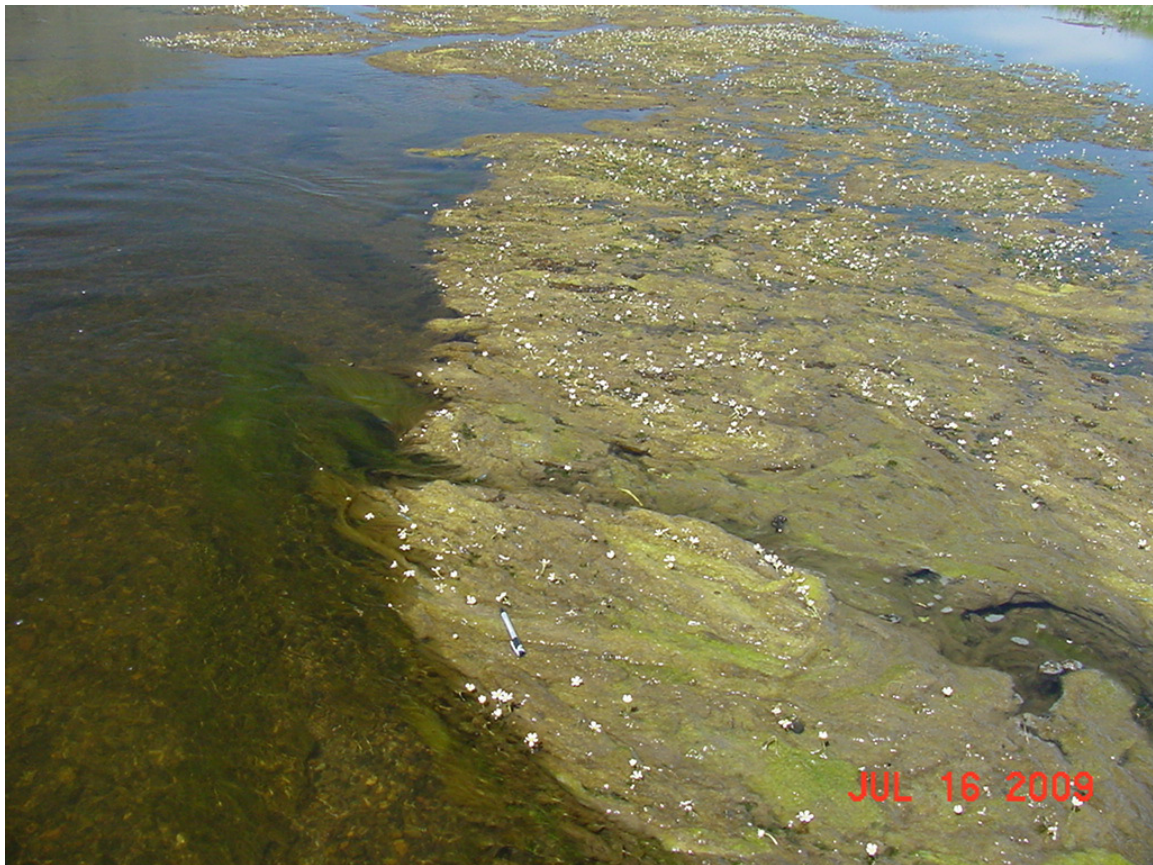


# Upper Humboldt Basin Nutrient Investigations – 2009

November 2009



*Heavy Algae and Macrophytes in North Fork Humboldt River below Bellows Ranch, July 2009*



Prepared by:  
Nevada Division of Environmental Protection  
Bureau of Water Quality Planning

# Upper Humboldt Basin Nutrient Screening Results – 2009

## Table of Contents

Introduction.....	1
Background and Methods .....	1
Level I Assessment .....	1
Level II Assessment.....	2
Summary of Sites Investigated .....	2
Results.....	10
Conners Creek.....	10
Maggie Creek.....	15
Pine Creek.....	16
North Fork Humboldt River.....	16
Indian Creek.....	18
South Fork Humboldt River.....	18
Huntington Creek.....	18
Dixie Creek.....	18
Humboldt River .....	18
Summary and Recommendations.....	20
References.....	21

## List of Tables

Table 1. Upper Humboldt Basin Waters on the 2006 303(d) List for Total Phosphorus.....	2
Table 2. Selected Waters in the Upper Humboldt Basin and Summary of TP and TN Levels at Monitoring Sites .....	3
Table 3. Locations of Nutrient Investigations.....	5
Table 4. Summary of Nutrient Investigations.....	12
Table 5. Upper Humboldt Basin Sites with Known Algae Levels during 2008 Surveys .....	20

## List of Figures

Figure 1. Location Map –NF Humboldt Watershed and Upper Humboldt WQ Stations and Nutrient Investigation Sites .....	7
Figure 2. Location Map – Maggie Creek and Pine Creek WQ Stations and Nutrient Investigation Sites .....	8
Figure 3. Location Map – Dixie Creek and SF Humboldt Watershed WQ Stations and Nutrient Investigation Sites .....	9
Figure 4. Clean Substrate on Conners Creek .....	10
Figure 5. Lack of Riparian Vegetation in Conners Creek.....	11
Figure 6. Maggie Creek East of Carlin .....	15
Figure 7. Pine Creek about 1.5 miles above Humboldt River .....	16

Figure 8. Flows at 10317500 – NF Humboldt River at Devil’s Gage compared to  
Historic Levels ..... 17  
Figure 9. Turbid and Stagnant Conditions in Lower Dixie Creek ..... 19

# ***Upper Humboldt Basin Nutrient Investigations – 2009***

## ***Introduction***

A number of stream reaches within the Upper Humboldt River basin are listed in 2006 303(d) List for exceedances of phosphorus standards. However, NDEP is not confident that these waters are actually experiencing eutrophication problems. As discussed by TetraTech (2005), the use of nutrient concentrations alone are poor predictors of assessing eutrophication impacts. Also, Dodds et al. (2002) examined data from over 600 streams and found that nutrients concentrations accounted for less than half of the variance in the benthic algae biomass. They speculated that other factors, such as flow, light availability, channel conditions, grazing, etc. were responsible for the remaining variability.

Before a large amount of resources are potentially devoted to developing TMDLs and control strategies for these Listed waters, NDEP believes it is advisable to undertake field investigations to evaluate their eutrophication status. During the summer of 2008, NDEP performed nutrient screening surveys for selected sites in the upper Humboldt basin (NDEP, April 2009). In 2009, NDEP undertook another series of nutrient screening surveys for selected waters in the upper Humboldt basin. This report presents the results of the 2009 activities

## ***Background and Methods***

*Nutrient Assessment Protocols for Wadeable Streams in Nevada* (NDEP, 2009) discusses a multi-tiered approach for assessing nutrient impairment status. In general, the assessment tiers are as follows. First, a Level I assessment can be performed to rather quickly identify possible problem areas. A Level I assessment is primarily qualitative in nature allowing for rapid assessments of numerous sites. If the Level I assessment indicates a possible nutrient problem, a Level II assessment is initiated which involves more quantitative measurements.

### **Level I Assessment**

The Level I assessment relies primarily upon qualitative estimates of algal biomass as an indicator for possible next assessment steps. Under this assessment, reaches of interest are visually surveyed and the percentage of the stream bottom covered by filamentous algae, microalgae, and macrophytes are estimated by field personnel. Given the spatial and temporal variability of algal biomass, it is recommended that numerous locations be evaluated two or more times during the growing season. However, land ownership can greatly dictated survey locations. As water conditions can be highly variable, it may be necessary to visit the assessment site during two or more years.

It is recognized that there are no clear cut %cover levels at which impairment can be assumed to occur. However based upon the best available information, Nevada's Level I protocols currently recommend that Level II assessments be undertaken when the combined microalgae (>1 mm thick), macroalgae (filamentous, etc.), and macrophytes cover more than 25% of the stream. The appropriateness of the >25% threshold needs to be tested over time. Some researchers have identified algae cover levels of 20 to 40% as affecting recreation and aquatic life uses. Regardless of the result of the Level I assessment, it may be desirable to perform a Level II assessment to better understand the system under study.

## Level II Assessment

Under the Level II assessment, more quantitative measurements of algal biomass along with measurements of daily minimum/maximum DO and pH levels are taken for comparison to the water quality standards or indicators. In addition to the parameters collected in Level I, the Level II assessment consists of collecting the following: algal characteristics (chlorophyll-a, ash free dry weight), DO, DO saturation, pH and temperature.

## Summary of Sites Investigated

During the summer of 2009, a number of selected streams in the upper Humboldt watershed were investigated (Level I) for potential nutrient-related problems, such as excessive algae levels and depressed dissolved oxygen. Many of the waters were selected because of their inclusion on Nevada's 303(d) (See Table 1). It was desirable to determine whether or not eutrophic-type conditions actually existed in these waters.

**Table 1. Upper Humboldt Basin Waters on the 2006 303(d) List for Total Phosphorus**

<b>Stream</b>	<b>Reach Description</b>
<b><i>Humboldt River Mainstem</i></b>	
Humboldt River	From the upstream source to Osino
<b><i>Marys River Basin</i></b>	
Marys River	From T42N, R59E to the Humboldt River
Connors Creek	
<b><i>Maggie Creek Basin</i></b>	
Maggie Creek	From where it is formed by tributaries to its confluence with Jack Creek
<b><i>Pine Creek Basin</i></b>	
Pine Creek	From its confluence with Dry Creek to the Humboldt River
<b><i>NF Humboldt Basin</i></b>	
NF Humboldt River	From the National Forest Boundary to its confluence with Beaver Creek
NF Humboldt River	From its confluence with Beaver Creek to the Humboldt River
Indian Creek	From its origin to the NF Humboldt River
<b><i>SF Humboldt Basin</i></b>	
SF Humboldt River	From Lee to South Fork Reservoir
Huntington Creek	From its confluence with Smith Creek to SF Humboldt River
Dixie Creek	From its origin to SF Humboldt River
SF Reservoir	The entire reservoir

Table 2 summarizes the selected upper Humboldt tributaries investigated for this study and the available nutrient data for various sites. The actual locations visited during the field activities are listed in Table 3. Figures 1 through 3 display the locations of the pertinent water quality monitoring sites and the nutrient investigation sites visited in 2008 and 2009.

**Table 2. Selected Waters in the Upper Humboldt Basin and Summary of TP and TN Levels at Monitoring Sites**

Stream	Reach	Agency - Site ID	Site Description	TP Range (TP Median)	TN Range (TN Median)	On 2006 303(d) List for TP?
<b><i>Marys River Basin</i></b>						
Conners Creek	Entire length	BLM – CC1	Conner (Upper)	0.09 – 0.14 (0.12)	No data	Yes
		BLM – CC2	Conner (Lower)	0.01 – 0.12 (0.09)	No data	
<b><i>Maggie Creek Basin</i></b>						
Maggie Creek	From where it is formed by tribs to Jack Creek	NDEP – HS17	Above Jacks Creek	0.21 – 0.33 (0.26)	0.14 – 0.45 (0.28)	Yes
	From Jack Creek to Humboldt River	NDEP – HS14	At SR 221	0.01 – 1.8 (0.08)	0.1 – 3.5 (0.4- 0.44)	No
<b><i>Pine Creek Basin</i></b>						
Pine Creek	From Dry Creek to Humboldt River	NDEP – PC3	South Tomera Ranch	0.12 – 0.58 (0.16)	0.15 – 2.13 (0.82)	Yes
		NDEP – PC2	At North Tomera Ranch	0.11 – 0.29 (0.21)	0.14 – 2.4 (1.24)	
		NDEP – HS13	Pine Creek	0.04 – 2.4 (0.14)	0.21 – 3.8 (0.67)	
<b><i>NF Humboldt River Basin</i></b>						
NF Humboldt	From Natl Forest Boundary to Beaver Creek	NDEP – HS15	At North Fork Ranch	0.01 – 0.27 (0.02)	0.1 – 2.37 (0.51 – 0.54)	Yes
		NDEP – HS29	At Haystack Ranch	0.11 – 0.35 (0.16)	0.5 – 1.5 (0.58 – 0.9)	
	From Beaver Creek to Humboldt River	NDEP – HS2B	below I-80	0.01 – 2.1 (0.1)	0.13 – 6.6 (0.45)	Yes
Indian Creek	Entire length	BLM – IC1	Indian Creek (Lower)	0.08 – 0.18 (0.15)	No data	Yes
<b><i>SF Humboldt River Basin</i></b>						
SF Humboldt	From Lee to South Fork Reservoir	NDEP – SF1	Below Hwy 228	0.01 – 0.02 (0.02)	0.1 – 0.7 (0.2 – 0.3)	Yes
		NDEP – HS23	At Twin Bridges	0.02 (0.02)	0.2 – 0.4 (0.25 – 0.35)	
	From South Fork Reservoir to Humboldt River	NDEP – HS22	Below Dam @ Gage	0.04 – 0.06 (0.04)	0.4 – 0.6 (0.5 -0.6)	No
		NDEP – HS26	Below Dixie at Bridge	0.03 – 0.2 (0.12)	0.3 – 0.9 (0.55 – 0.65)	
		NDEP – HS3A	Below Dixie Creek	0.01 – 1.07 (0.03)	0.1 – 2.16 (0.43 – 0.45)	

**Table 2. Selected Waters in the Upper Humboldt Basin and Summary of TP and TN Levels at Monitoring Sites (cont'd)**

Stream	Reach	Agency - Site ID	Site Description	TP Range (TP Median)	TN Range (TN Median)	On Draft 2006 303(d) List for TP?
<b><i>SF Humboldt River Basin</i></b>						
Huntington Creek	From Smith Creek to SF Humboldt	NDEP – HC	4.2 Miles above Twin Bridges	0.12 – 0.14 (0.13)	0.4 – 1.1 (0.42 – 0.5)	Yes
		NDEP – HS24	At Twin Bridges	0.05 – 0.13 (0.09)	0.5 – 0.7 (0.55 – 0.65)	
Dixie Creek	Entire length	NDEP - DIXIEU	Dixie Creek (Upper)	0.19 (0.19)	0.3 – 1.0 (0.4 – 0.7)	Yes
		BLM – DC1	Dixie Creek (Upper)	0.06 – 0.17 (0.13)	No data	
		BLM – DC2	Dixie Creek (Lower, Culvert)	0.04 – 0.25 (0.19)	No data	
		BLM – DC3	Dixie Creek (RAWS)	0.34 (0.34)	No data	
		BLM – DC4	Dixie Creek (Lower, Sec. 14)	0.09 (0.09)	No data	
		NDEP – HS25	Dixie Creek Lower	0.04 – 0.58 (0.31)	0.1 – 1.7 (0.9 – 1.0)	
<b><i>Mainstem Humboldt River</i></b>						
Humboldt River	Above Osino	NDEP – HS4	At Osino	0.01 – 0.37 (0.07)	0.07 – 2.4 (0.43)	Yes

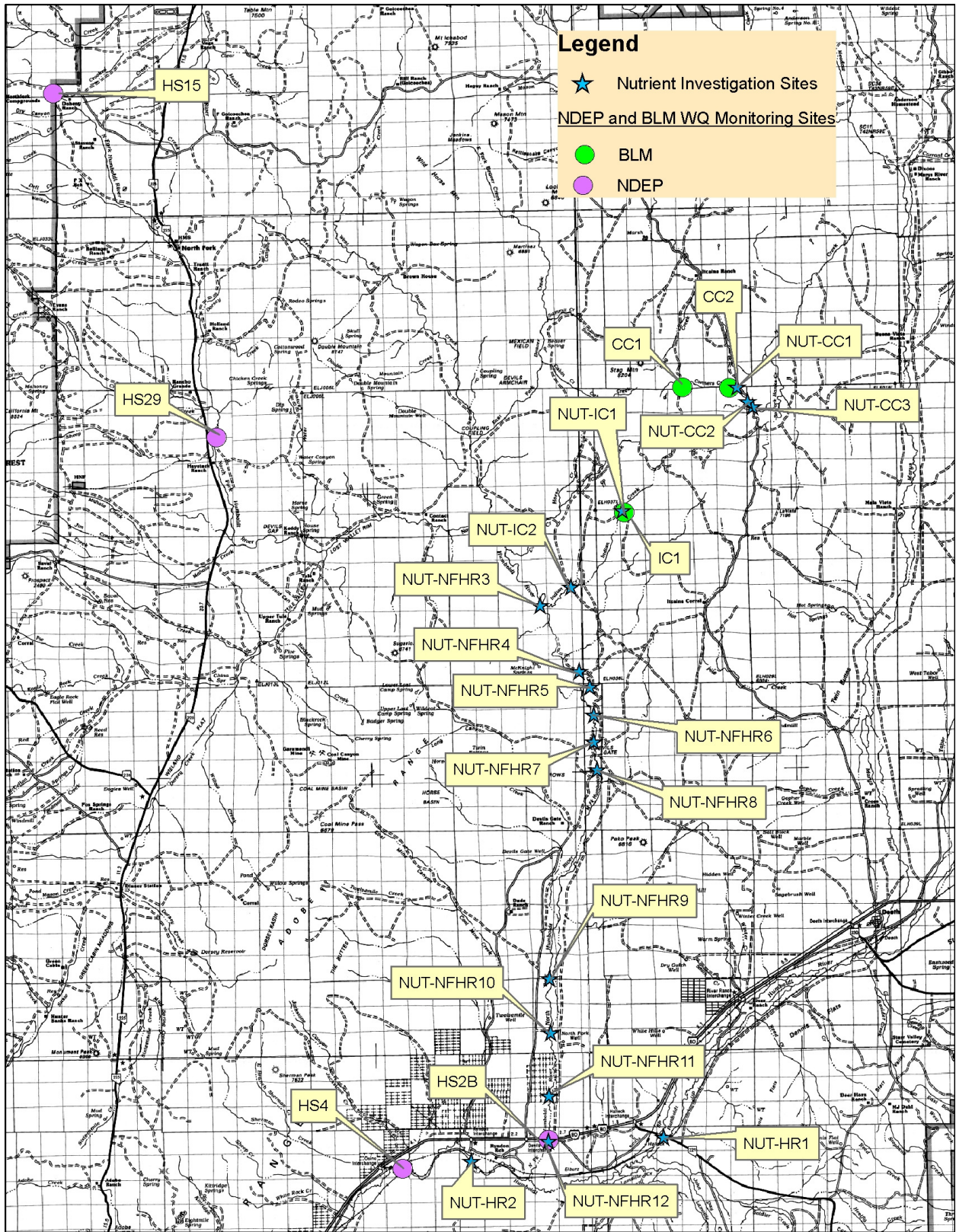
**Table 3. Locations of Nutrient Investigations, 2009**

Stream Reach	Reach	Site No.	Site Description	UTM Zone 11 NAD 83		Elevation (ft)		
				Northing	Easting			
<b><i>Marys River Basin</i></b>								
Conners Creek	Entire length	NUT-CC1	Upper	4583712	635819			
		NUT-CC2	Middle	4582736	636512			
		NUT-CC3	Lower	4582403	636859			
<b><i>Maggie Creek Basin</i></b>								
Maggie Creek	From Jack Creek to Humboldt River	NUT-MC4	On Highway east of Carlin	4508058	576495	4900		
<b><i>Pine Creek Basin</i></b>								
Pine Creek	From Dry Creek to Humboldt River	NUT-PC1	~1.5 miles above Humboldt River	4493588	570276	4910		
		NUT-PC2	~1 mile above Humboldt River	4494330	569516	4900		
<b><i>NF Humboldt River Basin</i></b>								
NF Humboldt River	From Beaver Creek to Humboldt River	NUT-NFHR3	Below Indian Creek	4569312	622850	5480		
		NUT-NFHR4	Bellows Ranch	4564958	625411	5410		
		NUT-NFHR5	Below Bellows Ranch	4563953	626130	5405		
		NUT-NFHR6	Above Devil's Gate	4562088	626372	5400		
		NUT-NFHR7	Devil's Gate	4560314	626362	5390		
		NUT-NFHR8	Below Devil's Gate	4558410	626588	5360		
		NUT-NFHR9	Below irrigation	4544724	623480	5260		
		NUT-NFHR10	Lower NF Humboldt	4541152	623554			
		NUT-NFHR11	Above I-80	4537021	623423			
		NUT-NFHR12	Below I-80	4534018	623385	5080		
		Indian Creek	Entire length	NUT-IC1	Upper	4575604	628277	6300
				NUT-IC2	~1 mile above NF Humboldt River	4570503	624838	5740



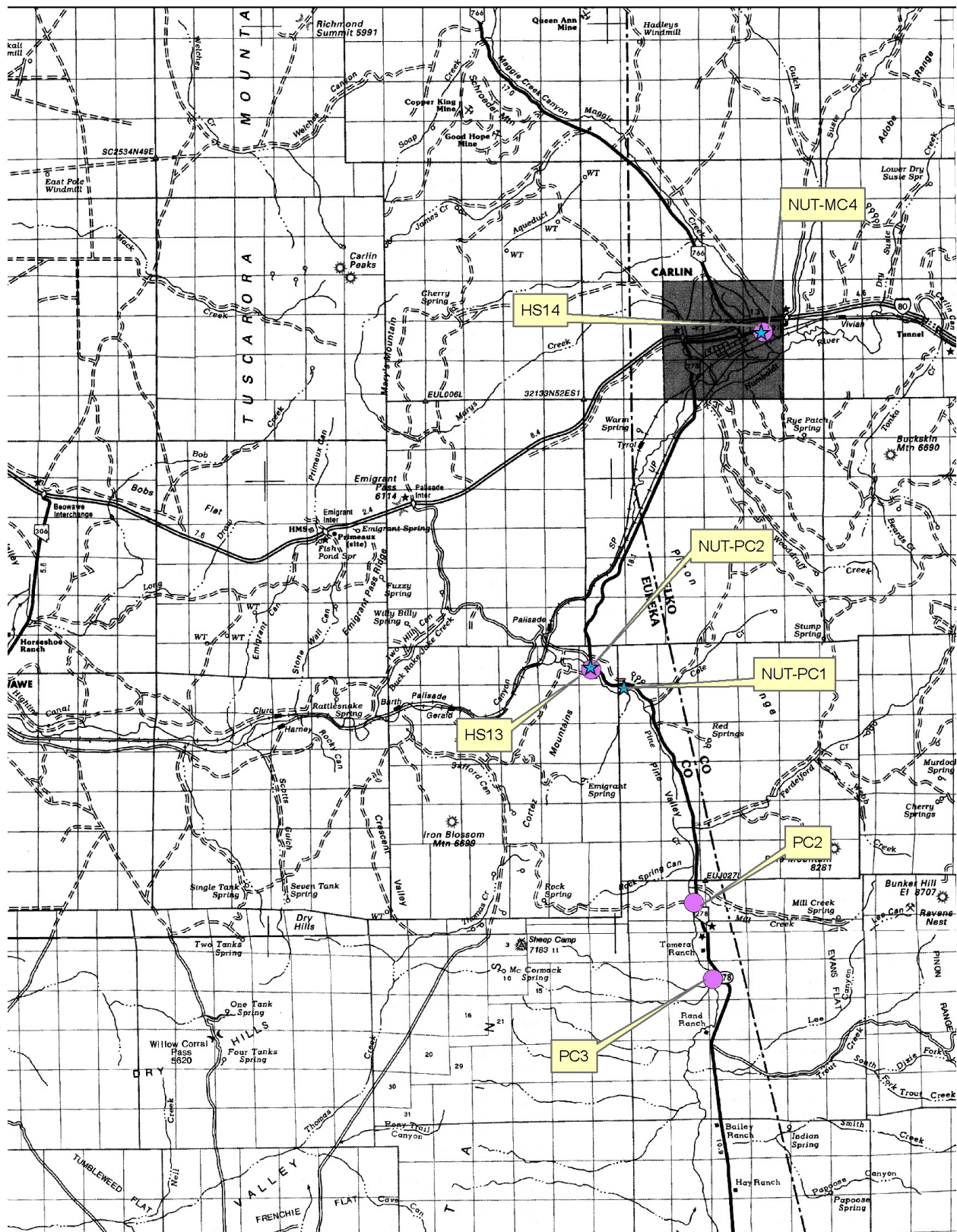
**Table 3. Locations of Nutrient Investigations, 2009 (cont'd)**

Stream Reach	Reach	Site No.	Site Description	UTM Zone 11 NAD 83		Elevation (ft)
				Northing	Eastings	
<b><i>SF Humboldt River Basin</i></b>						
SF Humboldt	From Lee to South Fork Reservoir	NUT-SFHR2	At Twin Bridges	4497658	607672	5280
Ten Mile Creek	Entire length	NUT-TMC1	Near Mouth	4504734	602064	5150
Huntington Creek	From Smith Creek to SF Humboldt	NUT-HC2	At Twin Bridges	4497122	607495	5280
Dixie Creek	Entire length	NUT-DC1	Upper Dixie	4477005	590499	6540
		NUT-DC2		4481728	592022	6025
		NUT-DC3		4485306	591283	5760
		NUT-DC4		4487209	591645	5660
		NUT-DC5		4489294	592510	5565
		NUT-DC6		4490843	593579	5490
		NUT-DC7		4494264	594420	
		NUT-DC8		4497360	595467	5285
		NUT-DC9	At Road to South Fork Reservoir	4498152	596112	5270
		NUT-DC10		4499351	596837	5235
		NUT-DC11		4501772	596964	5190
		NUT-DC12	~1 mile above SF Humboldt River	4502374	597072	5200
<b><i>Mainstem Humboldt River</i></b>						
Humboldt River	Above Osino	NUT-HR1	At Halleck Road			
		NUT-HR2	Near Ryndon	4532941	618332	5170



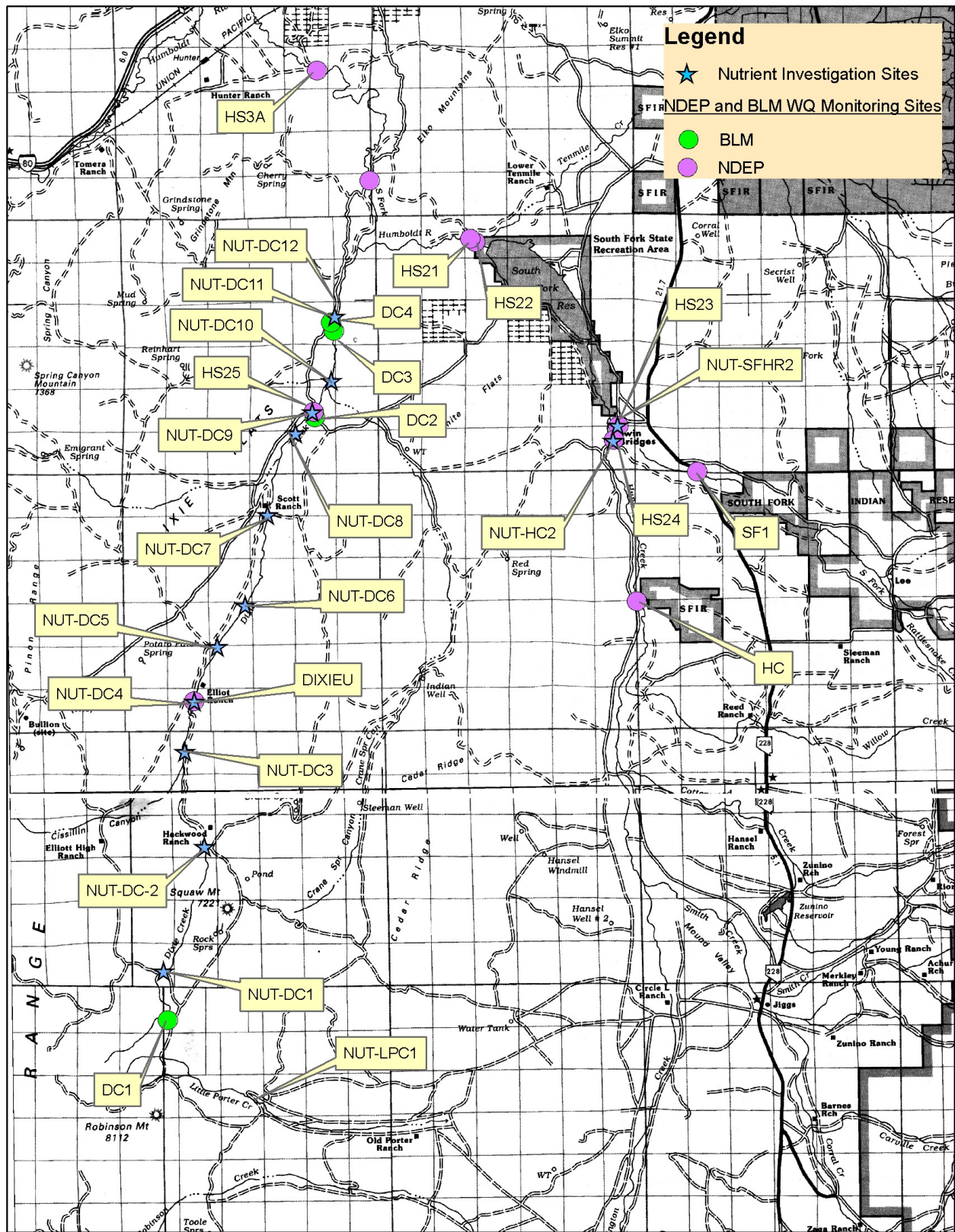
**Figure 1. Location Map – NF Humboldt Watershed and Upper Humboldt River WQ Stations and Nutrient Investigation Sites**





**Figure 2. Location Map – Maggie Creek and Pine Creek WQ Stations and Nutrient Investigation Sites**





**Figure 3. Location Map – Dixie Creek and SF Humboldt Watershed WQ Stations and Nutrient Investigation Sites**



## ***Results***

Table 4 and the following discussions summarize the findings of the 2009 nutrient investigations. When available, flow data have been described for the selected waters. As discussed earlier, flow levels can have a great influence on algae levels, and need to be considered when drawing conclusions from these findings.

### **Connors Creek**

Connors Creek is on the 2006 303(d) List due to exceedances of the TP standard (0.1 mg/l) based upon BLM samples collected at 2 locations (Table 4). Connors Creek is not specifically mentioned in the NAC, however under the tributary rule, lower Mary's River standards (NAC 445A.125) apply to Connors Creek. During the summer of 2009, NDEP visited 3 locations on the lower Connors Creek (on 7/14/09 and 8/17/09) and observed no algae levels of any significance (Figure 4; Table 4). The lowest site was dry during both visits. By the August 17, 2009 visit, all 3 sites were dry. As no gaging is available, it is uncertain how the 2009 flows compared to historic conditions. However given the lack of riparian vegetation in the lower Connors Creek, it is likely that dry conditions are common in this stream.



**Figure 4. Clean Substrate on Connors Creek at NUT-CC1, July 14, 2009**





**Figure 5. Lack of Riparian Vegetation in Connors Creek at NUT-CC3**

**Table 4. Summary of Nutrient Investigations, 2009**

Stream Reach	Site No.	Site Description	Date(s) of Invest.	% Cover Filamentous Algae	% Cover Microalgae > 1 mm thick	% Cover Macrophytes	Comments
<b><i>Marys River Basin</i></b>							
Connors Creek	NUT-CC1	Upper Connors	7/14/09	< 10%	< 10%	< 10%	
			8/17/09	No sign of dried algae on substrate			Stream dry
	NUT-CC2	Middle Connors	7/14/09	No sign of algae			Limited flow
			8/17/09	No sign of dried algae on substrate			Stream dry
	NUT-CC3	Lower Connors	7/14/09	No sign of dried algae on substrate			Stream dry
8/17/09							
<b><i>Maggie Creek Basin</i></b>							
Maggie Creek below Jacks Creek	NUT-MC4	On Highway east of Carlin	7/15/09	50 – 75% cover by algae and macrophytes			
<b><i>Pine Creek Basin</i></b>							
Pine Creek	NUT-PC1	~1.5 miles above Humboldt River	7/15/09	> 75% cover by algae and macrophytes			Surveyed from road
	NUT-PC2	~1 mile above Humboldt River	7/15/09	50 – 75% cover by algae and macrophytes			
<b><i>NF Humboldt River Basin</i></b>							
NF Humboldt bel. Beaver Creek	NUT-NFHR3	Below Indian Creek	7/16/09	0%	<10%	< 10%	
			8/18/09	0%	< 25%	< 25%	
	NUT-NFHR4	Bellows Ranch	7/16/09	< 25% cover by algae			<10%
			8/19/09	< 25% cover by algae			< 10%
	NUT-NFHR5	Below Bellows Ranch	7/16/09	25 – 50% cover by algae			25 – 50%
			8/19/09	< 25% cover by algae			~ 50%
	NUT-NFHR6	Above Devil's Gate	7/16/09	< 25% cover by algae			0%
			8/19/09	< 25%	< 25%	< 25%	
NUT-NFHR7	Devil's Gate	7/16/09	< 25%	< 25%	0%		
		8/19/09	< 10%	< 10%	0%		

**Table 4. Summary of Nutrient Investigations, 2009 (cont'd)**

Stream Reach	Site No.	Site Description	Date(s) of Invest.	% Cover Filamentous Algae	% Cover Microalgae > 1 mm thick	% Cover Macrophytes	Comments
<b><i>NF Humboldt River Basin</i></b>							
NF Humboldt bel. Beaver Creek	NUT-NFHR8	Below Devil's Gate	7/16/09	0%	< 5%	0%	
			8/19/09	0%			
	NUT-NFHR9	Below Irrigation 1	7/16/09	< 5%	0%	0%	
			8/18/09	25-50% cover by algae		< 25%	Rather stagnant with little visible flow
	NUT-NFHR10	Below Irrigation 2	7/15/09	< 25% cover by algae		<25%	
			8/18/09	25-50% cover by algae		<25%	Very low flow with stagnant areas
	NUT-NFHR11	Above I-80	7/15/09	<25% cover by algae		<25%	
			8/18/09	<25% cover by algae		<25%	Very low flow
NUT-NFHR12	Below I-80	7/15/09	25-50% cover by algae		<25%		
		8/18/09	~75% cover by algae		<25%	Very low flow	
Indian Creek		Upper	7/17/09	25 - 50% cover by algae and macrophytes			
		~1 mile above NF Humboldt River	6/10/09	No sign of dried algae on substrate		Site was dry.	
<b><i>SF Humboldt River Basin</i></b>							
SF Humboldt		At Twin Bridges	8/18/09	50-75% cover by algae		< 25%	Surveyed from bridge
Huntington Creek		At Twin Bridges	7/15/09	~50% cover by algae and macrophytes			Surveyed from bridge.
			8/17/09				
Dixie Creek	NUT-DC1	Upper Dixie	7/15/09	<10 % algae and macrophytes			
			8/18/09				
	NUT-DC2		7/15/09	< 25%	< 25%	< 25%	
			8/18/09	< 25%	< 25%	< 25%	



**Table 4. Summary of Nutrient Investigations, 2009 (cont'd)**

Stream Reach	Site No.	Site Description	Date(s) of Invest.	% Cover Filamentous Algae	% Cover Microalgae > 1 mm thick	% Cover Macrophytes	Comments
<b><i>SF Humboldt River Basin</i></b>							
Dixie Creek	NUT-DC3		7/15/09	<25%	~ 25%	<25%	
			8/18/09	~ 25% cover by algae		< 25%	
	NUT-DC4		7/15/09	25 – 50% cover by algae		< 25%	
			8/18/09	50 – 75% cover by algae		< 25%	
	NUT-DC5		7/15/09	25 – 50% cover by algae		< 25%	
			8/18/09	25 – 50% cover by algae		< 25%	
	NUT-DC6		7/15/09	~ 50% cover by algae		< 25%	
			8/18/09	N/A			Site was dry
	NUT-DC7		7/15/09	Algae exists. However, flow was very low – not appropriate to assess			
			8/18/09	N/A			Standing water only
	NUT-DC8		7/15/09	N/A			Standing water only
			8/18/09	N/A			Site was dry
	NUT-DC9	At Road to South Fork Reservoir	7/15/09	Water dammed in several places with slow, turbid water. Bottom not visible			
	8/18/09						
NUT-DC10		6/9/09	< 25%	< 25%	< 25%	Flow is turbid	
		7/15/09	Water dammed in several places with slow, turbid water. Bottom not visible				
NUT-DC11		7/15/09	50 – 75% cover by algae		< 25%		
		8/18/09	> 75% cover by algae		< 25%	Stream dry short distance below this site. Algae survey may not be appropriate.	
<b><i>Mainstem Humboldt River</i></b>							
Humboldt River		At Halleck	7/15/09	50 – 75% cover by algae and macrophytes		Surveyed from bridge	
		At Ryndon	8/3/09	50 – 75% algae		< 25%	

## Maggie Creek

As in 2008, high algae and macrophyte levels were observed (7/15/09) in the lower Maggie Creek just east of Carlin (Figure 6). Flows at this site are not natural, but are maintained with dewatering discharges from the Gold Quarry Mine. Interestingly, this reach is not on the 2006 303(d) List. However, this reach of Maggie Creek has a higher total phosphorus standard (0.33 mg/l), than the upper reaches (0.1 mg/l). Based upon the visual inspections, the lower Maggie Creek should be considered for 303(d) listing.



**Figure 6. Maggie Creek East of Carlin, 2009**



## Pine Creek

Pine Creek (from Dry Creek to Humboldt River) is on the 2006 303(d) List for exceedances of the TP standard (0.1 mg/l) based upon data collected by NDEP at 3 different sites - PC2, PC2, and HS13. As in 2008, high algal/macrophyte cover (50% to >75%) was again observed in the lower Pine Creek (Figure 7; Table 4).

No active gaging stations exist on Pine Creek so it is uncertain how the 2009 flows compared to historic levels. However, flows appeared to be near “normal” levels as no dry creek bottom or creek banks was observed in this reach.

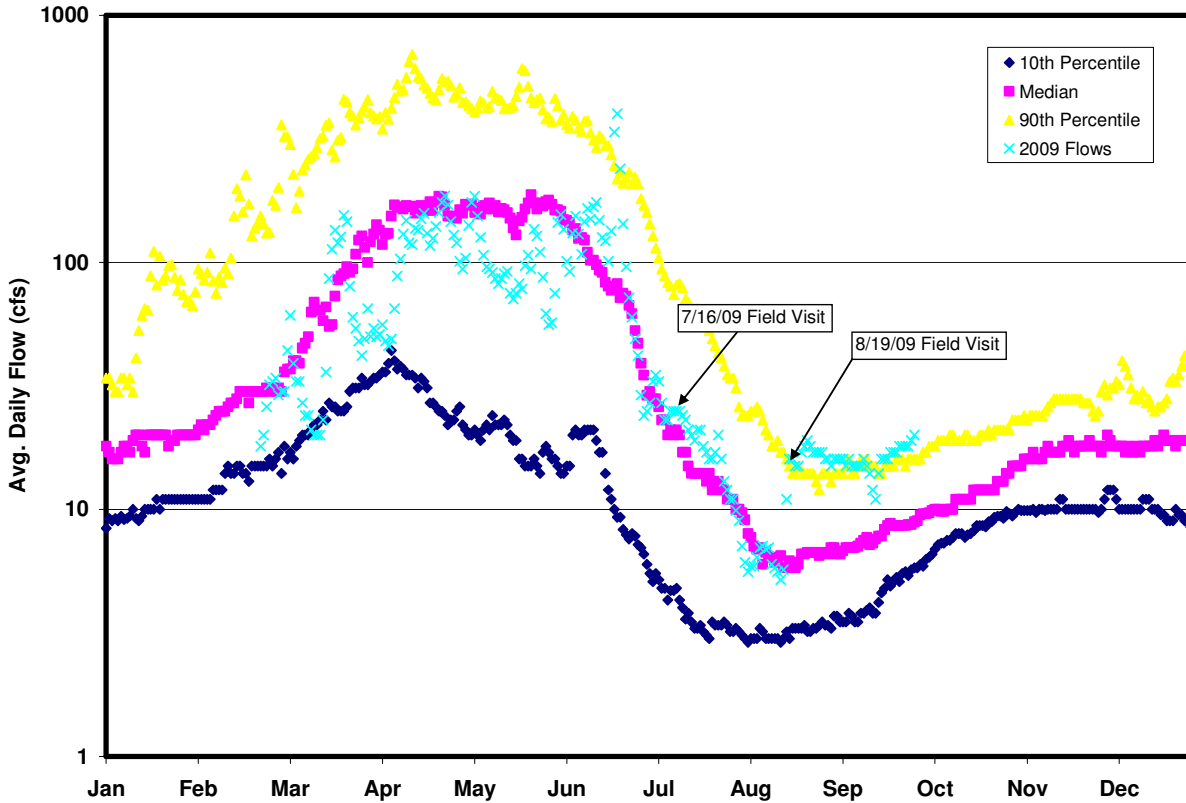


**Figure 7. Pine Creek about 1.5 Miles above Humboldt River, 2009**

## North Fork Humboldt River

Two reaches of the North Fork Humboldt River (from the national forest boundary to Beaver Creek; and from Beaver Creek to the Humboldt River) are on the 2006 303(d) List due to exceedances of the TP standard (0.1 mg/l) based upon NDEP data collected at sites HS29 and HS2B. However, only the reach below Beaver Creek was visited during the summer of 2009.

During 2009, 10 sites were visited on July 16 and August 19 with varying results. Only a few sites consistently showed elevated algae/macrophyte levels (>25%). The Below Bellows Ranch site (NUT-NFHR5) was experiencing macrophytes varying from 25 to 50% coverage, and algae levels varying from <25% to 25-50% coverage. Flows in this stretch of the river (above Devil's Gate) were at or above the median flows for that time of year (Figure 8).



**Figure 8. 2009 Flows at 10317500 – NF Humboldt River at Devil's Gate compared to Historic Levels**

Two sites located below irrigation activities (NFHR9, NFHR10) only experienced algae levels >25% during the very low flows occurring during the August 18, 2009 visit. The Below I-80 site experienced algae levels >25% during both the July and the August visits. However, the flows during the August visit were very low. The utility of this type of survey needs to be questioned for those sites (NFHR9 through NFHR12) when very low flows are experienced. With no flow gaging station in the lower river, the character of the historic flow conditions is unknown.

## **Indian Creek**

Indian Creek is on the 2006 303(d) List for exceedances of the TP standard (0.1 mg/l) based upon data collected by BLM. During 2009, Indian Creek was visited with similar results to 2008: 25 – 50% algae/macrophytes at NUT-IC1 and dry conditions at NUT-IC2. Again, no gaging station data are available to evaluate 2009 flows in comparison with historic flows. However, it is expected that dry conditions are common in the lower reaches given the lack of riparian vegetation.

## **South Fork Humboldt River**

Currently, the South Fork Humboldt River (above South Fork Reservoir) is on the 303(d) List based upon compliance with the TP standard (0.1 mg/l). During survey efforts in 2007 and 2008, low algae levels were observed in the South Fork Humboldt River above South Fork Reservoir. A subsequent 2009 visit to the South Fork Humboldt River at Twin Bridges showed elevated algae levels (50 – 75% algae coverage). Flows at the time of the survey (August 18, 2009) were somewhat lower than the median flows for that day (6.1 cfs vs. 9.7 cfs).

## **Huntington Creek**

Huntington Creek (from Smith Creek to South Fork Humboldt River) is on the Draft 2006 303(d) List for exceedances of the TP standard (0.1 mg/l) based upon data collected by NDEP at sites HC and HS24. Visual observations from a public bridge (Twin Bridges) indicated that algae/macrophyte coverage could be around 50% at that site ( ) (Table 4). These conditions were similar to those occurring in 2008. Again, it is uncertain if the flow conditions at the time of the survey were “normal”.

## **Dixie Creek**

Dixie Creek is on the 2006 303(d) List due to exceedances of the TP standard (0.1 mg/l) based upon data collected by both BLM and NDEP. The 2009 surveys indicated quite a bit of variability in the algae and flow conditions in Dixie Creek. Generally, the upper sites had limited algae levels (<25% coverage) while the lower sites had either higher algae levels, turbid/stagnant water conditions, or were dry (Table 4).

Based upon the 2008 and 2009 survey, the upper Dixie Creek should not be considered impaired by nutrients and should be considered for delisting. However, the survey results were rather mixed for the lower reaches. The dry, stagnant and turbid conditions may limit the utility of the visual nutrient screening methodology (Figure 9).

## **Humboldt River**

The Humboldt River above Osino is on the 2006 303(d) List due to exceedances of the TP standard (0.1 mg/l – Apr. to Nov. seasonal average). The 2009 field visits indicated algae levels above 50% cover in the 2 locations surveyed.





**Figure 9. Turbid and Stagnant Conditions in Lower Dixie Creek (NUT-DC8)**

## *Summary and Recommendations*

Key purposes of these investigations were to check the nutrient impairment status of 303(d) listed waters in the upper Humboldt watershed, identify waters where additional investigations (additional Level I assessments; Level II nutrient assessments possibly) may be appropriate, test the use of the Level I protocols, and to provide information for prioritizing potential future TMDL and nonpoint source management activities.

Based upon the 2008 and 2009 investigations, many of the waters investigated seem to be experiencing elevated algae levels in one or more locations. As discussed earlier, one season of nutrient screening may not be sufficient for an accurate Level I assessment. It may be appropriate (but not necessary) to revisit some of the assessment sites for at least another season or more depending upon resources and expected uses for this information. For a few waters with limited algae, it may be appropriate to pursue a delisting action. However, there is considerable uncertainty about the extent of data/information needed to support such a delisting based upon algae information.

Some possible future actions include:

- Delist Conners Creek: This could serve as a test project for delisting using algae data.
- Dixie Creek: Dixie Creek is currently listed based upon the tributary rule (tributary to the SF Humboldt River). A standards review is scheduled within the next few years, and it is hoped that the nutrient/algae issues can begin to be addressed at that time.
- Lower Maggie Creek: While this section is not exceeding TP standards, NDEP should consider listing this stretch based upon elevated algae levels.
- Pine Creek: Continue listing for TP.
- NF Humboldt River: An additional season of investigations may be appropriate.
- Humboldt River: An additional season of investigations may be appropriate.

## *References*

- Dodds, W.K., V.H. Smith and K. Lohman. 2002. Nitrogen and phosphorus relationships to benthic algal biomass in temperature streams. *Can. J. Fish. Aquat. Sci.* 59:865-874.
- Nevada Division of Environmental Protection. 2009. Nutrient Assessment Protocols for Wadeable Streams. Version 2. Carson City, Nevada.
- Nevada Division of Environmental Protection. April 2009. Upper Humboldt Basin Nutrient Investigations - 2008. Carson City, Nevada.
- Tetra Tech, Inc. 2005. Technical Approach to Develop Nutrient Numeric Endpoints for California. Prepared for U.S. EPA Region IX.