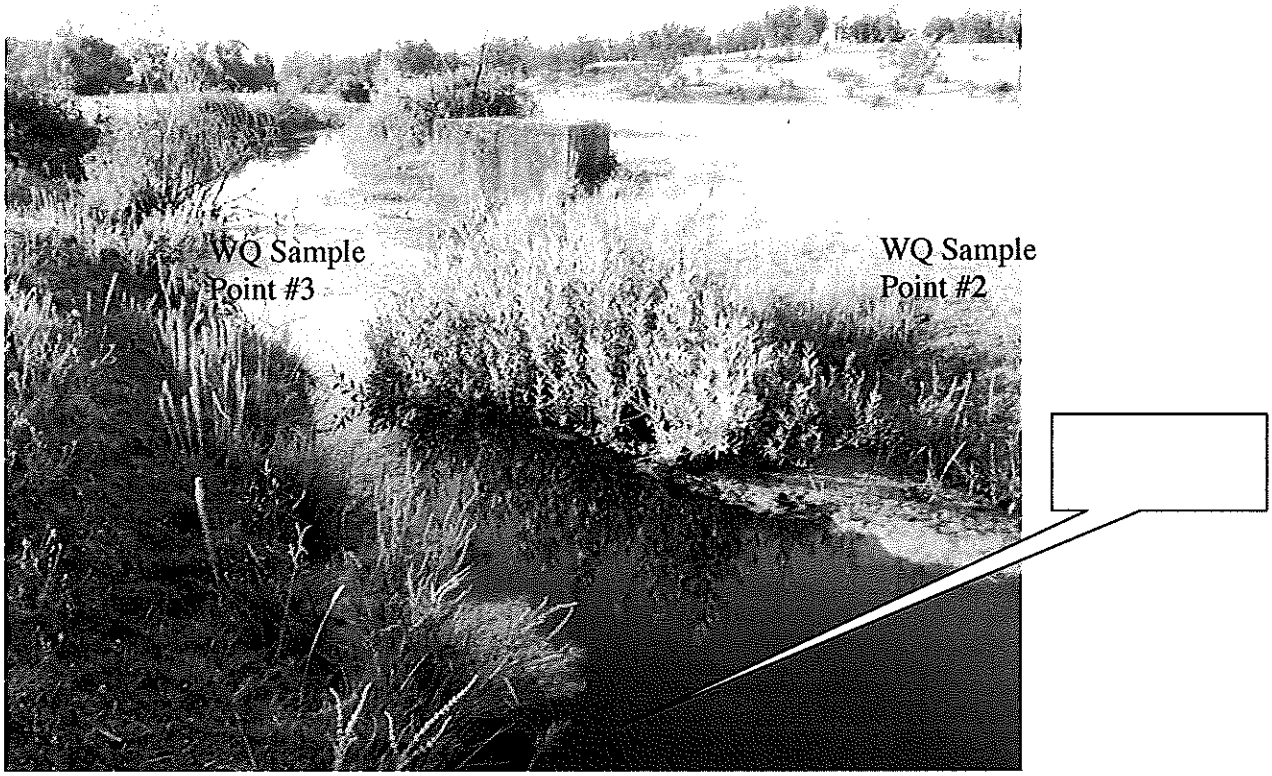


Photo #11: Beginning of slack water from dam where water quality sample #2 was taken.

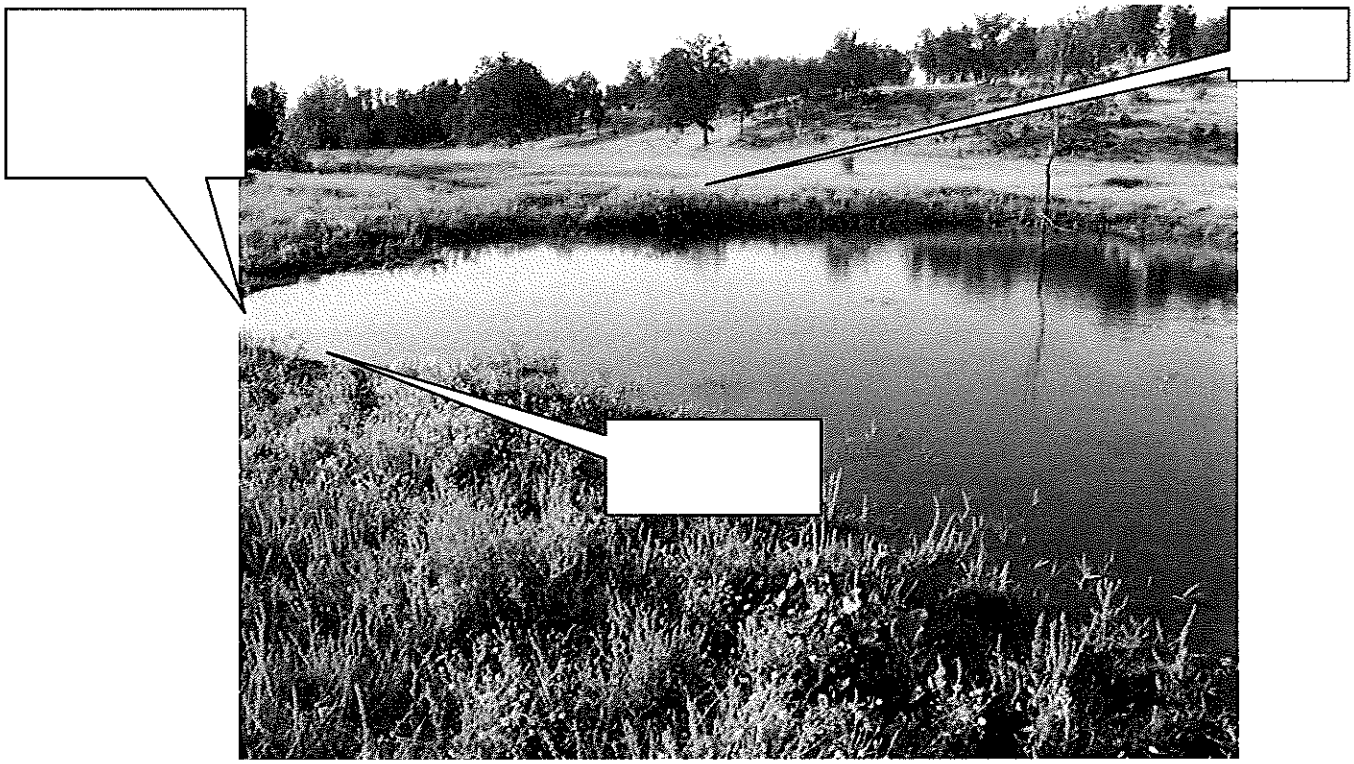


Photo #12: Dam on Dry Creek where water quality sample #3 was taken just before outlet of water around edge of dam. Water quality samples were taken at points #2 & #3 to determine input of *E. coli* at various points along the creek due to unrestricted livestock access.

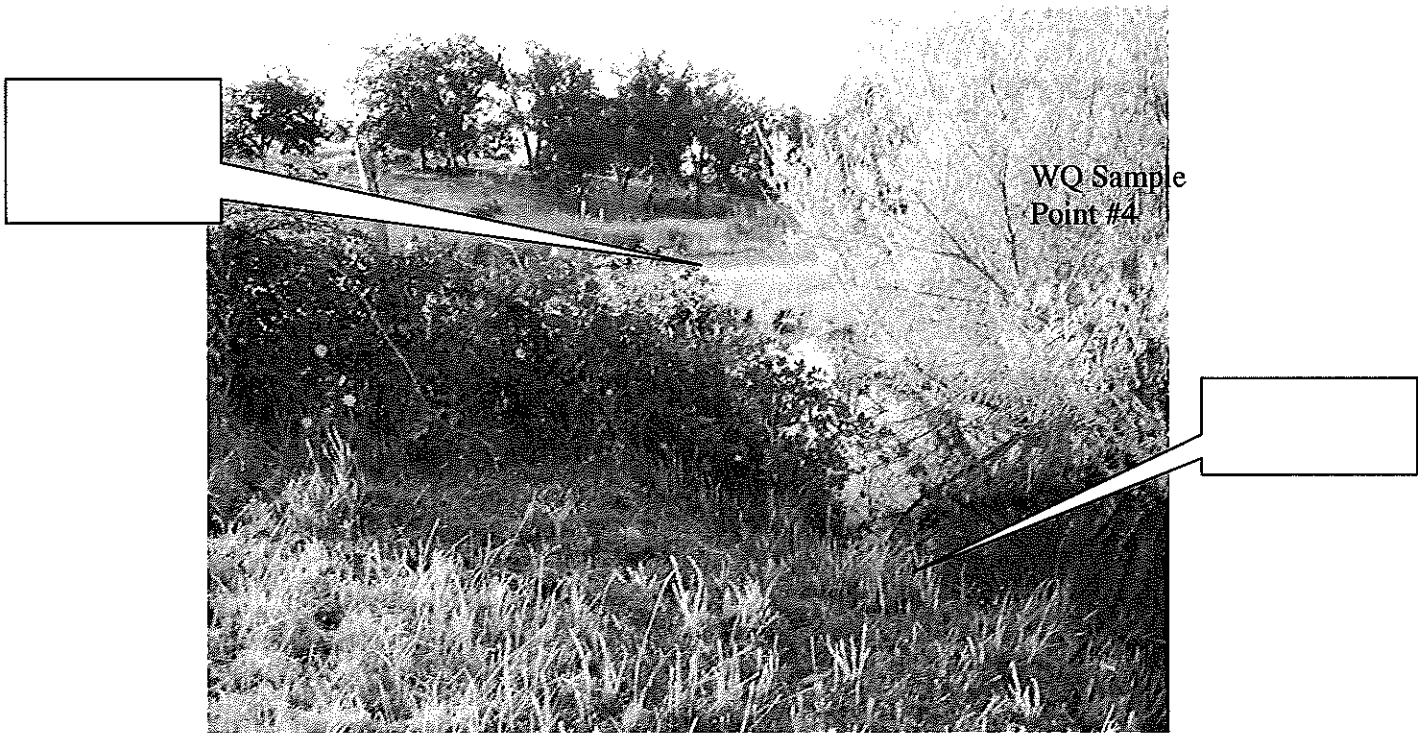


Photo #13: Near downstream edge of property line where water quality sample #4 was taken.

Agriculture Water Quality Management Program
Compliance Investigation Reporting Form
CI5

Water Quality Management Area: Inland Rogue

Date/time complaint received: March 12, 2008

Complainant contact information: Maynard Flohaug, Rogue Valley Sewer Services, 541-664-6300

ODA investigator: Eric Nusbaum

Others present at meeting: Paulette Cagle

Date/time of investigation: October 25, 2010 12:00PM

Name and contact information of person in-charge who gave permission to enter premises:

Russ Cagle
622 Bigham-Brown Rd
Eagle Point, OR 97524
541-830-0086 (h)

Owner of property under investigation:

Paulette Cagle

Site address/phone number:

622 Bigham-Brown Rd.
Eagle Point, OR 97524
541-830-0086 (h)
541-826-2111 x 3427(work – VA facility)

Latitude & Longitude (decimal degrees)

42.4369 -122.8021

Mailing address:

Same

Township, Range, Section, Tax Lot

T 36S R. 01W, S. 15, TL #300

Purpose of investigation:

Follow up to 8/2/2010 site visit and resulting Notice of Non Compliance and Plan of Correction dated September 8, 2010.

Facility description:

This property has 14 horses, 1 mule and 9 cows in the field/pasture. There are about 40 acres total.

Management Area Rules (insert or summarize)

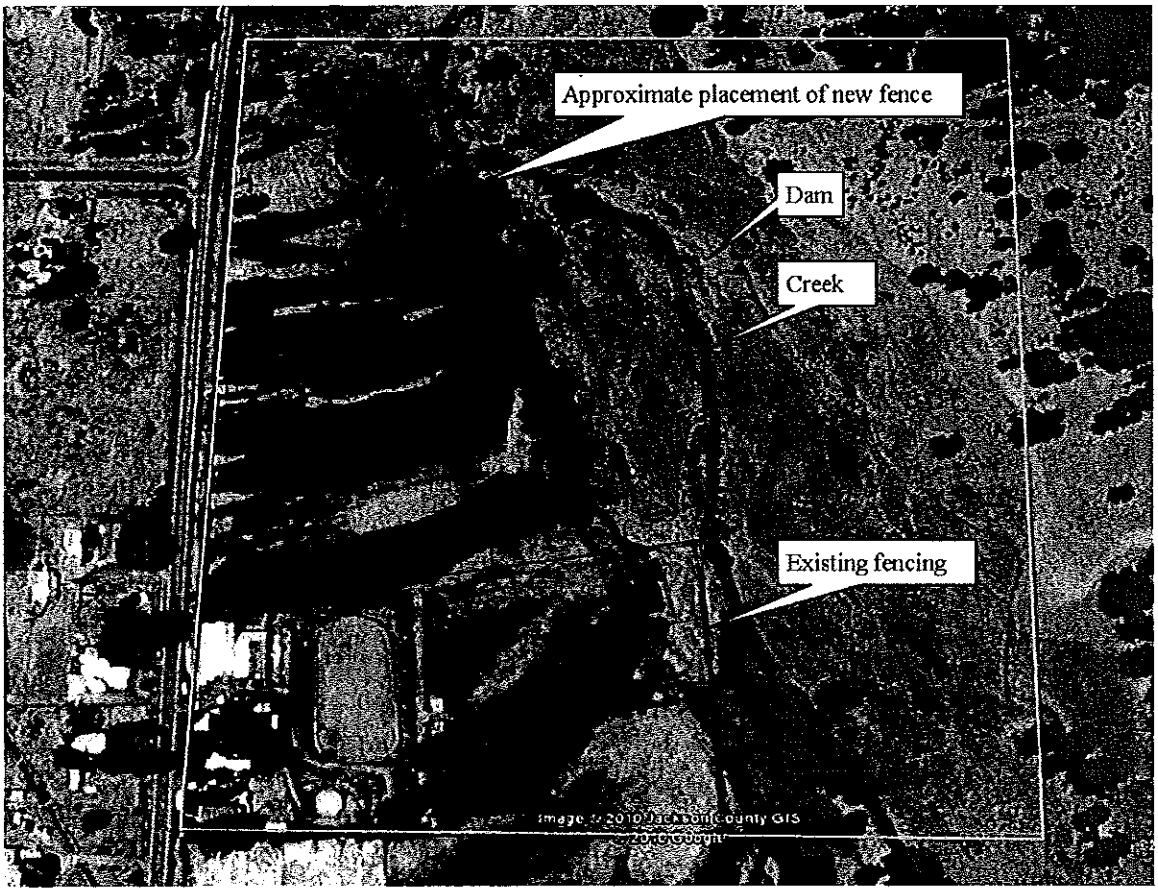
OAR 603-095-1440 (2) States "Riparian Vegetation Destruction. Agricultural management of riparian areas shall not impede the development of adequate riparian vegetation to control water pollution.
(a) Effective four years after rule adoption[1], vegetation and streambank conditions in riparian areas shall not result in the following:
(A) Sloughing of streambanks due to management practices which result in sediment entering a stream beyond what would be expected; or
(B) Destabilized streambanks beyond what would be expected in that specific hydrologic regime; or
(C) Damage to riparian vegetation that degrades its proper function and the vegetative recovery that is reasonably necessary to withstand a 25-year high flow event; or
(D) Absence of seasonally appropriate regeneration and recruitment, according to site capability.
(b) This condition is not intended to prohibit riparian grazing where it can be done while managing for proper functioning riparian condition."
(4) Excessive Nutrient Introductions
(a) Effective on rule adoption, no person subject to these rules shall violate any provision of ORS 468B.025 or ORS 468B.050.

Plan of Corrective Actions:

By October 15, 2010, construct and maintain a fence along both sides of Dry Creek that provides at least a 15-foot distance between the fence and the top of the bank along the creek. The fence must exclude livestock from Dry Creek at all times throughout the year.

[1] Inland Rogue Rules were adopted in 2001

Site drawing:



Activity log:

3/12/08 - Received complaint.

3/20/08 - Enough information received to make a complete complaint. Eric Nusbaum started process to contact landowner. Determining the landowner and getting a response was difficult.

4/15/08 In an effort make contact with the landowner, Tom Straughan and Mike Powers of ODA, and Randy White, Jackson SWCD, dropped by the Cagle residence at 11:30 AM after a site visit to a different property in the county. Paulette Cagle was not home. Mr. Straughn spoke with Ms. Cagle's mother, who gave him Mr. Cagle's work phone number. From the road, we could see a large pasture (maybe 40-50 acres) with the creek flowing through it. A road across the creek with a culvert was installed in approximately the center of the property. The culvert is apparently undersized or plugged and is backing up the creek with water flooding the pasture. There are some cross fences that look to be in disrepair. There were about 15-20 horses and 5-6 cows in the pasture. There are few trees or shrubs along the creek, other than blackberry bushes.

6/5/08 Site visit.

1/21/09 Follow up site visit.

10/9/09	Meeting between Cagles and Jackson SWCD to discuss need to have a farm plan and progress on meeting water quality rules.
1/22/10	Follow-up site visit.
2/3/10	EN met with Jackson SWCD to discuss landowner applying for assistance grant for permanent fencing.
2/26/10	EN talked to Mrs. Cagle about status of Jackson SWCD Landowner Assistance grant application.
3/3/10	Received signed grant application to Jackson Landowner Assistance Program for fencing via fax.
6/29/10	EN left message at both home and work numbers to set up site visit after July 16th. Mrs. Cagle returned call and site visit scheduled for July 26th.
7/12/10	Mrs. Cagle left message while EN on vacation requesting one-week delay in site visit due to financial difficulties in purchasing fencing material.
7/22/10	EN left message to reschedule to August 2nd.
8/2/10	Follow-up site visit.
10/10/10	Left message for follow-up visit.
10/14/10	Ms. Cagle left message concerning follow-up visit.
10/17/10	Left message for follow-up visit. Mrs. Cagle returned call and scheduled for 10/25/2010.
10/25/10	Site visit.

Documentation methods:

Photos and observations.

Summary of findings (observations):

I met Mr. Cagle at the house at 12:00pm. He gave me permission to enter the property and walk through the pastures and down to the creek unaccompanied. Passing through the barn and into the pasture, I observed a new watering trough for off stream watering of the livestock. After walking through the pastures, I observed that a three-strand electrified fence had been installed along the west side of the creek. The setback from the creek appeared to range from 15 to 30 feet. The fence appeared adequate to exclude livestock from the riparian area. No fence constructed on east side of creek.

After inspecting the fence and taking photos, I returned to the house and discussed the need for keeping up the fence maintenance with Mr. Cagle. I also reiterated that livestock should not be given access to the opposite side of the creek until a fence is constructed on the opposite bank. We also discussed having him contact the local watershed council to actively restore the riparian area.

Determination: (suggested agency action with summary of supportive observations)

Mrs. Cagle installed an exclusionary riparian fence on the west side of the creek and excluded livestock from the east side, providing essentially the same level of protection as the Plan of Correction, I recommend a Letter of Compliance.

Recommendations discussed with landowner/operator:

- Ensure maintenance is performed on the fence to keep it functioning.
- Continue to exclude livestock from the opposite side of the creek until a riparian exclusion fence is installed on the opposite bank.
- Contact the local watershed council to inquire about active riparian restoration.

Additional recommendations to include in correspondence:

None

Actions taken:

Letter of Compliance

Follow-up activities:

Cagle CI4
Photo Documentation

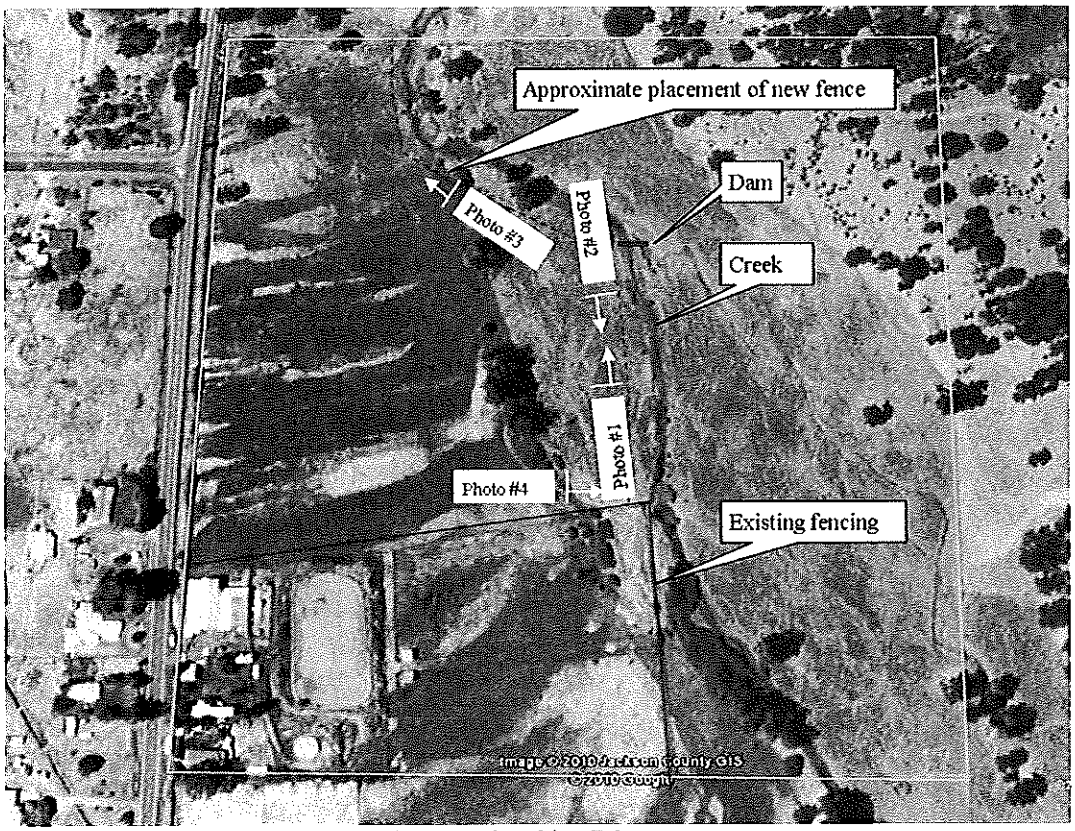


Photo Point Site Diagram

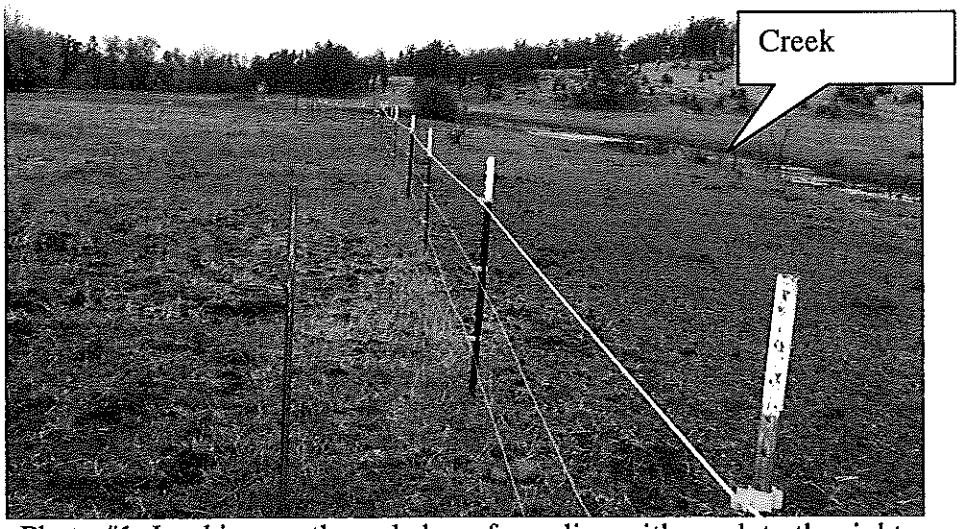


Photo #1: Looking northward along fence line with creek to the right.

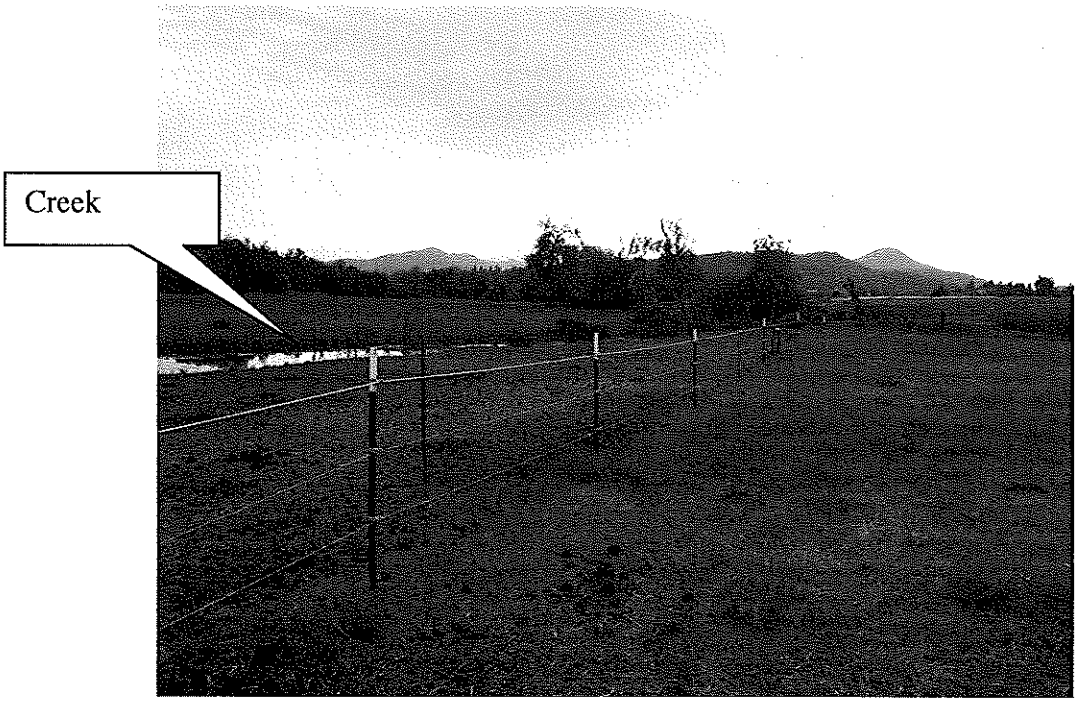


Photo #2: Looking southward along fence line with creek to the left.

Photo #3: Looking northward along fence line with creek to right.

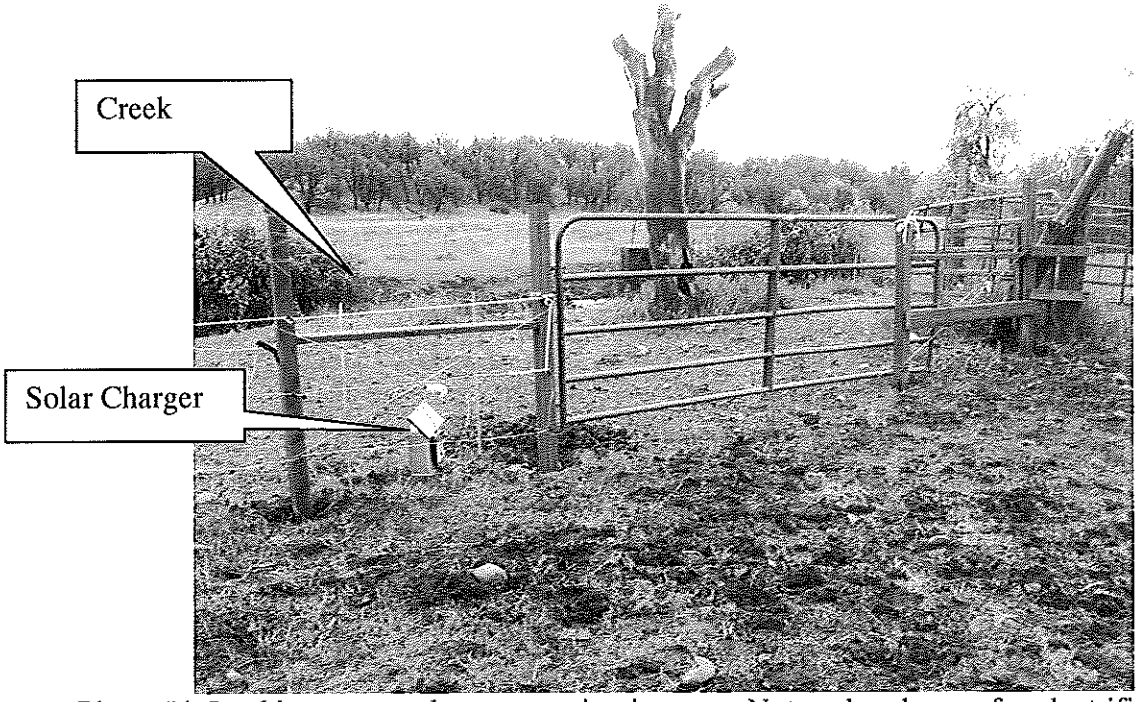


Photo #4: Looking eastward at gate to riparian area. Note solar charger for electrified fence.

Oregon
Theodore R. Kulongoski, Governor

Department of Agriculture
635 Capitol Street NE
Salem, OR 97301-2532

December 30, 2010

Paulette Cagle
622 Bigham-Brown Rd
Eagle Point, OR 97524

Dear Mrs. Cagle:

Thank you for meeting with Eric Nusbaum from the Oregon Department of Agriculture (Department) on October 25, 2010, to follow-up on the Notice of Noncompliance sent to you on September 8, 2010.

The Plan of Correction (POC) within the Notice of Noncompliance called for the following:

1. By October 15, 2010, construct and maintain a fence along both sides of Dry Creek that provides at least a 15-foot distance between the fence and the top of the bank along the creek. The fence must exclude livestock from Dry Creek at all times throughout the year.

Mr. Nusbaum observed that you installed an exclusionary fence along the west side of Dry Creek, and you have excluded cattle from the east side of the creek where you plan to hay the area and not pasture it.

Because the actions you have taken are equivalent to the POC, the Department has determined that you are in compliance with the Notice of Noncompliance.

To maintain compliance with riparian vegetation rules (OAR 603-095-1440(2)) and continue to improve conditions, the Department recommends the following actions:

- Ensure maintenance is performed on the fence to keep it functioning.
- Continue to exclude livestock from the field on the east side of the creek unless a riparian exclusion fence is installed.
- Contact the local watershed council to inquire about active riparian restoration.

The Department appreciates your efforts to protect water quality. If you have any questions, please contact Eric Nusbaum at 541-846-6424.

Sincerely,

Ray Jaindl

Ray Jaindl, Administrator
Natural Resources Division
PH (503) 986-4700
FX (503) 986-4730

cc: Jackson SWCD

Oregon
Theodore R. Kulongoski, Governor

Department of Agriculture
635 Capitol Street NE
Salem, OR 97301-2532

BEFORE THE OREGON DEPARTMENT OF AGRICULTURE

In the Matter of Paulette Cagle	)	**NOTICE OF NONCOMPLIANCE**
622 Bigham-Brown Rd.	)	**AND PLAN OF CORRECTION**
Eagle Point, OR 97524	)	**(tracking #08-016)**

I. BACKGROUND

Pursuant to its authority under Oregon Revised Statute (ORS) 568.900 through 568.933, ORS 561.190 through 561.200, and any other applicable ORS and Oregon Administrative Rules, the Oregon Department of Agriculture (Department) may require any landowner whose land is located within an area subject to a water quality management plan to perform those actions on the landowner's land necessary to prevent and control water pollution from agricultural activities or soil erosion. Upon finding that a landowner in an area subject to a water quality management plan has failed to perform actions necessary to comply with the rules adopted under ORS 568.912, the Department shall notify the landowner and direct the landowner to take any actions necessary to bring the condition of the subject lands into compliance with the rules within a reasonable period of time. A Notice of Noncompliance (NON) informs the owner or operator of a violation, including a reference to a particular statute, administrative rule, or order involved, the location of the violation, and the consequences of the violation and future violations. A Plan of Correction (POC) is a statement of the actions that must be taken by the landowner to eliminate the violation and shall include a schedule stating the time by which each of the actions is required to be accomplished to achieve compliance.

The Department herein finds that Paulette Cagle (Mrs. Cagle) is in violation of OAR 603-095-1440(2), which reads as follows:

OAR 603-095-1440
(2) Riparian Vegetation Destruction. Agricultural management of riparian areas shall not impede the development of adequate riparian vegetation to control water pollution.
(a) Effective four years after rule adoption, vegetation and streambank conditions in riparian areas shall not result in the following:
(A) Sloughing of streambanks due to management practices which result in sediment entering a stream beyond what would be expected; or
(B) Destabilized streambanks beyond what would be expected in that specific hydrologic regime; or
(C) Damage to riparian vegetation that degrades its proper function and the vegetative recovery that is reasonably necessary to withstand a 25-year high flow event; or
(D) Absence of seasonally appropriate regeneration and recruitment, according to site capability.
(b) This condition is not intended to prohibit riparian grazing where it can be done while

managing for proper functioning riparian condition.
(c) Exceptions:
(A) Written, limited duration exemptions to conditions described in OAR 603-095-1440(2)(a)(C) and (D) above will be considered for short-term activities included in a department (or its designee) approved plan intended to enhance the long-term function and quality of the riparian area.

II. NOTICE OF NONCOMPLIANCE

A. Findings of Fact

1. Paulette Cagle (Mrs. Cagle) is an individual landowner who owns a farm at 622 Bigham-Brown Rd., Eagle Point, Oregon. The property is operated by her and her husband, Russ Cagle (Mr. Cagle), for the purpose of raising livestock and horses. The Legal Description of this property is: T36S R01W S15, TL300. Dry Creek flows through the property.

2. Agricultural activities on the property described in paragraph 1 above are subject to the Inland Rogue Agricultural Water Quality Management Area Rules, Oregon Administrative Rules 603-095-1400 to 603-095-1440.

3. Department staff visited the property with Mr. Cagle on June 5, 2008, to investigate a complaint regarding potential water pollution from agricultural activities along Dry Creek. During the investigation, Department staff documented violations of the streamside vegetation rule, OAR 603-095-1440(2) along Dry Creek. Livestock had grazed and trampled much of the streamside vegetation, leaving from 26% to 71% bare ground and closely grazed grass. Areas of streambank were trampled and eroding. Grazing had impeded the development of adequate riparian vegetation.

4. The Department issued a letter dated July 11, 2008, to Mr. Cagle describing the violations of the water quality rules and potential solutions to achieve compliance. Potential solutions included: rotational grazing, planting appropriate woody species, fencing the stream to exclude livestock, and providing water for livestock away from the stream.

5. On January 21, 2009, Department staff met Mrs. Cagle and conducted a follow-up site visit to view changes that had been made in response to the Department letter dated July 11, 2008. Mr. and Mrs. Cagle had taken no actions. During the investigation, Department staff documented violations of streamside vegetation rule, OAR 603-095-1440(2), along Dry Creek. Livestock had grazed and trampled

streamside vegetation, creating an area greater than 50% bare and muddy ground. Areas of streambank were trampled and eroding. Grazing had impeded the development of adequate riparian vegetation.

6. The Department issued a letter dated February 2, 2009, to Mrs. Cagle describing the violations of the water quality rules and potential solutions to achieve compliance. Potential solutions included rotational grazing, planting appropriate woody species, fencing the stream to exclude livestock, and providing water for livestock away from the stream.

7. On January 22, 2010, Department staff conducted a follow-up site visit with Mr. Cagle to view changes Mr. and Mrs. Cagle had made in response to the Department letter dated February 2, 2009. Mr. and Mrs. Cagle had attempted to install an electric tape fence but the livestock repeatedly knocked it down. The electric tape fence was not operational during the investigation. During the investigation, Department staff documented violations of the streamside vegetation OAR 603-095-1440(2). Livestock had grazed and trampled streamside vegetation, creating areas from 64% to 75% bare and muddy ground. Areas of streambank were trampled and eroding. Grazing had impeded the development of adequate riparian vegetation.

8. The Department issued a letter dated April 5, 2010, to Mrs. Cagle describing the violation of the water quality rules.

9. On August 2, 2010, Department staff conducted a follow-up site visit with Mrs. Cagle to view changes Mr. and Mrs. Cagle had made in response to the Department letter dated April 5, 2010. Mr. and Mrs. Cagle had begun building a permanent fence to exclude livestock from the west side of Dry Creek. However, it was incomplete and livestock still had uncontrolled access to Dry Creek. During the investigation, Department staff documented violations of the streamside vegetation OAR 603-095-1440(2). Livestock had grazed and trampled streamside vegetation, leaving from 27% to 48% bare ground and closely grazed grass. Areas of streambank were trampled and eroding. Grazing had impeded the development of adequate riparian vegetation. Also during this site visit, Department staff collected four water samples.

10. On August 10, 2010, the Department received results of the water samples collected on August 2, 2010, and submitted for analyses to Neilson Research Corporation in Medford, Oregon. Sample results indicated multiple exceedances of the *E-coli* standard (406 MPN/100 ml of water) in surface waters of the state. Sample results and sample locations map are attached as Exhibit A.

B. Ultimate Findings of Fact

OAR 603-095-1440(2) requires that agricultural management of riparian areas shall not impede the development of adequate riparian vegetation to control water pollution. Vegetation and streambank condition shall not result in sloughing of streambanks which result in: sediment entering a stream beyond what would be expected; or destabilization of streambanks beyond what would be expected in that specific hydrologic regime; or damage to riparian vegetation that degrades its proper function and the vegetative recovery that is reasonably necessary to withstand a 25-year high flow event; or absence of seasonally appropriate regeneration and recruitment, according to site capability.

Agricultural activities conducted by Mrs. Cagle, along Dry Creek at T36S R01W S15, TL300, do not allow the growth and maintenance of riparian vegetation.

C. Conclusions of Law

On August 2, 2010, Mrs. Cagle violated the Inland Rogue Agricultural Water Quality Management Area Rules OAR 603-095-1440(2) by allowing damage to riparian vegetation, and impeding the development of riparian vegetation to control water pollution.

III. PLAN OF CORRECTION

Required Corrective Action:

By October 15, 2010, construct and maintain a fence along both sides of Dry Creek that provides at least a 15-foot distance between the fence and the top of the bank along the creek. The fence must exclude livestock from Dry Creek at all times throughout the year.

IV. CONCLUSION

If Mrs. Cagle fails to timely comply with any part of this Notice of Noncompliance and Plan of Correction (NON/POC), the Department may issue a Notice of Civil Penalty. OAR 603-090-0110 to 603-090-0120.

DATED this 8th day of September, 2010.

Ray Jaindl, Administrator
Natural Resources Division
PH: (503) 986-4700
FAX: (503) 986-4730

NOTICE OF APPEAL RIGHTS: This is an order in other than a contested case. This order is subject to judicial review under Oregon Revised Statutes (ORS) 183.484. A petition for judicial review must be filed within 60 days of the date this order is served, as specified by ORS 183.484(2). You may also request reconsideration of this order by filing a petition for reconsideration with the Department within 60 calendar days after the date of the order, OAR 137-004-0080. A petition for reconsideration must set out the specific grounds for reconsideration and may be supported by a written argument.

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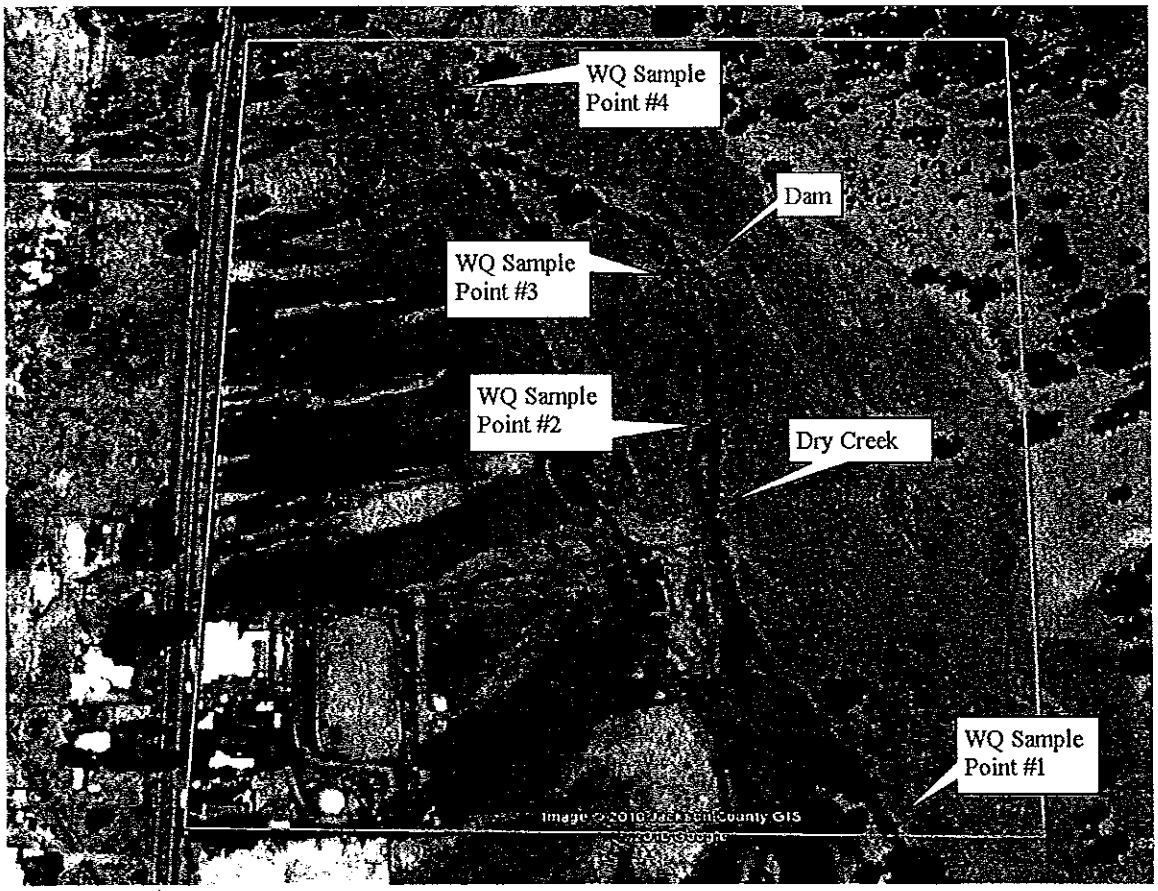
cc: Jackson County Soil and Water Conservation District

Exhibit A
Sample Locations and Results



Sample Results

All results in MPN/100 mL. *E-coli* standard is 406 MPN/100 mL. 2419.6 MPN/100 mL is the maximum threshold of laboratory analysis.

Sample #	**1**	**2**	**3**	**4**
Description	Upstream property line	Beginning of slack water above dam	Just before water leaves dam	Approximately 20 feet before downstream property line
8/2/2010	727.0	1986.3	>2419.6	344.8

CERTIFICATE OF SERVICE

Certified USPS Mail Service and First Class USPS Mail Service, with postage paid

I certify that on September 8, 2010, I sent Notice of Noncompliance and Plan of Correction (tracking #08-016), via USPS certified mail, in a sealed envelope, with postage paid, to Paulette Cagle addressed as follows:

Paulette Cagle
622 Bigham-Brown Rd.
Eagle Point, OR 97524

I also sent a copy of the above-noted document to Paulette Cagle on September 8, 2010, via first-class USPS mail service, in a sealed envelope, with postage paid, addressed as noted above. I also sent a copy to the Jackson County Soil and Water Conservation District addressed as follows:

Jackson County Soil and Water Conservation District
573 Parsons Dr., Suite 102
Medford, OR 97501-3795

Renita McNaughtan, Administrative Specialist
Natural Resources Division
Oregon Department of Agriculture

Little Butte Creek Bacteria Study 2011

June 4th 2012

In cooperation with the Medford Water Commission, Jackson County Watermaster's Office and Oregon Department of Environmental Quality

Prepared by:
Forrest English, Water Quality Coordinator, Rogue Riverkeeper

FIGURES

TABLES

MAPS

Project Overview

Executive Summary

The Little Butte Creek Bacteria Study 2011 is a collaboration between Rogue Riverkeeper (RRK), Southern Oregon University (SOU), Oregon Department of Environmental Quality (DEQ) the Jackson County Watermaster's Office (JCWO) and the Medford Water Commission (MWC), with assistance from the City of Eagle Point. While this project has been a collaborative effort, Rogue Riverkeeper takes full responsibility for any mistakes or omissions in this document.

The purpose of this study was to gain a more detailed understanding of current *E. coli* bacteria pollution levels and trends in streams in the Little Butte Creek watershed that are identified by DEQ as water quality impaired. In addition, some sites were selected to help identify portions of the stream where *E. coli* pollution problems significantly worsen. The intent of the study is to help inform and guide water quality restoration work throughout the watershed.

Water quality parameters (including *E. coli*, temperature, conductivity, pH and turbidity) were collected by RRK staff and SOU student volunteers from June 16th through October 31st. Flow measurements were collected by MWC and JCWO staff from June 27th through October 31st 2011.

The data shows that fecal bacteria concentrations for the months of June through October are increasing, with a 99% confidence in a statistically significant upward trend since 1998. Additionally the main stem of Little Butte Creek at the mouth needs an overall 59% reduction in fecal pollution to meet DEQ water quality criteria that indicate a healthy unimpaired waterway. Some tributaries may require up to a 91% reduction in pollutants to meet DEQ water quality criteria.

Based on these results, significant improvements throughout the watershed will be required to bring Little Butte Creek to levels of fecal pollution that meet DEQ water quality criteria. To achieve these reductions will require modernizing irrigation delivery methods by using sprinklers instead of flood irrigation, reducing overall quantity of water withdrawals and protecting and restoring stream buffers. Many of these actions would be achieved through the proposed WISE (Water for Irrigation Streams and Economy) project should it be implemented.

Thanks

Rogue Riverkeeper would not have been able to complete this project without the great deal of assistance that we received throughout the study. We received help in the form of equipment loans, access to property, taking flow measurements, collecting samples, analyzing samples in the lab, reviewing sampling plans, and assisting with data analysis and portions of this report. We would like to thank the following people for their assistance.

James Ellsworth, Watershed Technician, Medford Water Commission
Steve Hanson, Volunteer Monitoring Coordinator, Department of Environmental Quality
Claire Hegg, Student, Southern Oregon University
Emelye Hugo, Student, Southern Oregon University
David Hussell, City Administrator, City of Eagle Point

Bob Jones, Geologist, Medford Water Commission
Travis Kelley, Assistant Watermaster, Jackson County Watermaster's Office
Natasche O'Brien Legg, Watershed Technician, Medford Water Commission
Bill Meyers, Rogue Basin Coordinator, Department of Environmental Quality
Michael Mulvey, Aquatic Biologist, Department of Environmental Quality
Kathleen Page, Ph.D., Biology Professor, Southern Oregon University
Erin Gardner-Ray, Watershed Technician, Medford Water Commission
Isaac Skibinski
Hans Teuscher, Student, Southern Oregon University
Greg Wacker, Assistant Watermaster, Jackson County Watermaster's Office

Background on Little Butte Creek

The Little Butte Creek watershed is an approximately 238,000-acre 5th field (HUC10) watershed located in Jackson and Klamath counties in southwestern Oregon (see Map 1). It is a tributary to the Rogue River and part of the 3.3 million-acre Rogue River watershed. As per the Clean Water Act, the mainstem of Little Butte Creek and many of its tributaries were listed on the State of Oregon's 303(d) water quality impaired list for bacteria, including Antelope Creek, Nichols Branch, Salt Creek, Lick Creek, Lake Creek, North Fork Little Butte Creek and South Fork Little Butte Creek. Due the listing of these streams on the 303(d) list, a Total Maximum Daily Load (TMDL) document required by the Clean Water Act was prepared for temperature and bacteria as part of the Rogue River Basin TMDL, which includes Little Butte Creek.

Map 1. Location of Little Butte Creek Watershed.

According to the Rogue River Basin TMDL (DEQ, 2008), many streams in the watershed do not meet criteria for beneficial uses under the Clean Water Act by exceeding the *E. coli* 126 MPN/100mL 30 day 5 sample minimum geomean criteria at most sample sites in DEQ's LASAR database (the LASAR database contains data collected by DEQ as well as by volunteer monitoring partners, which include the Little Butte Creek Watershed Council, Rogue Valley Council of Governments and Rogue Riverkeeper). These streams also frequently exceed the 406 MPN/100mL single sample criteria. In addition, parts of the Little Butte Creek watershed are listed on the 303(d) list as water quality impaired for alkalinity, phosphorus, pH, habitat and flow modification, iron, manganese, temperature, sedimentation and dissolved oxygen, making it one of the most impaired watersheds in the Rogue basin (DEQ 2006).

However, even in the currently degraded and impaired state, Little Butte Creek is one of the most important salmon streams in the Rogue Basin, producing some of the highest densities of Endangered Species Act-listed Southern Oregon Northern California Coho (SONCC) salmon in the Rogue Basin (NMFS, 2012). Coho within the Upper Rogue watershed that includes Little Butte Creek are facing many stresses and threats within the region, including impaired water quality and water quantity. While bacteria pollution may not affect coho directly, activities that introduce bacteria can also increase temperature, limit riparian shade, reduce flows and increase turbidity and sedimentation, all of which directly affect the health of salmonids.

There are two excellent resources that this study relied on to better understand bacteria and other pollution issues in the Little Butte Creek watershed and thereby focus our analysis. The Little Butte Creek Watershed Council's Little Butte Creek Bacteria Study, prepared by Frances Oyung and Kathy Balogh in 2002, looked at bacteria from storm drains and mixed return ditches mostly in or near Eagle Point. DEQ's 2008 Rogue River Basin TMDL contains a wealth of information on bacteria pollution in the watershed and Little Butte Creek in particular. Additionally, the City of Eagle Point has been collecting and testing water samples for the presence of *E. coli* to monitor public health risks. Due to very high bacteria levels found at all times in Little Butte Creek, the City of Eagle Point has placed permanent metal warning signs in public parks near the creek.

What is E. coli*?*

Escherichia coli, more commonly known as *E. coli,* is a fecal coliform bacteria that is predominantly found in the lower intestines of mammals. Of the hundreds of strains of *E. coli* bacteria, most of them are harmless to humans, however some pose a risk of severe gastro-intestinal problems especially for the elderly, children and people with otherwise compromised immune systems. These are the strains that cause *E. coli* outbreaks to be in the news when found in milk, meat or drinking water supplies.

E. coli can survive for a short time outside of the body, making the bacteria a widely used indicator of recent fecal contamination in waterbodies. Methods used in this study and most other water quality tests cannot distinguish between the benign and harmful strains of bacteria.

E. coli depends on the presence of sufficient mineral and organic nutrients as well as warm water temperatures for growth. Studies have shown that treated or untreated municipal wastewater can at times provide sufficient nutrients for *E. coli* growth, but this growth is not possible in unpolluted stream water with less than 5 parts per million organic carbon (Hendricks, 1972; Camper et al, 1991). The temperature that is optimal for *E. coli* growth is the natural body temperature of warm-blooded animals, generally 37 degrees Celsius, waterways with

temperatures less than 20 degrees Celsius are generally considered to be insufficient in temperature and nutrients to allow growth, and the organisms will begin to die off (Winfield and Groisman, 2003; Raghubeer and Matches, 1990).

Water Quality Standards

Under the Clean Water Act, states are required to establish water quality standards that define the goals and pollution limits for all waters within their jurisdiction. Water quality standards determine which healthy waters need protection, which waters must be restored and how much they need to be restored. Standards are waterbody specific.

The U.S. Environmental Protection Agency (EPA) sets baseline health standards for water quality, but they delegate to each state to provide water quality standards for the protection of "beneficial uses" such as the propagation of fish and contact recreation. The agency largely responsible for water quality in Oregon is the DEQ.

If water is found to be unsafe for its users or designated beneficial uses, it will be listed under section 303(d) of the Clean Water Act as an "impaired waterbody" for that contaminant; this is referred to as the 303(d) list. When a waterway is 303(d)-listed it must then be investigated by the state agency that is delegated Clean Water Act responsibilities by the EPA (in our case, DEQ) who will prepare a TMDL, which designates how much of a pollutant may be discharged and still meet water quality standards. Little Butte Creek is covered under the 2008 Rogue River Basin TMDL.

The DEQ numeric criteria for *E. coli* levels in surface waterways is less than 406 most probable number of organisms per 100 milliliters of water (MPN/100mL) for any single sample, and less than 126 MPN/100mL geometric mean with at least 5 samples in a 30 day period (OAR 340-041-0009). The Oregon criteria for single sample exceedance is one of the numerically highest in the nation. For comparison, most of California uses 235 MPN/100mL as the single sample maximum, with some states applying an even more stringent criteria, such as Vermont with 77 MPN/100mL for a single sample (EPA, 2003).

Glossary

cfs: Cubic feet per second, a common measurement used for describing the amount of water flowing in a creek or ditch.

Conductivity: Conductivity measures the quantity of ionic material dissolved in water, and its ability to conduct electricity. Conductivity is often used to measure the amount of dissolved solids in water, which may contain more contaminants. Conductivity is measured in micro-Siemens per centimeter (µS/cm).

E. coli: *Escherichia coli* is used as an indicator for fecal contamination due to having the ability to survive for a time outside of the digestive tract. Some strains of *E. coli* are harmful to human health, but many are benign.

Geometric Mean: Geometric mean differs from what is commonly thought of as mean (otherwise known as arithmetic mean). Geometric mean multiplies the values of each sample together and takes the *n*th root (where *n* is the number of samples) as the result. Geometric mean greatly reduces the effect of occasional high sample values and outlier data points that are common in bacteria testing.

Interquartile Range: The interquartile range (or IQR) is the 50% of data that falls between the 25th percentile and the 75th percentile range. IQR is used in presenting our data in boxplot graphs, also shown with min and max values, and the median.

Load: Loading is the total amount of pollutants discharged into a waterway over a 24 hour period. This is calculated using a measurement of the concentration of a pollutant, combined with measurements of the volume of water at that location.

Mean: Otherwise known as arithmetic mean, this is the statistic most people are commonly familiar with as average. An arithmetic mean adds the values of all samples together, and divides by the total number of samples. Arithmetic mean is affected by outliers (very high or low numbers) much more so than geometric mean.

Median: The median divides the distribution of the data in two. Unlike mean which calculates the average value, median is the value that has 50% of the samples on either side of it, regardless of value. For example with a set of data numbering 1, 1, 2, 2 and 10, the median value is 2 with half of the data set on either side.

MPN: The Most Probable Number (MPN) is a statistically determined value used to estimate the concentration of bacteria when they are present at very low concentrations. *E. coli* MPN methods such as the IDEXX quanti-tray method estimate bacterial population size by dividing a water sample into a large number of small samples, incubating the samples and determining how many small samples include a single, viable *E. coli*.

pH: A measure of liquids acidity or alkalinity, pH is measured on a logarithmic scale from 0-14 with 0 being the most acidic, 14 being the most basic and 7 is neutral. A healthy waterway is generally in the 6-8 range. High or low values, or a shift from an established baseline, can represent water pollution issues.

Temperature: The temperature of the water was measured in Celsius.

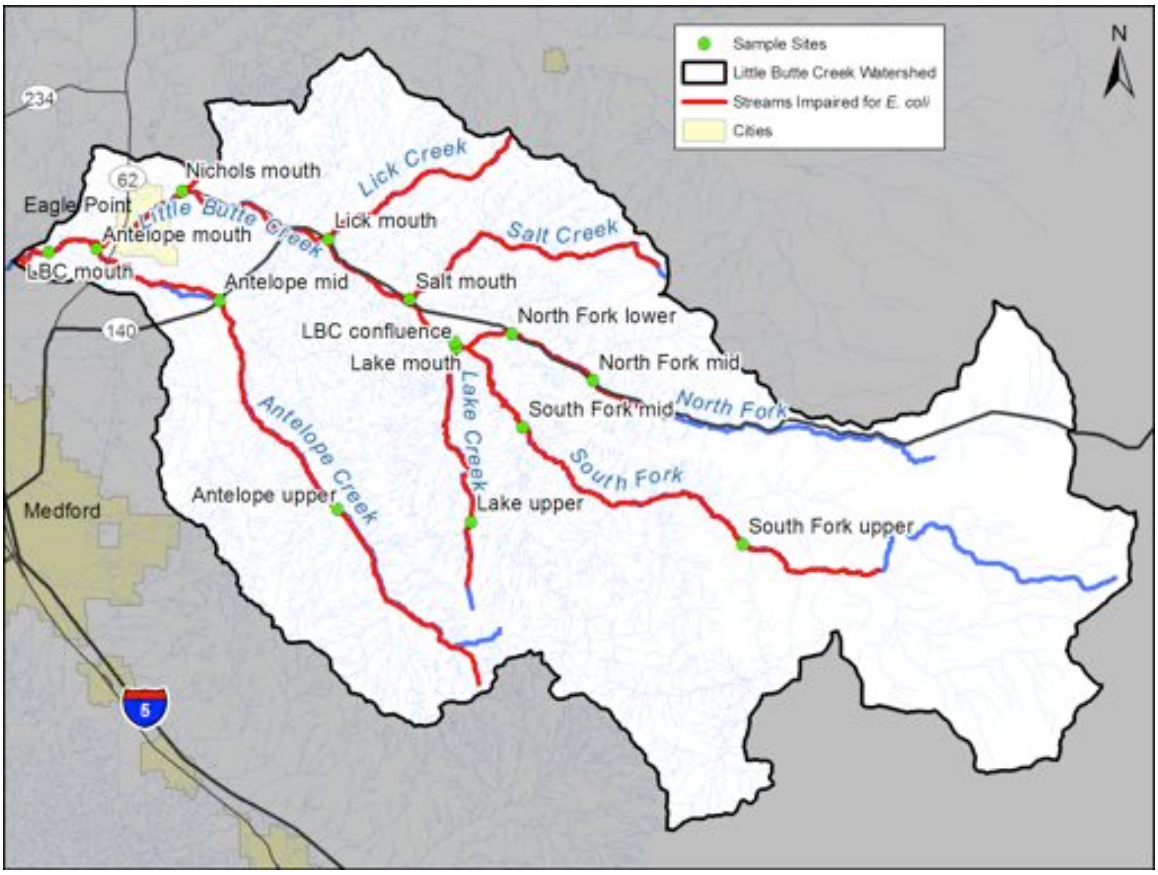
Turbidity: The measure of suspended matter present in the water, turbidity could include inorganic materials such as soils, or organic materials such as feces. Turbidity is measured in Nephelometric Turbidity Units (NTU) and is measured by the amount of light scattered from suspended particles in the water column. The higher the number, the more material suspended. Higher numbers will be found with events that mobilize material into the waterway, such as rain events with surface flow, disturbance of the creek bed or irrigation return water.

Methods

Site Selection

For this study we focused on all of the streams within the Little Butte Creek Watershed that were listed on the 303(d) list as water quality impaired for *E. coli or Fecal coliform*. We selected sites at the mouth of all tributary streams where feasible, as well as some additional points in the watershed. We selected sites that had historic data collection by another entity as well as new sites to help pinpoint where high levels of pollution begin. See Map 2 for site locations.

Map 2. Sample site locations and all streams in the Little Butte Creek watershed impaired for *E. coli*.



Little Butte Creek

Mouth: Located at the Agate Road bridge over Little Butte Creek and approximately 1.3 miles upstream from the mouth itself (this was as close to the mouth as we could effectively sample). The small stretch downstream before Little Butte Creek flows into the Rogue River is part of Denman Wildlife Area and has no tributaries or irrigation outfalls to add significant additional flow in this reach. This location was sampled by DEQ for the development of the TMDL and with some frequency after that. Flow measurements at this location were collected by an OWRD/JCWO gage on lower Antelope Creek and an OWRD/JCWO gage on Little Butte Creek in Eagle Point, these measurements were combined for the total flow. Flow was checked at Agate Rd bridge site and the cfs matched the combined output from these 2 gages.

Below Confluence: Located just downstream of the confluence of the North and South Forks of Little Butte Creek, as well as Lake Creek, this sample site is at the bridge in the settlement of Lake Creek where South Fork Little Butte Creek Road crosses Little Butte Creek. This sample site was chosen to compare bacteria levels at the mouth. This site was previously sampled by DEQ for the development of the TMDL. Flow measurements at this location were collected by an OWRD/JCWO gage at the site.

Antelope Creek

Mouth: Located on the City of Eagle Point's property for the old sewage ponds, the sample site is approximately 1000 feet upstream of the mouth itself, but given the minimal if any addition of water below this point we believe it to be sufficient. The mouth of Antelope Creek was previously sampled by DEQ for the development of the TMDL. Flow measurements at this location were collected by an OWRD/JCWO gage just upstream from the sample site.

Mid: In the middle of the watershed, this sample site is located at the Meridian Road bridge where it crosses Antelope Creek just off of Highway 140. This site was selected to give a better picture of flow and bacteria levels in the middle of the watershed. No previous sample data was found for this location. Flow measurements at this location were collected weekly for the duration of the study by MWC.

Upper: In the upper end of the watershed, this is located at bridge 641 on Antelope Creek Road. This site was selected since it is above most of the private land in the watershed, and is as high as we realistically could get access in this watershed on our sampling runs. No previous sample data was found for this location. Flow measurements at this location were collected weekly for the duration of the study by MWC.

Nichols Branch

Mouth: Located at a bridge where Brownsboro Highway crosses Nichols Branch just outside of Eagle Point. The mouth of Nichols Branch was previously sampled by DEQ for the development of the TMDL. Flow measurements at this location were collected weekly for the duration of the study by JCWO.

Lick Creek

Mouth: Sample site located at the bridge where Highway 140 crosses Lick Creek. The mouth of Lick Creek was previously sampled by DEQ for the development of the TMDL. Flow measurements at this location were collected weekly for the duration of the study by JCWO.

Salt Creek

Mouth: The sample site is located at the bridge where Highway 140 crosses Salt Creek. The mouth of Salt Creek was previously sampled by DEQ for the development of the TMDL. Flow measurements at this location were collected weekly for the duration of the study by JCWO.

Lake Creek

Mouth: The sample site is located in the settlement of Lake Creek where South Fork Little Butte Creek Rd crosses Lake Creek. The mouth is approximately 450 feet downstream of the sample site, but this is the closest point feasible to sample from and should capture most if not all inputs to the system. This site was previously sampled by DEQ for the development of the TMDL.

Flow measurements at this location were collected weekly for the duration of the study by MWC.

Upper: This sample site is located on BLM land where road 37-2E-7.2 crosses Lake Creek. No previous sample data was found for this location. No flow measurements were collected at this location.

South Fork Little Butte Creek

Mid: This site is located where South Fork Little Butte Creek Road crosses the South Fork of Little Butte Creek at approximately where Lost Creek Road meets South Fork Little Butte Creek Road. This site was previously sampled by DEQ for the development of the TMDL. Flow measurements at this location were collected weekly for the duration of the study by the MWC.

Upper: This site is located at the end of South Fork Little Butte Creek Road adjacent to Camp Latgawa near the mouth of Dead Indian Creek. This site was selected since it is above most of the private land in this watershed and is as high as we realistically could get access in this watershed on our sampling runs. No previous sample data was found for this location. Flow measurements at this location were collected by an OWRD/JCWO gage station approximately one mile downstream. In an area with no diversions and a relatively high stream flow this should be reasonably accurate.

North Fork Little Butte Creek

Lower: Located approximately 15.4 miles east of the Highway 62 and Highway 140 intersection at a bridge where Highway 140 crosses the North Fork of Little Butte Creek. This site was previously sampled by DEQ for the development of the TMDL. No flow measurements were collected at this location.

Mid: Located approximately 18.2 miles east of the Highway 62 and Highway 140 intersection at a bridge where Highway 140 again crosses the North Fork of Little Butte Creek. No previous sample data was found for this location. Flow measurements at this location were collected by an OWRD/JCWO gage station approximately half a mile upstream from this location.

Sampling Methods and QA/QC

Samples, field parameters and flow measurements were taken once a week on Mondays starting June 13th (June 27th for flow measurements) through October 31st of 2011. On each sample day there were three groups collecting measurements, but not always on the same time schedule. Rogue Riverkeeper staff, volunteers and SOU students collected *E. coli*, temperature, turbidity, conductivity and pH from all sites that had water (some sites dried up or became stagnant). The Jackson County Watermaster's Office had staff take flow measurements on Nichols Branch, Lick and Salt Creeks. The Medford Water Commission had staff take flow measurements on Antelope Creek, Lake Creek and South Fork of Little Butte Creek. Additionally the intent was to sample during rain events to look at the effects of precipitation on bacteria levels in Little Butte Creek. However the period of sampling was so dry that we were unable to obtain samples during rain events.

E. Coli.

Water samples were collected at creek locations from running water free of sediment. 120 mL was collected in sterile IDEXX bottles containing sodium thiosulfate. Upon collection sample containers were immediately placed in a cooler containing ice. Samples were kept at 4°C until processing at Southern Oregon University's laboratory within 24 hours of collection. Sampling protocols conformed to Oregon DEQ volunteer water quality monitoring guidelines (Oregon DEQ Quality Assurance Project Plan, http://www.deq.state.or.us/lab/wqm/volmonresources.htm).

At least 10% of water samples were collected and tested in duplicate. Due to collecting up to 14 samples per trip, this meant two duplicate samples per sample survey. We collected a total of 29 duplicates and found that the *E. coli* MPN/100ml result for each was within 0.45 $\log_{10}$, which is within guidelines set by DEQ. In addition, two sterile water samples were processed and yielded values of <1 *E. coli* MPN/100mL. The maximum value that we can yield from our testing methods is 2420 MPN/100mL, so any value of 2420 should read as >2420. Our results indicated that our protocols gave accurate, reproducible results at the DEQ "A" level standard.

For some graphs and analysis, data from the DEQ LASAR database was downloaded and used where sample sites in the database overlapped with the sites in this study. Some data in the DEQ database had higher maximum values than 2420 so for the purposes of comparison between the two data sets all data from LASAR was reduced to 2420 whenever it was recorded as higher.

Temperature

At sites where feasible, temperature was measured directly in stream. Samples collected via buckets were measured immediately after removal from the stream. Temperature was taken using a conductivity meter issued by DEQ and recorded on field sheets at each location. The temperature meter was compared against a thermometer on a monthly basis and would be recalibrated should the variance become greater than 1°C.

Conductivity

At sites where feasible conductivity was measured directly in stream. Samples collected via buckets were measured immediately after removal from the stream. Conductivity was measured using an YSI 30/10 FT meter issued by DEQ. The meter's probe was rinsed with distilled water before placing in the creek for readings and also after removal from the creek. The meter was compared against prepared Oregon DEQ low and high conductivity standards (147 µS/cm and 1412 µS/cm) before and after each outing. Standards were replaced if variance from standards was above 10%.

Turbidity

Grab samples were taken from the creek directly in a reading bottle or in a Nalgene vessel and brought back to vehicle for measurement. Sample collection bottles were rinsed in the creek three times before use. Turbidity was measured using a HACH 2100P meter, issued by DEQ and calibrated according to the HACH manual using a StablCal calibration set for the 2100P. Prior to and after each sampling, the unit's accuracy was tested using the turbidity standards kit. The meter was recalibrated if variance was above 15%.

pH

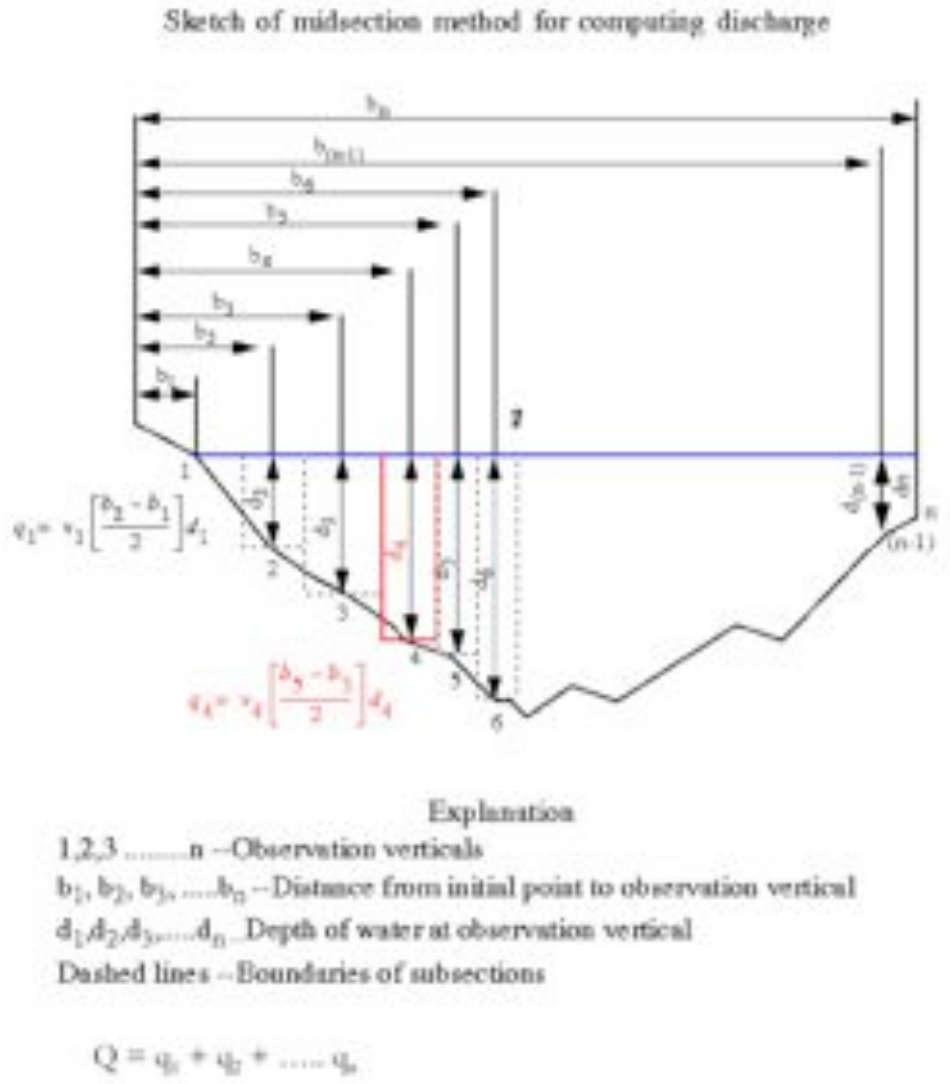
Grab samples were taken from the creek and brought back to vehicle for measurement. A HACH HQ11d field meter device was used for pH testing. Prior to and after each sampling event, the unit's accuracy was tested using three HACH standards (4.01, 7 and 10.01). Standards were replaced with fresh samples if variance went over 10%.

Flow

Flow was measured two ways, either by an installed and maintained OWRD/JCWO gage station, or by measurements of a stream cross section with a flow meter by both the Medford Water Commission and the Jackson County Watermaster's Office. The field measurements were performed using the USGS midsection method, which is described below.

Select a cross section across the stream where the streambed is relatively uniform and free of obstructions or eddies. Stretch a measuring tape across the width of the stream, and affix it there. Determine and record the width of the water's surface. Determine the spacing to use for the measurement of depth and flow to be used, if the stream width is less than 5 feet, the minimum number of verticals is 10 while the preferred number is 20 to 30. The locations to be metered do not need to be equally spaced across the transect, the locations should be spaced more closely where velocity and depth change more rapidly to ensure that no more than 5 to 10 percent of the total discharge is within any one subsection. Determine the number and location of metering points. At each metering station, stand off to one side and at least 1.5 feet downstream from meter, record the distance from the bank, record the channel depth, if the water depth is more than 2.5 feet then measure at 0.2 and 0.8 of the depth (these points will be averaged), if the depth is less than 2.5 feet measure the velocity at 0.6 of the depth. The wading rod should stay vertical and the flow sensor perpendicular to the tape during measurement of velocity. Discharge for each area is later tallied, and the total discharge is found. See Figure 1 below.

Figure 1. USGS midsection flow measurement method (Western Washington University)



Lab Methods

The IDEXX Colilert EPA-approved Quanti-Tray/2000 method was used to determine *E. coli* concentrations (U.S. EPA, 2003). Water samples were taken to the lab, and colilert reagent was added to approximately 100 mL water sample, according to standard protocol (IDEXX Quanti-Tray/2000 product insert http://www.idexx.com/view/xhtml/en_us/water-microbiology.jsf). Quanti-Trays were filled, sealed, and incubated at 35°C. After incubation results were read. Fluorescent yellow wells indicate the metabolism of the substrate 4-methyl-umbelliferyl–β-flucuronidase (MUG) by the enzyme ®-glucuronidase and were considered positive for *E. coli*. If the fluorescence or yellow color was questionable it was compared to the Quanti-Tray reference comparator, which indicates the minimum fluorescence and yellow color that may still be considered positive. The total number of wells that were both yellow and fluorescent in the Quanti-Tray were counted and the data was recorded. Number of *E. coli* per 100 mL is determined using most probable number (MPN) tables.

GIS Methods

Land cover by watershed results were calculated in ArcGIS using spatial analyst tools and the National Land Cover Database (NLCD) for land cover information. Watersheds were calculated using 10 meter Digital Elevation Models from the United States Geographic Survey (USGS) by setting pour points at each sampling location and calculating land upstream of that sample location. All area calculations were performed using the NAD 1983 Oregon Statewide Lambert International Feet projection.

Results

Notes on figures, maps and tables

The data was transformed to a $\log_{10}$ scale for many of the calculations in this report. This was done to better allow parametric statistical analysis on the bacteria data, which generally are not normally distributed (as opposed to a normal distribution; i.e. a "bell curve"). Performing a $\log_{10}$ transform on the data makes the data more closely resemble a normal distribution, and allows a better fit for parametric analysis. All calculations using $\log_{10}$ transformed data has then had an inverse log function applied to the results to bring it back into the original scale and unit of the data. Arithmetic calculations used original scales.

All *E. coli* concentration results have been rounded to the nearest whole number. As bacteria samples can be highly variable this has been done to reduce a false feeling of precision.

Throughout the report there are several types of graphs. Bar, box plot and scatter plot graphs are all used.

Bar graphs are used to depict *E. coli* MPN, temperature and cfs. All *E. coli* data used in these graphs is geometric mean and cfs data uses arithmetic mean.

Box plot graphs are used to depict *E. coli* MPN. Box plot graphs show the maximum sample value as the top bar, the interquartile range (IQR) of the data as a hollow box (25^{th} to 75^{th} percentile), the median as a bar within the IQR, and the minimum sample value as the bar at the bottom. All box plot graphs use original sample data that were not $\log_{10}$ transformed.

2420 MPN is the highest value that our *E. coli* testing equipment and methods could return, so it is possible that any value of 2420 was actually higher than that. Data used from DEQ's LASAR database that exceeded 2420 was changed to 2420 for the purposes of analysis.

All *E. coli* graphs include a red dashed line representing the 406 MPN/100mL single sample water quality criteria, and a shorter segment length orange dashed line representing the 126 MPN/100mL 5 sample 30 day geomean water quality criteria. Note that 2 graphs produced by DEQ found in the Loading section use a different line style for these levels, but both are present.

E. coli

The results shown in Table 1 and Figure 2 show the *E. coli* concentrations at each sample location by month of sampling in 2011. Most sample sites had the highest monthly geomean in July or September, with only Lick Creek and Antelope Creek mid having the highest monthly geomean in October and June respectively.

Note that several sites (Antelope Creek upper, Lake Creek upper and Lick Creek) dried up or became stagnant during the sampling period so that they were not sampled on every trip. Antelope Creek upper became dry on August 24^{th}, Lake Creek upper on August 8^{th} and Lick Creek was frequently stagnant and not flowing from August 8^{th} onward.

Figure 2. Geometric mean *E. coli* MPN/100mL by month for sample sites (approximately 4 samples per month).

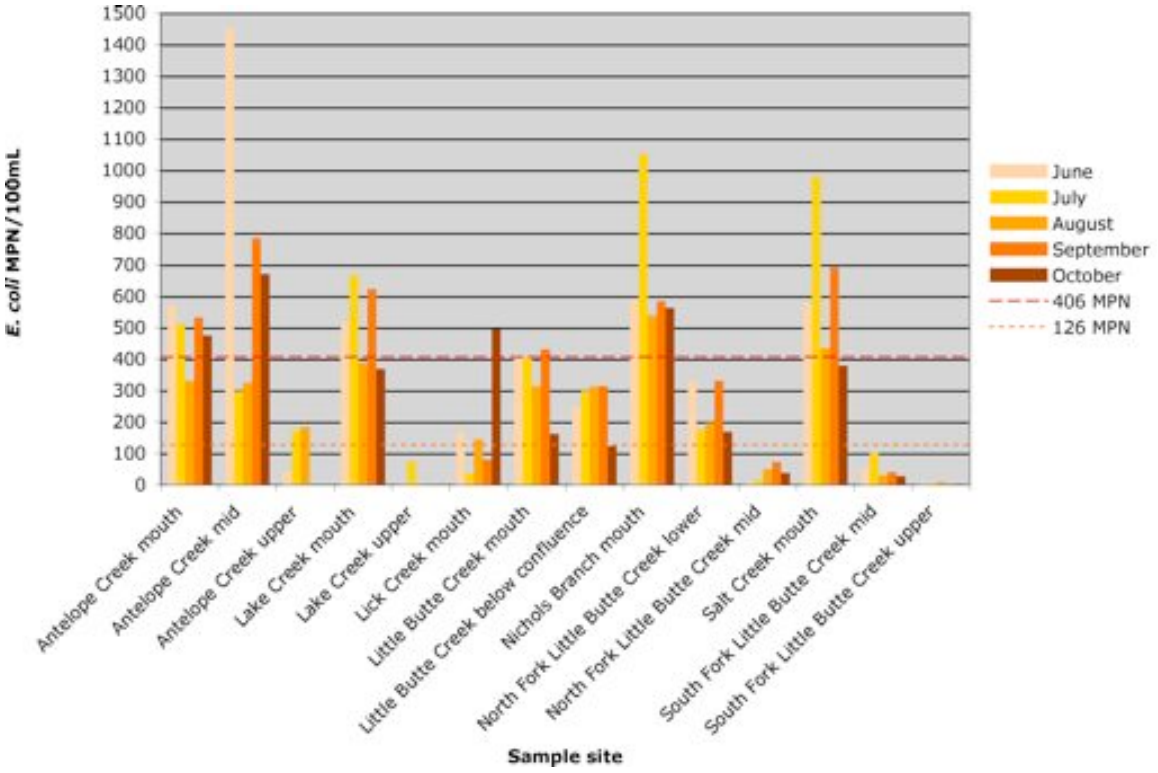
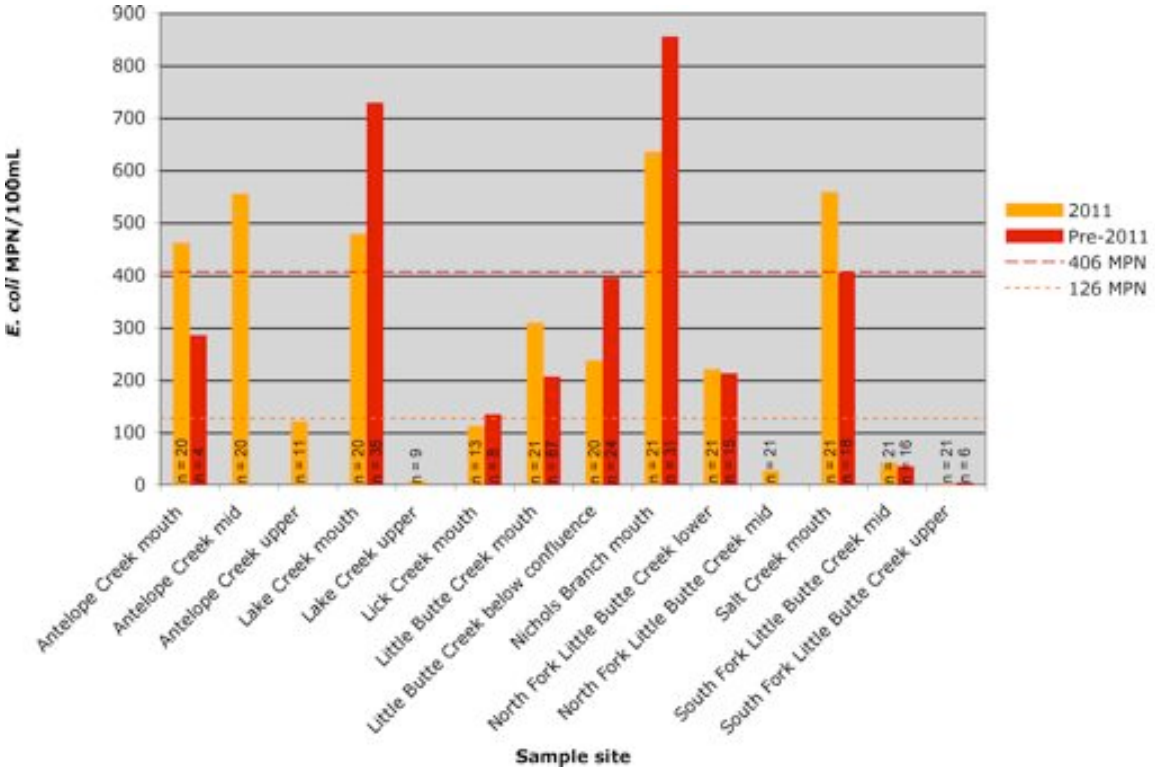


Table 1. Geometric mean *E. coli* MPN/100mL with sample size by month for sample sites.

Site	June	July	August	September	October
Antelope Creek mouth	570 n = 3	511 n = 4	330 n = 5	531 n = 4	474 n = 4
Antelope Creek mid	1453 n = 3	297 n = 4	325 n = 5	784 n = 4	670 n = 5
Antelope Creek upper	42 n = 3	173 n = 4	184 n = 4		
Lake Creek mouth	516 n = 3	669 n = 4	388 n = 5	623 n = 3	368 n = 5
Lake Creek upper	1 n = 3	75 n = 4	2 n = 2		
Lick Creek mouth	166 n = 3	36 n = 4	143 n = 3	79 n = 1	494 n = 2
Little Butte Creek mouth	403 n = 3	405 n = 4	313 n = 3	431 n = 4	162 n = 5
Little Butte Creek below confluence	247 n = 3	298 n = 3	313 n = 5	314 n = 4	123 n = 5
Nichols Branch mouth	589 n = 3	1054 n = 4	538 n = 5	584 n = 4	562 n = 5
North Fork Little Butte Creek lower	331 n = 3	175 n = 4	197 n = 5	330 n = 4	168 n = 5
North Fork Little Butte Creek mid	4 n = 3	15 n = 4	49 n = 5	72 n = 4	37 n = 5
Salt Creek mouth	580 n = 3	982 n = 4	434 n = 5	691 n = 4	378 n = 5
South Fork Little Butte Creek mid	54 n = 3	102 n = 4	30 n = 5	40 n = 4	27 n = 5
South Fork Little Butte Creek upper	2 n = 3	3 n = 4	8 n = 5	2 n = 4	1 n = 5

At locations where previous data was available through DEQ's LASAR database, the geometric mean for all data for June through October of 1998 to 2010 was graphed side by side with the geometric mean for June through October the data from 2011 in Figure 3. The mouth of Little Butte Creek is the only site for which there is some data recorded 1998 through 2011. Data for other sites was available from 1998 to 2002.

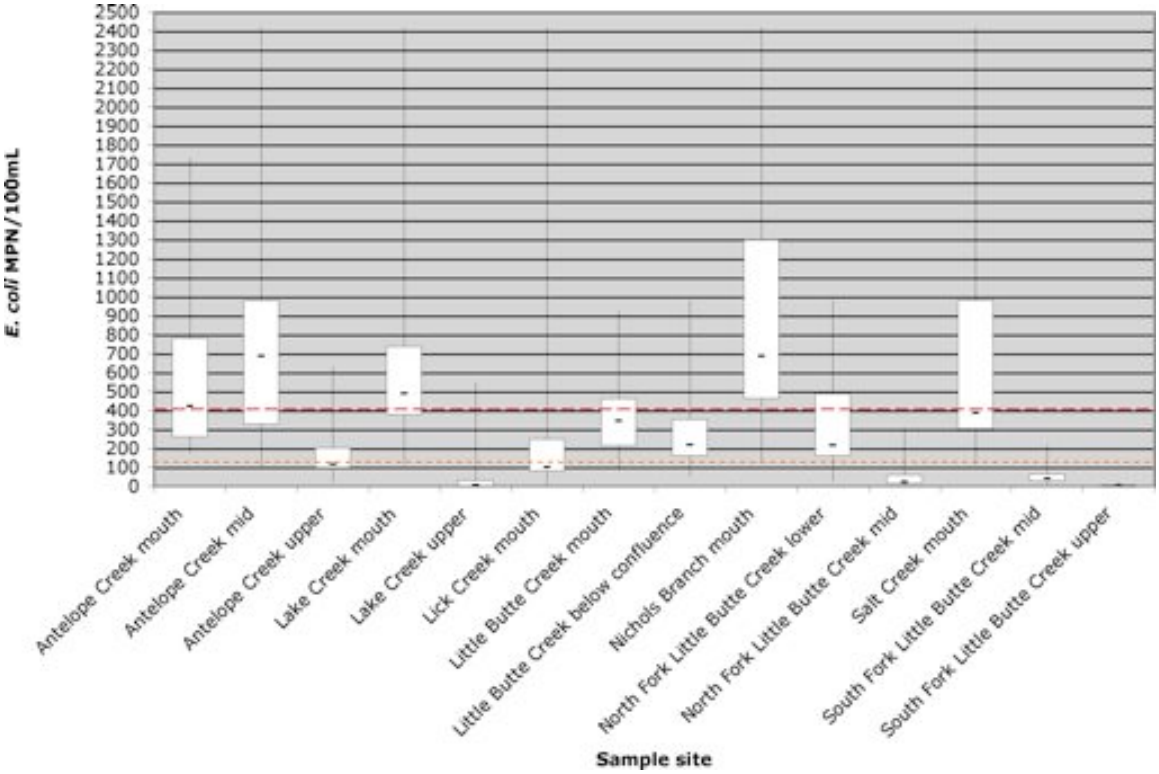
Figure 3. Geometric mean for June-October 2011 *E. coli* MPN/100mL at sites, shown with June-October from years before 2011 for the same site where available.



The range of values collected at each sample site varied widely. The values are represented in Figure 4 as IQR boxplots to better reflect the range of the data.

Map 3 shows the geomean of all *E. coli* data collected during the study plotted on a map, increasing size of points reflects an higher concentration of *E. coli* organisms.

Figure 4. 2011 *E. coli* MPN/100mL per site in IQR boxplots for June-October.



Map 3. Overall site *E. coli* geomean plotted by location, size and color of location dots refects higher *E. coli* geomean.

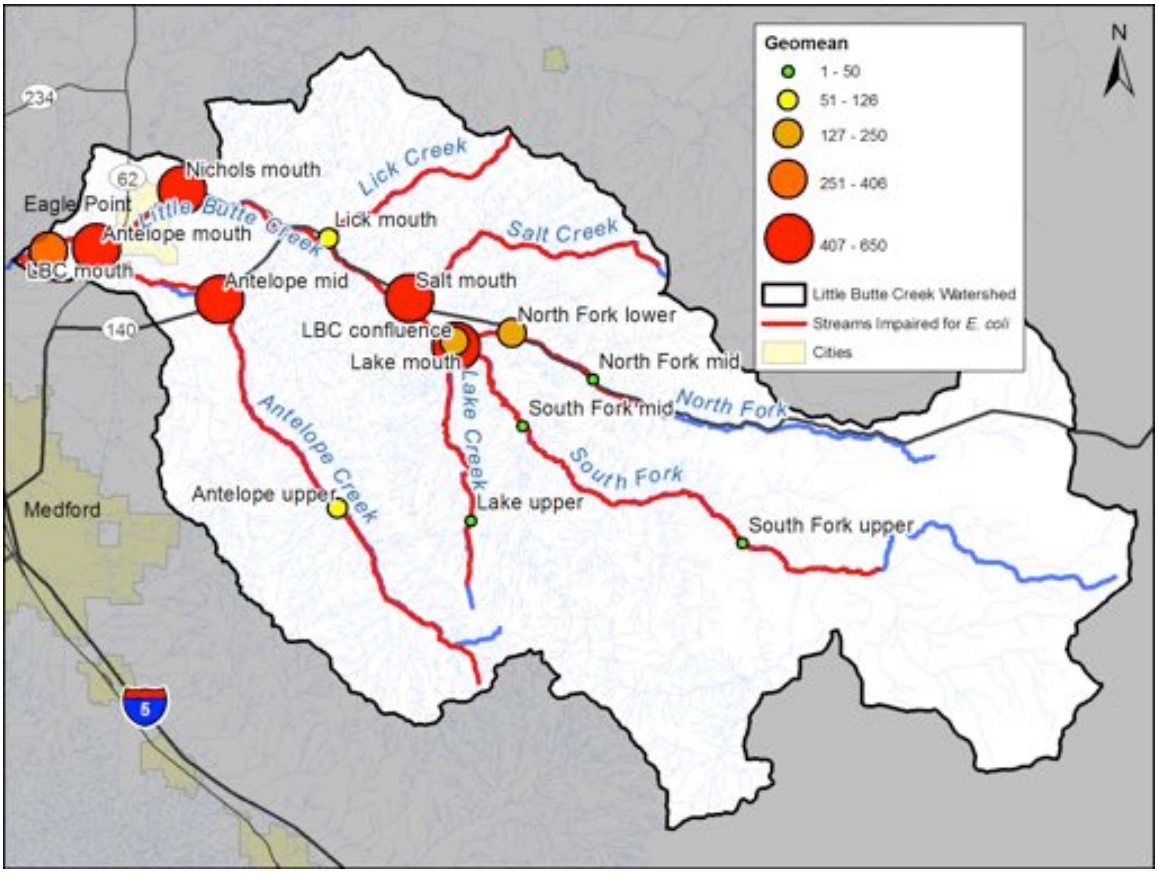


Figure 5 shows all *E. coli* data available from the LASAR database for the June through October range as well as the RRK data from 2011 for the mouth of Little Butte Creek with a plotted trendline. The data available shows that the levels of *E. coli* at the mouth of Little Butte Creek are trending upward since 1998. A seasonal Kendall test on the data using "Closest to Midpoint" aggregation returns a Z value of 3.446 and 2xP value of 0.0006, indicating a 99% confidence in an increasing trend. Additionally a slope of 31.28571 indicates that *E. coli* concentrations are increasing by approximately 31 MPN/100mL at this location per year.

Figure 5. *E. coli* MPN/100mL results for the mouth of Little Butte Creek for all available data with trendline plotted (produced by Steve Hanson at DEQ Laboratory using WQHydro). Lower WQ Standard line is 126 MPN/100mL criteria, upper WQ Standard line is 406 MPN/100mL criteria.

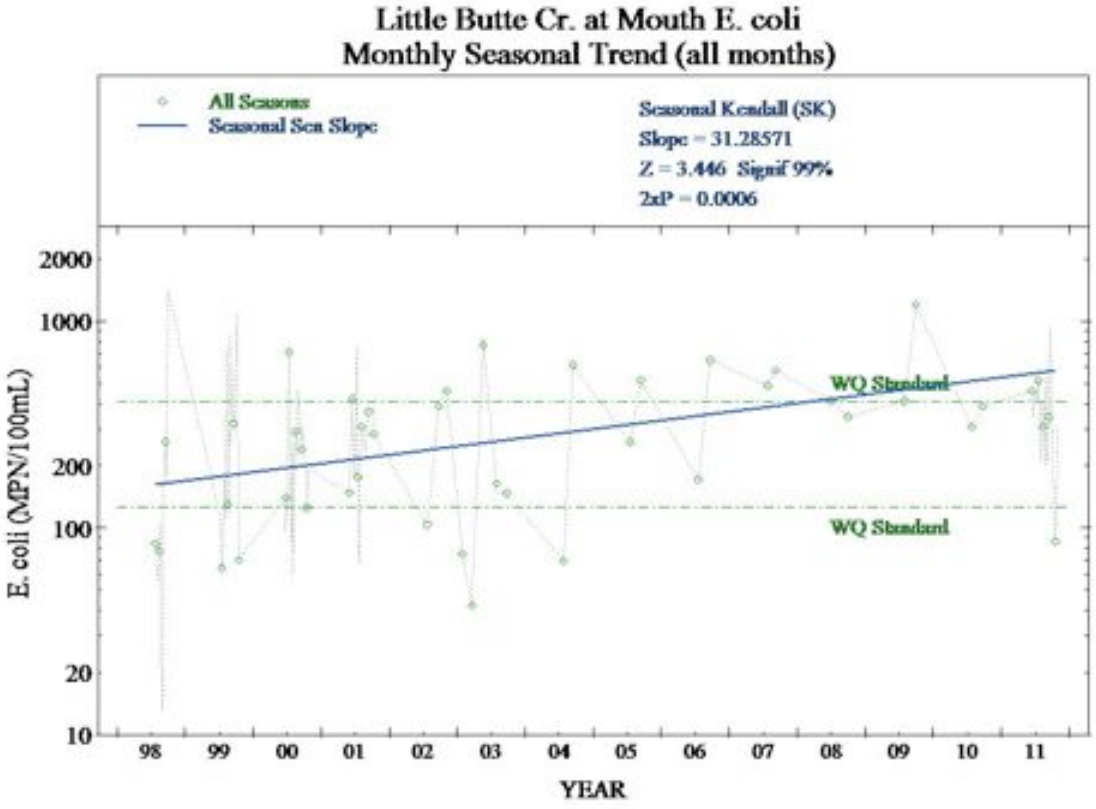


Figure 3 and Table 2 indicate the highest concentrations of *E. coli* to be found in Nichols Branch (636 MPN 100mL), Salt Creek (559 MPN/100mL) and Antelope Creek mid 556 MPN/100mL. The lowest concentrations were found at South Fork Little Butte Creek upper (1 MPN/100mL), Lake Creek upper 8 MPN/100mL) and North Fork Little Butte Creek mid (27 MPN/100mL). Table 2 lists sites in order of geometric mean *E. coli* MPN/100mL for study duration.

Table 2. Geometric mean for June-October 2011 *E. coli* MPN/100mL at sites sorted by *E. coli* concentration.

Site	*E. coli* MPN/100mL geomean	Sample size (n)
Nichols Branch mouth	636	21
Salt Creek mouth	559	21
Antelope Creek mid	556	21
Lake Creek mouth	478	20
Antelope Creek mouth	462	20
Little Butte Creek mouth	309	21
Little Butte Creek below confluence	238	20
North Fork Little Butte Creek lower	220	21
Antelope Creek upper	120	11
Lick Creek mouth	112	13
South Fork Little Butte Creek mid	42	21
North Fork Little Butte Creek mid	27	21
Lake Creek upper	8	9
South Fork Little Butte Creek upper	3	21

The only sample sites to attain water quality criteria during 2011 sampling were the two sites on South Fork Little Butte Creek, with the highest single sample recorded of 248 *E. coli* MPN/100mL. All other sample sites had at least one sample over the 406 MPN criteria, or a 30-day period with 5 samples where the geomean exceeded the 126 MPN/100mL criteria. See Table 3 for number of samples over 126 MPN/100mL and Table 4 for recorded single sample exceedances of 406 MPN/100mL water quality criteria.

Some samples were not collected due to loss of sample container or stagnant or non- existent water in the creek channel, in these cases the 30 day geomean with a 5 sample minimum could not be calculated during any 30 day period that overlapped with the missing samples. Antelope Creek upper dried up after 8/22. Lake Creek mouth had one sample lost on 9/19. Lake Creek upper dried up after 8/8. Lick Creek mouth was stagnant frequently from 9/5 onward. Little Butte Creek below confluence had one sample on 7/25 that was accidentally spilled at the lab.

Table 3. Quantity of samples exceeding *E. coli* 126 MPN/100mL.

Site	Number exceeding	Sample n	Percent exceeding
Antelope Creek mouth	19	21	90%
Antelope Creek mid	20	20	100%
Antelope Creek upper	5	11	45%
Lake Creek mouth	18	20	90%
Lake Creek upper	2	9	22%
Lick Creek mouth	5	21	24%
Little Butte Creek mouth	19	20	95%
Little Butte Creek below confluence	17	21	81%
Nichols Branch mouth	20	21	95%
North Fork Little Butte Creek lower	17	21	81%
North Fork Little Butte Creek mid	3	21	14%
Salt Creek mouth	20	21	95%
South Fork Little Butte Creek mid	2	21	10%
South Fork Little Butte Creek upper	0	21	0%

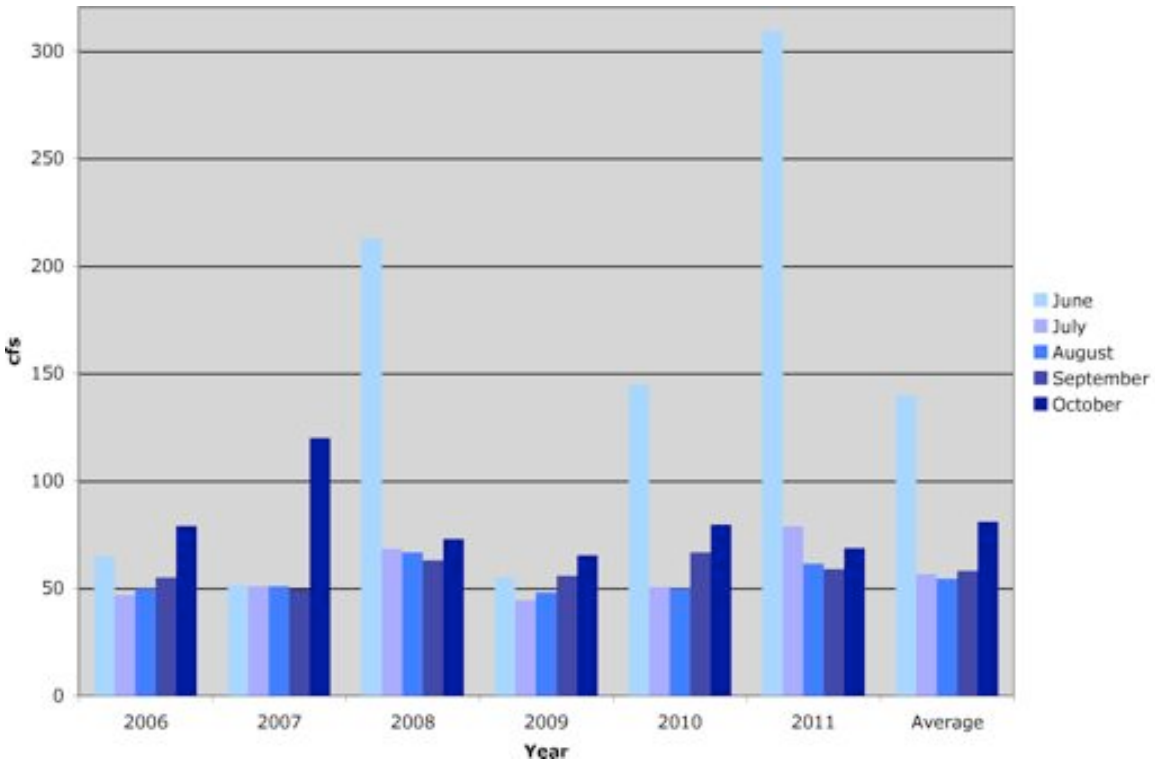
Table 4. Quantity of exceedances per sample site of E. coli 406 MPN/100mL water quality criteria.

Site	Number exceeding	Sample n	Percent exceeding
Antelope Creek mouth	14	21	67%
Antelope Creek mid	11	20	55%
Antelope Creek upper	1	11	9%
Lake Creek mouth	14	20	70%
Lake Creek upper	1	9	11%
Lick Creek mouth	2	13	15%
Little Butte Creek mouth	9	21	43%
Little Butte Creek below confluence	5	20	25%
Nichols Branch mouth	16	21	76%
North Fork Little Butte Creek lower	6	21	29%
North Fork Little Butte Creek mid	0	21	0%
Salt Creek mouth	10	21	48%
South Fork Little Butte Creek mid	0	21	0%
South Fork Little Butte Creek upper	0	21	0%

Flow

Total discharge of Little Butte Creek to the Rogue River in 2011 averaged well above the 5-year average in June, July and August (see Figure 6).

Figure 6. Little Butte Creek mouth monthly flow average by year for 2006 through 2011.



During this study period, the majority of streams had their peak flows in June.

North Fork Little Butte Creek and South Fork Little Butte Creek where measured at upper sites had by far the most flow of any of tributary stream to Little Butte Creek, though a significant

amount of their flow is diverted for irrigation before it reaches the main stem (compare total flow of North Fork Little Butte Creek upper and South Fork Little Butte Creek mid to the flow on the main stem of Little Butte Creek just below the confluence of the North and South Forks at Lake Creek).

Flows at the upper sites for Antelope and Lake Creeks dried up entirely in August, and only had water in them for small moments after rainfall in October.

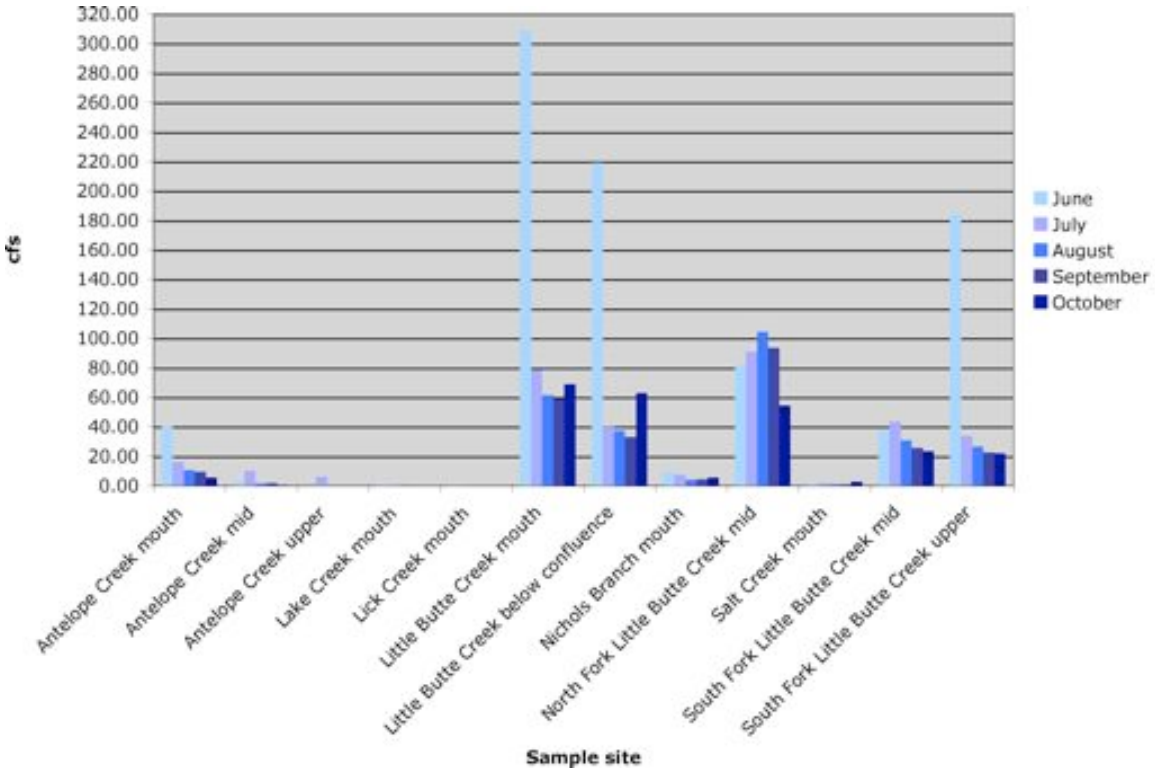
Salt Creek maintained flows below 3 cfs for the duration of study and was the only stream to record the highest flow in October.

Stream flow monthly averages are shown in Table 5 and Figure 7.

Table 5. Monthly and total average flow in cfs for each sample site where flow was recorded.

Site	June	July	August	September	October	Total Average
Antelope Creek mouth	40.27	16.25	10.49	9.39	5.50	16.38
Antelope Creek mid	2.61	9.97	1.54	1.76	0.25	3.22
Antelope Creek upper		5.87	0.11		0.04	2.00
Lake Creek mouth	0.78	0.69	0.34	0.00	0.08	0.38
Lick Creek mouth	0.25	0.33	0.03	0.04	0.03	0.14
Little Butte Creek mouth	309.25	78.74	61.37	58.76	68.64	115.35
Little Butte Creek below confluence	219.13	39.71	37.10	33.07	62.74	78.35
Nichols Branch mouth	9.31	7.33	4.02	4.13	5.33	6.02
North Fork Little Butte Creek mid	81.60	90.81	104.42	93.40	54.39	84.92
Salt Creek mouth	1.11	1.82	0.96	0.92	2.59	1.48
South Fork Little Butte Creek mid	37.58	43.39	30.71	25.56	23.19	32.09
South Fork Little Butte Creek upper	184.03	33.94	26.42	22.33	21.94	57.73

Figure 7. Monthly average flow in cfs for each sample site where flow was recorded.



Loading

Loading was calculated using a monthly average of flow, and the monthly geometric mean for *E. coli* MPN/100mL to give the number of *E. coli* organisms per 24 hour period. Five out of 12 sites sampled where flow data was collected would require a 70+% reduction in *E. coli* levels to meet the 126 MPN/100mL 5 sample 30 day geomean water quality criteria. The Little Butte Creek watershed as a whole as sampled from the mouth would require a 59% decrease in fecal pollution to meet water quality criteria for the sampling period, a 10% higher reduction than the matching Typical flow regime reduction estimate from the Rogue Basin TMDL (DEQ 2008). No clear monthly trends were seen in the data. See Figure 8 for average for the entire sampling period, and Table 6 for monthly breakdowns of the data.

Figure 8. Average *E. coli* organisms per day during sampling period (using monthly average flow and monthly geomean *E. coli* MPN/100mL), shown with the target average load for these flows at 126 MPN/100ml criteria and percent reduction in pollution to meet that target.

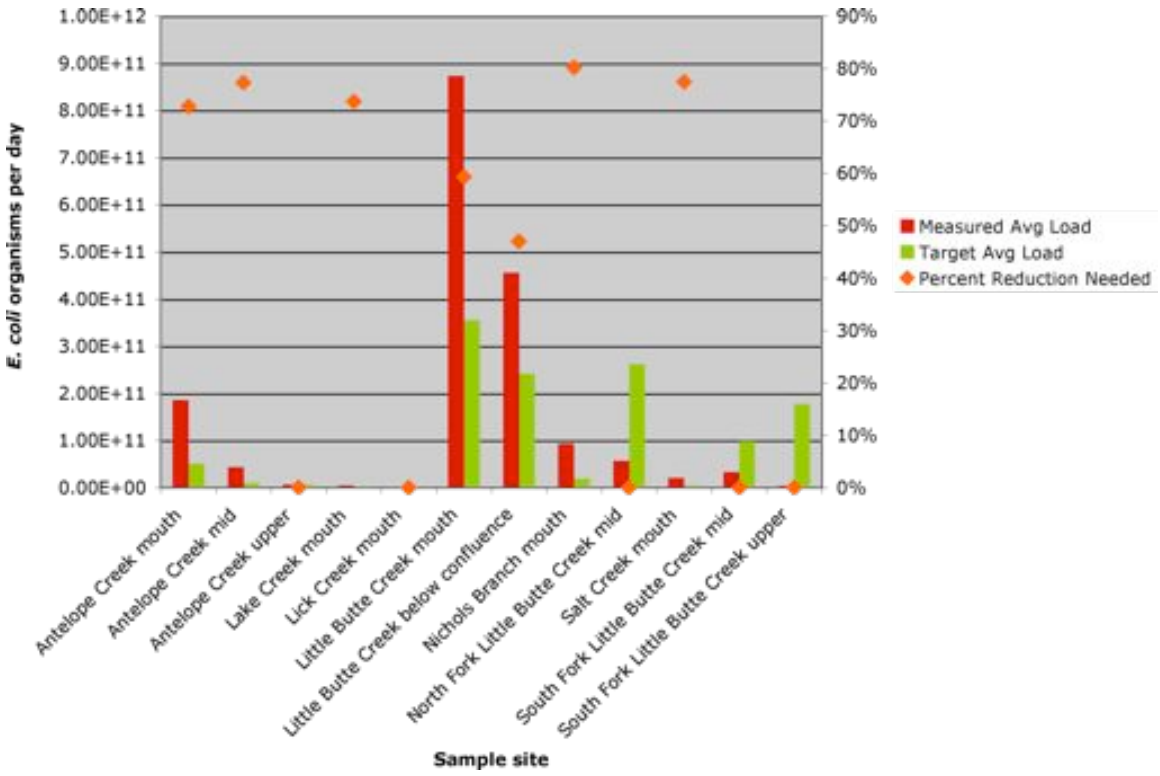


Table 6. *E. coli* organisms per day (using monthly average flow, and monthly geomean *E. coli* MPN/100mL), target levels of *E. coli* organisms per day to meet 126 MPN/100mL water quality criteria, and percent reduction of pollutants required to meet target levels.

Sample site		June	July	August	September	October	Average
Antelope Creek mouth	Measured	5.61E+11	2.03E+11	8.47E+10	1.22E+11	6.38E+10	1.85E+11
	Target	1.24E+11	5.01E+10	3.23E+10	2.90E+10	1.70E+10	5.05E+10
	Reduction	77.89%	75.35%	61.83%	76.29%	73.40%	72.74%
Antelope Creek mid	Measured	9.28E+10	7.23E+10	1.22E+10	3.37E+10	4.07E+09	4.38E+10
	Target	8.05E+09	3.07E+10	4.75E+09	5.41E+09	7.65E+08	9.94E+09
	Reduction	91.33%	57.51%	61.19%	83.93%	81.20%	77.33%
Antelope Creek upper	Measured	0.00E+00	2.49E+10	4.78E+08	0.00E+00	0.00E+00	5.90E+09
	Target	0.00E+00	1.81E+10	3.27E+08	0.00E+00	1.08E+08	6.17E+09
	Reduction	0.00%	27.36%	31.65%	0.00%	0.00%	0.00%
Lake Creek mouth	Measured	9.85E+09	1.12E+10	3.23E+09	3.81E+07	7.02E+08	4.41E+09
	Target	2.40E+09	2.11E+09	1.05E+09	7.71E+06	2.40E+08	1.16E+09
	Reduction	75.59%	81.16%	67.53%	79.77%	65.77%	73.66%
Lick Creek mouth	Measured	1.02E+09	2.90E+08	1.19E+08	6.90E+07	3.39E+08	3.72E+08
	Target	7.71E+08	1.02E+09	1.05E+08	1.09E+08	8.63E+07	4.19E+08
	Reduction	24.16%	0.00%	12.07%	0.00%	74.51%	0.00%
Little Butte Creek mouth	Measured	3.05E+12	7.81E+11	4.69E+11	6.19E+11	2.72E+11	8.73E+11
	Target	9.53E+11	2.43E+11	1.89E+11	1.81E+11	2.12E+11	3.56E+11
	Reduction	68.71%	68.91%	59.70%	70.76%	22.11%	59.28%
Little Butte Creek below confluence	Measured	1.33E+12	2.89E+11	2.84E+11	2.54E+11	1.89E+11	4.55E+11
	Target	6.76E+11	1.22E+11	1.14E+11	1.02E+11	1.93E+11	2.42E+11
	Reduction	49.09%	57.72%	59.74%	59.82%	0.00%	46.97%
Nichols Branch mouth	Measured	1.34E+11	1.89E+11	5.28E+10	5.90E+10	7.33E+10	9.37E+10
	Target	2.87E+10	2.26E+10	1.24E+10	1.27E+10	1.64E+10	1.86E+10
	Reduction	78.62%	88.05%	76.56%	78.41%	77.59%	80.18%
North Fork Little Butte Creek mid	Measured	7.87E+09	3.36E+10	1.25E+11	1.65E+11	4.88E+10	5.69E+10
	Target	2.52E+11	2.80E+11	3.22E+11	2.88E+11	1.68E+11	2.62E+11
	Reduction	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Salt Creek mouth	Measured	1.58E+10	4.37E+10	1.02E+10	1.56E+10	2.40E+10	2.02E+10
	Target	3.42E+09	5.61E+09	2.96E+09	2.84E+09	7.98E+09	4.56E+09
	Reduction	78.28%	87.17%	70.96%	81.77%	66.69%	77.45%
South Fork Little Butte Creek mid	Measured	4.94E+10	1.08E+11	2.23E+10	2.51E+10	1.52E+10	3.31E+10
	Target	1.16E+11	1.34E+11	9.47E+10	7.88E+10	7.15E+10	9.89E+10
	Reduction	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
South Fork Little Butte Creek upper	Measured	1.05E+10	2.54E+09	4.94E+09	1.03E+09	6.16E+08	3.73E+09
	Target	5.67E+11	1.05E+11	8.14E+10	6.88E+10	6.76E+10	1.78E+11
	Reduction	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Land Use

Delineated watersheds for each sampling site at the mouth of a creek were analyzed for quantity of land use types. See Map 4 for watershed areas and sample site locations. The percent of each of those watersheds made up of each land use type is shown in Figure 9 and Table 7 with *E. coli* MPN/100mL for the duration of the sampling period for each site. Of the eight sample sites for which watersheds were calculated, the watersheds with the lowest percent of land in agricultural use appear to have the lowest *E. coli* geomeans (South Fork mid, North Fork lower and Lick Creek mouth).

Map 4. Watershed areas delineated for land use calculations.

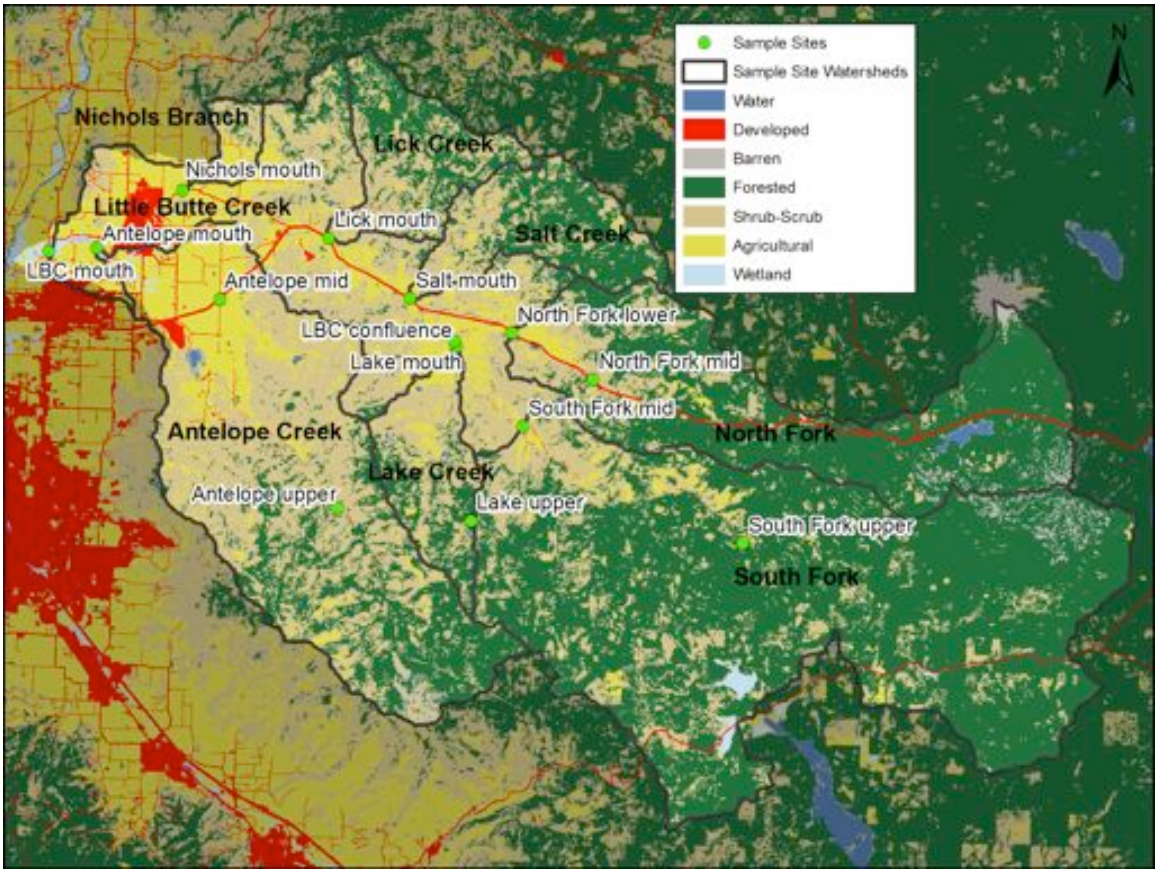


Figure 9. Land cover within watersheds defined for the lowest sample site per creek sampled shown with geometric mean of *E. coli* MPN/100mL for project duration at that site.

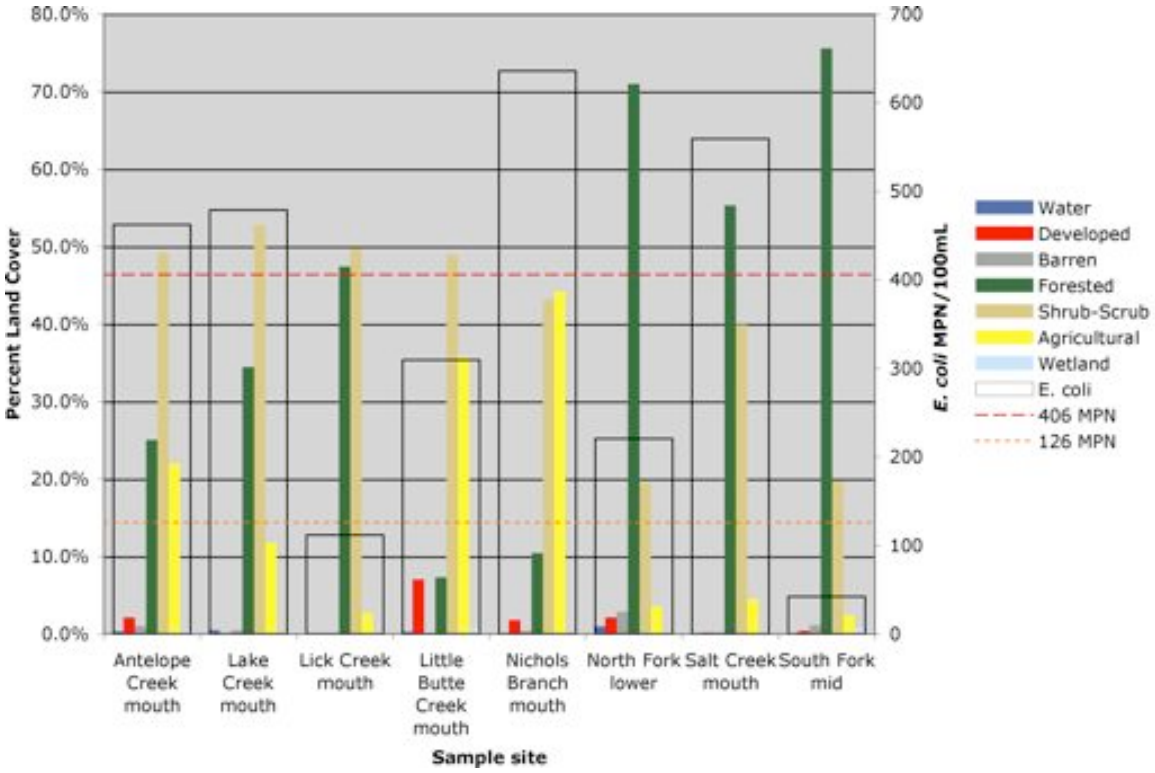


Table 7. Land cover within watersheds defined for the lowest sample site per creek sampled shown with geometric mean of *E. coli* MPN/100mL for project duration at that site.

Sample site	*E. coli* Geomean	Water	Developed	Barren	Forested	Shrub-Scrub	Agricultural	Wetland
Antelope Creek mouth	462	1.2%	2.2%	3.4%	77.4%	14.5%	1.3%	0.0%
Lake Creek mouth	478	0.2%	6.4%	0.1%	16.4%	45.5%	30.7%	0.6%
Lick Creek mouth	112	0.1%	0.1%	0.0%	47.4%	49.8%	2.7%	0.0%
Little Butte Creek mouth	309	0.1%	0.4%	0.1%	41.1%	48.6%	9.8%	0.0%
Nichols Branch mouth	636	0.0%	1.8%	0.4%	10.4%	43.2%	44.2%	0.0%
North Fork lower	220	0.0%	0.1%	0.2%	55.3%	39.9%	4.5%	0.0%
Salt Creek mouth	559	0.0%	0.1%	0.2%	55.3%	39.9%	4.5%	0.0%
South Fork mid	42	0.4%	0.3%	0.2%	19.4%	63.0%	16.6%	0.0%

Turbidity

Results show that most creeks fit one of two patterns. One common pattern appears to be that turbidity levels are highest for that site in June, and steadily decreasing over time, with October having the lowest levels of turbidity. The second common pattern appears to be a curve, with the levels starting low in June, going higher in the middle months, and going back down to lower levels in October. The biggest exception to this would be Salt Creek, which had an average turbidity of 173 NTU in October due to a stock watering tank failure which led to three weeks of between 1000% and 6000% increase above background turbidity levels in this tributary. See Figure 10 and Table 8.

Salt Creek had the highest recorded turbidity values, with samples in October as high as 413 NTU. Antelope Creek and Nichols Branch had the consistently highest turbidity hovering at approximately 15 NTU throughout the duration of sampling. The lowest turbidity was found at both locations on the South Fork Little Butte Creek, with monthly averages between 1.4 and 3.6 NTU.

Figure 10. Arithmatic mean turbidity in NTU by month for sample sites (note off chart value of Salt Creek is 173 NTU).

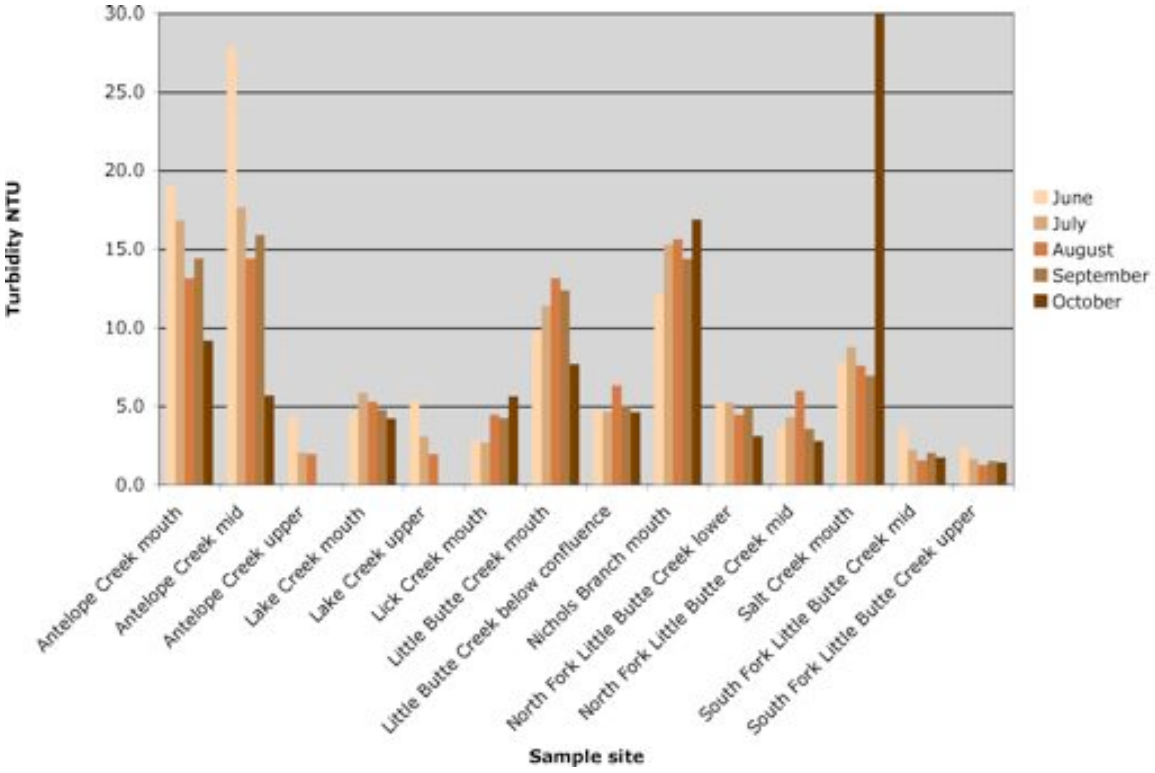


Table 8. Arithmatic mean turbidity NTU with standard deviation and sample size by month for sample sites.

Turbidity (NTU) mean, standard deviation and sample size	June	July	August	September	October
Antelope Creek mouth	19.0 ± 1.3 n = 3	16.8 ± 3.2 n = 4	13.1 ± 1.1 n = 5	14.4 ± 1.8 n = 4	9.2 ± 4.4 n = 4
Antelope Creek mid	27.8 ± 1.7 n = 3	17.6 ± 3.5 n = 4	14.4 ± 3.5 n = 5	15.9 ± 3.0 n = 4	5.7 ± 5.2 n = 5
Antelope Creek upper	4.3 ± 1.2 n = 3	2.1 ± 0.5 n = 4	1.9 ± 0.9 n = 4		
Lake Creek mouth	4.5 ± 0.2 n = 3	5.8 ± 2.4 n = 4	5.3 ± 2.3 n = 5	4.8 ± 2.1 n = 4	4.2 ± 3.4 n = 4
Lake Creek upper	5.4 ± 1.5 n = 3	3.1 ± 0.8 n = 3	1.9 ± 0.6 n = 2		
Lick Creek mouth	2.8 ± 0.2 n = 3	2.7 ± 1.4 n = 4	4.5 ± 1.7 n = 3	4.2 ± 0.0 n = 1	5.6 ± 1.4 n = 2
Little Butte Creek mouth	9.7 ± 0.2 n = 3	11.4 ± 1.3 n = 4	13.1 ± 2.3 n = 5	12.4 ± 2.3 n = 4	7.7 ± 1.8 n = 5
Little Butte creek below confluence	4.7 ± 0.4 n = 3	4.6 ± 0.7 n = 4	6.3 ± 1.4 n = 5	5.0 ± 1.0 n = 4	4.6 ± 1.4 n = 4
Nichols Branch mouth	12.1 ± 2.6 n = 3	15.3 ± 2.8 n = 4	15.6 ± 2.0 n = 5	14.4 ± 2.1 n = 4	16.9 ± 7.3 n = 5
North Fork Little Butte Creek lower	5.3 ± 1.5 n = 3	5.2 ± 0.8 n = 4	4.4 ± 0.6 n = 5	5.0 ± 0.7 n = 4	3.1 ± 1.1 n = 5
North Fork Little Butte Creek mid	3.6 ± 0.9 n = 3	4.3 ± 1.0 n = 4	6.0 ± 4.1 n = 5	3.5 ± 0.7 n = 4	2.8 ± 0.9 n = 5
Salt Creek mouth	7.8 ± 2.7 n = 3	8.8 ± 2.9 n = 4	7.6 ± 0.7 n = 5	6.9 ± 2.3 n = 4	173.5 ± 161.1 n = 6
South Fork Little Butte Creek mid	3.6 ± 1.1 n = 3	2.2 ± 0.6 n = 4	1.5 ± 0.1 n = 5	2.0 ± 0.9 n = 4	1.7 ± 1.3 n = 5
South Fork Little Butte Creek upper	2.5 ± 0.7 n = 3	1.6 ± 0.2 n = 4	1.2 ± 0.2 n = 5	1.5 ± 0.6 n = 4	1.4 ± 0.5 n = 5

Other parameters

In addition to water samples that were analyzed for *E. coli* bacteria, data was collected for turbidity, conductivity, pH and temperature using field meters at the time of sample collection. Most of these parameters cannot be directly related to the issue of bacteria pollution, but were simple field parameters to gather at the time and add to DEQ's public database. Because the timing of samples was in general the mornings and early afternoon, the pH readings had not yet

reached the highs that they might have in the later afternoon. Because of the sometimes inconsistent timing between samplers, and the samples being collected over an up to 5-hour period in the summertime, temperature and conductivity comparisons are not easily done using our data set. However the data will be available to DEQ and the public for use in future analysis.

Discussion

E. coli

While the intent was to sample for rain events to look at the effects of precipitation on bacteria levels in Little Butte Creek, the period of sampling has so little precipitation that we were unable to obtain samples during rain events.

Data on streams with more than one sample site (Antelope Creek, Lake Creek, Little Butte Creek, North Fork Little Butte Creek and South Fork Little Butte Creek) showed that the upstream *E. coli* levels are lower than the downstream *E. coli* levels. The only exception being Antelope Creek where the highest *E. coli* levels were consistently found at our mid watershed sampling location at Meridian Road. The Meridian Road site is just downstream of an irrigation return discharge point and it is possible that the high levels of bacteria at this simple site are due to its proximity to that discharge.

In 2011, only the sites on South Fork Little Butte Creek attained water quality standards, with no 30 day period with five samples exceeding the *E. coli* 126 MPN/100mL geomean criteria and all samples lower than the 406 MPN/100mL single sample criteria. It is likely that some areas downstream of the sample site locations on South Fork Little Butte were not attaining water quality criteria, but the upstream portions showed relatively good water quality in 2011.

All other sampled sites at least once failed to meet DEQ water quality criteria during the study duration. Antelope Creek mouth, Antelope Creek mid, Lake Creek mouth, Little Butte Creek mouth, Nichols Branch mouth and Salt Creek mouth 406 MPN/100mL single sample water quality criteria for 40% or greater of the samples taken (up to 76% of samples on Nichols Branch, and 70% on Lake Creek).

Looking at the long-term data for the mouth of Little Butte Creek from 1998 to 2011, it appears that *E. coli* levels are steadily trending upwards, suggesting that fecal bacteria pollution throughout the entire watershed is increasing.

The loading calculations further support this with an overall 59% decrease required at the mouth of Little Butte Creek in 2011 to meet water quality criteria, while for the same flow range, the Rogue TMDL (DEQ 2008) identifies only a 49% decrease in pollutants using the data available at the time. Some monthly time frames and streams require an even larger reduction in pollution, up to 91% to meet water quality criteria.

It seems clear that additional measures need to be taken to drastically reduce bacteria pollution throughout the watershed.

Flow

Water quantity in 2011 was exceptionally high with snowpack recorded as 184% of average for the Rogue & Umpqua basins as of May 10th, 2011 (NRCS 2011). The wet and cold spring and relatively cool summer lead to a higher than average recorded flow for the months of June, July and August in the Little Butte Creek watershed. The June 2011 flow was over 100 cfs higher at the mouth of Little Butte Creek than the average flow for June for the last 5 years. With very little precipitation in October, flows were slightly below average.

The higher than average amount of water from snowmelt and cooler weather could have contributed to lower than normal *E. coli* concentrations by having instream a slightly increased quantity of water to dilute pollutants. In a more average water year it might be expected for bacteria levels to be higher throughout the watershed.

Land use

There appears to be some correlation between a higher amount of agricultural use within a given watershed and higher levels of *E. coli*. The watershed contains a significant amount of both public and private lands grazing, which is identified in the Rogue TMDL land use analysis as possibly the largest contributor of bacteria in the watershed. Nationwide, the EPA lists bacteria pollution as the most frequent cause of water quality impairments, and agricultural sources of pollution as the number one cause of water quality impairments (EPA 2004).

The percent of land use coverage appear to be different than the numbers used in the Rogue TMDL. It appears that DEQ used 1km resolution land cover data from NLCD 2001, while for the purposes of analysis in this report 30m resolution data from NLCD 2006 was used. Based on the large disparity of resolution, this most likely does not reflect a major change in land cover within the region, just more accurate reporting.

The watersheds with higher *E. coli* levels seem to have a less clear relationship between land cover percentages and water quality. Due to irrigation water withdrawal and discharge locations often crossing sub-watersheds, it is likely that this is too fine a scale to use this type of analysis on and get consistent results, and may be more applicable to comparing watersheds on a 5th field watershed scale (HUC10).

E. coli levels do not appear exceed the water quality criteria until reaching the portions of the watershed in private ownership used for pasture and crops. The upper sample sites of all creeks that had an upper sample site (Antelope Creek upper, Lake Creek upper, North Fork Little Butte Creek upper and South Fork Little Butte Creek upper) had bacteria levels that were generally very low and meeting the water quality criteria.

Recommendations

This study shows that many streams within the Little Butte Creek watershed continue to fail in attaining water quality criteria. The following recommendations may help improve water quality throughout the watershed.

1. Modernize irrigation delivery methods

Flood irrigation contributes large amounts of bacteria and turbidity to streams, as well as increases stream temperatures. Modernizing irrigation systems and eliminating the practice of flood irrigation through the use of sprinkler systems would bring an immediate reduction in fecal bacteria and sediment pollution by removing the conveyance of runoff directly to the streams.

2. Reduce overall withdrawal quantities

Low flows in the tributaries and mainstem of Little Butte Creek reduce the dilution potential for pollutants and causes more rapid increases in temperature. The reduction of water withdrawals via conservation and system efficiency would have an immediate improvement in temperature and pollution levels in streams by retaining higher instream flow.

3. Protect and restore stream buffers

Small, degraded and inadequate riparian buffers allow pollutants to be quickly washed into streams during rain events and from irrigation runoff, or be introduced directly by livestock. The restoration and protection of streamside riparian vegetation through fencing livestock out and focused plantings would provide a broader area for water filtration to happen before entering the stream. These stream buffers would reduce fecal bacteria and sediment amounts as well as shading the stream and reducing the rate of temperature increase.

4. Implement Water for Irrigation, Streams and Economy (WISE)

The WISE project would reduce water lost in existing conveyance systems, improve delivery methods and increase stream flows through a series of irrigation system upgrades. The modernization of irrigation systems would increase the amount of water left in-stream while decreasing the inputs of polluted water back from return flows

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Appendicies

Sample Site Photographs

Little Butte Creek mouth, sampled at the Agate Rd bridge.

Little Butte Creek below confluence, sampled at the bridge in Lake Creek.

Antelope Creek mouth, accessed by trail system from City of Eagle Point property.

Antelope Creek mid, sampled from the bridge on Meridian Rd just off Highway 140.

Antelope Creek upper, sampled from bridge 641 on Antelope Creek Rd.


Nichols Branch mouth, sampled at base of bridge on Brownsboro Highway.

Lick Creek mouth, sampled from bridge on Highway 140.

Salt Creek mouth, sampled from bridge on Highway 140.

Lake Creek mouth, sampled from bridge on South Fork Little Butte Creek Rd.

Lake Creek upper, sampled just above culvert going under BLM road 37-2E-7.2.

South Fork Little Butte Creek mid, sampled from bridge on South Fork Little Butte Creek Rd.

South Fork Little Butte Creek upper, sampled from bridge leading to Camp Latgowa at the top of South Fork Little Butte Creek Rd.

North Fork Little Butte Creek lower, sampled from bridge on Highway 140.

North Fork Little Butte Creek upper, sampled from bridge on Highway 140.

Raw Data

Due to the quantity of data used in this report, it is not included with the report. Copies of all data used for the production of this report may be requested from forrest@rogueriverkeeper.org and supplied in electronic form.

types of activities impact stream banks stability, and unnaturally increase the speed of runoff and stream flow following precipitation events, altering the natural hydrograph and changing erosion patterns. These types of pollution and other alterations effect threatened species such as Southern Oregon Northern California Coast (SONCC) coho salmon, other aquatic life and the public's ability to safely recreate and obtain clean drinking water.

Forestry

Oregon does not have sufficient program, as additional measures are needed to meet water quality standards. Oregon states in the July 1, 2013 submittal that land use rules keeping forest lands in production as forest lands, combined with what it considers protections in the Oregon Forest Practices Act and voluntary measures are sufficient. Voluntary measures, and existing incredibly limited protections are not sufficient.

Land use

While Oregon's land use laws are of course valuable, the water quality issues on forest lands derive from their very use as forest lands. Impacts in the form of sediment from roads, pesticides from aerial spraying, temperature increases from removal of riparian trees, and removal of sufficient riparian buffers to filter sediments from clearcuts. Keeping these lands in production may be valuable, but it is not protecting our streams, fish or downstream residents.

Oregon's forest practices

Flaws in Oregon's program were identified by EPA and NOAA in the 1998 findings, again by the Independent Multidisciplinary Science Team (IMST) in 1999, again by the State's own Statewide Evaluation of Forest Practices Act Effectiveness in Protecting Water Quality in 2002, again in a court settlement in 2010, again in NOAA Fisheries draft SONCC coho recovery plan in 2012. The State has had more than 16 years of notice, in a number of different forms, that additional management measures were required to protect beneficial uses. Why have sufficient measures not been implemented yet to protect medium and small fish and non-fish bearing streams? Instead the State's July 1, 2013 submission points at voluntary measures, adopted measures that ignore the clearly identified evidence and a rulemaking that is still not complete.

The IMST (1999) and National Marine Fisheries Service (NMFS) draft SONCC coho recovery plan (2012) both clearly identify that Oregon's forest practices are not sufficient to recover wild salmonids, a signficant beneficial use of coastal watersheds.

> "the current site-specific approach of regulation and voluntary actions is not sufficient to accomplish the recovery of wild salmonids" – Recovery of Wild Salmonids in Western Oregon Forests: Oregon Forest Practices Act Rules and the Measures in the Oregon Plan for Salmon and Watersheds, IMST 1999

> "NMFS determined that Oregon's Forest Practices Act (OFPA) did not have implementing rules that adequately protect coho salmon habitat. NMFS determined that there was a low probability that adequate LWD recruitment could be achieved under the requirements of the OFPAs. The OFPA was also found to not adequately consider and manage timber harvest and road construction on sensitive, unstable slopes subject to mass wasting, nor did it address cumulative effects. In particular, the OFPA was found to not provide adequate protection for the production and introduction of large woody debris (LWD) to medium, small, and non-fish bearing streams." – Public Draft Recovery Plan for Southern Oregon/Northern California Coast Coho Salmon, NMFS 2012

Riparian buffers

Stream side no-cut buffers that have been identified by NMFS as sufficient to protect threatened salmonids include 170-foot from Ordinary High Water (OHW) (as identified in Ramping up Salmon Recovery Efforts through Floodplain Regulations; DLCD December 2013), and 300-foot on fish bearing streams or 150-foot on non-fish bearing streams (Northwest Forest Plan as reviewed by NMFS 2012). In contrast current Oregon Forest Practices Act buffers are at best a 20-foot buffer on fish bearing streams, or a 10-foot buffer of six-inch trees (larger trees may be cleared) on small non-fish bearing streams. At an absolute minimum, Oregon's no cut buffers need to be increased substantially to ensure large wood recruitment, filtration of sediments and pesticides, and sufficient basal area in the riparian corridor for shade required for protection of cold water.

Pesticides

The availability of monitoring data for pesticides in water is rather limited. In the July 1, 2013 submission Oregon says it is currently using a multi-agency approach that depends on available monitoring data to drive focus of resources. We suggest it might be substantially more effective and involve less staff resources to simply designate sufficiently large no-spray buffers for both fish bearing and non-fish bearing streams from aerial and ground applications.

Roads

Sediment from timber harvest operations and infrastructure is widely acknowledged to be a significant issue to the recovery and survival of salmonids. The State's July 1, 2013 submission lacks any description or details about what methods the state uses in evaluating effectiveness of BMPs, nor a process for evaluating when additional BMPs may be required to protect beneficial uses, nor any criteria for enforcement if the use (or not) of those BMPs results in detrimental impacts to beneficial uses. The State goes on to claim that "Voluntary reporting of voluntary measures has diminished in past years, however it is reasonable to assume that voluntary measure implementation has not." If reporting has dropped, it does not seem reasonable to assume that implementation continues, considering the voluntary nature.

Below are photos that should explain our skepticism of the effectiveness of the OFPA measures to protect water quality and designated uses.

Private lands logging along the Illinois River in 2003. The harvest and road sediments pictured above are pictured reaching the Illinois River below. Siskiyou Project file photos.

Urban development

Oregon does not have sufficient program to meet state obligations under CZARA. Oregon states in the July 1, 2013 submittal that it will use voluntary guidance through TMDL implementation plans to achieve this. Oregon goes on to say that there are a number of regulatory mechanisms that it *could* use to provide guarantees for these implementations.

The measures described by Oregon do not constitute a program, but rather are more of a potential for the development of a plan. At this point in time, compliance with CZARA requires a functional program to meet these conditions.

A program would require that the state choose a specific regulatory backstop mechanism, outline the specific criteria that would be applied for the use of that authority, as well as specific criteria to evaluate the success of both voluntary and regulatory approaches towards meeting the real world goals of protecting designated uses. The State describing what it could do, but without any demonstrated implementation of those plans does not constitute a program. The State needs to be very clear what authority they will use, show development of an implementation structure, a commitment of resources to that structure, a track record of use of backup authority when criteria require it, and a clearly articulated method to evaluate progress. In the interim while those are being developed, the State needs to be clear on what type of outreach and training will be done as part of the voluntary measures that are being proposed.

Furthermore, the use of the State's proposed measures is awkward. On temperature for example, the State has determined that it is not an urban runoff issue. How does that mesh with the State's plan to use MS4 permitting as the backstop for temperature issues? Another example is that TMDLs for a number of parameters certainly cover the bulk of the area in question, but may not cover the whole CZARA area, nor would they be for all the parameters that may be at issue in those areas.

Oregon should do a rule, and then tie in a new or existing permitting mechanism (MS4 or a new permit) to address post-construction runoff standards that sets reasonable thresholds for size of developments that would require coverage. Those thresholds should look at both the size of the individual projects as well as cumulative impacts in the watershed. Both the overall impacts to the watershed, as well as individually large impacts matter.

Agriculture

Oregon does not have sufficient program to meet state obligations under CZARA, and additional management measures are needed. Specifically Rogue Riverkeeper is concerned that water quality in heavily used agricultural areas is in fact declining, not improving as Oregon's press claims would have us believe. The Inland Rogue Agricultural Water Quality Management Area Plan (IRAWQMAP) management plans lacks specific thresholds for unacceptable activity, and thus are based on the subjective

opinion of ODA staff. ODA does not appear to take water quality issues seriously as enforcement is strictly complaint driven, and enforcement is limited and incredibly slow when it does occur.

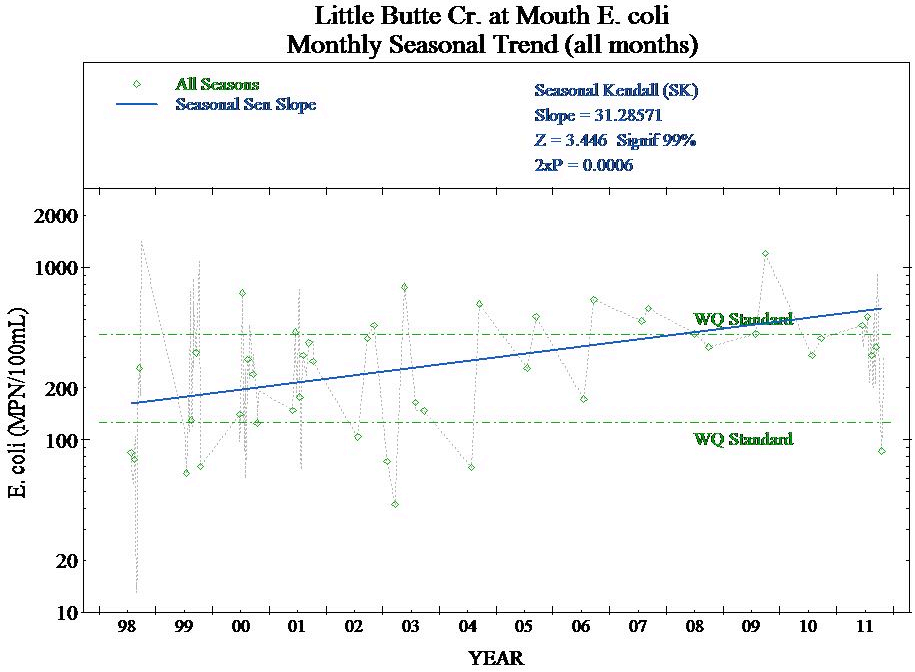
Water quality

Rogue Riverkeeper performed a study of 14 sites throughout the Little Butte Creek Watershed in 2011. Little Butte Creek is a major tributary to the Rogue River and has heavy agricultural use. Little Butte Creek discharges into the Rogue River just above the City of Medford's intake for backup drinking water from the Rogue. Data was collected for temperature, turbidity, conductivity, pH and *E. coli* (Little Butte Creek Bacteria Study 2011 which is attached with these comments as "Little Butte Creek Bacteria Study 2011-sm.pdf").

Based on our results, additional data from DEQ's ambient monitoring program and TMDL development data available through the State's LASAR database from 1998 to 2011, DEQ staff determined that fecal bacteria concentrations in Little Butte Creek have been increasing since at least 1998.

> Figure 5 shows all *E. coli* data available from the LASAR database for the June through October range as well as the RRK data from 2011 for the mouth of Little Butte Creek with a plotted trendline. The data available shows that the levels of *E. coli* at the mouth of Little Butte Creek are trending upward since 1998. A seasonal Kendall test on the data using "Closest to Midpoint" aggregation returns a Z value of 3.446 and 2xP value of 0.0006, indicating a 99% confidence in an increasing trend. Additionally a slope of 31.28571 indicates that *E. coli* concentrations are increasing by approximately 31 MPN/100mL at this location per year.

Figure 5. *E. coli* MPN/100mL results for the mouth of Little Butte Creek for all available data with trendline plotted (produced by Steve Hanson at DEQ Laboratory using WQHydro). Lower WQ Standard line is 126 MPN/100mL criteria, upper WQ Standard line is 406 MPN/100mL criteria.



The data collected also demonstrates significantly higher turbidity and *E. coli* at sites where flows are substantially made up of irrigation return water. The majority of the watershed is listed as water quality impaired, with tributaries currently listed for *E. coli*, temperature, sedimentation, dissolved oxygen and pH.

Inland Rogue Agricultural Water Quality Management Area Plan

The IRAWQMAP lacks specificity around prohibited conditions, thus leaving interpretation of those conditions strictly up to judgment of ODA staff.

The excessive soil erosion language (OAR 603-095-1440(2)) contains no language about violating water quality standards. Sediment in the water is a very good indicator of it coming off of the land. The language also lacks any other numeric criteria other than the one square foot language for multiple rills.

The riparian vegetation destruction language (OAR 603-095-1440(3)) does not contain specific or numeric criteria and is widely left open to interpretation of ODA staff. In our experience, ODA staff will read the conditions particularly in (a) to mean very different things than our staff. There needs to be clear, specific criteria for the important issue of functioning riparian vegetation such as buffer width and minimum percent cover of native trees and shrubs.

The surface irrigation return flows language is simple (OAR 603-095-1440(4)), "Runoff of surface irrigation that enters waters of the state shall not exceed water quality standards or cause pollution of the receiving water." This language is actually excellent, however our staff would happily take you to any number of irrigation return ditches where the water does not meet water quality standards, and certainly causes pollution in the receiving waters. For example, Nichols Branch, Little Butte Creek, Lake Creek, or Antelope Creek just to name a few. If this is being enforced, we have seen no evidence of it.

Lastly, measures do not appear to be sufficient to measure effectiveness of the plan. The plan specifically states the effectiveness will be measured by water quality improvement over time, but that ODA will do no such monitoring and will rely on other public and private entities to do this work for them (page 27 of IRAWQMAP). Hoping that someone else will collect and analyze the data to demonstrate the effectiveness of your program is not a plan.

Clear standards need to be set for what compliance with ODA's water quality rules looks like so it can be clearly communicated to landowners, meaningfully enforced by ODA staff and effectively evaluated.

Enforcement

ODA staff has informed our staff that enforcement is complaint driven. Considering that the property to be regulated is private, the public has no ability to perform any sort of meaningful inspection. In this fashion, ODA's reliance on complaints is not effective in meeting the goals of improved water quality. There must be more proactive efforts on behalf of ODA.

When there is enforcement, it is incredibly slow and ineffective. In 2011 Rogue Riverkeeper requested all complaints from since the IRAWQMAP was put in place for the Inland Rogue. Only 20 complaints for both the Inland Rogue and Bear Creek areas were filed, and most of them had limited follow up. In one instance on Antelope Creek first reported in early 2008, it took 1.5 years from the initial complaint of significant bacteria pollution from horses and cows to a letter of non-compliance (report tracking number 08-16). As of May 2011, the case was still unresolved (file attached with these comments as "ODA complaint 08-16.pdf"). Voluntary compliance and direction towards assistance programs are certainly to be commended, but the agency needs to demonstrate a willingness to enforce the rules designed to protect water quality.

Conclusion

Rogue Riverkeeper supports the findings of EPA and NOAA regarding Oregon's coastal nonpoint programs.

We urge EPA and NOAA to disapprove Oregon's purported program for failing to implement required management measures required to meet water quality standards and

protect designated uses within the CZARA area, specifically the Rogue Basin. Furthermore we ask that EPA/NOAA require Oregon to implement additional management measures, in particular for agriculture, forestry and urban development, to meet water quality standards and protect designated uses.

We look forward to a time where Oregon has sufficient will to protect our valuable aquatic resources. We hope that EPA and NOAA can help us get there.

Thank you.

Forrest English
Program Director
Rogue Riverkeeper
PO Box 102, Ashland, OR 97520
541-488-9831