

# WM796

## OPTIMIZATION OF BEST MANAGEMENT PRACTICES FOR BEEF CATTLE RANCHING IN THE LAKE OKEECHOBEE BASIN, Part 2.

### PROGRESS REPORT #4

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## Introduction

The 4<sup>th</sup> progress report for WM 769 stoking rate BMP demonstration project at MEARC is focus on summarizing and analyzing data for all the years 1998-2001, also flow and annual nutrient calculation for the year 2001. The previous reports were for water quality and flow calculations during the years 2000 and 2002.

The task documented in this report include:

- ?? Rainfalls Summary 1998-2001
- ?? Runoff Summary 1998-2001;
- ?? Concentrations Summary 1998-2001;
- ?? Mean concentrations and loads summary based on different treatment 1998-2001;
- ?? Back flow, runoff, and combined flow concentrations summary for 2001;
- ?? Annual load assessment 1998-2001;
- ?? Load summary for TP, NH<sub>4</sub>, NO<sub>x</sub>, TKN, Ortho-P parameters 2001;
- ?? Load summary for summer and winter plots 2001;
- ?? QA/QC analysis results 2001.

## Methods

The weather data was collected with the Buck Island Ranch from four weather stations: the main weather station, summer weather station, and two winter stations. These data were in raw form mainly on hourly time interval. They were summarized into daily and monthly averages and monthly and annual totals as appropriate. Gaps in the data have been identified and documented and, where possible, patched up with available data.

The flow data was collected from the Buck Island ranch from sixteen summer and winter plots. The flumes upstream and downstream readings were collected form data logger every 20 minutes interval, and data were formatted in row for all summer and winter plots. The flow was calculated by formulas in spreadsheets for every 20 minutes interval and results for summary report were summarized into yearly averages for all sites. Gaps in the data have been identified, documented and, where possible, patched up with available data.

The nutrient loads were calculate for TP, NH<sub>4</sub>, NO<sub>x</sub>, TKN, Ortho-P parameters, by formula “concentrations multiply by flow” for every 20 minutes interval, and then summarize into annual nutrient averages for all parameter for all summer and winter sites.

For Flow and nutrient load calculations we did double check and calculate runoff and nutrient load result in two different ways. To estimate runoff we took average flow (cfs) value from spreadsheets convert it to cubic meters per second (cms), multiply it (cms) by time (s)[s/year] and in result we have how much water we have for all year in (cm), then we took the quantity (cm) and divided it by area (sm), and in result we have runoff depth in meters. The same calculations we did in Americans unit systems. There were no differences between spreadsheet result and runoff depth calculated by formulas.

To estimate nutrient load we took Net flow total (liters) and multiply it by concentration's yearly average (mg/l), and divided by 1000000, in result we have a quantity of loads in (kg). The quantity we divide by area (ha) and in consequence we have nutrient load kg/ha for the year. The spreadsheets results for summer pastures was approximately 1.37 times bigger than load calculate by formulas, and for winter pastures was opposite the calculated result was 1.20 time bigger than data results form spreadsheets. All results for each site are represented in table 1.

Table 1. Results Summary.

Station Code	Flow avg		Quantity		Area			RunofDepth (avg)		Runof Depth (data)	Ratio	Net flow Total (data)	TP conc avg	Load (avg)	Load avg	Load data	Ratio
	cms	cfs	cm	cf	sm	sf	ha	m	feets	m	data/avg	liters	mg/l	kg	kg/ha	kg/ha	data/avg
S1	0.002	<b>0.06</b>	56336.67	2.0E+06	202343	2178000	20.234	<b>27.8</b>	0.91	<b>27.8</b>	1.00	5.6E+07	<b>1.07</b>	6.0E+01	<b>2.97</b>	<b>4.41</b>	1.49
S2	0.002	<b>0.07</b>	59697.3	2.1E+06	202343	2178000	20.234	<b>29.5</b>	0.97	<b>29.5</b>	1.00	6.0E+07	<b>0.88</b>	5.2E+01	<b>2.59</b>	<b>3.07</b>	1.19
S3	0.002	<b>0.07</b>	62684.26	2.2E+06	202343	2178000	20.234	<b>31.0</b>	1.02	<b>31.0</b>	1.00	6.3E+07	<b>0.79</b>	4.9E+01	<b>2.44</b>	<b>2.69</b>	1.10
S4	0.002	<b>0.05</b>	48915.35	1.7E+06	202343	2178000	20.234	<b>24.2</b>	0.79	<b>24.2</b>	1.00	4.9E+07	<b>1.11</b>	5.4E+01	<b>2.67</b>	<b>4.36</b>	1.63
S5	0.002	<b>0.08</b>	67399.16	2.4E+06	202343	2178000	20.234	<b>33.3</b>	1.09	<b>33.3</b>	1.00	6.7E+07	<b>0.80</b>	5.4E+01	<b>2.67</b>	<b>4.20</b>	1.57
S6	0.002	<b>0.09</b>	77920.16	2.8E+06	202343	2178000	20.234	<b>38.5</b>	1.26	<b>38.3</b>	1.00	7.8E+07	<b>0.85</b>	6.6E+01	<b>3.28</b>	<b>4.24</b>	1.29
S7	0.002	<b>0.07</b>	65923.86	2.3E+06	202343	2178000	20.234	<b>32.6</b>	1.07	<b>32.6</b>	1.00	6.6E+07	<b>0.70</b>	4.6E+01	<b>2.29</b>	<b>3.47</b>	1.52
S8	0.002	<b>0.08</b>	70224.69	2.5E+06	202343	2178000	20.234	<b>34.7</b>	1.14	<b>34.6</b>	1.00	7.0E+07	<b>0.82</b>	5.7E+01	<b>2.83</b>	<b>3.26</b>	1.15
<b>S Avg</b>	<b>0.002</b>	<b>0.07</b>	<b>63637.68</b>	<b>2.2E+06</b>	<b>202343</b>	<b>2178000</b>	<b>20.234</b>	<b>31.5</b>	<b>1.03</b>	<b>31.4</b>	<b>1.00</b>	<b>6.4E+07</b>	<b>0.88</b>	<b>5.6E+01</b>	<b>2.75</b>	<b>3.71</b>	<b>1.37</b>
W1	0.001	<b>0.05</b>	46633.18	1.6E+06	323749	3484800	32.375	<b>14.4</b>	0.47	<b>14.5</b>	1.00	4.7E+07	<b>0.12</b>	5.5E+00	<b>0.27</b>	<b>0.23</b>	0.85
W2	0.003	<b>0.09</b>	80046.16	2.8E+06	323749	3484800	32.375	<b>24.7</b>	0.81	<b>24.8</b>	1.00	8.0E+07	<b>0.14</b>	1.1E+01	<b>0.56</b>	<b>0.40</b>	0.71
W3	0.002	<b>0.06</b>	54684.61	1.9E+06	323749	3484800	32.375	<b>16.9</b>	0.55	<b>16.8</b>	1.00	5.5E+07	<b>0.24</b>	1.3E+01	<b>0.64</b>	<b>0.62</b>	0.96
W4	0.002	<b>0.08</b>	74724.59	2.6E+06	323749	3484800	32.375	<b>23.1</b>	0.76	<b>23.1</b>	1.00	7.5E+07	<b>0.11</b>	8.4E+00	<b>0.42</b>	<b>0.35</b>	0.83
W5	0.003	<b>0.12</b>	108594.2	3.8E+06	323749	3484800	32.375	<b>33.5</b>	1.10	<b>33.5</b>	1.00	1.1E+08	<b>0.16</b>	1.8E+01	<b>0.87</b>	<b>0.67</b>	0.76
W6	0.002	<b>0.09</b>	78394.63	2.8E+06	323749	3484800	32.375	<b>24.2</b>	0.79	<b>24.2</b>	1.00	7.8E+07	<b>0.18</b>	1.4E+01	<b>0.70</b>	<b>0.67</b>	0.96
W7	0.003	<b>0.12</b>	103794.4	3.7E+06	323749	3484800	32.375	<b>32.1</b>	1.05	<b>32.1</b>	1.00	1.0E+08	<b>0.15</b>	1.5E+01	<b>0.76</b>	<b>0.88</b>	1.16
W8	0.003	<b>0.09</b>	81861.91	2.9E+06	323749	3484800	32.375	<b>25.3</b>	0.83	<b>25.2</b>	1.00	8.2E+07	<b>0.08</b>	6.6E+00	<b>0.33</b>	<b>0.21</b>	0.65
<b>W Avg</b>	<b>0.002</b>	<b>0.09</b>	<b>78591.71</b>	<b>2.8E+06</b>	<b>323749</b>	<b>3484800</b>	<b>32.375</b>	<b>24.3</b>	<b>0.80</b>	<b>24.3</b>	<b>1.00</b>	<b>7.9E+07</b>	<b>0.15</b>	<b>1.2E+01</b>	<b>0.57</b>	<b>0.50</b>	<b>0.86</b>

## Rainfalls Summary 1998-2001

The rainfall data was collected with the Buck Island Ranch from four weather stations: the main weather station, summer weather station, and two winter stations. Results were summarized into yearly averages and represented in table 2.

Table 2. Summary for rainfall's yearly averages in inches given by the four weather stations at Buck Island Ranch during the years 1998, 1999, 2000 and 2001.

Year	Main (in)	Main (cm)	Summer	Winter-1	Winter-2	BIR Avg	<a href="mailto:FAWN@ona">FAWN@ona</a>	Yearly av.
1998	54.50	138.43	33.00	27.70	29.10	36.10	43.00	51.69
1999	45.20	114.81	2.30	37.90	50.60	34.00	53.10	48.27
2000	29.20	74.17	23.50	24.10	53.00	32.50	25.30	37.40
2001	50.70	128.78				50.70	59.90	72.52
<b>4 year av.</b>	<b>44.90</b>	<b>114.05</b>	<b>19.60</b>	<b>29.90</b>	<b>44.23</b>	<b>38.33</b>	<b>45.33</b>	<b>52.47</b>

Table 3. Represents the Runoff volume, TP concentration, and nutrient load for all 4 years 1998,1999,2000, and 2001. The NOx concentrations for w2 there are very high we have like 10 results ~1mg/l – 3.4mg/l.

Table 3. Summary table for rainfall’s, Runoff volume, TP concentration, and Nutrient Load yearly averages during the years 1998, 1999, 2000 and 2001.

Year	Rainfall	01/01/1998										12/31/1998								545'
		01/01/1999										12/31/1999								452'
Station code	Unit	S1	S2	S3	S4	S5	S6	S7	S8	Summer average		W1	W2	W3	W4	W5	W6	W7	W8	Winter average
		1998	Runoff Volume	cm	8.7	13.5	14.5	6.6	14.7	15.3	16.0	14.2	<b>1294</b>	10.5	15.7	12.0	21.5	24.7	20.9	24.4
inch	3.4			5.3	5.7	2.6	5.8	6.0	6.3	5.6	<b>509</b>	4.1	6.2	4.7	8.5	9.7	8.2	9.6	8.2	<b>741</b>
TP Conc.	mg/l		0.35	0.19	0.76	0.47	0.62	0.33	0.22	0.76	<b>0.49</b>	0.06	0.06	0.10	0.06	0.06	0.08	0.13	0.07	<b>0.07</b>
Load	Kg/ha		0.58	0.51	0.60	0.66	1.17	0.46	0.64	1.25	<b>0.73</b>	0.07	0.07	0.10	0.12	0.14	0.14	0.13	0.10	<b>0.11</b>
1999	Runoff Volume	cm	10.2	13.0	9.5	15.1	14.9	14.2	20.2	7.6	<b>1309</b>	6.7	6.9	14.8	10.8	13.4	15.7	15.0	12.9	<b>1203</b>
		inch	4.0	5.1	3.7	5.9	5.9	5.6	8.0	3.0	<b>515</b>	2.6	2.7	5.8	4.3	5.3	6.2	5.9	5.1	<b>473</b>
	TP Conc.	mg/l	0.51	0.56	0.48	0.58	0.65	0.58	0.60	0.65	<b>0.60</b>	0.13	0.19	0.08	0.07	0.10	0.08	0.22	0.10	<b>0.12</b>
	Load	Kg/ha	0.55	0.89	0.47	0.89	1.12	0.64	1.37	0.58	<b>0.82</b>	0.16	0.24	0.18	0.08	0.12	0.12	0.18	0.10	<b>0.15</b>
2000	Runoff Volume	cm	-1.1	-3.0	-0.1	0.4	1.2	2.4	2.6	2.1	<b>0.55</b>	1.0	1.3	0.6	2.5	1.8	0.6	1.0	2.0	<b>134</b>
		inch	-0.4	-1.2	-0.1	0.2	0.5	0.9	1.0	0.8	<b>0.22</b>	0.4	0.5	0.2	1.0	0.7	0.2	0.4	0.8	<b>0.53</b>
	TP Conc.	mg/l	0.06	0.29	0.07	0.64	0.42	0.54	0.25	1.05	<b>0.42</b>	0.25	0.13	0.50	0.14	0.31	0.62	0.32	0.30	<b>0.32</b>
	Load	Kg/ha	-0.01	-0.04	0.00	0.03	0.08	0.08	0.21	0.32	<b>0.08</b>	0.04	0.03	0.07	0.06	0.11	0.08	0.04	0.05	<b>0.06</b>
2001	Runoff Volume	cm	27.8	29.5	31.0	24.2	33.3	38.3	32.6	34.6	<b>3141</b>	14.5	24.8	16.8	23.1	33.5	24.2	32.1	25.2	<b>2426</b>
		inch	11.0	11.6	12.2	9.5	13.1	15.1	12.8	13.6	<b>1237</b>	5.7	9.8	6.6	9.1	13.2	9.5	12.6	9.9	<b>955</b>
	TP Conc.	mg/l	1.07	0.88	0.78	1.10	0.80	0.85	0.70	0.81	<b>0.87</b>	0.12	0.13	0.24	0.11	0.16	0.18	0.15	0.08	<b>0.15</b>
	Load	Kg/ha	4.41	3.07	2.69	4.36	4.20	4.24	3.47	3.26	<b>3.71</b>	0.23	0.44	0.62	0.35	0.67	0.67	0.88	0.21	<b>0.51</b>

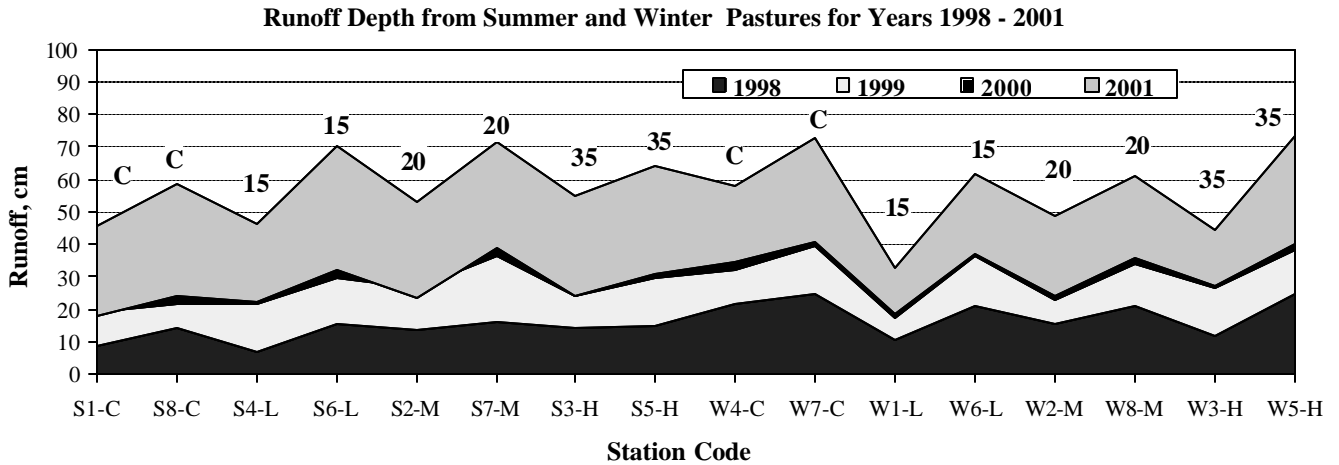


Figure 1. Total runoff depth results calculated for summer and winter pastures blocks in the years 1998, 1999, 2000, and 2001.

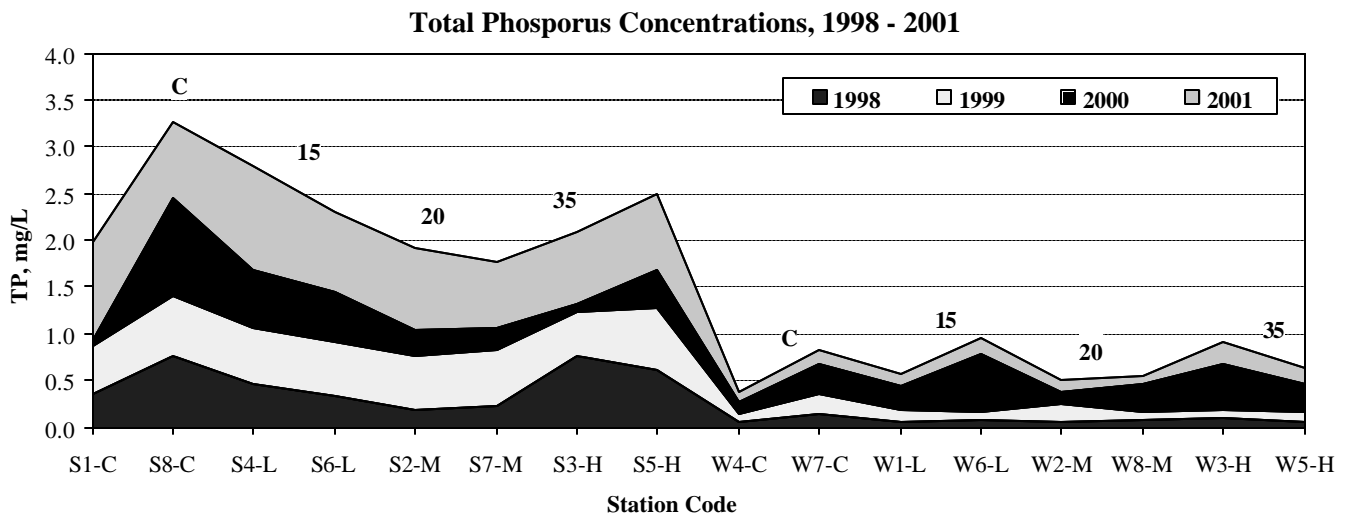


Figure 2. Summary statistics for ISCO samples Total P concentration results from summer and winter pastures for the year 1998, 1999, 2000, and 2001 showing mean phosphorus concentrations in mg/L.

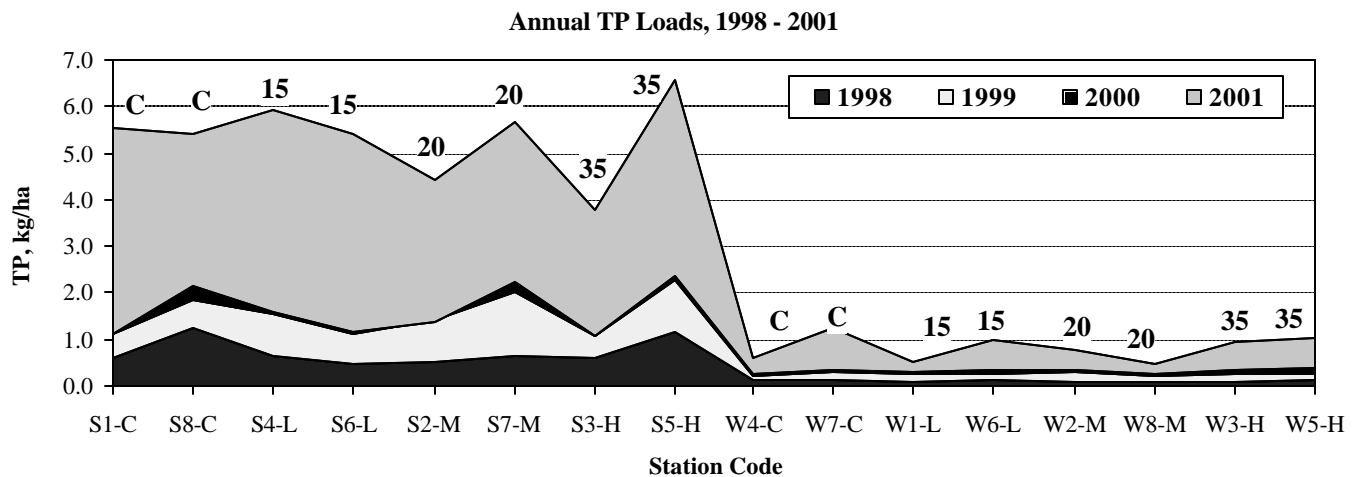


Figure 3. Comparison of nutrient loads calculated using TP concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000, and 2001.

## Summary of mean concentration and load 1998-2001

This section represents NH<sub>4</sub>, NO<sub>x</sub>, TKN, and Total Phosphorus concentrations and Nutrient loads treatments yearly averages. The highest concentrations averages are basically for the year 2001 except for TKN concentrations, they are lowest.

Special attention requires NO<sub>x</sub> concentration standard. Like you may note for winter (medium) pastures in year 2000 and 2001 the yearly average has the highest value 0.83mg/l and 0.20mg/l, this is because in the same W2 pasture for 2000 and 2001 we having the highest concentrations, averages are 1.56 mg/l and 0.38 mg/l. And overall the NO<sub>x</sub> concentrations has been increased for the year 2001.

Site	Treatment	NH <sub>4</sub>				NO <sub>x</sub>				TKN				TP			
		Concentration (mg/L)				Concentration (mg/L)				Concentration (mg/L)				Concentration (mg/L)			
		1998	1999	2000	2001	1998	1999	2000	2001	1998	1999	2000	2001	1998	1999	2000	2001
S	Control	0.28	0.29	0.27	0.47	0.01	0.02	0.01	0.07	3.43	4.98	2.99	3.92	0.56	0.58	0.56	0.94
	Low	0.21	0.27	0.41	0.35	0.01	0.01	0.03	0.04	3.63	4.39	2.75	3.60	0.40	0.58	0.59	0.97
	Medium	0.28	0.32	0.26	0.38	0.01	0.02	0.07	0.07	3.11	4.77	2.17	3.91	0.21	0.58	0.27	0.79
	High	0.36	0.58	0.22	0.41	0.02	0.01	0.02	0.05	3.84	4.37	2.11	3.51	0.69	0.57	0.25	0.79
W	Control	0.20	0.21	0.90	0.31	0.03	0.01	0.14	0.09	3.67	3.79	4.30	3.08	0.10	0.15	0.23	0.13
	Low	0.17	0.18	1.06	0.23	0.02	0.05	0.08	0.18	3.50	6.60	4.98	2.82	0.07	0.11	0.44	0.15
	Medium	0.19	0.21	1.41	0.32	0.02	0.03	0.83	0.20	3.51	3.04	4.98	2.92	0.07	0.15	0.22	0.11
	High	0.19	0.22	1.91	0.23	0.04	0.02	0.20	0.08	3.60	3.68	6.08	2.79	0.08	0.09	0.41	0.20

Table4. Summarize the mean concentrations of the 2 replicates for each treatment and the mean for all 8 plots within a block winter and summer

Site	Treatment	NH <sub>4</sub>				NO <sub>x</sub>				TKN				TP			
		Load (Kg/ha)				Load (Kg/ha)				Load (Kg/ha)				Load (Kg/ha)			
		1998	1999	2000	2001	1998	1999	2000	2001	1998	1999	2000	2001	1998	1999	2000	2001
S	Control	0.19	0.30	0.05	2.09	0.02	0.01	0.00	0.11	4.68	4.31	0.71	14.78	0.92	0.57	0.16	3.84
	Low	0.19	0.36	0.01	1.34	0.01	0.01	0.00	0.12	4.78	6.50	0.59	11.56	0.56	0.77	0.06	4.30
	Medium	0.23	0.55	0.03	1.34	0.02	0.02	0.00	0.06	7.57	8.67	1.21	13.38	0.58	1.13	0.09	3.27
	High	0.22	0.43	0.01	1.59	0.03	0.00	0.00	0.04	6.77	5.59	0.20	12.14	0.88	0.80	0.04	3.45
W	Control	0.35	0.28	0.17	0.75	0.06	0.02	0.02	-0.16	7.65	4.29	1.02	10.19	0.12	0.13	0.05	0.61
	Low	0.21	0.22	0.15	0.61	0.03	0.03	0.00	-0.27	5.28	4.38	0.62	7.70	0.11	0.14	0.06	0.45
	Medium	0.34	0.21	0.32	0.70	0.04	0.02	0.13	0.11	6.27	3.06	1.29	8.82	0.09	0.17	0.04	0.31
	High	0.21	0.32	0.34	0.49	0.03	0.03	0.00	-0.12	6.50	4.65	0.83	8.36	0.12	0.15	0.09	0.64

Table 5. Summarize the mean loads of the 2 replicates for each treatment and the mean for all 8 plots within a block winter and summer

## Runoff summary 1998-2001

Table 6. Summary of runoff depth in cm and inches for summer and winter pasture plot and blocks in the years 1998, 1999, 2000 and 2001.

Station code	Treatment	Runoff Volume							
		1998		1999		2000		2001	
		cm	inch	cm	inch	cm	inch	cm	inch
S1	C	8.7	3.4	10.2	4.0	-1.1	-0.4	27.8	11.0
S2	20	13.5	5.3	13.0	5.1	-3.0	-1.2	29.5	11.6
S3	35	14.5	5.7	9.5	3.7	-0.1	-0.1	31.0	12.2
S4	15	6.6	2.6	15.1	5.9	0.4	0.2	24.2	9.5
S5	35	14.7	5.8	14.9	5.9	1.2	0.5	33.3	13.1
S6	15	15.3	6.0	14.2	5.6	2.4	0.9	38.3	15.1
S7	20	16.0	6.3	20.2	8.0	2.6	1.0	32.6	12.8
S8	C	14.2	5.6	7.6	3.0	2.1	0.8	34.6	13.6
<b>Summer average</b>		<b>12.9</b>	<b>5.1</b>	<b>13.1</b>	<b>5.2</b>	<b>0.5</b>	<b>0.2</b>	<b>31.4</b>	<b>12.4</b>
W1	15	10.5	4.1	6.7	2.6	1.0	0.4	14.5	5.7
W2	20	15.7	6.2	6.9	2.7	1.3	0.5	24.8	9.8
W3	35	12.0	4.7	14.8	5.8	0.6	0.2	16.8	6.6
W4	C	21.5	8.5	10.8	4.3	2.5	1.0	23.1	9.1
W5	35	24.7	9.7	13.4	5.3	1.8	0.7	33.5	13.2
W6	15	20.9	8.2	15.7	6.2	0.6	0.2	24.2	9.5
W7	C	24.4	9.6	15.0	5.9	1.0	0.4	32.1	12.6
W8	20	20.9	8.2	12.9	5.1	2.0	0.8	25.2	9.9
<b>Winter average</b>		<b>18.8</b>	<b>7.4</b>	<b>12.0</b>	<b>4.7</b>	<b>1.3</b>	<b>0.5</b>	<b>24.3</b>	<b>9.5</b>

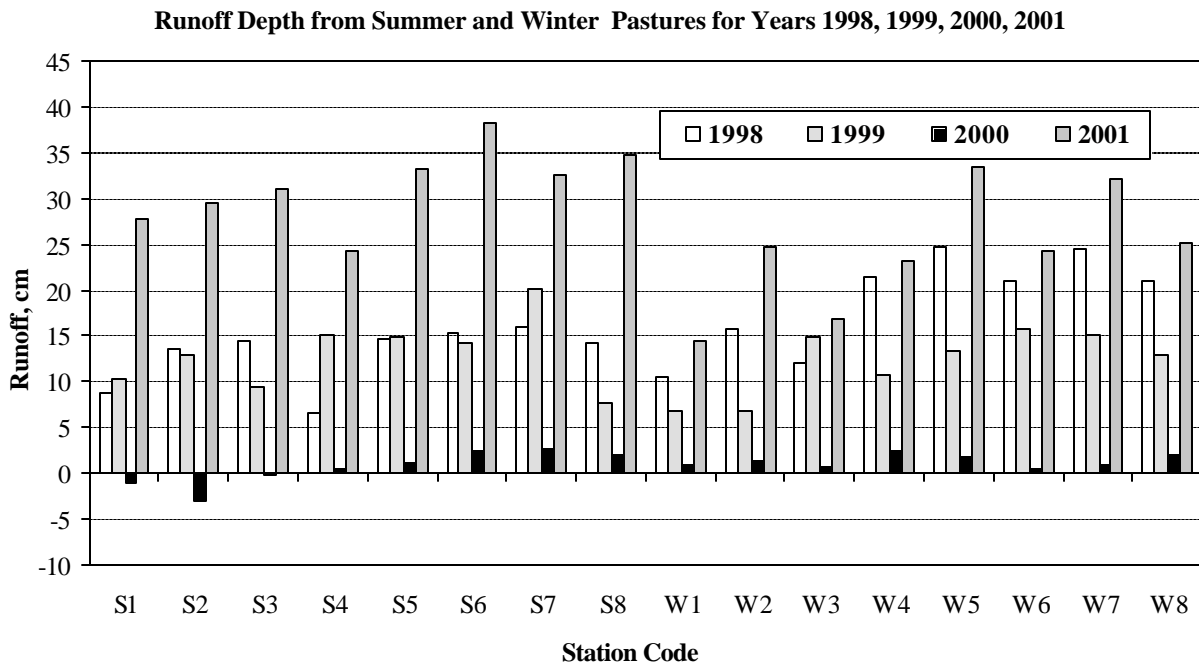


Figure 6. Total runoff depth results calculated for summer and winter pastures blocks in the years 1998, 1999, 2000 and 2001.



### Concentrations summary 1998-2001

Table 7a. Summary statistics for ISCO samples Total P concentration results from summer and winter pastures for the year 1998, 1999, 2000 and 2001 showing mean phosphorus concentrations in mg/L (C represents the control plots).

Site	Treatment	Rep	Number of Samples				TP Concentration (mg/L)			
			1998	1999	2000	2001	1998	1999	2000	2001
S1	C	1	97	49	20	98	0.35	0.51	0.06	1.07
S2	20	1	41	44	6	92	0.19	0.56	0.29	0.88
S3	35	1	7	29	5	89	0.76	0.48	0.07	0.78
S4	15	1	91	45	14	97	0.47	0.58	0.64	1.10
S5	35	2	69	42	28	92	0.62	0.65	0.42	0.80
S6	15	2	112	53	21	94	0.33	0.58	0.54	0.85
S7	20	2	125	68	79	108	0.22	0.60	0.25	0.70
S8	C	2	83	49	32	103	0.76	0.65	1.05	0.81
<b>Summer Average</b>			<b>78</b>	<b>47</b>	<b>26</b>	<b>96</b>	<b>0.46</b>	<b>0.58</b>	<b>0.42</b>	<b>0.87</b>
W1	15	1	188	51	16	113	0.06	0.13	0.25	0.12
W2	20	1	144	39	15	114	0.06	0.19	0.13	0.13
W3	35	1	204	31	15	91	0.10	0.08	0.50	0.24
W4	C	1	131	74	17	119	0.06	0.07	0.14	0.11
W5	35	2	188	43	15	124	0.06	0.10	0.31	0.16
W6	15	2	183	51	8	101	0.08	0.08	0.62	0.18
W7	C	2	158	35	10	114	0.13	0.22	0.32	0.15
W8	20	2	217	22	14	111	0.07	0.10	0.30	0.08
<b>Winter Average</b>			<b>176</b>	<b>43</b>	<b>14</b>	<b>110</b>	<b>0.08</b>	<b>0.12</b>	<b>0.32</b>	<b>0.15</b>

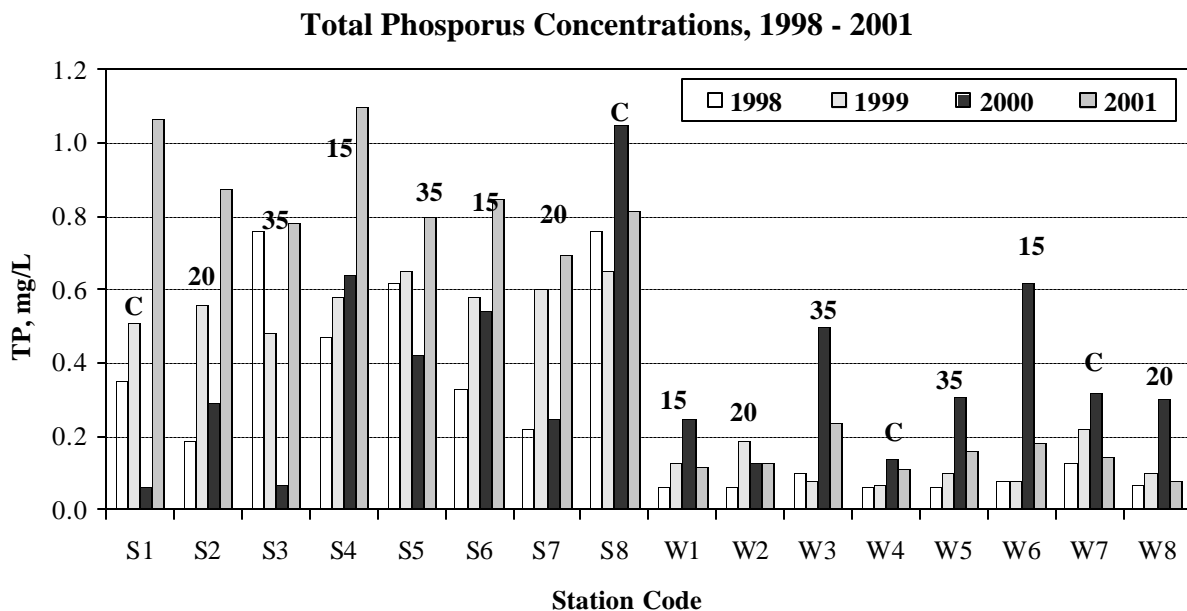


Figure 7a. Summary statistics for ISCO samples Total P concentration results from summer and winter pastures for the year 1998, 1999, 2000 and 2001 showing mean phosphorus concentrations in mg/L (C represents the control plots).

Table 7b. Summary statistics for ISCO samples NOX concentration results from summer and winter pastures for the year 1998, 1999, 2000 and 2001 showing mean phosphorus concentrations in mg/L (C represents the control plots).

Site	Treatment	Rep	Number of Samples				NOX Concentration (mg/L)			
			1998	1999	2000	2001	1998	1999	2000	2001
S1	C	1	97	49	20	98	0.01	0.02	0.01	0.11
S2	20	1	41	44	6	92	0.01	0.02	0.01	0.05
S3	35	1	7	29	5	89	0.02	0.01	0.01	0.08
S4	15	1	91	45	14	97	0.01	0.01	0.01	0.04
S5	35	2	69	42	28	92	0.02	0.01	0.02	0.03
S6	15	2	112	53	21	94	0.01	0.01	0.05	0.03
S7	20	2	125	68	79	108	0.01	0.02	0.12	0.09
S8	C	2	83	49	32	103	0.01	0.01	0.01	0.03
<b>Summer Average</b>			<b>78</b>	<b>47</b>	<b>26</b>	<b>96</b>	<b>0.01</b>	<b>0.01</b>	<b>0.03</b>	<b>0.06</b>
W1	15	1	188	51	16	113	0.02	0.09	0.12	0.27
W2	20	1	144	39	15	114	0.02	0.02	1.56	0.38
W3	35	1	204	31	15	91	0.05	0.01	0.15	0.04
W4	C	1	131	74	17	119	0.02	0.01	0.13	0.12
W5	35	2	188	43	15	124	0.02	0.02	0.25	0.12
W6	15	2	183	51	8	101	0.02	0.01	0.03	0.08
W7	C	2	158	35	10	114	0.03	0.01	0.14	0.06
W8	20	2	217	22	14	111	0.02	0.03	0.09	0.03
<b>Winter Average</b>			<b>176</b>	<b>43</b>	<b>14</b>	<b>110</b>	<b>0.03</b>	<b>0.03</b>	<b>0.31</b>	<b>0.14</b>

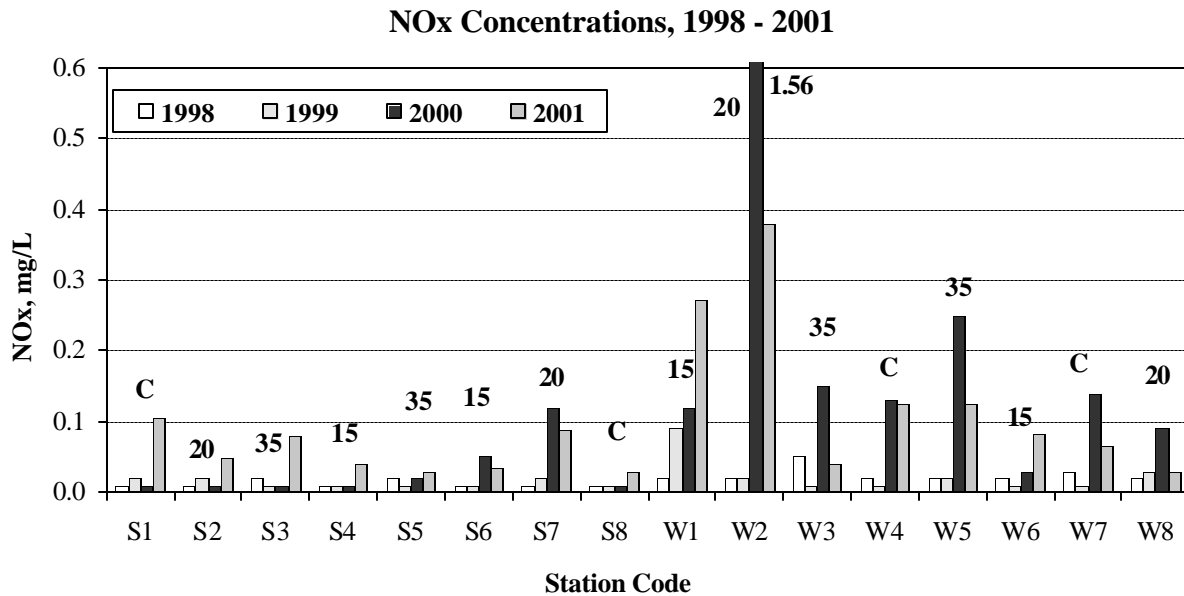


Figure 7b. Summary statistics for ISCO samples NOX concentration results from summer and winter pastures for the year 1998, 1999, 2000 and 2001 showing mean phosphorus concentrations in mg/L (C represents the control plots).

Table 7c. Summary statistics for ISCO samples NH4 concentration results from summer and winter pastures for the year 1998, 1999, 2000 and 2001 showing mean phosphorus concentrations in mg/L (C represents the control plots).

Site	Treatment	Rep	Number of Samples				NH4 Concentration (mg/L)			
			1998	1999	2000	2001	1998	1999	2000	2001
S1	C	1	97	49	20	98	0.23	0.32	0.21	0.65
S2	20	1	41	44	6	92	0.27	0.35	0.28	0.41
S3	35	1	7	29	5	89	0.36	0.9	0.2	0.33
S4	15	1	91	45	14	97	0.2	0.3	0.33	0.30
S5	35	2	69	42	28	92	0.35	0.25	0.24	0.50
S6	15	2	112	53	21	94	0.21	0.23	0.48	0.40
S7	20	2	125	68	79	108	0.28	0.28	0.24	0.34
S8	C	2	83	49	32	103	0.33	0.25	0.33	0.29
<b>Summer Average</b>			<b>78</b>	<b>47</b>	<b>26</b>	<b>96</b>	<b>0.28</b>	<b>0.36</b>	<b>0.29</b>	<b>0.40</b>
W1	15	1	188	51	16	113	0.18	0.16	1.52	0.24
W2	20	1	144	39	15	114	0.18	0.18	2.25	0.43
W3	35	1	204	31	15	91	0.19	0.2	2.38	0.20
W4	C	1	131	74	17	119	0.17	0.22	0.82	0.40
W5	35	2	188	43	15	124	0.18	0.24	1.44	0.25
W6	15	2	183	51	8	101	0.16	0.19	0.6	0.23
W7	C	2	158	35	10	114	0.22	0.2	0.98	0.21
W8	20	2	217	22	14	111	0.2	0.24	0.56	0.20
<b>Winter Average</b>			<b>176</b>	<b>43</b>	<b>14</b>	<b>110</b>	<b>0.19</b>	<b>0.20</b>	<b>1.32</b>	<b>0.27</b>

NH4 Concentrations, 1998 - 2001

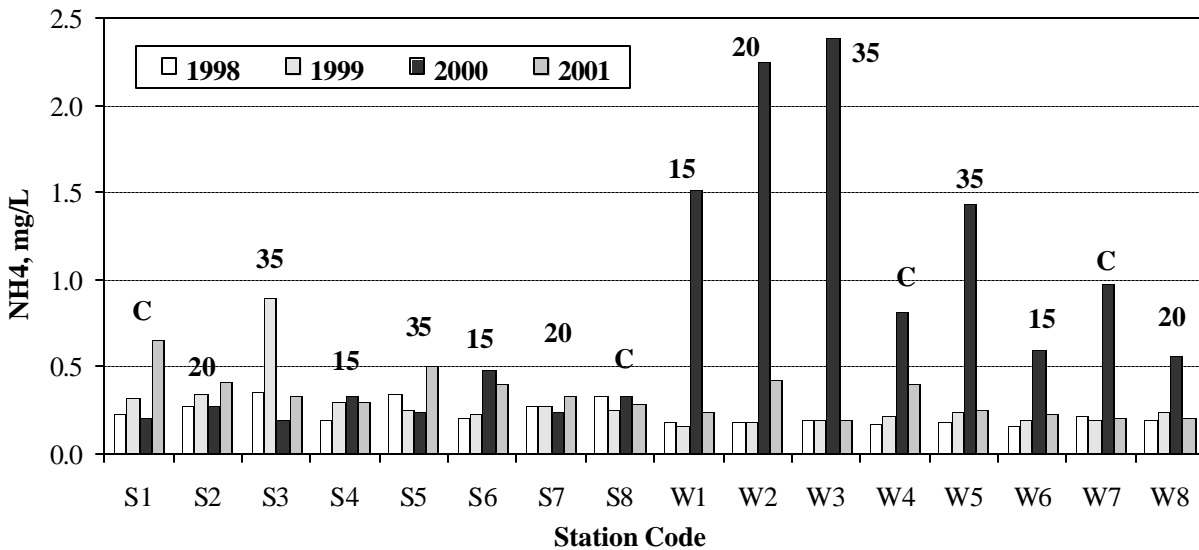


Figure 7c. Summary statistics for ISCO samples NH4 concentration results from summer and winter pastures for the year 1998, 1999, 2000 and 2001 showing mean phosphorus concentrations in mg/L (C represents the control plots).

Table 7d. Summary statistics for ISCO samples TKN concentration results from summer and winter pastures for the year 1998, 1999, 2000 and 2001 showing mean phosphorus concentrations in mg/L (C represents the control plots).

Site	Treatment	Rep	Number of Samples				TKN Concentration (mg/L)			
			1998	1999	2000	2001	1998	1999	2000	2001
S1	C	1	97	49	20	98	3.21	5.74	1.44	4.14
S2	20	1	41	44	6	92	3.05	4.95	2.27	4.32
S3	35	1	7	29	5	89	3.86	4.24	1.66	3.59
S4	15	1	91	45	14	97	3.25	4.1	2.61	3.34
S5	35	2	69	42	28	92	3.82	4.49	2.55	3.44
S6	15	2	112	53	21	94	4.01	4.67	2.89	3.87
S7	20	2	125	68	79	108	3.17	4.58	2.07	3.51
S8	C	2	83	49	32	103	3.65	4.22	4.54	3.70
<b>Summer Average</b>			<b>78</b>	<b>47</b>	<b>26</b>	<b>96</b>	<b>3.50</b>	<b>4.62</b>	<b>2.50</b>	<b>3.74</b>
W1	15	1	188	51	16	113	3.61	3.25	4.70	2.66
W2	20	1	144	39	15	114	3.6	3.04	6.15	3.31
W3	35	1	204	31	15	91	3.29	3.7	7.76	2.78
W4	C	1	131	74	17	119	3.42	3.76	3.83	3.06
W5	35	2	188	43	15	124	3.9	3.65	4.4	2.81
W6	15	2	183	51	8	101	3.38	9.94	5.26	2.97
W7	C	2	158	35	10	114	3.92	3.81	4.76	3.11
W8	20	2	217	22	14	111	3.42	3.04	3.81	2.54
<b>Winter Average</b>			<b>176</b>	<b>43</b>	<b>14</b>	<b>110</b>	<b>3.57</b>	<b>4.27</b>	<b>5.08</b>	<b>2.90</b>

TKN Concentrations, 1998 - 2001

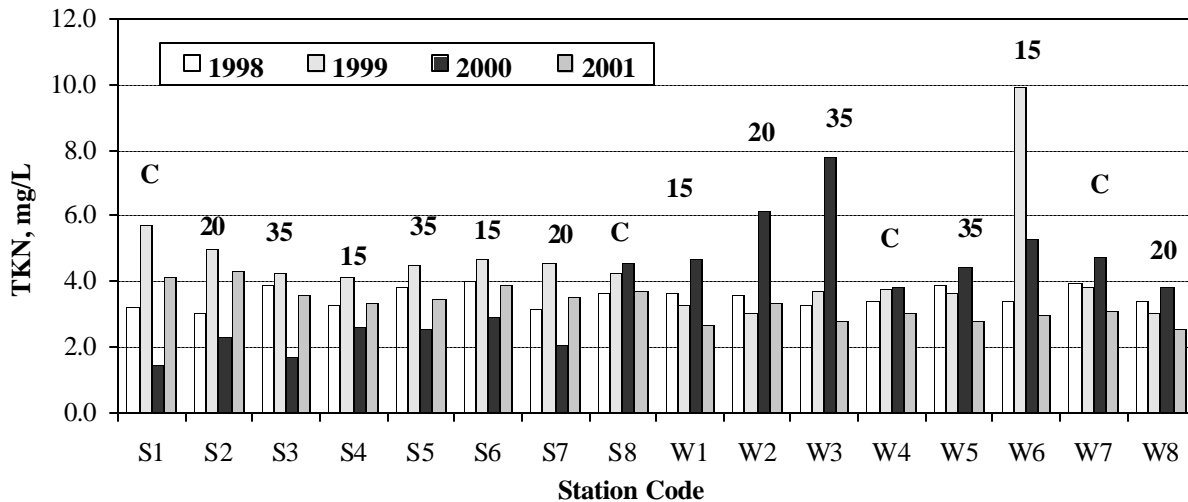


Figure 7d. Summary statistics for ISCO samples TKN concentration results from summer and winter pastures for the year 1998, 1999, 2000 and 2001 showing mean phosphorus concentrations in mg/L (C represents the control plots).

## Summary of Backflow, Runoff and Combined flow concentrations 2001

Table 8a. Summary of TP concentrations associated with backflow, runoff and combined flow for each pasture plot and block in the year 2001.

Station Code	Treatment	TP (mg/L)		
		Inflow	Runoff	Combined
S1	C	0.28	1.28	1.15
S2	20	0.32	0.92	0.88
S3	35	0.24	0.85	0.78
S4	15	0.31	1.22	1.10
S5	35	0.33	0.92	0.80
S6	15	0.42	0.87	0.85
S7	20	0.37	0.77	0.69
S8	C	0.44	0.86	0.81
<b>Summer Average</b>		<b>0.34</b>	<b>0.96</b>	<b>0.88</b>
W 1	15	0.13	0.85	0.68
W 2	20	0.07	0.15	0.14
W 3	35	0.10	0.25	0.24
W 4	C	0.09	0.12	0.11
W 5	35	0.09	0.17	0.16
W 6	15	0.06	0.20	0.18
W 7	C	0.05	0.16	0.15
W 8	20	0.05	0.09	0.08
<b>Winter Average</b>		<b>0.08</b>	<b>0.25</b>	<b>0.22</b>

Total Phosphorus Concentrations for 2001

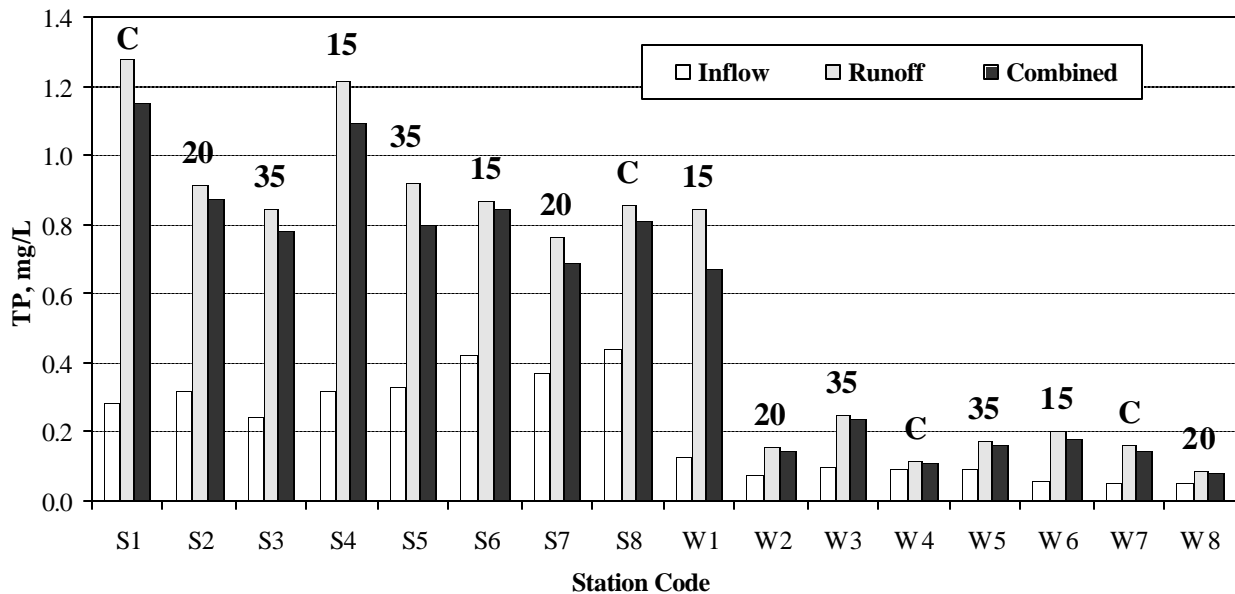


Figure 8a. Total Phosphorus mean concentrations for inflow, runoff and combined flow from every summer and winter blocks in the year 2001.

Table 8b. Summary of NOx concentrations associated with backflow, runoff and combined flow for each pasture plot and block in the year 2001.

Station	Treatment	NOx (mg/L)		
		Inflow	Runoff	Combined
S1	C	0.48	0.20	0.11
S2	20	0.14	0.04	0.05
S3	35	0.43	0.03	0.08
S4	15	0.15	0.02	0.04
S5	35	0.03	0.03	0.03
S6	15	0.04	0.03	0.03
S7	20	0.34	0.03	0.09
S8	C	0.04	0.03	0.03
<b>Summer Average</b>		<b>0.21</b>	<b>0.05</b>	<b>0.06</b>
W 1	15	0.66	0.03	0.18
W 2	20	0.62	0.33	0.38
W 3	35	0.08	0.04	0.04
W 4	C	0.38	0.09	0.12
W 5	35	0.48	0.07	0.12
W 6	15	0.41	0.03	0.08
W 7	C	0.26	0.03	0.07
W 8	20	0.09	0.02	0.03
<b>Winter Average</b>		<b>0.37</b>	<b>0.08</b>	<b>0.13</b>

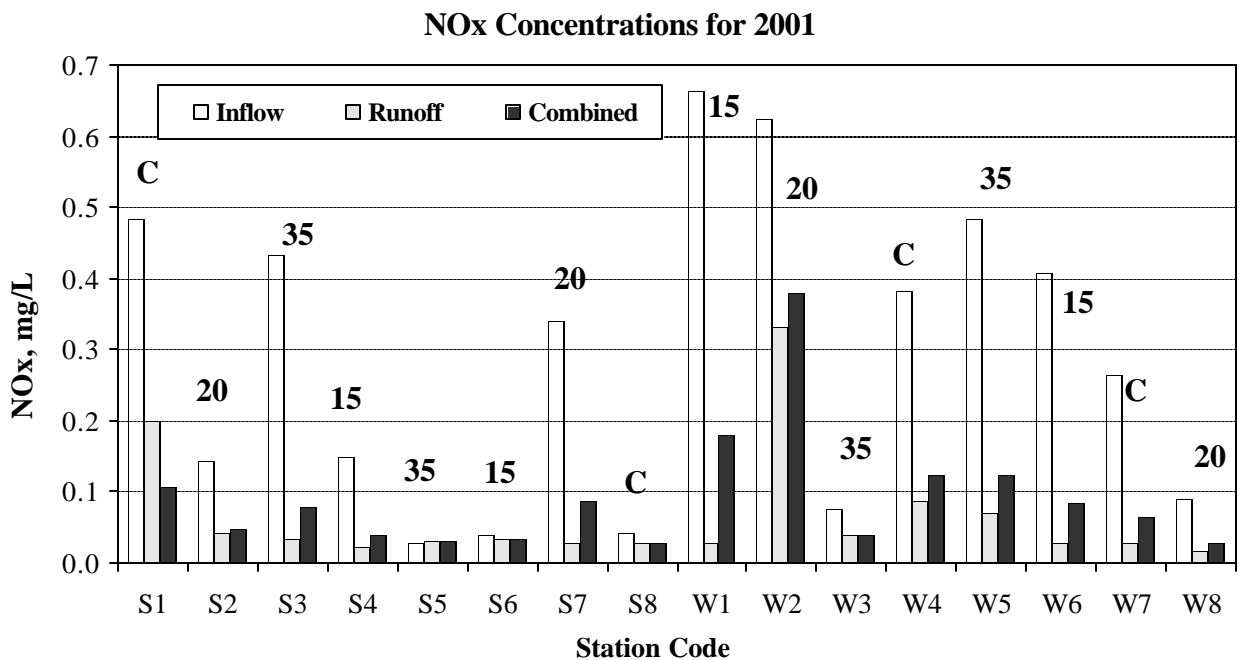


Figure 8b. Total Phosphorus mean concentrations for inflow, runoff and combined flow from every summer and winter blocks in the year 2001.

Table 8c. Summary of NH4 concentrations associated with backflow, runoff and combined flow for each pasture plot and block in the year 2001.

Station Code	Treatment	NH4 (mg/L)		
		Inflow	Runoff	Combined
S1	C	0.45	0.67	0.65
S2	20	0.28	0.42	0.42
S3	35	0.24	0.34	0.33
S4	15	0.23	0.31	0.30
S5	35	0.31	0.55	0.50
S6	15	0.20	0.42	0.40
S7	20	0.33	0.33	0.33
S8	C	0.26	0.29	0.29
<b>Summer Average</b>		<b>0.36</b>	<b>0.42</b>	<b>0.42</b>
W1	15	0.19	0.29	0.27
W2	20	0.29	0.63	0.58
W3	35	0.15	0.20	0.21
W4	C	0.29	0.43	0.39
W5	35	0.24	0.25	0.25
W6	15	0.19	0.23	0.23
W7	C	0.21	0.21	0.21
W8	20	0.18	0.21	0.20
<b>Winter Average</b>		<b>0.22</b>	<b>0.31</b>	<b>0.29</b>

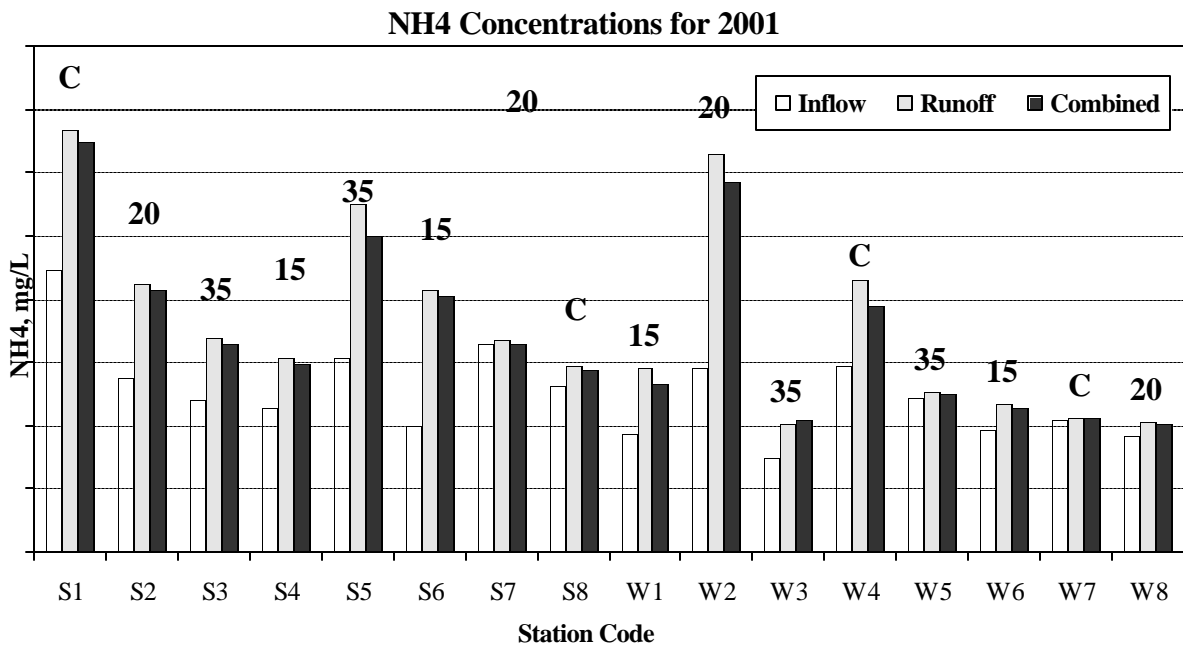


Figure 8c. NH4 mean concentrations for inflow, runoff and combined flow from every summer and winter blocks in the year 2001.

Table 8d. Summary ofTKN concentrations associated with backflow, runoff and combined flow for each pasture plot and block in the year 2001.

Station	Treatment	TKN (mg/L)		
		Inflow	Runoff	Combined
S1	C	1.83	4.46	4.14
S2	20	2.08	4.47	4.32
S3	35	1.65	3.83	3.55
S4	15	2.01	3.54	3.34
S5	35	2.11	3.78	3.44
S6	15	1.14	4.02	3.87
S7	20	1.81	3.88	3.50
S8	C	1.65	3.95	3.67
<b>Summer Average</b>		<b>2.27</b>	<b>3.99</b>	<b>3.82</b>
W1	15	1.44	3.91	3.32
W2	20	1.69	3.78	3.48
W3	35	1.38	2.86	2.75
W4	C	1.65	3.41	3.06
W5	35	1.43	3.01	2.81
W6	15	1.61	3.20	2.97
W7	C	1.28	3.46	3.11
W8	20	1.16	2.81	2.54
<b>Winter Average</b>		<b>1.46</b>	<b>3.31</b>	<b>3.00</b>

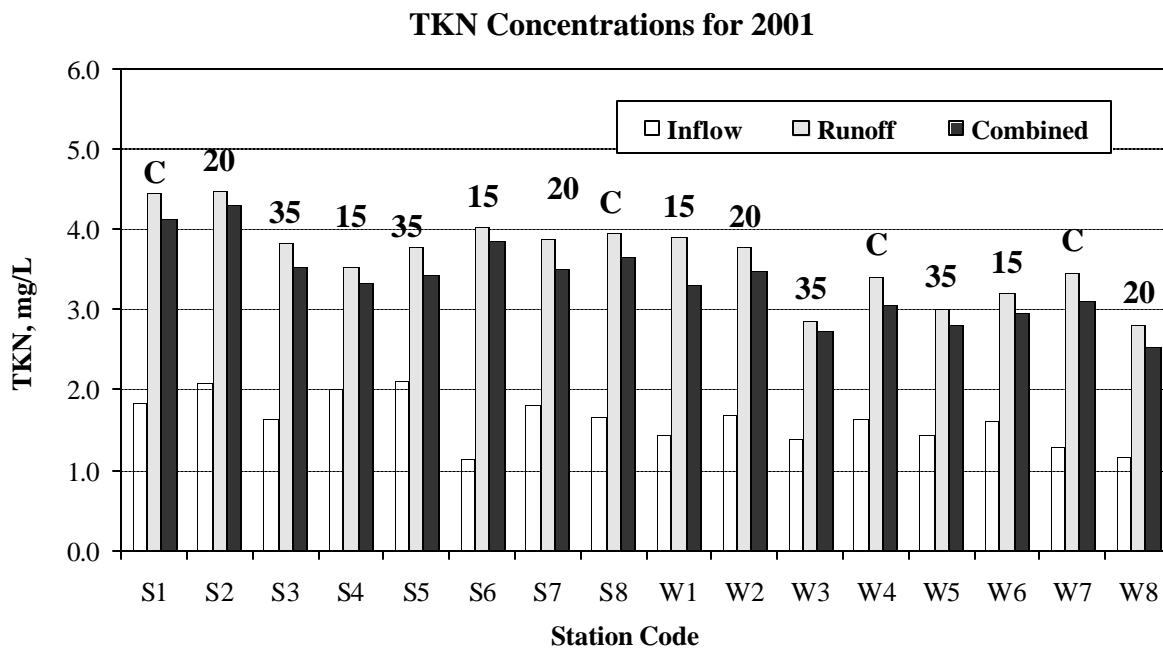


Figure 8d. TKN mean concentrations for inflow, runoff and combined flow from every summer and winter blocks in the year 2001.



## Annual Load Assessments 1998-2001

Table 9a. Comparison of loads calculated using TP concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000 and 2001.

Site	Treatment	Rep	TP			
			Load (Kg/ha)			
			1998	1999	2000	2001
S1	C	1	0.58	0.55	-0.01	4.41
S2	20	1	0.51	0.89	-0.04	3.07
S3	35	1	0.60	0.47	0.00	2.69
S4	15	1	0.66	0.89	0.03	4.36
S5	35	2	1.17	1.12	0.08	4.20
S6	15	2	0.46	0.64	0.08	4.24
S7	20	2	0.64	1.37	0.21	3.47
S8	C	2	1.25	0.58	0.32	3.26
<b>Summer Average</b>			<b>0.73</b>	<b>0.82</b>	<b>0.08</b>	<b>3.71</b>
W1	15	1	0.07	0.16	0.04	0.23
W2	20	1	0.07	0.24	0.03	0.40
W3	35	1	0.10	0.18	0.07	0.62
W4	C	1	0.12	0.08	0.06	0.35
W5	35	2	0.14	0.12	0.11	0.67
W6	15	2	0.14	0.12	0.08	0.67
W7	C	2	0.13	0.18	0.04	0.88
W8	20	2	0.10	0.10	0.05	0.21
<b>Winter Average</b>			<b>0.11</b>	<b>0.15</b>	<b>0.06</b>	<b>0.50</b>

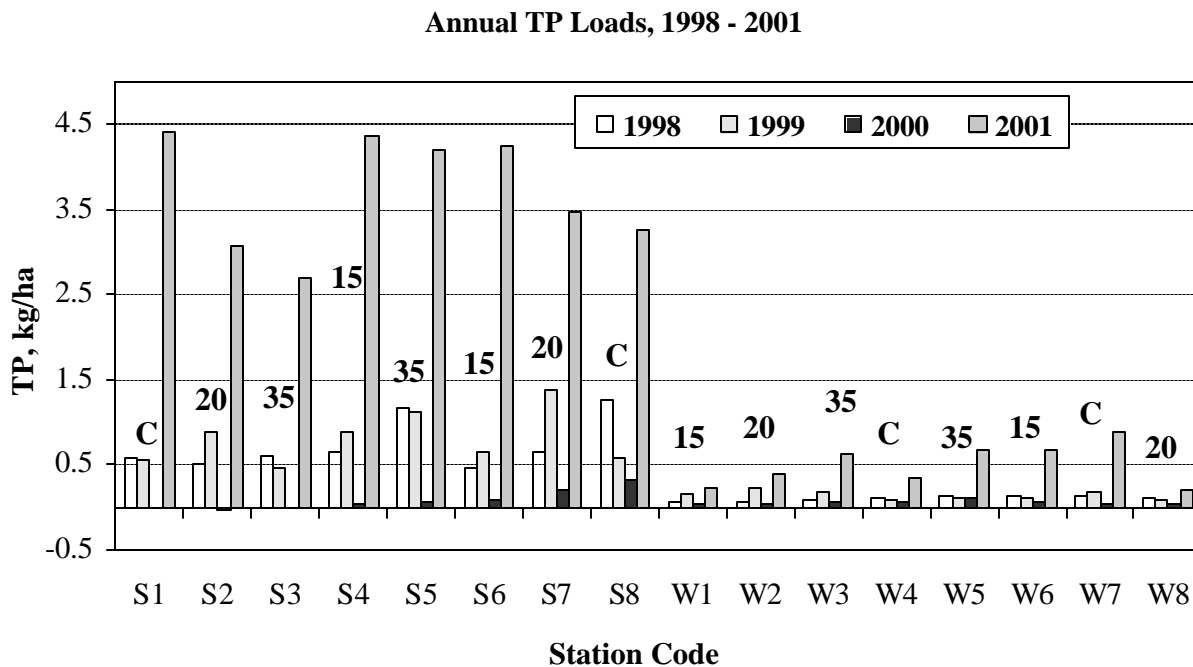


Figure 9a. Comparison of nutrient loads calculated using TP concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000 and 2001.

Table 9b. Comparison of nutrient loads calculated using NOX concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000 and 2001.

Site	Treatment	Rep	NOX			
			Load (Kg/ha)			
			1998	1999	2000	2001
S1	C	1	0.02	0.01	0.001	0.11
S2	20	1	0.02	0.02	0.003	0.06
S3	35	1	0.03	0.00	0.000	0.02
S4	15	1	0.01	0.01	0.000	0.03
S5	35	2	0.04	0.01	0.001	0.05
S6	15	2	0.01	0.01	0.002	0.20
S7	20	2	0.01	0.03	0.003	0.06
S8	C	2	0.02	0.01	0.002	0.10
<b>Summer Average</b>			<b>0.02</b>	<b>0.01</b>	<b>0.002</b>	<b>0.08</b>
W 1	15	1	0.02	0.03	0.005	-0.38
W 2	20	1	0.03	0.02	0.254	0.17
W 3	35	1	0.02	0.01	0.001	-0.13
W 4	C	1	0.04	0.02	0.023	-0.19
W 5	35	2	0.04	0.04	0.007	-0.11
W 6	15	2	0.03	0.02	0.002	-0.16
W 7	C	2	0.07	0.01	0.008	-0.13
W 8	20	2	0.06	0.02	0.016	0.05
<b>Winter Average</b>			<b>0.04</b>	<b>0.02</b>	<b>0.04</b>	<b>-0.11</b>

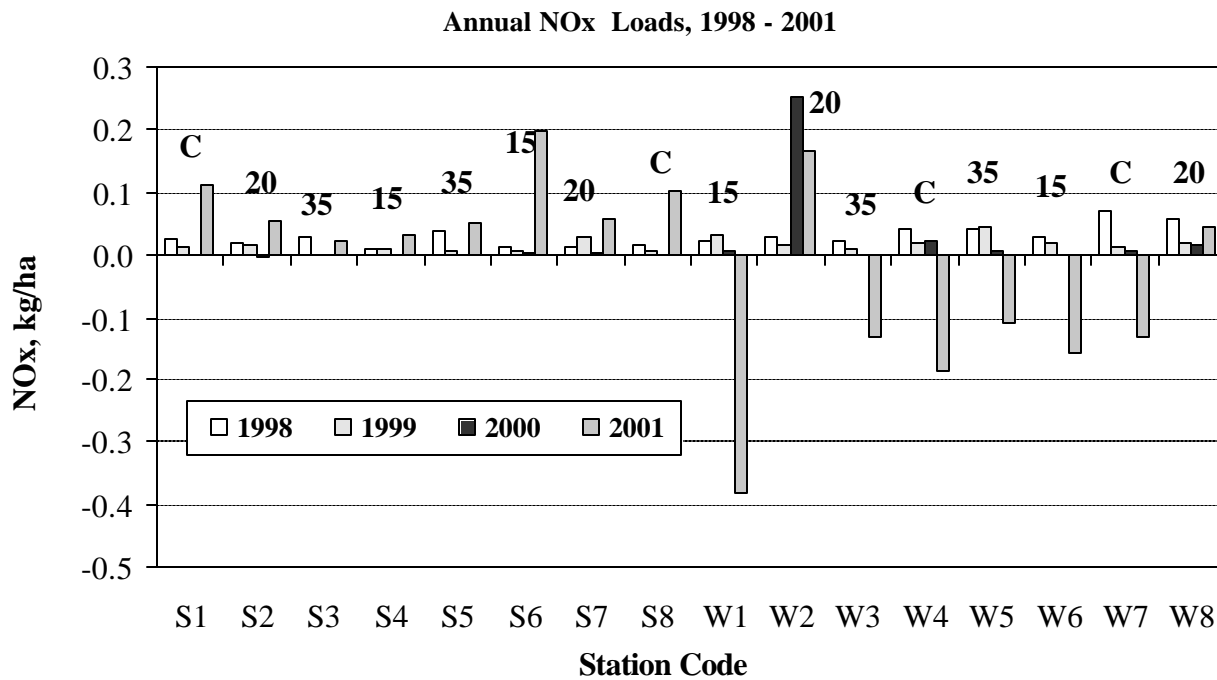


Figure 9b. Comparison of nutrient loads calculated using NOX concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000 and 2001.

Table 9c. Comparison of nutrient loads calculated using NH4 concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000 and 2001.

Site	Treatment	Rep	NH4			
			Load (Kg/ha)			
			1998	1999	2000	2001
S1	C	1	0.12	0.34	0.02	3.00
S2	20	1	0.17	0.49	0.02	1.45
S3	35	1	0.10	0.46	0.00	1.08
S4	15	1	0.13	0.39	0.01	0.86
S5	35	2	0.35	0.39	0.02	2.10
S6	15	2	0.26	0.34	0.02	1.83
S7	20	2	0.29	0.61	0.03	1.22
S8	C	2	0.26	0.27	0.08	1.19
<b>Summer Average</b>			<b>0.21</b>	<b>0.41</b>	<b>0.02</b>	<b>1.59</b>
W 1	15	1	0.12	0.15	0.25	0.55
W 2	20	1	0.25	0.13	0.53	0.88
W 3	35	1	0.14	0.32	0.10	0.32
W 4	C	1	0.30	0.24	0.29	0.79
W 5	35	2	0.29	0.32	0.58	0.65
W 6	15	2	0.31	0.29	0.05	0.67
W 7	C	2	0.41	0.32	0.06	0.71
W 8	20	2	0.43	0.30	0.11	0.52
<b>Winter Average</b>			<b>0.28</b>	<b>0.26</b>	<b>0.25</b>	<b>0.64</b>

Annual NH4 Loads, 1998 - 2001

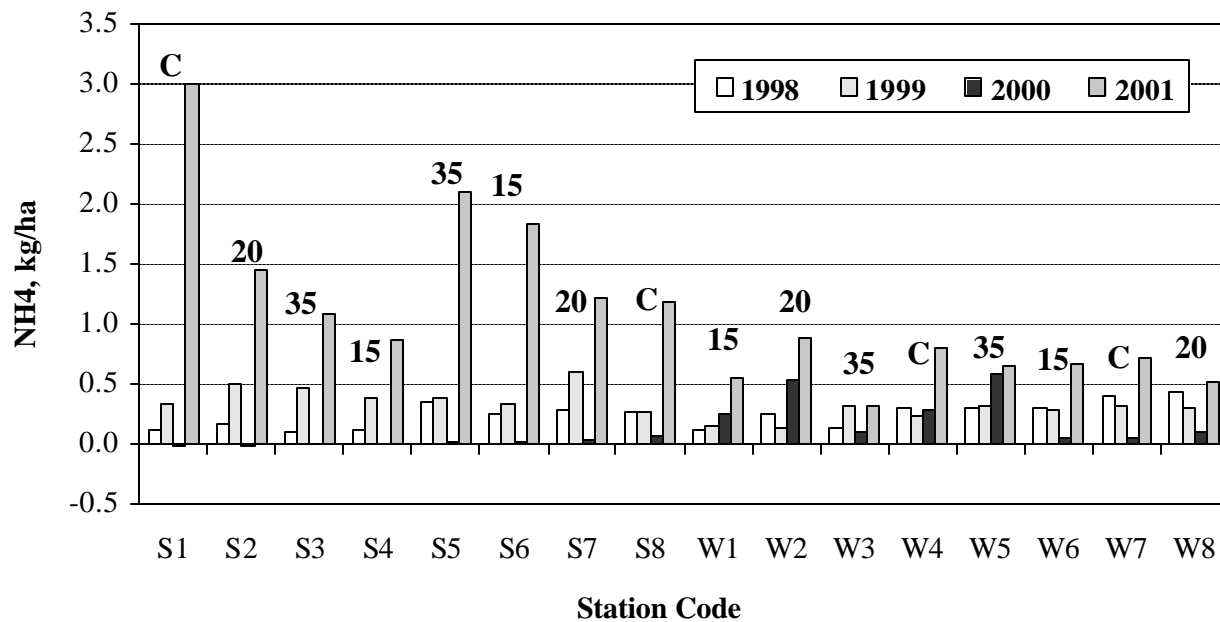


Figure 9c. Comparison of nutrient loads calculated using concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000 and 2001.

Table 9d. Comparison of nutrient loads calculated using TKN concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000 and 2001.

Site	Treatment	Rep	TKN			
			Load (Kg/ha)			
			1998	1999	2000	2001
S1	C	1	4.08	4.60	0.15	15.13
S2	20	1	6.98	6.86	0.66	14.10
S3	35	1	6.89	4.25	-0.02	11.65
S4	15	1	2.31	5.83	0.12	8.34
S5	35	2	6.65	6.93	0.43	12.63
S6	15	2	7.25	7.17	1.07	14.79
S7	20	2	8.17	10.48	1.76	12.65
S8	C	2	5.29	4.02	1.26	14.42
<b>Summer Average</b>			<b>5.95</b>	<b>6.27</b>	<b>0.68</b>	<b>12.96</b>
W 1	15	1	3.87	2.58	0.77	7.05
W 2	20	1	5.62	2.13	1.43	9.95
W 3	35	1	4.11	4.80	1.41	5.79
W 4	C	1	6.95	4.91	1.43	9.29
W 5	35	2	8.88	4.51	0.25	10.93
W 6	15	2	6.70	6.19	0.47	8.34
W 7	C	2	8.36	3.67	0.60	11.10
W 8	20	2	6.92	3.98	1.16	7.69
<b>Winter Average</b>			<b>6.43</b>	<b>4.10</b>	<b>0.94</b>	<b>8.77</b>

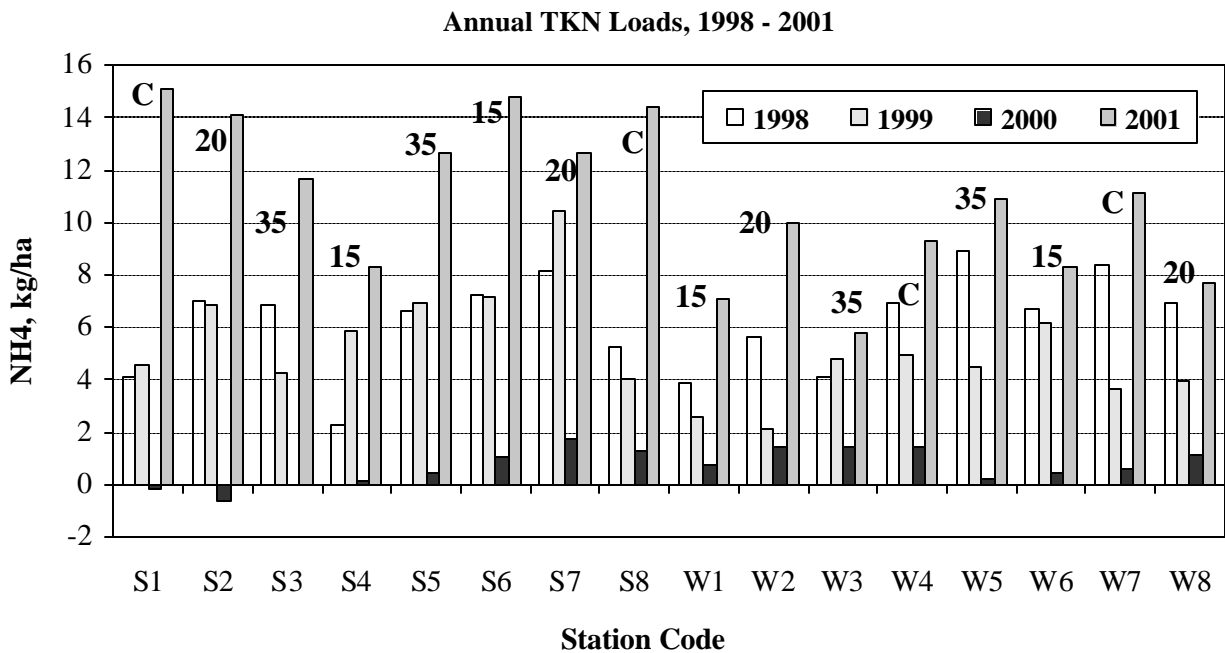


Figure 9d. Comparison of nutrient loads calculated using TKN concentrations from ISCO and grab samples collected from summer and winter pastures in the years 1998, 1999, 2000 and 2001.

## Load summary by Parameter 2001

Table 10. Comparison of nutrient loads calculated using TP, NOx, NH<sub>4</sub>, TKN, ortho-P concentrations from ISCO and grab samples collected from summer and winter pastures in the year 2001.

Station Code	Treatment	Nutrient Load, kg/ha				
		TP	NOx	TKN	NH <sub>4</sub>	ortho_P
S1	C	4.41	0.11	15.13	3.00	0.72
S2	20	3.07	0.06	14.10	1.45	0.35
S3	35	2.69	0.02	11.65	1.08	0.30
S4	15	4.36	0.03	8.34	0.86	0.35
S5	35	4.20	0.05	12.63	2.10	0.34
S6	15	4.24	0.20	14.79	1.83	0.35
S7	20	3.47	0.06	12.65	1.22	0.16
S8	C	3.26	0.10	14.42	1.19	0.36
<b>Summer average</b>		<b>3.7</b>	<b>0.1</b>	<b>13.0</b>	<b>1.6</b>	<b>0.4</b>
W 1	15	0.23	-0.38	7.05	0.55	0.10
W 2	20	0.40	0.17	9.95	0.88	0.01
W 3	35	0.62	-0.13	5.79	0.32	0.04
W 4	C	0.35	-0.19	9.29	0.79	0.01
W 5	35	0.67	-0.11	10.93	0.65	0.05
W 6	15	0.67	-0.16	8.34	0.67	0.07
W 7	C	0.88	-0.13	11.10	0.71	0.04
W 8	20	0.21	0.05	7.69	0.52	0.04
<b>Winter average</b>		<b>0.5</b>	<b>-0.1</b>	<b>8.8</b>	<b>0.6</b>	<b>0.0</b>

**Total Load of TP for Summer and Winter Pastures for 2001**

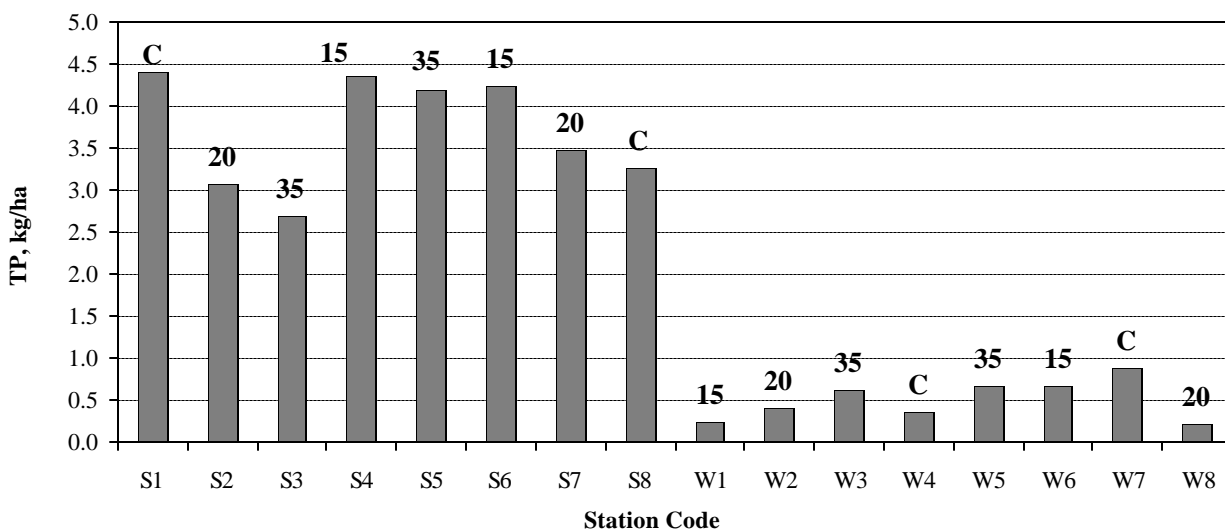


Figure 10a. Nutrient loads calculated using TP concentrations from ISCO and grab samples collected from summer and winter pastures in the year 2001.

**Total Load of NOx for Summer and Winter Pastures for 2001**

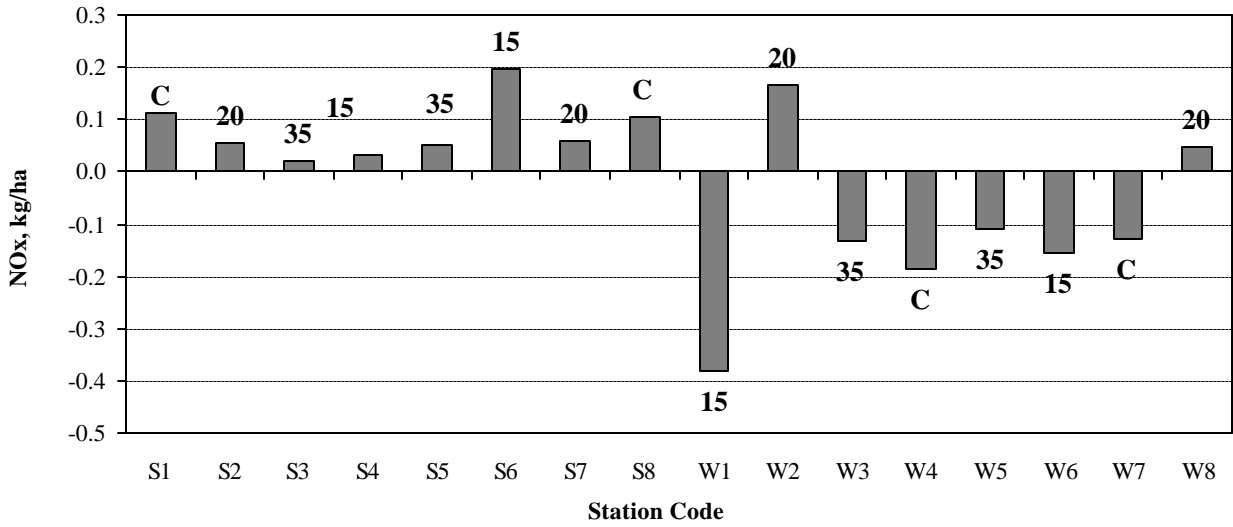


Figure 10b. Nutrient loads calculated using NOx concentrations from ISCO and grab samples collected from summer and winter pastures in the year 2001.

**Total Load of NH4 for Summer and Winter Pastures for 2001**

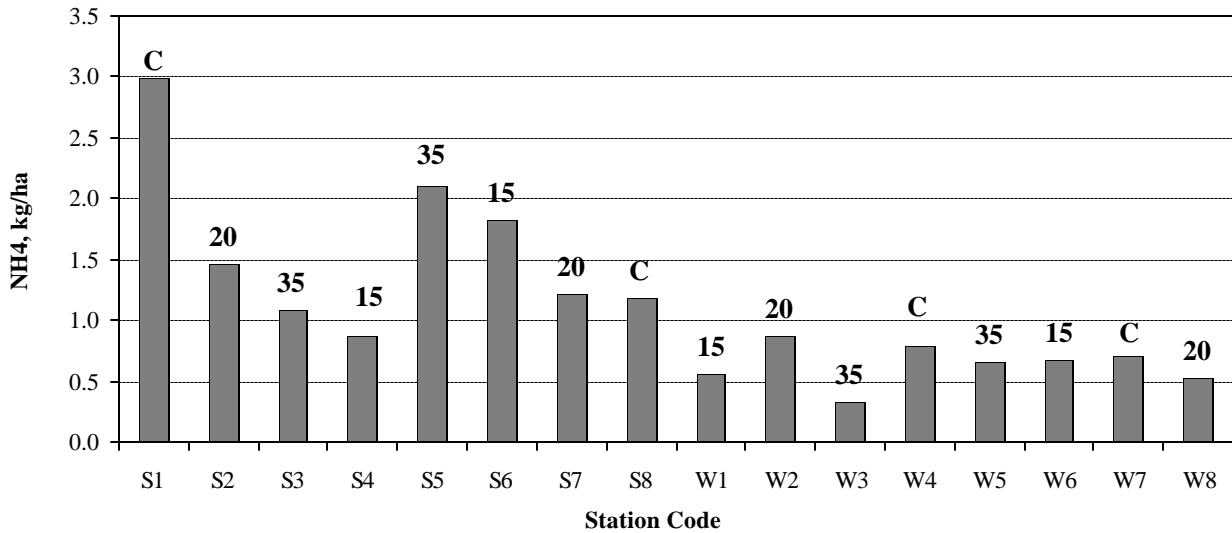


Figure 10c. Nutrient loads calculated using NH4 concentrations from ISCO and grab samples collected from summer and winter pastures in the year 2001.

**Total Load of TKN for Summer and Winter Pastures for 2001**

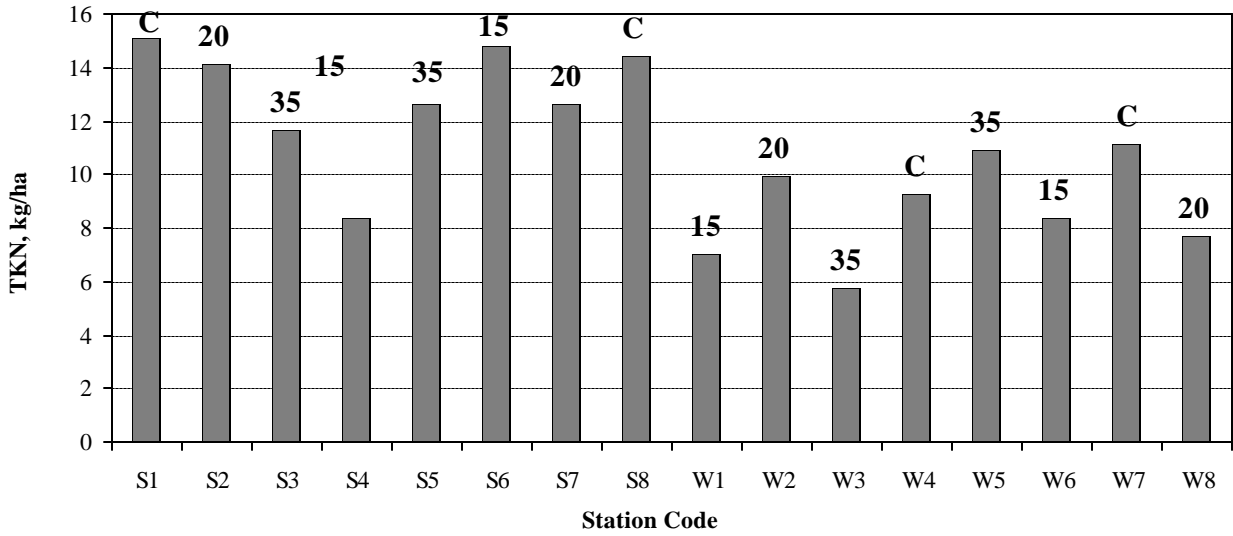


Figure 10d. Nutrient loads calculated using TKN concentrations from ISCO and grab samples collected from summer and winter pastures in the year 2001.

**Total Load of ortho\_P for Summer and Winter Pastures for 2001**

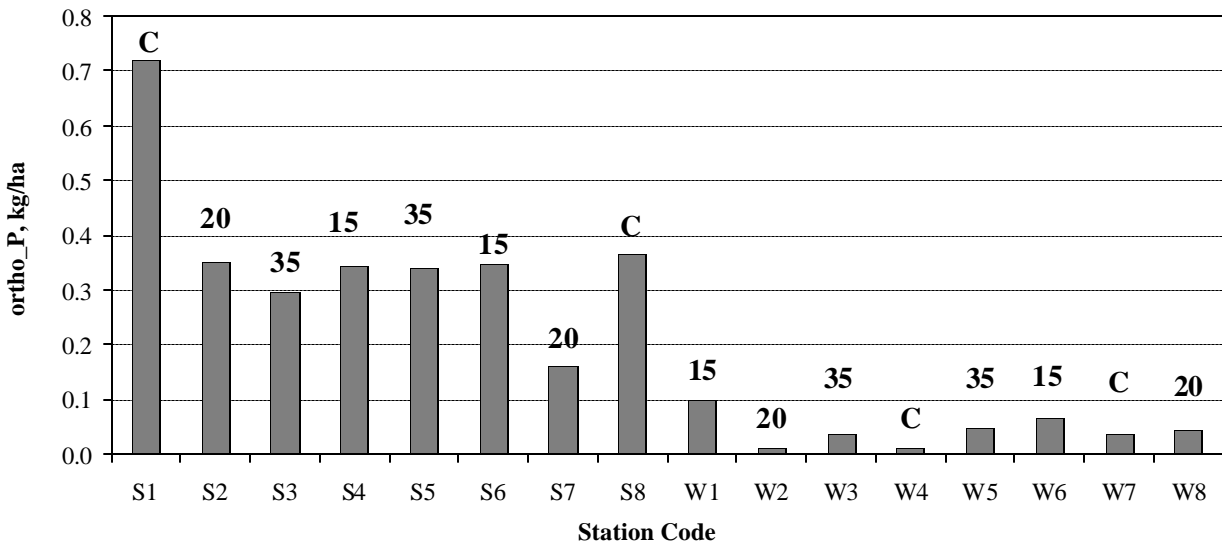


Figure 10e. Nutrient loads calculated using ortho-P concentrations from ISCO and grab samples collected from summer and winter pastures in the year 2000.

### Load summary by Station 2001

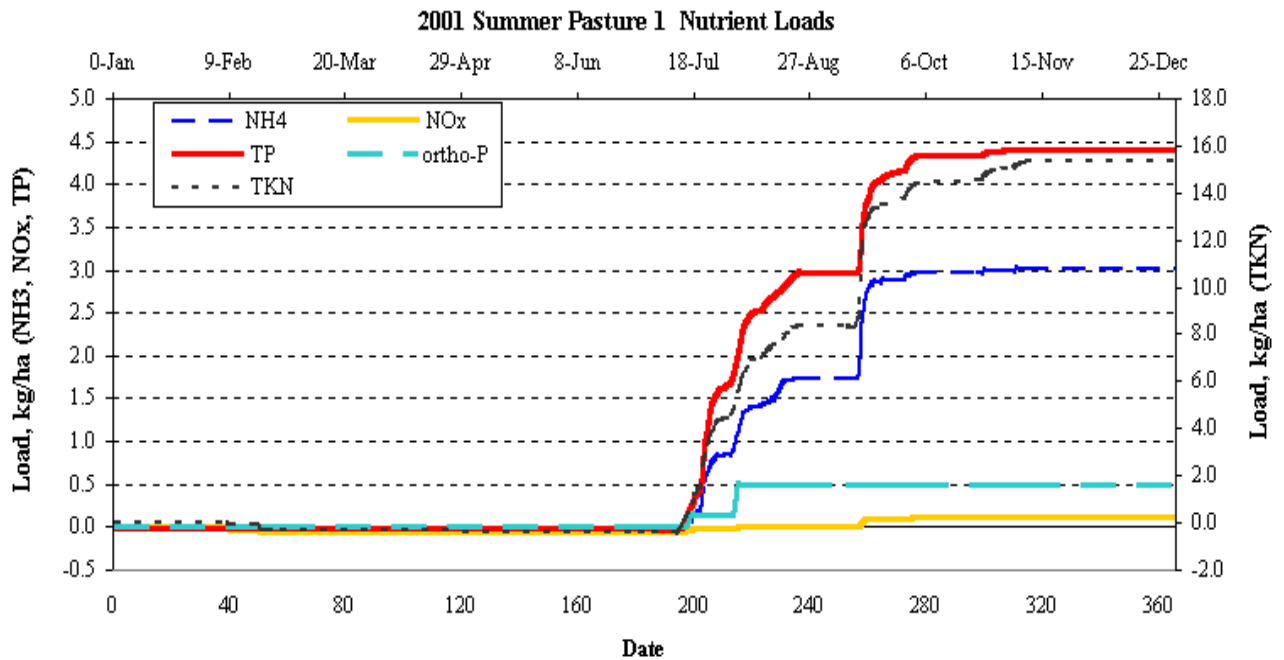


Figure 11. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at summer pasture 1 in the year 2001.

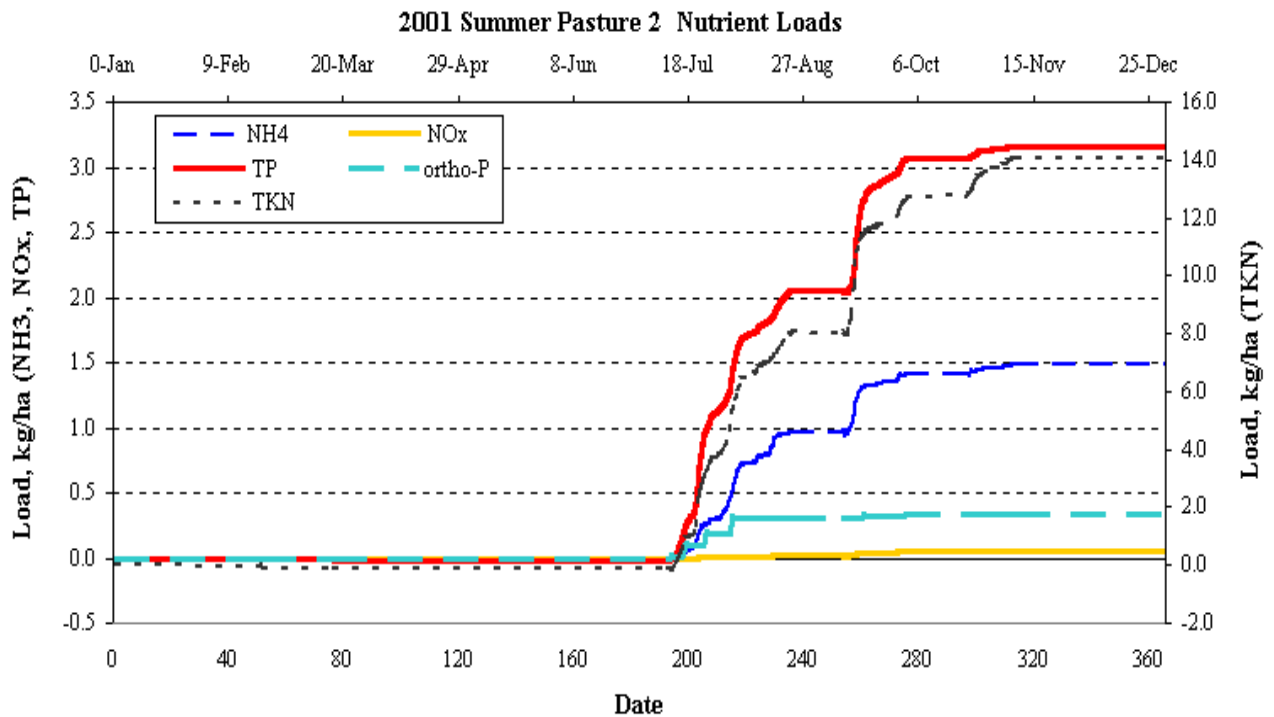


Figure 12. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at summer pasture 2 in the year 2001.



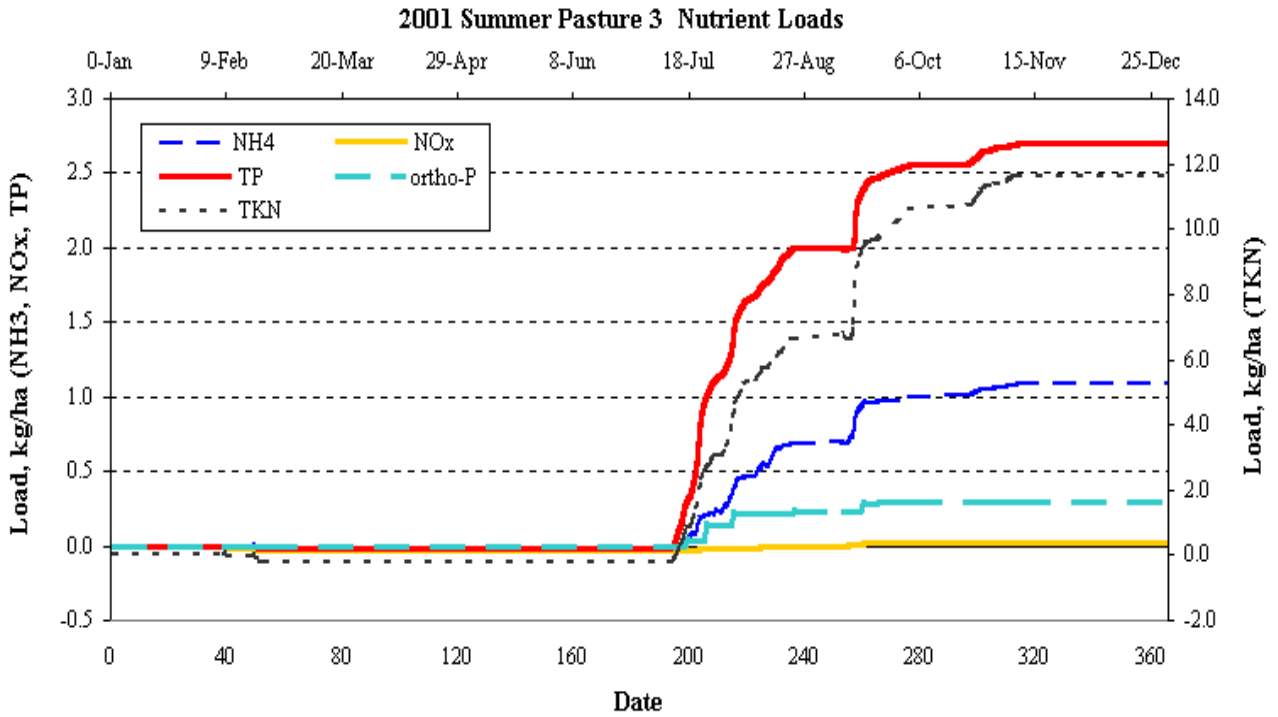


Figure 13. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at summer pasture 3 in the year 2001.

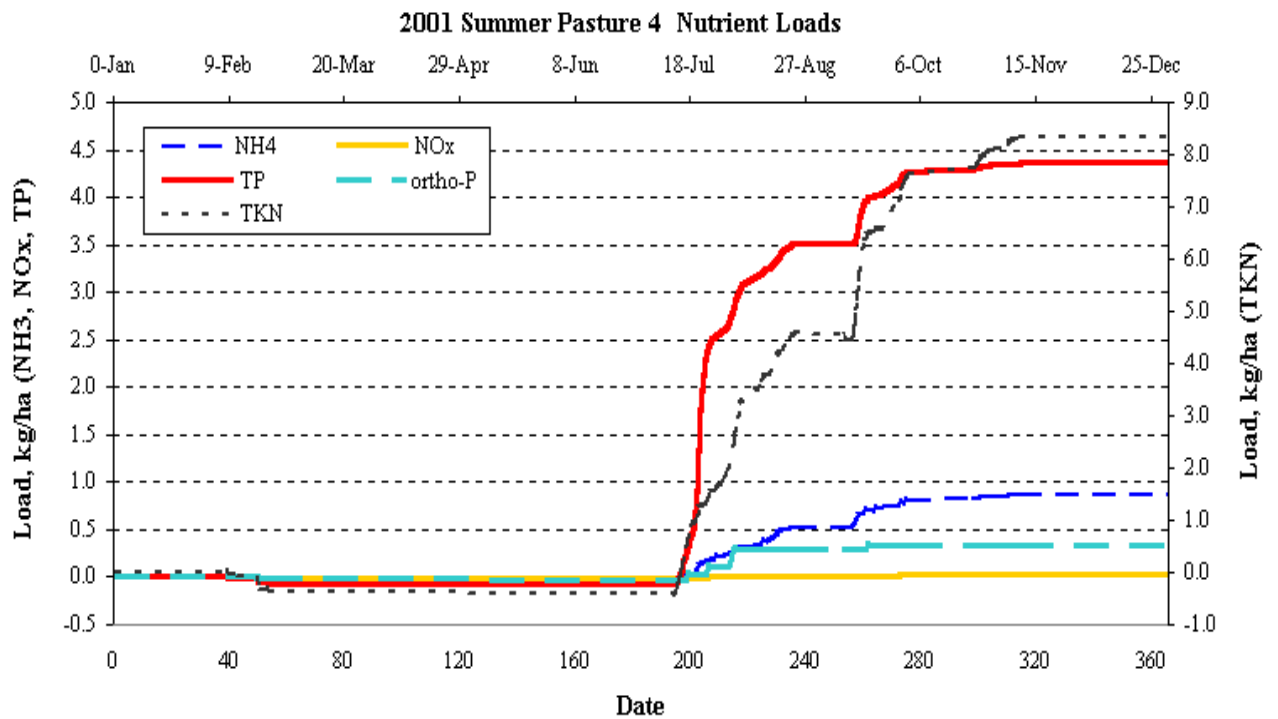


Figure 14. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at summer pasture 4 in the year 2001.

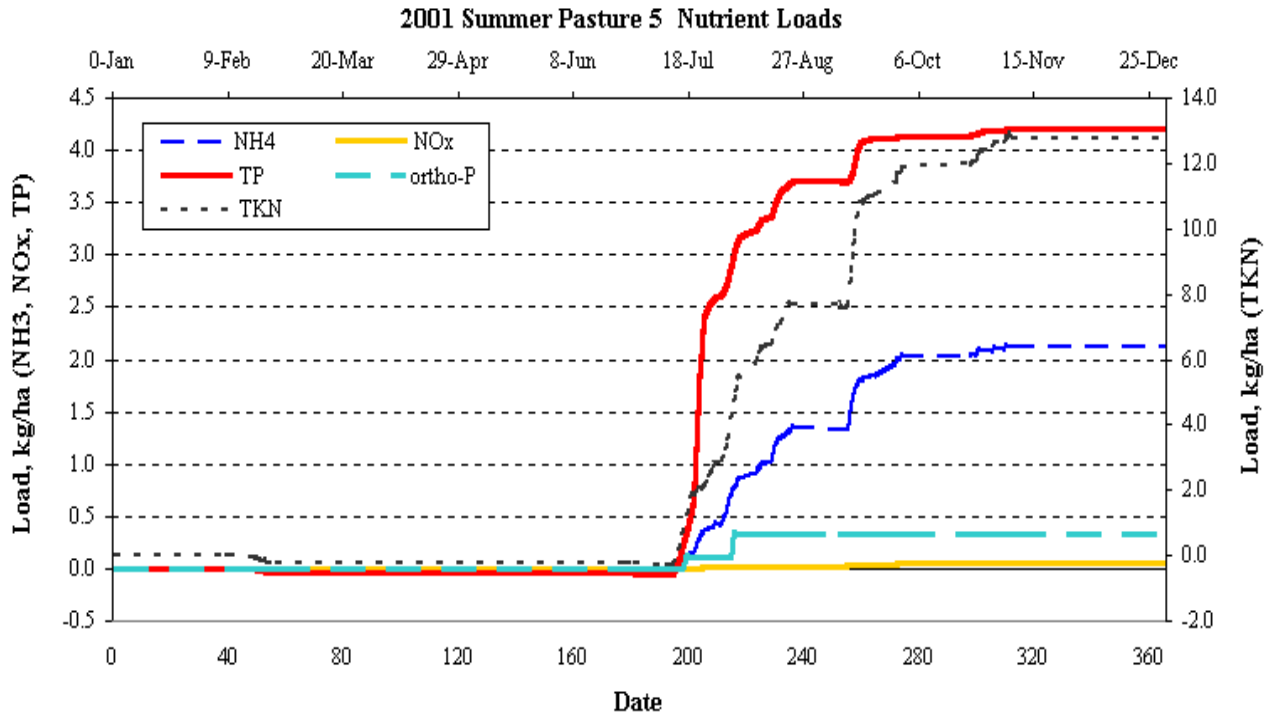


Figure 15. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at summer pasture 5 in the year 2001.

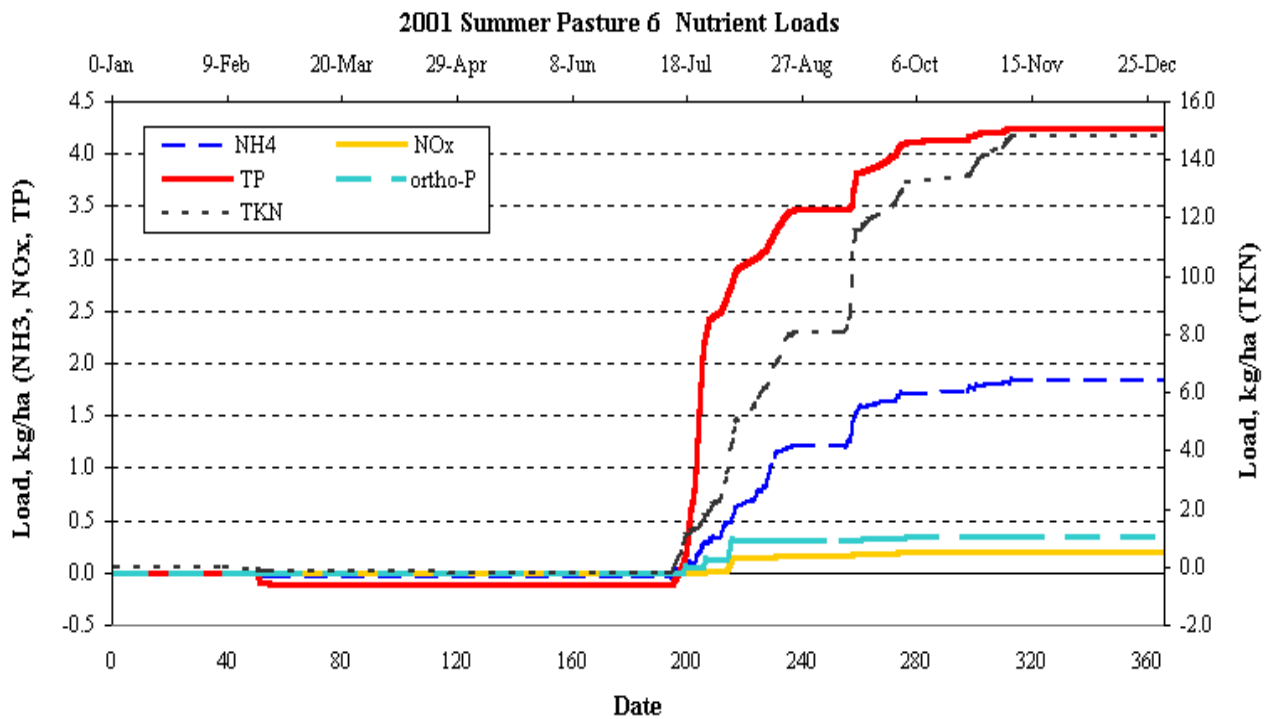


Figure 16. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at summer pasture 6 in the year 2001.

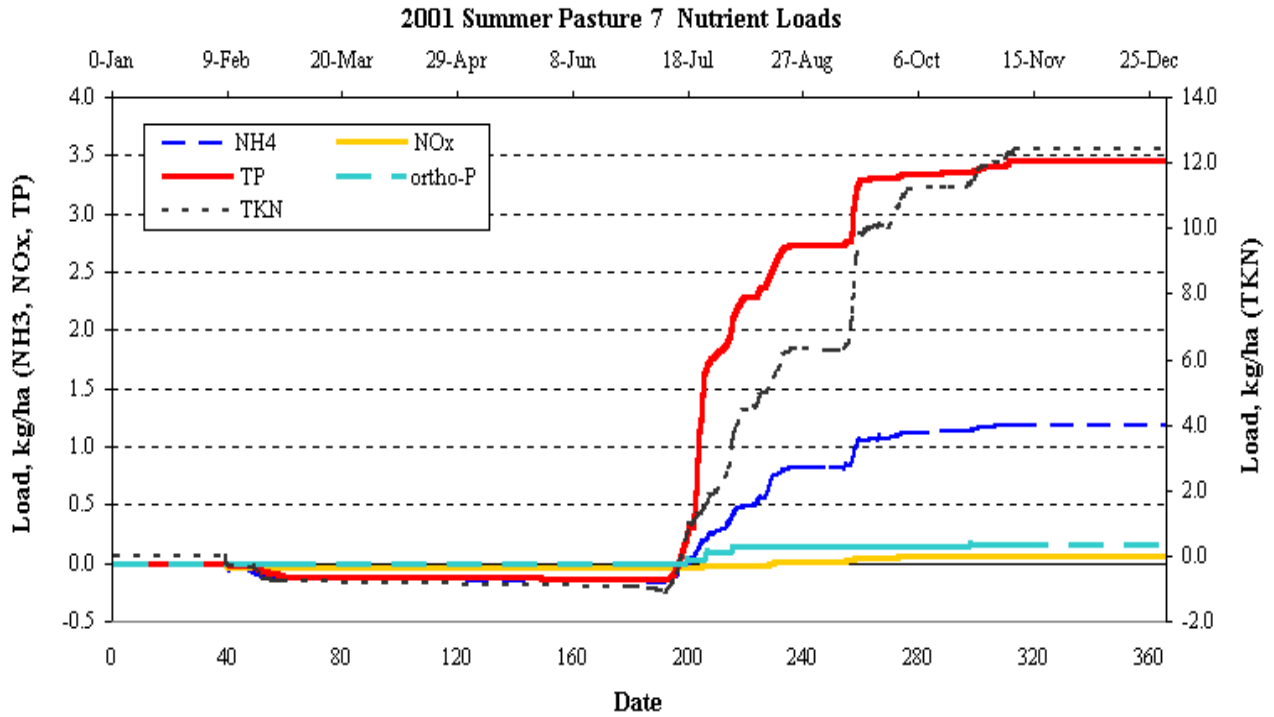


Figure 17. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at summer pasture 7 in the year 2001.

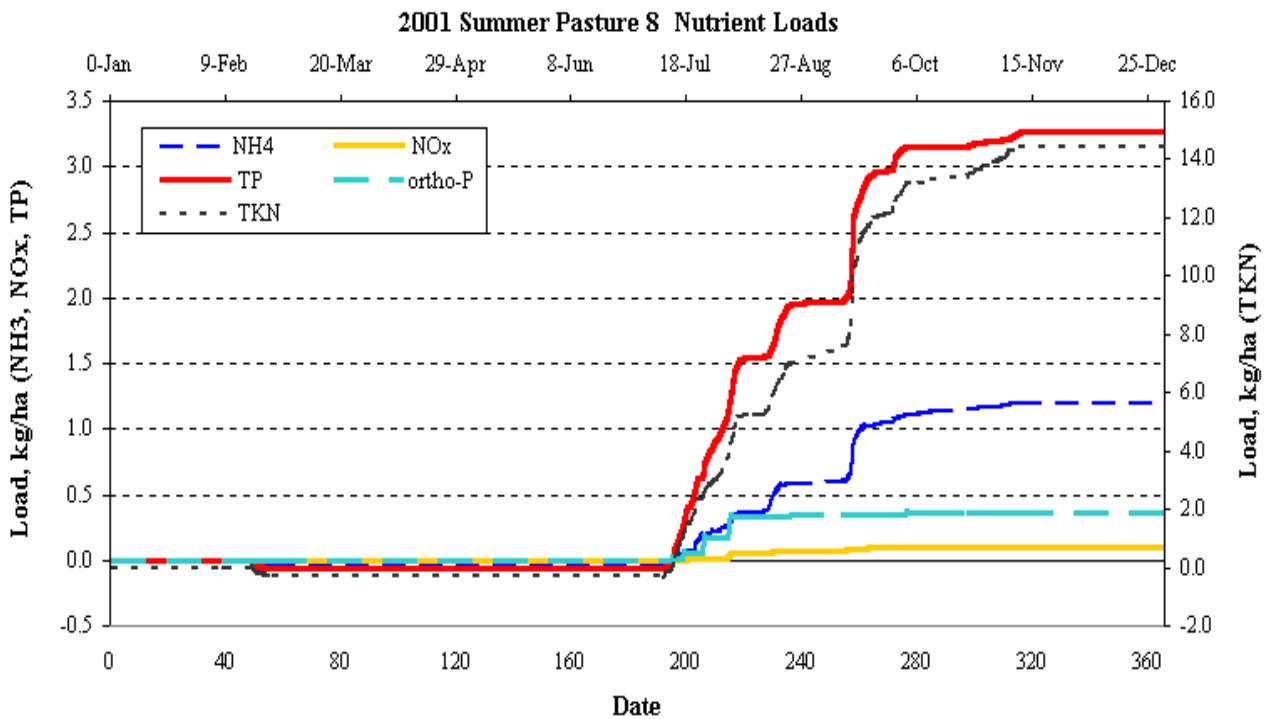


Figure 18. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at summer pasture 8 in the year 2001.

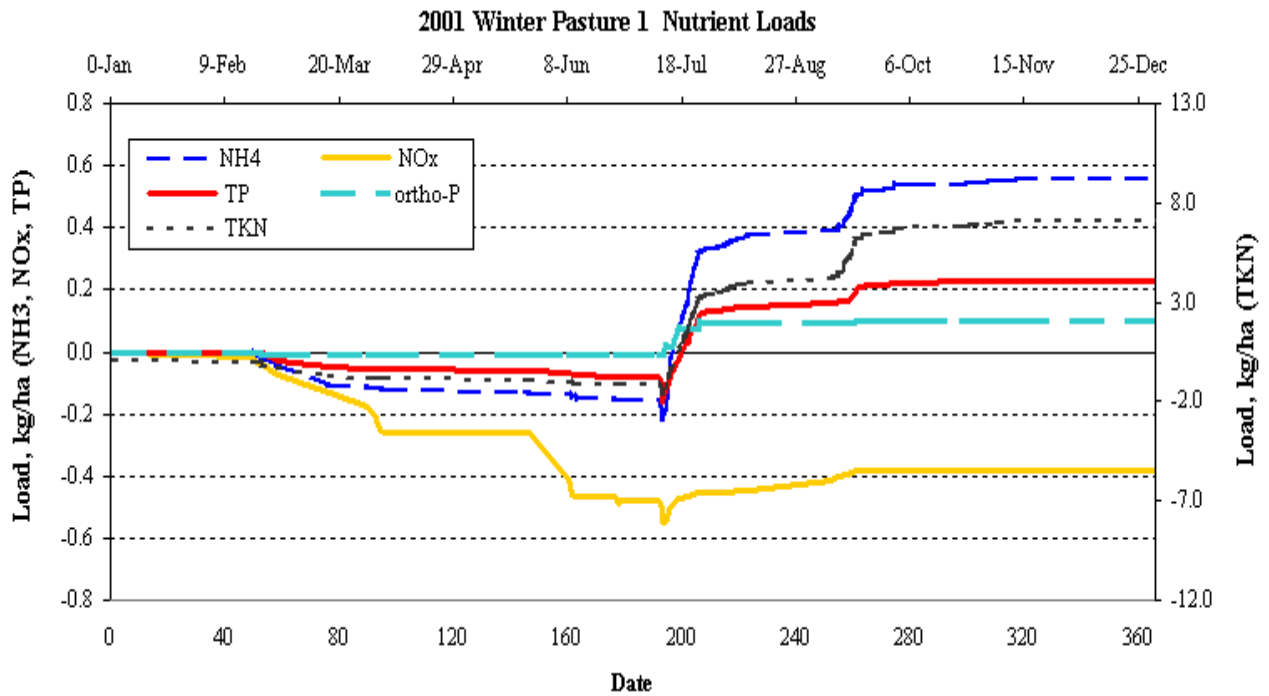


Figure 19. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at winter pasture 1 in the year 2001.

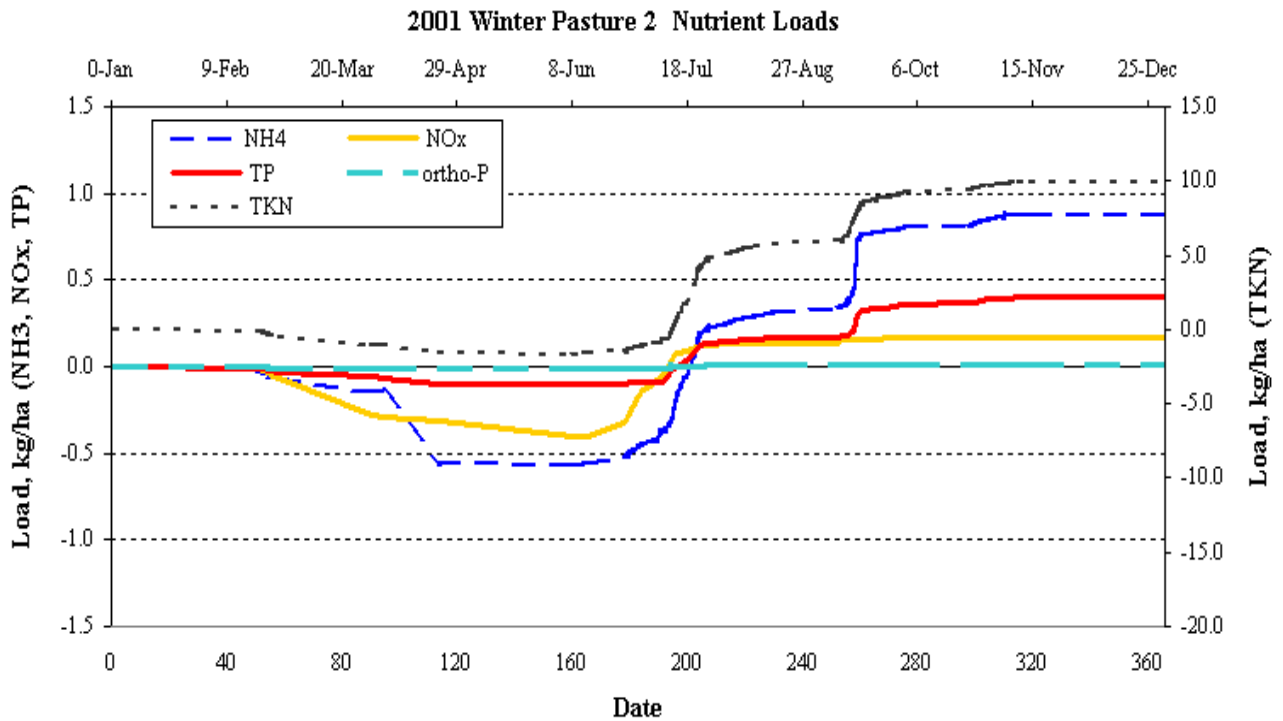


Figure 20. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at winter pasture 2 in the year 2001.

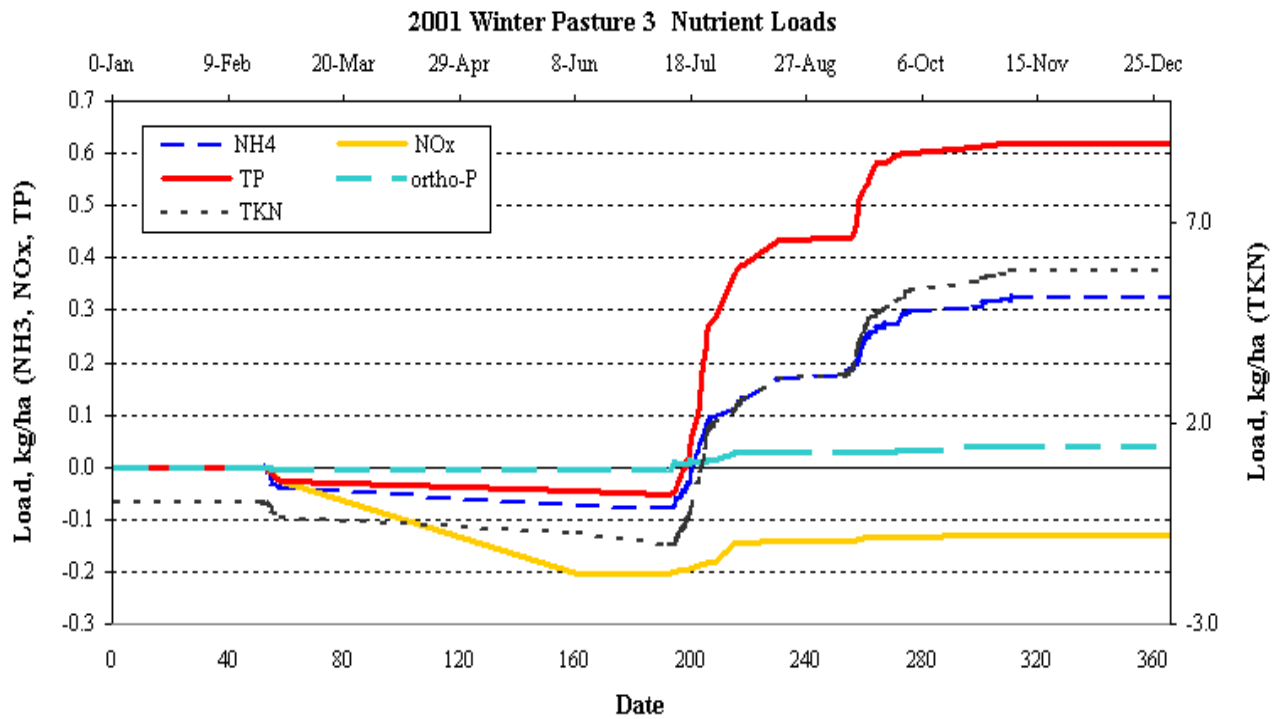


Figure 21. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at winter pasture 3 in the year 2001.

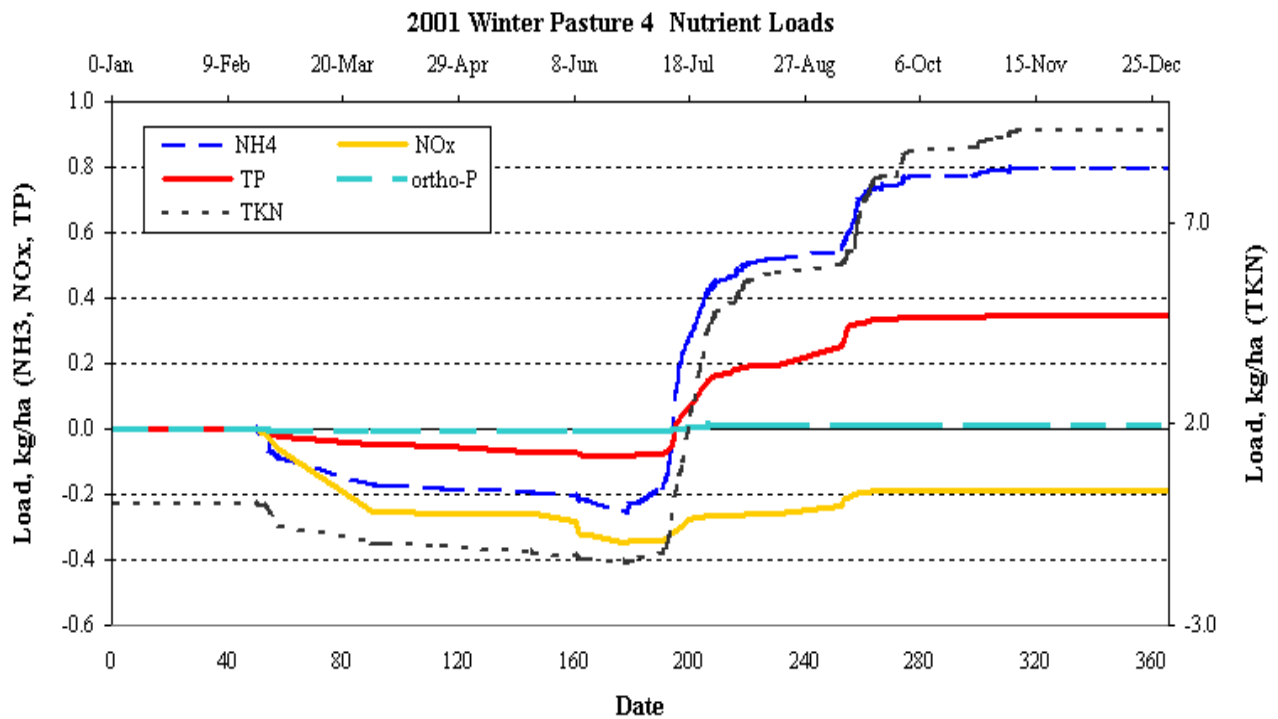


Figure 22. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at winter pasture 4 in the year 2001.

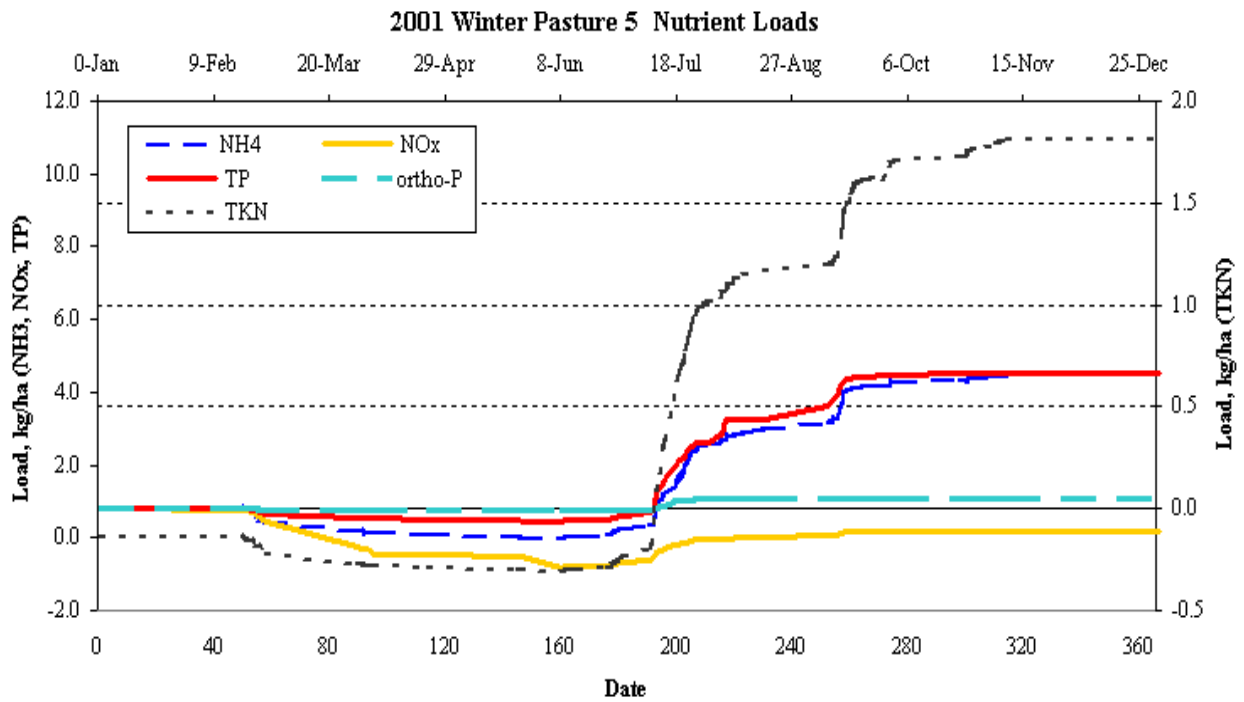


Figure 23. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at winter pasture 5 in the year 2001.

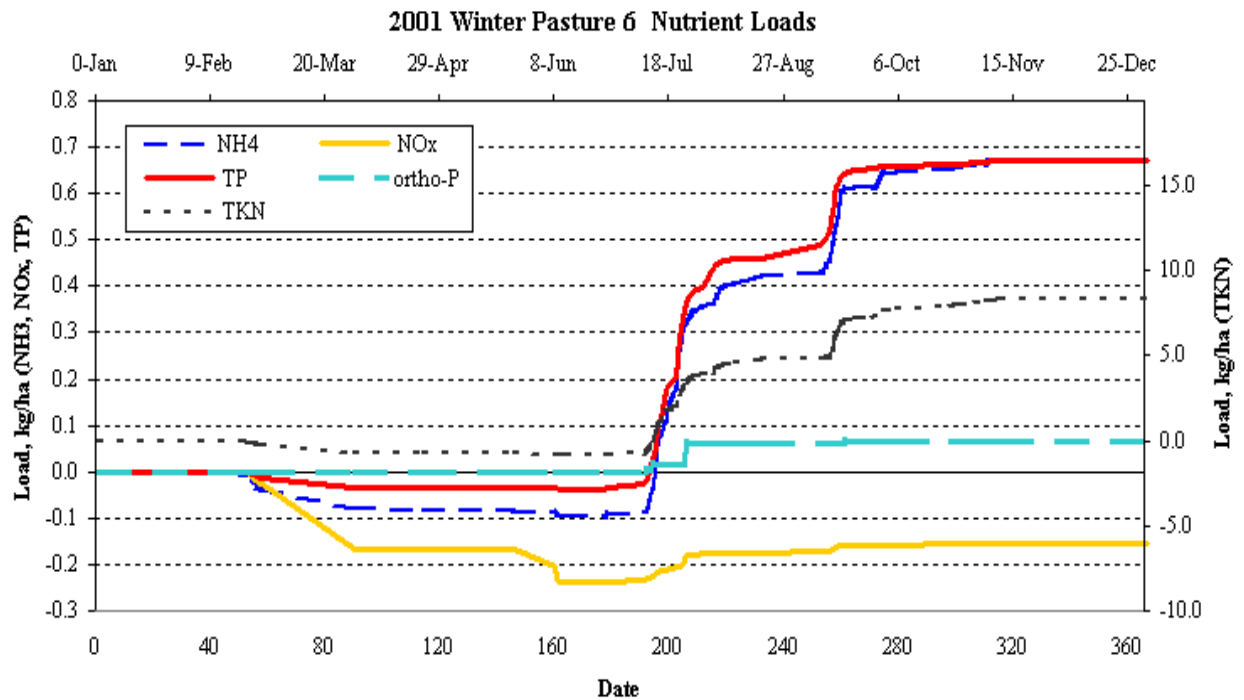


Figure 24. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at winter pasture 6 in the year 2001.

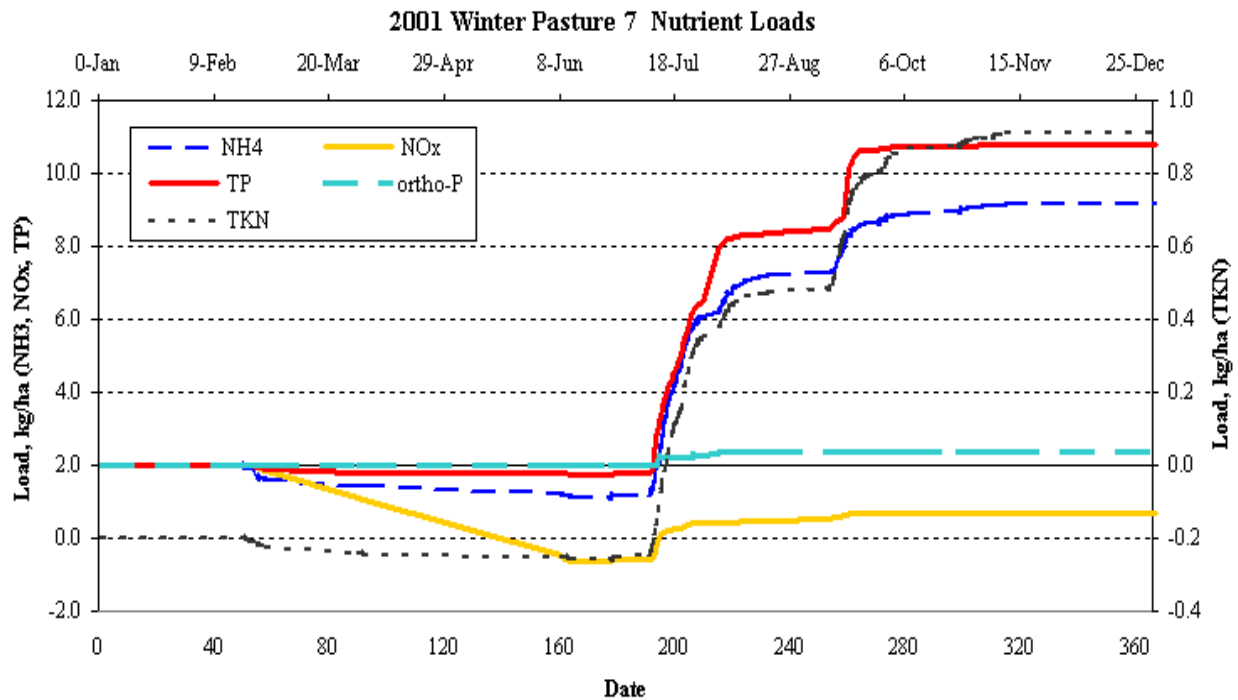


Figure 25. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at winter pasture 7 in the year 2001.

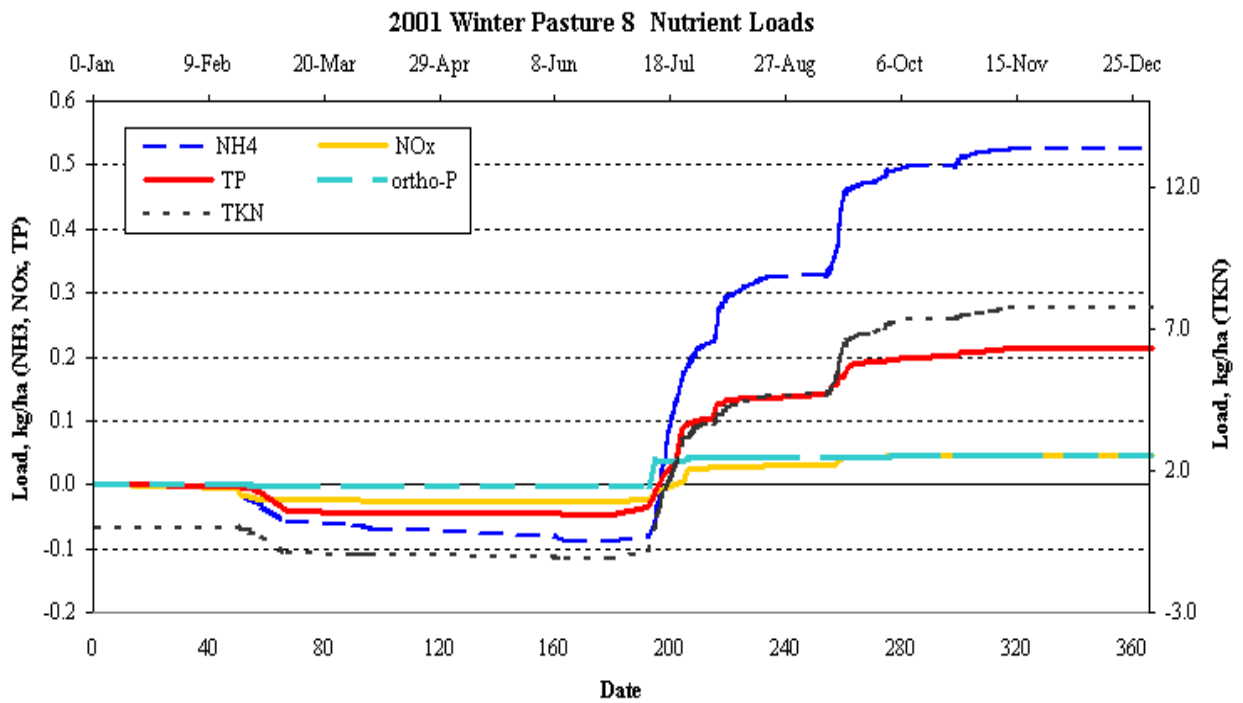


Figure 26. Nutrient load in kg/ha of elemental N and P as calculated using ISCO and grab samples at winter pasture 8 in the year 2001.

## QA/QC analysis results

Table 12. **ISCO** sample sets collected at each flume station and description of QA/QC problems related to equipment blanks (**EB**) and field duplicate (**FD**) criteria

Project Code	Station Code	FQC	Set Date	Number Of Samples	EB Problems	FD Problems	QA/QC Pass	TP ONLY QA/QC Pass
BIR	S1	EB	02/07/01	7	NH4	NH4 TKN TP	No	No
BIR	S1	EB	02/12/01	5	NH4 NOX TP	OK	No	No
BIR	S1	EB	02/21/01	4	NH4	NH4	No	YES
BIR	S1	EB	06/26/01	9	TKN	OK	No	YES
BIR	S1	EB	07/12/01	5	OK	NOX TP	No	No
BIR	S1	EB	07/18/01	11	OK	OK	YES	YES
BIR	S1	EB	07/25/01	14	OK	OK	YES	YES
BIR	S1	EB	08/10/01	11	TP	OK	No	No
BIR	S1	EB	08/22/01	12	OK	NO FD	No	No
BIR	S1	EB	09/12/01	12	OK	OK	YES	YES
BIR	S1	EB	09/16/01	8	OK	OK	YES	YES
BIR	S1	EB	09/21/01	9	OK	OK	YES	YES
BIR	S1	EB	10/10/01	12	OK	NO FD	No	No
BIR	S1	EB	11/01/01	9	OK	OK	YES	YES
BIR	S2	EB	02/07/01	4	NH4	OK	No	YES
BIR	S2	EB	02/21/01	9	NH4	OK	No	YES
BIR	S2	EB	07/12/01	8	OK	NOX	No	YES
BIR	S2	EB	07/18/01	11	OK	OK	YES	YES
BIR	S2	EB	07/25/01	15	OK	OK	YES	YES
BIR	S2	EB	08/10/01	11	OK	OK	YES	YES
BIR	S2	EB	08/22/01	10	OK	OK	YES	YES
BIR	S2	EB	09/12/01	11	TKN TP	TKN TP	No	No
BIR	S2	EB	09/16/01	9	TP	OK	No	No
BIR	S2	EB	09/21/01	10	OK	OK	YES	YES
BIR	S2	EB	10/10/01	11	OK	TP	No	No
BIR	S2	EB	11/01/01	10	OK	OK	YES	YES
BIR	S3	EB	02/07/01	5	NH4	OK	No	YES
BIR	S3	EB	02/12/01	5	NH4	OK	No	YES
BIR	S3	EB	02/21/01	4	NH4	OK	No	YES
BIR	S3	FD	07/11/01	6	No EB	NH4 TKN TP	No	No
BIR	S3	EB	07/12/01	3	OK	NO FD	No	No
BIR	S3	EB	07/13/01	6	OK	NO FD	No	No
BIR	S3	EB	07/18/01	10	OK	NH4 TKN TP	No	No
BIR	S3	EB	07/25/01	15	OK	OK	No	YES
BIR	S3	EB	08/10/01	9	TP	OK	No	No
BIR	S3	EB	08/22/01	10	OK	OK	YES	YES
BIR	S3	EB	09/12/01	12	TP	NH4 TKN TP	No	No
BIR	S3	EB	09/16/01	11	TP	OK	No	No
BIR	S3	EB	09/21/01	4	OK	NH4	No	YES
BIR	S3	EB	10/10/01	11	OK	TP	No	No
BIR	S3	EB	11/01/01	10	OK	OK	YES	YES
BIR	S4	EB	02/07/01	10	NH4	NOX	No	YES



Project Code	Station Code	FQC	Set Date	Number Of Samples	EB Problems	FD Problems	QA/QC Pass	TP ONLY QA/QC Pass
BIR	S4	EB	02/21/01	5	NH4	OK	No	YES
BIR	S4	EB	07/12/01	11	OK	OK	YES	YES
BIR	S4	EB	07/18/01	10	OK	OK	YES	YES
BIR	S4	EB	07/25/01	14	OK	OK	YES	YES
BIR	S4	EB	08/10/01	11		TP OK	No	No
BIR	S4	EB	08/22/01	11	NH4	OK	No	YES
BIR	S4	EB	09/12/01	13		TP TKNT	No	No
BIR	S4	EB	09/16/01	9	NH4	TKNT	No	No
BIR	S4	EB	09/21/01	10	OK	NH4	No	YES
BIR	S4	EB	10/10/01	11	OK	NH4 TP	No	No
BIR	S4	EB	11/01/01	9	OK	NH4	No	YES
BIR	S5	EB	02/07/01	8	NH4	NH4 TKNT	No	No
BIR	S5	EB	02/12/01	5	NH4	TP NH4	No	No
BIR	S5	EB	02/21/01	5	NH4	TKN OK	No	YES
BIR	S5	EB	07/12/01	12	NH4	OK	No	YES
BIR	S5	EB	07/19/01	10		TP OK	No	No
BIR	S5	EB	07/25/01	14	OK	OK	YES	YES
BIR	S5	EB	08/10/01	11	OK	OK	YES	YES
BIR	S5	EB	08/22/01	12	NH4	TKN OK	No	YES
BIR	S5	EBC	09/11/01	7	No EB	NO FD	No	No
BIR	S5	EB	09/16/01	8		TKN TP TKNT	No	No
BIR	S5	EB	09/21/01	4		TKN TP OK	No	No
BIR	S5	EB	09/28/01	8	OK	OK	YES	YES
BIR	S5	EB	10/10/01	10	OK	TKNT	No	No
BIR	S5	EB	11/01/01	9	OK	OK	YES	YES
BIR	S6	EB	02/07/01	5		TP OK	No	No
BIR	S6	EB	02/21/01	5	NH4	OK	No	YES
BIR	S6	EB	06/26/01	3	OK	NO FD	No	No
BIR	S6	EB	07/12/01	13	OK	NH4	No	YES
BIR	S6	EB	07/19/01	9		TP OK	No	No
BIR	S6	EB	07/25/01	16	OK	OK	YES	YES
BIR	S6	EB	08/10/01	11		TP OK	No	No
BIR	S6	EB	08/22/01	12	OK	OK	YES	YES
BIR	S6	EB	09/12/01	11	OK	OK	YES	YES
BIR	S6	EB	09/16/01	9	NH4	TP TKNT	No	No
BIR	S6	EB	09/21/01	9	OK	OK	YES	YES
BIR	S6	EB	10/10/01	10	OK	OK	YES	YES
BIR	S6	EB	11/01/01	10	OK	OK	YES	YES
BIR	S7	EB	02/07/01	9	NH4	TP NH4 TKNT	No	No
BIR	S7	EB	02/12/01	5	NH4	OK	No	YES
BIR	S7	EB	02/21/01	8	NH4	OK	No	YES
BIR	S7	EB	06/26/01	5	OK	NO FD	No	No
BIR	S7	EB	07/12/01	14	NH4	OK	No	YES
BIR	S7	EB	07/19/01	10		TP TKNT	No	No
BIR	S7	EB	07/25/01	14	OK	OK	YES	YES
BIR	S7	EB	08/10/01	11	OK	OK	YES	YES
BIR	S7	EB	08/22/01	13	OK	OK	YES	YES
BIR	S7	EB	09/12/01	12	OK	NH4	No	YES
BIR	S7	EB	09/16/01	8	NH4	TP TKNT	No	No

Project Code	Station Code	FQC	Set Date	Number Of Samples	EB Problems	FD Problems	QA/QC Pass	TP ONLY QA/QC Pass
BIR	S7	EB	09/21/01	10	TKN	TP	No	No
BIR	S7	EB	10/10/01	11	OK	NOX	No	YES
BIR	S7	EB	11/01/01	10	OK	OK	YES	YES
BIR	S8	EB	02/07/01	7	NH4	OK	No	YES
BIR	S8	EB	02/12/01	4	NH4	OK	No	YES
BIR	S8	EB	02/21/01	5	NH4	OK	No	YES
BIR	S8	EB	07/12/01	13	OK	OK	YES	YES
BIR	S8	EB	07/19/01	10	OK	TKN TP	No	No
BIR	S8	EB	07/25/01	14	OK	OK	YES	YES
BIR	S8	EB	08/10/01	13	OK	OK	YES	YES
BIR	S8	EBC	08/22/01	9	No EB	NO FD	No	YES
BIR	S8	EB	09/12/01	12	TKN TP	OK	No	No
BIR	S8	EB	09/16/01	9	NH4	NH4	No	YES
BIR	S8	EB	09/21/01	13	TP	NH4	No	No
BIR	S8	EB	10/10/01	11	OK	TP	No	No
BIR	S8	EB	11/01/01	12	OK	NH4	No	YES
BIR	W1	EB	02/12/01	7	OK	OK	YES	YES
BIR	W1	EB	03/07/01	3	NH4	OK	No	YES
BIR	W1	EB	03/16/01	11	NH4	NH4	No	YES
BIR	W1	EB	05/11/01	5	NH4	NO FD	No	No
BIR	W1	EB	06/04/01	7	NH4	NO FD	No	No
BIR	W1	EB	06/11/01	6	NH4	NO FD	No	No
BIR	W1	EB	06/25/01	7	OK	NH4	TP	No
BIR	W1	EB	07/02/01	7	OK	OK	YES	YES
BIR	W1	EB	07/13/01	7	OK	OK	YES	YES
BIR	W1	EB	07/18/01	15	OK	OK	YES	YES
BIR	W1	EB	07/25/01	9	TP	OK	No	No
BIR	W1	EB	08/03/01	9	TP	TP	No	No
BIR	W1	EB	08/17/01	3	No EB	NO FD	No	No
BIR	W1	EB	08/31/01	12	TKN TP	TP	No	No
BIR	W1	EB	09/13/01	11	NO FD	NO FD	No	No
BIR	W1	EB	09/16/01	9	OK	OK	YES	YES
BIR	W1	EBC	No EB	10	OK	NO FD	No	No
BIR	W1	EB	10/10/01	8	No EB	NO FD	No	No
BIR	W1	EB	11/02/01	11	OK	OK	YES	YES
BIR	W2	EB	02/12/01	4	OK	OK	YES	No
BIR	W2	EB	02/21/01	6	NH4	OK	No	YES
BIR	W2	EB	03/07/01	8	NH4	NO FD	No	No
BIR	W2	EB	06/04/01	3	NH4	NO FD	No	No
BIR	W2	EB	06/11/01	5	NH4	NO FD	No	No
BIR	W2	EB	06/25/01	10	OK	OK	No	YES
BIR	W2	EB	07/02/01	11	OK	TP	No	No
BIR	W2	EB	07/13/01	8	NH4	NH4 NOX	No	YES
BIR	W2	EB	07/18/01	9	NO FD	NO FD	No	No
BIR	W2	EB	07/25/01	7	OK	OK	YES	YES
BIR	W2	EB	08/03/01	11	OK	OK	YES	YES
BIR	W2	EB	08/17/01	4	OK	OK	YES	No
BIR	W2	EB	08/31/01	9	NH4 NOX	TP	No	No
BIR	W2	EB	09/13/01	13	OK	OK	YES	No

Project Code	Station Code	FQC	Set Date	Number Of Samples	EB Problems	FD Problems	QA/QC Pass	TP ONLY QA/QC Pass
BIR	W2	EB	09/16/01	10		OK	No	YES
BIR	W2	EB	09/21/01	14	OK	OK	YES	YES
BIR	W2	EB	10/10/01	8	OK	NO FD	No	No
BIR	W2	EB	11/02/01	11	OK	OK	YES	YES
BIR	W3	EB	02/12/01	8	OK	NOX	No	YES
BIR	W3	EB	06/04/01	2	OK	OK	YES	No
BIR	W3	EB	07/02/01	6	OK	NO FD	No	No
BIR	W3	EBC	07/13/01	12	No EB	NO FD	No	YES
BIR	W3	EB	07/18/01	12	OK	NO FD	No	No
BIR	W3	EB	07/25/01	9	OK	OK	YES	YES
BIR	W3	EB	08/03/01	9	OK	OK	YES	YES
BIR	W3	EB	08/17/01	4		TP	TP	No
BIR	W3	EB	08/31/01	10		TP	OK	No
BIR	W3	EB	09/13/01	11		TP	OK	No
BIR	W3	EB	09/16/01	10	OK	OK	YES	YES
BIR	W3	EB	09/21/01	11		TP	OK	No
BIR	W3	EB	10/10/01	8	OK		TP	No
BIR	W3	EB	11/02/01	10	OK	OK	YES	YES
BIR	W4	EB	02/12/01	6		TP	NOX	No
BIR	W4	EB	02/21/01	6	NH4	TKN TP	OK	No
BIR	W4	EB	03/07/01	7	NH4		NO FD	No
BIR	W4	EB	04/11/01	3	OK		NO FD	No
BIR	W4	EB	05/01/01	5	OK		NO FD	No
BIR	W4	EB	06/04/01	6	NH4		NO FD	No
BIR	W4	EB	06/11/01	6	NH4		NO FD	No
BIR	W4	EB	06/25/01	13	OK		OK	YES
BIR	W4	EB	07/02/01	7	OK		OK	YES
BIR	W4	EB	07/13/01	9	OK	NH4	TP	No
BIR	W4	EB	07/18/01	10	OK		NO FD	No
BIR	W4	EB	07/25/01	8	OK		OK	YES
BIR	W4	EB	08/03/01	10	OK		OK	YES
BIR	W4	EB	08/17/01	4		TP	TP	No
BIR	W4	EB	08/31/01	9	OK		OK	YES
BIR	W4	EB	09/13/01	12		TP	TKN TP	No
BIR	W4	EB	09/16/01	11	OK		TP	No
BIR	W4	EB	09/21/01	10	OK	NH4		No
BIR	W4	EB	10/10/01	8	OK		OK	YES
BIR	W4	EB	11/02/01	9	OK		OK	YES
BIR	W5	EB	02/12/01	5	OK		OK	YES
BIR	W5	EB	02/21/01	6	OK		OK	YES
BIR	W5	EB	03/07/01	8	NH4		OK	No
BIR	W5	EB	04/11/01	3		TP	NO FD	No
BIR	W5	EB	05/02/01	5	NH4		NO FD	No
BIR	W5	EB	06/04/01	5	OK		NO FD	No
BIR	W5	EB	06/11/01	6	NH4		NO FD	No
BIR	W5	EB	06/25/01	11	OK		OK	YES
BIR	W5	EB	07/02/01	7	OK		OK	YES
BIR	W5	EB	07/13/01	9	OK	NH4	NOX	No
BIR	W5	EB	07/18/01	14	OK		NO FD	No

Project Code	Station Code	FQC	Set Date	Number Of Samples	EB Problems	FD Problems	QA/QC Pass	TP ONLY QA/QC Pass
BIR	W5	EB	07/25/01	11	OK	OK	YES	YES
BIR	W5	EB	08/03/01	11	NH4 TP	TKN TP	No	No
BIR	W5	EB	08/17/01	2	TKN TP	NO FD	No	No
BIR	W5	EB	08/31/01	12	NH4	TP	No	No
BIR	W5	EB	09/13/01	12	OK	TP	No	No
BIR	W5	EB	09/16/01	10	OK	NH4 TP	No	No
BIR	W5	EB	09/21/01	9	OK	NH4	No	YES
BIR	W5	EB	10/10/01	8	OK	OK	YES	YES
BIR	W5	EB	11/02/01	9	OK	TKN	No	YES
BIR	W6	EB	02/12/01	5	OK		No	YES
BIR	W6	EB	02/21/01	6	NH4	TP	No	No
BIR	W6	EB	03/07/01	3	NH4	OK	No	YES
BIR	W6	EB	04/11/01	3	OK	NO FD	No	No
BIR	W6	EB	05/02/01	4	OK	NO FD	No	No
BIR	W6	EB	06/04/01	7	NH4	NO FD	No	No
BIR	W6	EB	06/11/01	3	OK	NO FD	No	No
BIR	W6	EB	06/25/01	5	NH4 TKN	TP	No	No
BIR	W6	EB	07/02/01	6	OK	OK	YES	YES
BIR	W6	EB	07/13/01	10	OK	OK	YES	YES
BIR	W6	EB	07/18/01	13	OK	OK	YES	YES
BIR	W6	EB	07/25/01	8	OK	OK	YES	YES
BIR	W6	EB	08/03/01	9	NH4 TP	NOX	No	No
BIR	W6	EB	08/17/01	6	TKN TP	OK	No	No
BIR	W6	EB	08/31/01	9	NH4	OK	No	YES
BIR	W6	EB	09/13/01	10		NOX	No	YES
BIR	W6	EB	09/16/01	9		NH4	No	YES
BIR	W6	EB	09/21/01	11	TKN	OK	No	YES
BIR	W6	EB	10/10/01	7	OK	OK	YES	YES
BIR	W6	EB	11/02/01	9	OK	OK	YES	YES
BIR	W7	EB	02/12/01	5	OK	NH4 NOX	No	YES
BIR	W7	EB	02/21/01	5	NH4	NO FD	No	No
BIR	W7	EB	03/07/01	5	NH4	OK	No	YES
BIR	W7	EB	06/04/01	5	NH4	NO FD	No	No
BIR	W7	EB	06/11/01	3	NH4	NO FD	No	No
BIR	W7	EB	06/25/01	8	OK	OK	YES	YES
BIR	W7	EB	07/02/01	7	OK	TKN TP	No	No
BIR	W7	EB	07/13/01	11	OK	OK	YES	YES
BIR	W7	EB	07/18/01	12	OK	OK	YES	YES
BIR	W7	EB	07/25/01	9	OK	OK	YES	YES
BIR	W7	EB	08/03/01	10	NH4 TP	OK	No	No
BIR	W7	EB	08/17/01	7	OK	OK	YES	YES
BIR	W7	EB	08/31/01	9	OK	OK	YES	YES
BIR	W7	EB	09/13/01	12	OK	OK	YES	YES
BIR	W7	EB	09/16/01	9	TP	OK	No	No
BIR	W7	EB	09/21/01	13	TKN	NH4	No	YES
BIR	W7	EB	10/10/01	9	TP	OK	No	No
BIR	W7	EB	11/02/01	10	OK	OK	YES	YES
BIR	W8	EB	02/12/01	6	OK	OK	YES	YES
BIR	W8	EB	02/21/01	6	NH4	OK	No	YES

Project Code	Station Code	FQC	Set Date	Number Of Samples	EB Problems	FD Problems	QA/QC Pass	TP ONLY QA/QC Pass	
BIR	W8	EB	03/07/01	10	NH4	NO FD	No	No	
BIR	W8	EB	06/04/01	3	NH4	NO FD	No	No	
BIR	W8	EB	06/11/01	1	NH4	TP	No	No	
BIR	W8	EB	06/25/01	3	OK	NO FD	No	No	
BIR	W8	EB	07/02/01	5	OK	NO FD	No	No	
BIR	W8	EB	07/13/01	10	OK	NO FD	No	No	
BIR	W8	EB	07/18/01	12	OK	TKN	No	YES	
BIR	W8	EB	07/25/01	10	NH4	TKN	OK	No	YES
BIR	W8	EB	08/03/01	10	NH4	TP	OK	No	No
BIR	W8	EB	08/17/01	6	NH4	OK	No	YES	
BIR	W8	EB	08/31/01	11		TP	TP	No	No
BIR	W8	EB	09/13/01	11	OK	NH4	TP	No	No
BIR	W8	EB	09/16/01	9		TP	OK	No	No
BIR	W8	EB	09/21/01	12	OK	OK	YES	YES	
BIR	W8	EB	10/10/01	9	OK		TP	No	No
BIR	W8	EB	11/02/01	10	OK	OK	YES	YES	

82      133  
 32%    53%

## Conclusions

We had mere result for the year 2001 than for 2000, and that's way we can provide more confident information then for the year 2000. This report basically summarizes and represents data comparison for 1998 - 2001 years. The conclusions would be:

- ?? The highest rainfall in the year 2001 (based by ona weather station),
- ?? The highest concentrations for TP, NO<sub>x</sub>, NH<sub>4</sub>, in summer pasture are for year 2001;
- ?? The highest concentrations for TP, NO<sub>x</sub>, NH<sub>4</sub>, in winter pasture are for year 2000;
- ?? The NO<sub>x</sub> concentrations increases 0.08 time compare with result for 1998-1999;
- ?? The highest Annual TP, NO<sub>x</sub>, NH<sub>4</sub>, TKN loads for the year 2001;
- ?? QA/QC test pass 32% of results;
- ?? QA/QC test for TP pass 53% of results.

## References

WM796 progress report#3\_ May 2, 2002 by John C. Capece, and Jurate Barkauskaite

WM7796 progress report#2\_ February 13, 2002 by John C. Capece, Jurate Barkauskaite, Samuel Adu-Bitherman, and Grant Griffith.

WM796 progress report#1\_ November 7, 2001 by John C. Capece, Jurate Barkauskaite, Samuel Adu-Bitherman, Eva Muro, and Marlene Canetti.

WM699 Final report by J.C. Capece, K.L Campbell, D.A Graetz, K.M Portier, and P.J. Bolen