

Nutrient Assessment of the Animas River, 2003

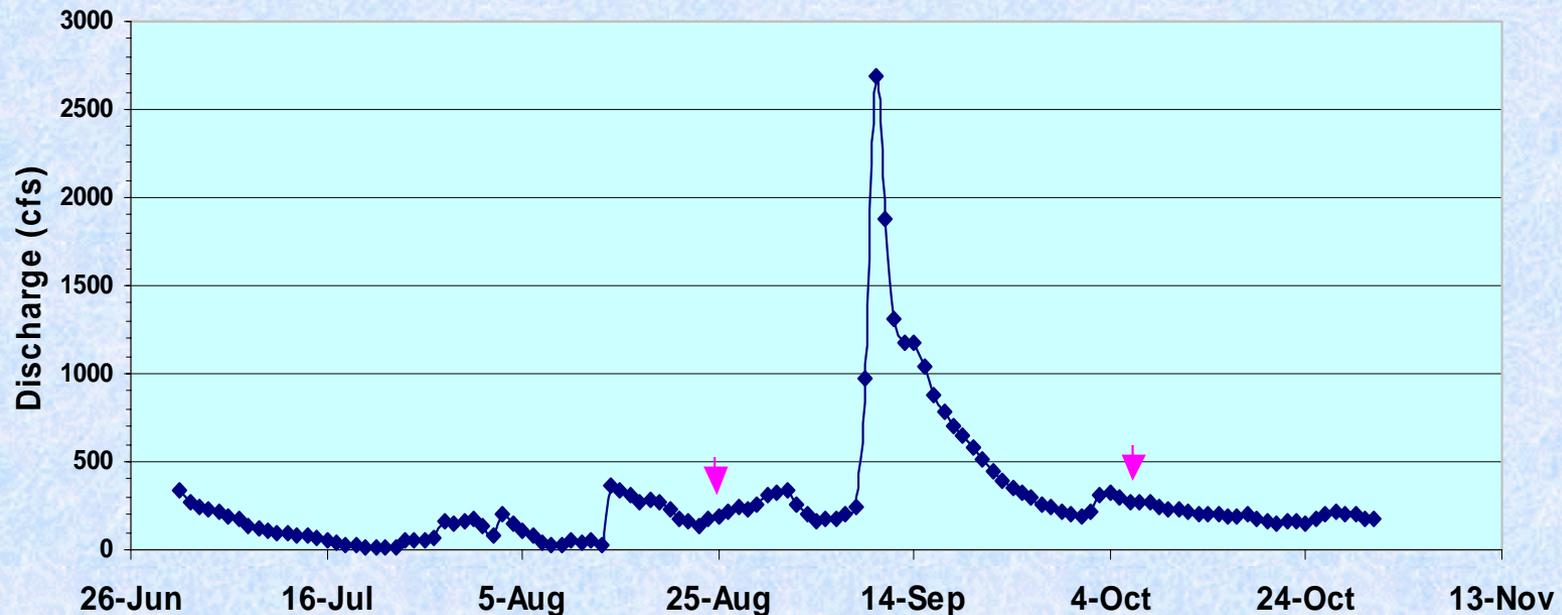
Seva J. Joseph

**Monitoring and Assessment Section of the
Surface Water Quality Bureau of the
New Mexico Environment Department**

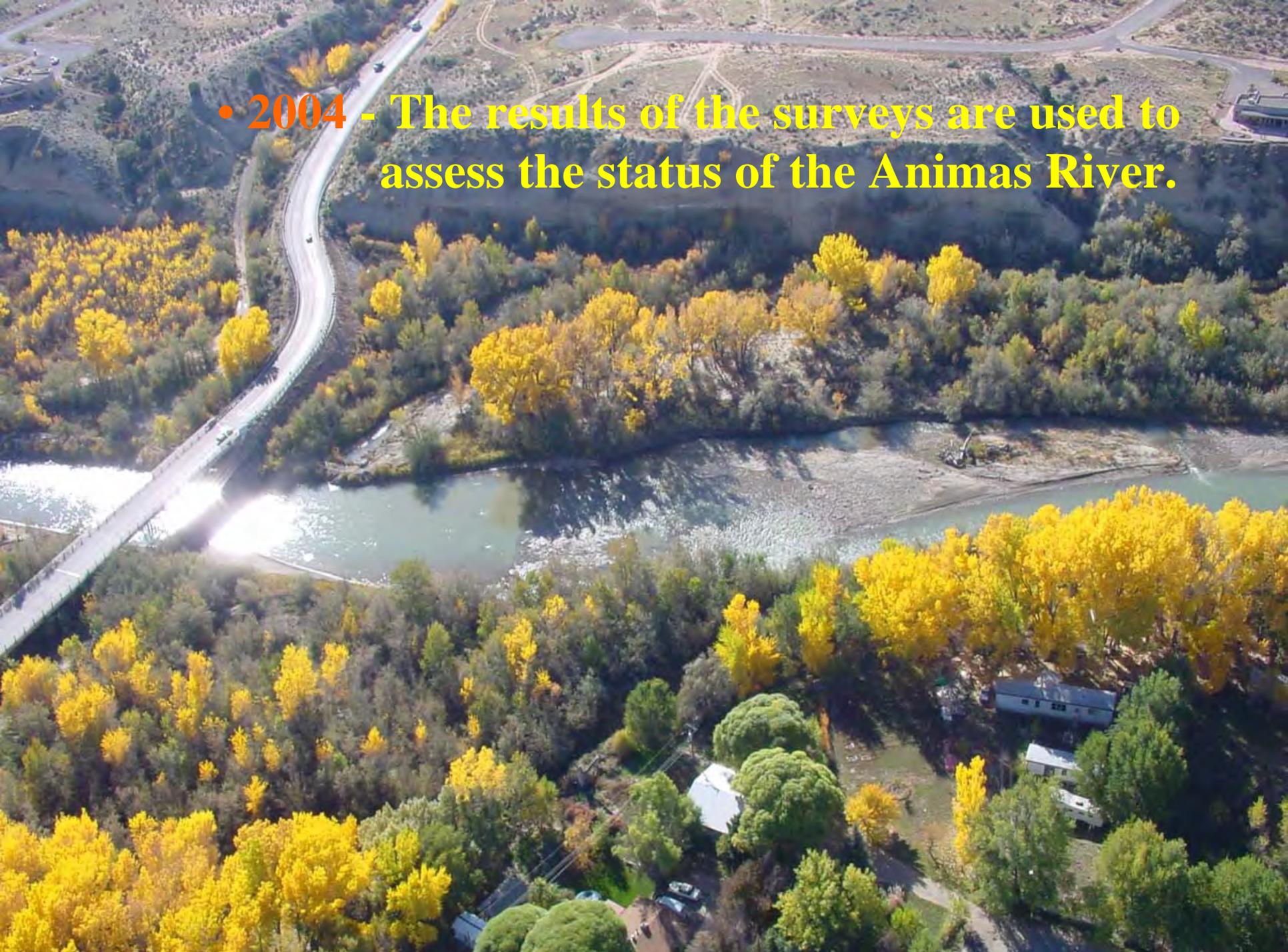


- 2002 - SWQB conducted a water quality survey of the San Juan River watershed, including the collection of samples from the Animas River 8 times between April and October. As indications of nutrient enrichment were noted, in
- 2003 - SWQB conducted a nutrient survey of Animas River in cooperation with members of the San Juan Watershed Group including the San Juan Citizens Alliance, Ute Mountain Ute Tribe, Southern Ute Indian Tribe, and State of Colorado Water Quality Control Division. The survey is challenging due to flow conditions during the August and October surveys.

Flow of the Animas River at Farmington July to November 2003



- **2004** - The results of the surveys are used to assess the status of the Animas River.



SWQB is in the ongoing process of refining the nutrient assessment protocol

In addition to the ecoregions based nutrient criteria developed by EPA, SWQB has selected a number of indicators of nutrient enrichment. Including the following:

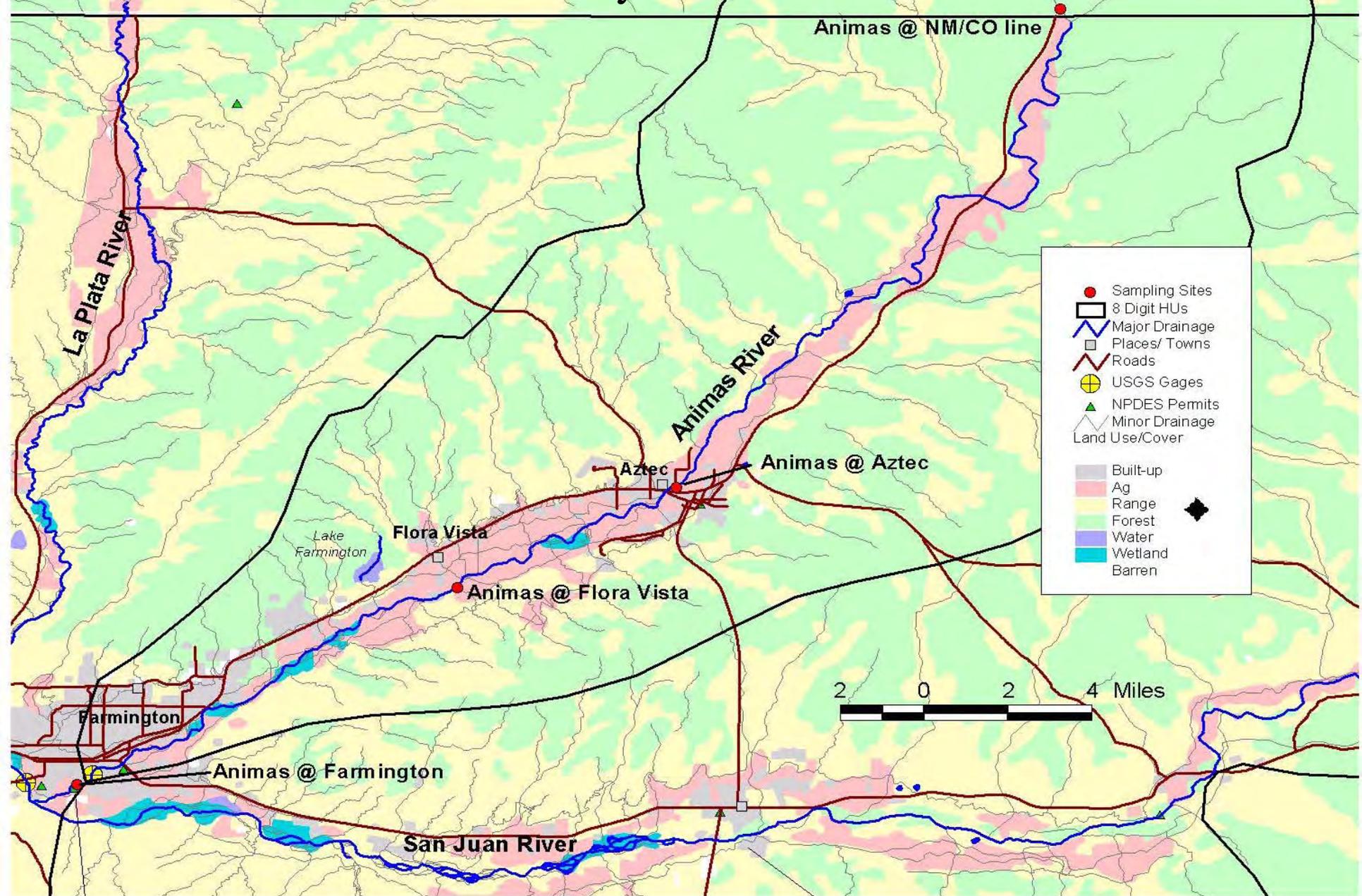
- Dissolved Oxygen Concentration
- Dissolved Oxygen Saturation
- pH
- Algal Productivity (from Algal bioassays)
- Chlorophyll a Concentration
- Ash Free Dry Mass (AFDM)
- Hilsenhoff Biotic Index
- Benthic Macroinvert. IBI Score

Threshold values that are indicative of nutrient enrichment were identified through a literature review. These values will be refined based on regional data as SWQB develops a suitable dataset.

The ecoregions based nutrient criteria developed by EPA were refined using regional data, level 3 ecoregions, and site medians for sites with multiple samples. A second round of analysis is underway incorporating more recent nutrient data and partitioning the data into warm and cold water fisheries as well as ecoregion.

In order to strengthen the assessment and to account for situations where the water column nutrient concentrations may be low due to the rapid assimilation by aquatic vegetation, a number of the indicators must exceed the threshold values (criteria) in order for a reach to be classified as not supporting its designated uses.

Four sites were surveyed on the Animas River



Animas @ NM/CO line

La Plata River

Animas River

Aztec

Animas @ Aztec

Flora Vista

Lake Farmington

Animas @ Flora Vista

Farmington

Animas @ Farmington

San Juan River

- Sampling Sites
- 8 Digit HUs
- ▬ Major Drainage
- ▬ Places/Towns
- ▬ Roads
- ⊕ USGS Gages
- ▲ NPDES Permits
- ▬ Minor Drainage
- Land Use/Cover
 - Built-up
 - Ag
 - Range
 - Forest
 - Water
 - Wetland
 - Barren



Total nitrogen and total phosphorus results (San Juan River to Estes Arroyo)

Site	Date/time	Total Nitrogen	Total Phosphorus	units
Animas River at Farmington	4/16/2002 14:00	0.395	<0.03	mg/L
Animas River at Farmington	5/21/2002 18:10	0.301	0.057	mg/L
Animas River at Farmington	5/28/2002 18:45	0.297	0.032	mg/L
Animas River at Farmington	6/19/2002 8:30	0.266	<0.03	mg/L
Animas River at Farmington	7/16/2002 16:45	0.656	<0.03	mg/L
Animas River at Farmington	8/19/2002 16:20	0.409	0.032	mg/L
Animas River at Farmington	9/17/2002 12:10	0.476	0.147	mg/L
Animas River at Farmington	8/25/2003 9:30	0.654	0.181	mg/L
Animas River at Farmington	10/8/2003 9:00	0.303	<0.03	mg/L
Exceedence Ratio		3/9 = 33%	2/9 = 22%	
Animas River near Flora Vista	4/16/2002 12:20	0.318	<0.03	mg/L
Animas River near Flora Vista	5/21/2002 17:00	0.325	0.069	mg/L
Animas River near Flora Vista	5/28/2002 17:45	0.243	0.037	mg/L
Animas River near Flora Vista	6/19/2002 9:15	0.244	<0.03	mg/L
Animas River near Flora Vista	7/17/2002 8:20	0.416	0.041	mg/L
Animas River near Flora Vista	8/20/2002 15:20	0.389	<0.03	mg/L
Animas River near Flora Vista	9/19/2002 9:30	0.517	0.118	mg/L
Animas River near Flora Vista	10/22/2002 12:00	0.15	<0.03	mg/L
Animas River near Flora Vista	8/25/2003 13:30	1.25	0.399	mg/L
Animas River near Flora Vista	10/7/2003 13:00	0.227	<0.03	mg/L
Exceedence Ratio		2/10 = 20%	2/10 = 20%	
San Juan River to Estes Arroyo - Exceedence Ratio		5/19 = 26%	4/19 = 21%	

shaded cells indicate exceedence of the criteria, 0.42 for TN and 0.07 for TP

Total nitrogen and total phosphorus results (Estes Arroyo to Colorado)

Site	Date/time	Total Nitrogen	Total Phosphorus	units
Animas at Aztec abv hyw 550	4/16/2002 10:30	0.282	<0.03	mg/L
Animas at Aztec abv hyw 550	5/20/2002 16:40	0.329	0.069	mg/L
Animas at Aztec abv hyw 550	5/28/2002 17:15	0.248	0.046	mg/L
Animas at Aztec abv hyw 550	6/18/2002 16:00	0.226	<0.03	mg/L
Animas at Aztec abv hyw 550	7/15/2002 15:15	0.407	0.036	mg/L
Animas at Aztec abv hyw 550	8/20/2002 15:00	0.282	<0.03	mg/L
Animas at Aztec abv hyw 550	9/19/2002 11:15	0.515	0.177	mg/L
Animas at Aztec abv hyw 550	10/22/2002 10:30	0.15	<0.03	mg/L
Animas at Aztec abv hyw 550	8/25/2003 17:10	0.689	0.208	mg/L
Animas at Aztec abv hyw 550	10/7/2003 8:30	0.233	<0.03	mg/L
Exceedence Ratio		2/10 = 20%	2/10 = 20%	
Animas at NM/CO state line	4/17/2002 10:45	0.282	<0.03	mg/L
Animas at NM/CO state line	5/21/2002 11:40	0.233	0.052	mg/L
Animas at NM/CO state line	5/28/2002 15:00	0.263	<0.03	mg/L
Animas at NM/CO state line	6/18/2002 15:00	0.231	<0.03	mg/L
Animas at NM/CO state line	7/15/2002 17:00	0.284	<0.03	mg/L
Animas at NM/CO state line	8/21/2002 10:20	0.303	0.073	mg/L
Animas at NM/CO state line	9/16/2002 16:15	0.398	0.115	mg/L
Animas at NM/CO state line	10/21/2002 15:00	0.15	0.4	mg/L
Animas at NM/CO state line	8/26/2003 17:00	0.304	0.121	mg/L
Animas at NM/CO state line	10/6/2003 14:00	0.284	<0.03	mg/L
Exceedence Ratio		0/10 = 0%	5/10 = 50%	
Estes Arroyo to Coloado - Exceedence Ratio		2/20 = 10%	7/20 = 35%	

shaded cells indicate exceedence of the criteria, 0.42 for TN and 0.07 for TP

Field Parameters at Lower Sites San Juan River to Estes Arroyo

Sample site	date/time	pH	EC	Temp	DO (mg/L)	DO %sat	Turb
Animas River at Farmington	11/15/01 9:10	8.20	812	8.00	9.90	148.4	12.0
Animas River at Farmington	3/19/02 14:40	8.30	734	9.00	10.30	158.7	17.0
Animas River at Farmington	4/16/02 14:00	8.15	775	19.30	10.85	172.9	6.3
Animas River at Farmington	5/14/02 8:40	8.20	709	15.00	7.80	138.1	16.0
Animas River at Farmington	5/21/02 18:10	8.02	517	18.42	7.63	119.4	53.0
Animas River at Farmington	5/28/02 18:45	8.34	597	22.28	7.00	118.1	20.3
Animas River at Farmington	6/19/02 8:30	7.93	843	17.53	8.56	131.9	0.4
Animas River at Farmington	7/16/02 16:45	8.05	767	30.50	7.47	146.8	6.0
Animas River at Farmington	7/18/02 17:50	8.10	1120	33.00	7.40	186.6	2.0
Animas River at Farmington	8/19/02 16:20	8.27	1264	28.95	11.85	226.6	16.7
Animas River at Farmington	9/17/02 12:10	8.03	590	17.67	8.90	139.1	313.8
Animas River at Farmington	10/23/02 9:00	8.30	750	10.30	9.55	125.5	35.6
Animas River at Farmington	10/8/03 9:00	8.47	682	13.68	9.31	161.3	18.8
Animas River near Flora Vista	4/16/02 12:20	8.40	650	17.36	12.33	156.6	3.3
Animas River near Flora Vista	4/17/02 13:45	8.62	577	16.70	11.08	139.0	3.6
Animas River near Flora Vista	5/21/02 17:00	7.85	486	18.92	8.17	107.1	33.5
Animas River near Flora Vista	5/28/02 17:45	8.22	599	22.29	7.31	102.7	15.5
Animas River near Flora Vista	6/19/02 9:15	7.99	830	17.01	10.45	132.3	0.1
Animas River near Flora Vista	7/17/02 8:20	7.74	1009	18.13	8.94	115.2	16.5
Animas River near Flora Vista	8/20/02 15:20	8.33	822	27.88	11.85	185.2	4.1
Animas River near Flora Vista	9/17/02 13:15	7.91	568	19.15	8.61	115.6	234.4
Animas River near Flora Vista	9/19/02 9:30	7.13	633	12.32	11.06	126.0	235.3
Animas River near Flora Vista	10/22/02 12:00	8.35	615	10.60	11.16	122.2	24.7
Animas River near Flora Vista	10/7/03 13:00	8.72	666	14.75	11.90	177.0	12.8
shaded cells indicate exceedence of the criteria - >120% DO							

Field Parameters at Upper Sites Estes Arroyo to Colorado

Sample site	date/time	pH	EC	Temp	DO (mg/L)	DO %sat	Turb
Animas at Aztec abv hyw 550	4/16/02 10:30	8.32	507	13.10	11.10	129.8	8.3
Animas at Aztec abv hyw 550	4/17/02 13:30	8.67	448	16.30	9.95	124.5	7.1
Animas at Aztec abv hyw 550	5/20/02 16:40	8.04	396	19.56	8.94	119.8	51.7
Animas at Aztec abv hyw 550	5/28/02 17:15	8.22	533	21.84	7.56	105.8	11.1
Animas at Aztec abv hyw 550	6/18/02 16:00	8.09	613	26.20	8.47	128.7	0.3
Animas at Aztec abv hyw 550	7/15/02 15:15	7.89	777	24.93	8.47	125.8	35.8
Animas at Aztec abv hyw 550	8/20/02 15:00	8.36	880	26.65	14.89	228.1	2.5
Animas at Aztec abv hyw 550	9/19/02 11:15	7.89	582	14.56	10.47	126.6	182.0
Animas at Aztec abv hyw 550	10/22/02 10:30	8.23	560	9.76	10.12	109.9	15.5
Animas at Aztec abv hyw 550	10/7/03 8:30	8.46	596	12.64	9.15	130.3	10.7
Animas at NM/CO state line	4/17/02 10:45	8.16	401	10.32	10.74	122.3	13.7
Animas at NM/CO state line	5/21/02 11:40	7.82	375	13.89	11.80	144.1	14.8
Animas at NM/CO state line	5/28/02 15:00	8.27	450	17.96	8.50	119.6	4.6
Animas at NM/CO state line	6/18/02 15:00	8.09	587	22.19	9.13	131.3	0.6
Animas at NM/CO state line	7/15/02 17:00	7.99	722	22.35	8.13	117.5	13.0
Animas at NM/CO state line	8/21/02 10:20	8.31	768	18.88	7.63	102.8	418.0
Animas at NM/CO state line	9/16/02 16:15	7.56	443	19.15	8.67	117.8	128.4
Animas at NM/CO state line	10/21/02 15:00	8.23	547	11.99	10.58	122.9	6.0
Animas at NM/CO state line	10/6/03 14:00	8.54	282	16.07	9.41	148.3	3.3
shaded cells indicate exceedence of the criteria - >120% DO Saturation							

Algal Biomass Results: Chlorophyll a and Ash Free Dry Mass

Site	Date	Chlorophyll a micro g/sq cm	AFDM mg/sq.cm
Animas at Farmington	10/8/03	6.6174	8.0906
		10.3391	6.2702
		7.5815	8.2591
Average		8.1793	7.5400
Animas at Flora Vista	10/7/03	14.7128	8.1365
		14.7416	6.5816
		7.5976	4.5582
Average		12.3507	6.4254
Animas at Aztec	10/7/03	4.0120	1.4003
"		3.0958	1.4205
		5.5827	1.3698
Average		4.2302	1.3969
Animas at CO/NM border	10/6/03	1.5384	3.2181
		2.4764	3.7414
		3.4850	4.2647
Average		2.4999	3.7414

shaded cells indicate exceedences of the criteria:
 10 micrograms per square centimeter for chlorophyll a and
 5 milligrams per square centimeter for ash free dry mass

Assessment: exceedence of >2 criteria indicates impairment

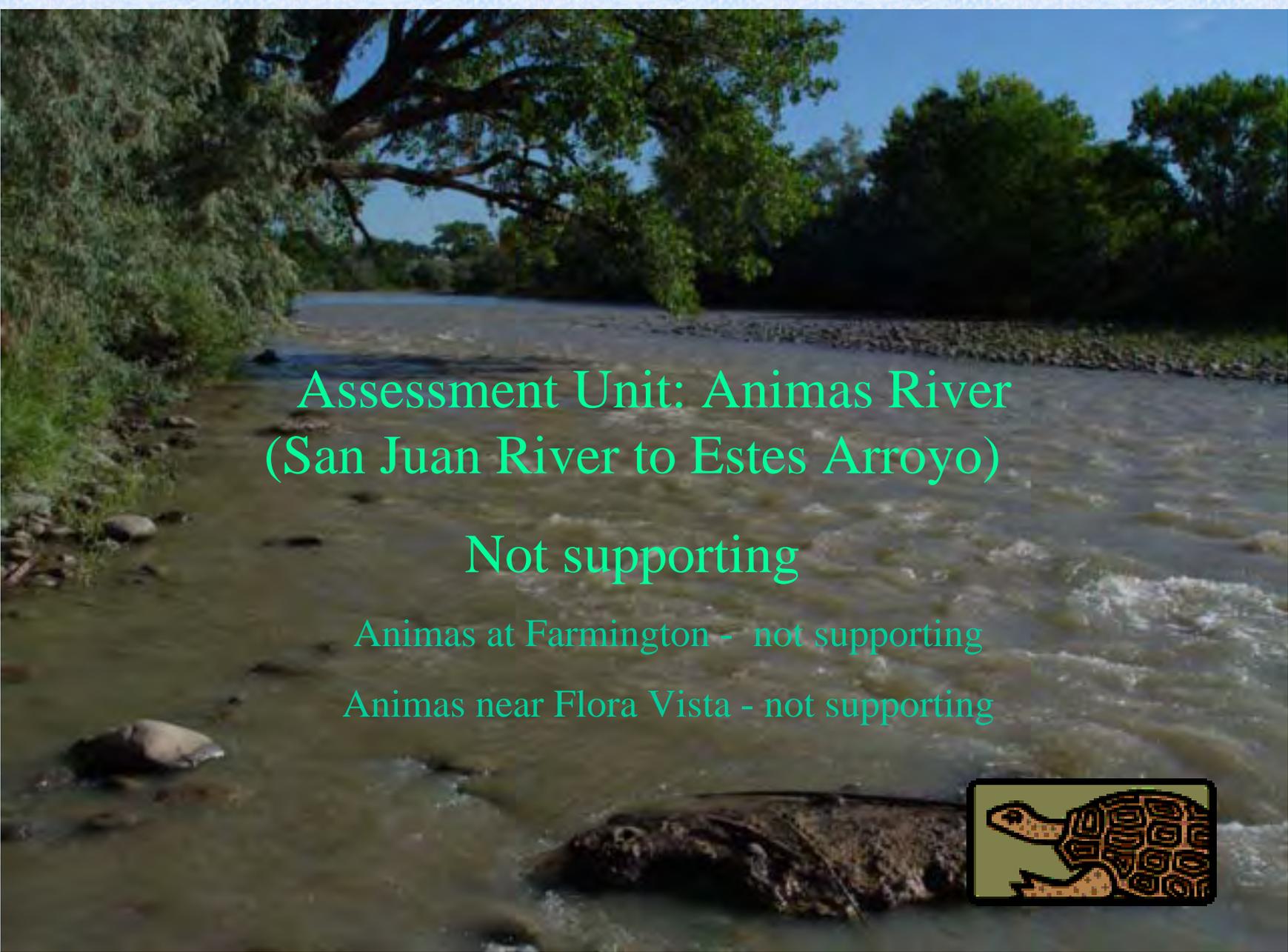
Sample Sites or Assessment Unit (AU)	DO Saturation	pH	DO	Total Nitrogen	Total Phosphorus
	Exceedence Ratio	maximum	minimum	Exceedence Ratio	Exceedence Ratio
Criteria	>15% (>120%)	>9.0	<6.0	>15% (>0.42 mg/L)	>15% (>0.07 mg/L)
Animas River at Farmington	69%	8.47	7.00	33% (50%*)	22% (26%*)
Animas River near Flora Vista	64%	8.72	7.31	20%	20%
San Juan R. to Estes Arroyo AU	67%	8.67	7.56	26%	21%
Animas at Aztec abv hyw 550	70%	8.67	7.56	20%	20%
Animas at NM/CO state line	56%	8.54	8.50	0%	50%
Estes Arroyo to Colorado AU	63%	8.67	7.56	10%	35%

* from USGS data 1990-93



Sample Sites or Assessment Unit (AU)	Chlorophyll a	AFDM	HBI
	(µg/cm ²)	(mg/cm ²)	Score
Criteria	>10	>5	>5.5
Animas River at Farmington	8.18	7.54	4.8
Animas River near Flora Vista	12.35	6.42	5.15
San Juan R. to Estes Arroyo AU	10.3	6.98	
Animas at Aztec abv hyw 550	4.23	1.4	5.15
Animas at NM/CO state line	2.5	3.74	4.8
Estes Arroyo to Colorado AU	3.36	1.95	



A photograph of a river with a large log in the foreground and trees on the banks. The river is flowing from the background towards the foreground. The water is a murky brown color. There are large rocks and a large log in the foreground. The banks are lined with green trees and bushes. The sky is blue.

Assessment Unit: Animas River (San Juan River to Estes Arroyo)

Not supporting

Animas at Farmington - not supporting

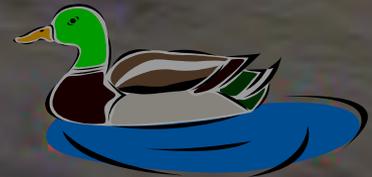
Animas near Flora Vista - not supporting



Assessment Unit: Animas River
(Estes Arroyo to CO) - Fully Supporting

Animas at Aztec - not supporting

Animas at NM/CO line - fully supporting



THE END
of the Animas at the San Juan River

