# VEGETATION MONITORING AT THE NATURE CONSERVANCY'S FLAT RANCH PRESERVE 2001 RESULTS

by

Michael Mancuso
Conservation Data Center

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Idaho Department of Fish and Game
600 South Walnut, P.O. Box 25
Boise, ID 83707
Steven Huffaker, Director

Prepared for:
The Nature Conservancy
Idaho Field Office

## ABSTRACT

The Flat Ranch Preserve (Preserve) is located in the Island Park area, approximately four miles southeast of Henrys Lake, in Fremont County, Idaho. It is one of The Nature Conservancy's (TNC) highest profile conservation projects in Idaho and monitoring is an important component of their management at the Preserve. Baseline vegetation monitoring information was collected in meadow habitats throughout the Preserve in 1995 and 1996, and specifically in the Jesse Creek restoration project area in 1997. Vegetation monitoring addresses two main questions: (1) whether or not TNC management is adversely affecting the quality of remnant native plant communities; and (2) whether or not TNC management is improving the ecological condition of the extensive grazing-modified meadow habitats within the Preserve. Monitoring includes nested plot frequency, plant community plot, shrub line intercept, greenline, comparative yield, and photo-point protocols. Monitoring focuses on three main vegetation patterns within the Preserve: tufted hairgrass, pasture grass, and mixed pasture grass/tufted hairgrass.

Monitoring plots were resampled in summer 2001. This report summarizes monitoring information collected in 2001, compares it to baseline information collected in previous years, and discusses vegetation trends in the context of TNC management objectives. Monitoring indicates a trend of increasing or stable native graminoid abundance, and decreasing abundance of pasture grasses for the tufted hairgrass type. The trend is largely stable for the pasture grass type, although changes such as reduced dandelion cover and increased total grass cover have been recorded. Vegetation trend also seems to be stable for the mixed pasture grass/tufted hairgrass type. Some of the vegetation changes following the re-watering of Jesse Creek are dramatic. Plots in this area show an increase in wet sedge abundance and a complementary decrease in pasture grasses. In addition, forage production greatly increased compared to baseline estimates.

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## INTRODUCTION

The Flat Ranch Preserve (Preserve) is one of The Nature Conservancy's (TNC) highest profile conservation projects in Idaho. The 1,659-acre Preserve is located in the Island Park area, approximately four miles southeast of Henrys Lake, in Fremont County, Idaho. The Preserve lies within the Henrys Lake Flat, an extensive wet meadow complex on alluvial sediments with springs and creeks contributing to the flow of the upper Henrys Fork River. Approximately 3.5 miles of the Henrys Fork flows through the Preserve, which has important fish, wildlife, and other conservation values. The river is also an integral part of the regional agricultural and recreational economies. TNC manages the Preserve as a working cattle ranch. However, it also serves as a place to experiment with and showcase alternative land stewardship methods, to actively participate in local water quality and quantity conservation issues on behalf of fish and wildlife, and to provide educational opportunities for the general public.

The Preserve is characterized by flat to gently undulating topography supporting a mosaic of wet and seasonally wet graminoid-dominated meadows. Historically, the Preserve probably supported a vegetation mosaic sorted along moisture gradients and dominated by various sedge species, tufted hairgrass, intermixed willow thickets and riparian stringers, and open water zones associated with beaver activity. Large portions of the Preserve were converted to hay meadow in the past, and introduced pasture grasses dominate the vegetation in many places as a result. Other portions of the Preserve have a mix of pasture and native grasses, or patches dominated by mostly native graminoid species. Seasonal irrigation occurs on portions of the Preserve, which has been divided into a series of pastures for livestock management purposes.

Monitoring is an important component of TNC's management at the Preserve. In 1995, a vegetation monitoring plan was incorporated into the Preserve's comprehensive monitoring program. The vegetation monitoring program was a cooperative project between TNC and the Idaho Department of Fish and Game's Conservation Data Center (CDC). Its objective was to help TNC assess whether or not vegetation management goals were being met on the Preserve, especially in regards to the management plan guiding cattle grazing operations. Based on species composition and relative abundance criteria, TNC wanted monitoring to address two main points: (1) whether or not their management was adversely affecting the quality of remnant native plant communities, and (2) whether or not their management was improving the ecological condition of the extensive grazing-modified meadow habitats within the Preserve. Baseline vegetation monitoring information was collected in meadow habitats throughout the Preserve in both 1995 and 1996 (Mancuso 1995; Mancuso 1996).

The vegetation monitoring program was expanded in 1997 to encompass the Jesse Creek restoration project area (Mancuso 1998). Jesse Creek historically meandered through the Preserve area before merging with Jones Creek, a major tributary of the upper Henrys Fork River. In the late 1940s, the creek was ditched in order to drain the associated wet meadows and support stock watering and irrigation. The ditch carrying the shunted water formed a section of the Preserve's eastern boundary when TNC purchased the Flat Ranch. The restoration project area encompassed roughly 5,300 ft (1615 m) of meandering stream length through the Preserve. In 1997, baseline vegetation monitoring information was collected along the original, de-watered Jesse Creek channel. Then, in the spring of 1998, TNC re-diverted water back into the historic, low-gradient creek channel passing through the Preserve. This was done under the auspices of the federal Wetland Reserve Program administered by the National Resource Conservation Service and Yellowstone Soil Conservation District.

In summer 2001, I resampled most of the original monitoring transects throughout the Preserve, including the Jesse Creek restoration area. This report summarizes the monitoring information

collected in 2001, compares it to baseline information collected in previous years, and discusses vegetation trends in the context of TNC management objectives.

## METHODS

Vegetation monitoring at the Preserve is designed to collect trend information. Trend data quantifies direction of change, if any, away from or towards specific management objectives (Bureau of Land Management 1985). The three main plant community types typifying the Preserve's meadow vegetation in 1995 were selected for the monitoring program:

1) Tufted hairgrass – meadow vegetation dominated by tufted hairgrass and other native mesic graminoids. Timothy may be common, but is subordinate to the native grasses. Other pasture grasses and weedy forbs tend to be uncommon or absent in this community.

2) Pasture grass – meadow vegetation dominated by the pasture grasses timothy and/or Kentucky bluegrass. Tufted hairgrass is rare or absent, but weedy or "increaser" forbs tend to be common.

3) Mixed pasture grass/tufted hairgrass – meadow vegetation dominated by pasture grasses, predominately timothy, but also having some tufted hairgrass and/or other mesic native graminoids present. Weedy or "increaser" forbs may be common in this community as well.

Baseline vegetation monitoring information was collected at 13 permanently marked plots during the summer of 1995 (Mancuso 1995). They were all resampled in 1996 to augment and strengthen the original baseline dataset, against which future monitoring results would be compared (Mancuso 1996). All of the monitoring plots were referenced using a unique alphanumeric identifier code, 95FR001 through 95FR013. Most plots were intensively sampled using nested frequency, plant community plot, and photo-point methods. Appendix 1 has a map with the location of each plot, as well as GPS information. All plots have been permanently marked using stakes hammered into the ground.

In 1997, three new permanent plots were added to the vegetation monitoring program along the channel of Jesse Creek (Mancuso 1998). They were established to document and monitor anticipated changes to the vegetation following the reintroduction of water into the channel in 1998. Vegetation along Jesse Creek was a mix of plant community types similar to elsewhere on the Preserve prior to the restoration effort. One monitoring plot was established in each of the three main plant community types occurring along the channel: tufted hairgrass, pasture grass, and mixed pasture grass/tufted hairgrass. A fourth plot was established along Jesse Creek upstream of the water diversion ditch and north of the Preserve. It was established as a reference plot with permission of the adjacent landowner. Each of the four 1997 plots were referenced using a unique identifier code, 97FR014 through 97FR017.

Monitoring for the Jesse Creek restoration project was also designed to collect trend information. Each plot was intensively sampled using nested frequency, line intercept, plant community plot, and greenline methods to monitor trends in plant species composition and abundance. Trends in forage production were monitored using the comparative yield method. In addition, photo-point photographs were taken at each plot. Earlier reports (Mancuso 1995; Mancuso 1998) have plot selection, directions, sketches, transect azimuths, and other information to help relocate and sample each plot. A brief description of each plot sampled in 2001 is included in Appendix 2. This appendix also summarizes 2001 sampling notes such as plot relocation problems, and plant identification issues.

Most monitoring plots are located in areas open to livestock grazing on an annual basis. Three plots (95FR010, 011, and 012) occur within the Henrys Fork riparian exclosure, an area open to livestock grazing only periodically. Construction of an exclosure along the Jesse Creek project area has eliminated livestock grazing from four plots (95FR001, 97FR014, 015, and 016) located in this part of the Preserve.

I use common names as much as possible in this report. Appendix 3 lists the common name, scientific name, and corresponding six-letter code used for field data forms, for all plant species encountered during the monitoring program. A vascular flora checklist for the entire Preserve has been compiled in Appendix 4. Common and scientific names follows either Hitchcock and Cronquist (1973) or Intermountain Flora (Cronquist et al. 1977; 1984; 1994; 1997). The vegetation monitoring program consists of a total of 17 plots. They are listed in Table 1, along with their pasture location and associated monitoring protocols. Specifics about using the various monitoring methods at the Preserve are discussed in detail in earlier reports (Mancuso 1995; Mancuso 1998). The methods are briefly outlined below.

Table 1. Monitoring protocols and pasture locations for monitoring plots at Flat Ranch Preserve.

| **Plot** | **Pasture location[1]** | **Monitoring protocols** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **Nested frequency** | **Plant community plots** | **Photo-point** | **Shrub intercept** | **Greenline** | **Comparative yield** |
| 95FR001 | 6 | X | X | X | | | |
| 95FR002 | 4 | X | X | X | | | |
| 95FR003 | 1 | X | X | X | | | |
| 95FR004 | 6 | X | X | X | | | |
| 95FR005 | 11 | X | X | X | | | |
| 95FR006 | 4 | X | X | X | | | |
| 95FR007 | 1 | X | X | X | | | |
| 95FR008 | 2 | X | X | X | | | |
| 95FR009 | 5 | X | X | X | | | |
| 95FR010 | 7 | X | X | X | | | |
| 95FR011 | 7 | X | X | X | | | |
| 95FR012 | 10 | X | X | X | | | |
| 95FR013 | 11 | | X | X | | | |
| 97FR014 | Jesse Cr | X | X | X | X | X | X |
| 97FR015 | Jesse Cr | X | X | X | X | X | X |
| 97FR016 | Jesse Cr | X | X | X | X | X | X |
| 97FR017 | NA | | X | X | | X | |

[1] Pasture number based on 2001 Flat Ranch Preserve pasture map.

*General vegetation monitoring*

Nested plot frequency method

Frequency is the indicator of trend with this method, which consists of sampling nested plots of various sizes along a belt transect (Bureau of Land Management 1985). Frequency is a measure of abundance, and changes in frequency values over time can be used to monitor changes in the vegetation. Nested frequency information at the Preserve is collected at plots consisting of three permanently marked 12 m long transects. Ten microplots are sampled along each transect. Frequency information is collected for vascular plant species, bare ground, litter, and moss from four microplot nested plot frame sizes: 5 x 5 cm; 10 x 10 cm; 25 x 25 cm; and 25 x 50 cm.

Plant community plot method

Plant community information is collected using 1/10$^{th}$ acre circular plots and methods outlined by Bourgeron et al. (1992). Plots are sampled using the same centerpoint as the nested frequency transects. Plant community information is based on visual estimates of cover class values for all vascular plant species within the plot. Because this method has an acceptable accuracy standard of +/- one cover class, an increase or decrease of two or more classes is required to indicate measurable change. Changes in plant community composition and cover can be assessed and monitored by comparing plot data from two different sampling periods.

Photo-points

Photo-points are landscape or feature photographs retaken from the same place so that differences between years can be compared (Elzinga et al. 1998). A total of seven photos are taken at each plot. One photo is taken for each of the three transect by standing five steps behind the transect start stake. Four landscape photos are taken from this same stake at $0^0$, $90^0$, $180^0$, and $270^0$ azimuths.

*Jesse Creek restoration area monitoring*

Nested plot frequency method

The degree of vegetation change in response to re-watering Jesse Creek had the potential to be different on opposite sides of the channel, and at various distances away from the channel. To monitor this extra consideration, nested plot sampling at Jesse Creek uses six transects for each plot, not three. Each side of the channel has three transects: 3 m, 10 m, and 25 m from the channel. Other portions of the nested plot frequency protocol are identical to that used for general vegetation monitoring purposes.

Shrub line intercept method

In 1997, silver sagebrush was the only shrub present within the Jesse Creek restoration area. However, other shrub species may become established in the future in response to stream restoration efforts. For example, several willow species occur along the creek upstream of the original channel diversion. Shrub line intercept (canopy) sampling occurs along the same transects used for nested plot frequency sampling. Increases or decreases in transect line intercept are used to quantitatively monitor changes to the shrub community with this method (Bureau of Land Management 1996).

Greenline method

The greenline method relies on the identification of plant community types along a line transect that follows the channel greenline (Cagney 1993). The greenline is the area where vegetation cover becomes more or less continuous when moving away from the center of a channel. The top edge of the creek channel forms the greenline for Jesse Creek. Greenline transects are 726 feet (221 m) long. Half this length is sampled on one side of the channel, half on the opposite side. The length is easily converted to acreage, as 726 feet, six feet wide, equals 0.1 acre. Trend is monitored by resampling the greenline over time and comparing to previous results.

Comparative yield method

In addition to plant composition and abundance trends, one of the monitoring goals for the Jesse Creek restoration area was to assess trends in forage production. The monitoring

protocol uses the comparative yield method (Bureau of Land Management 1996) to estimate forage production (plant biomass) along transects within a target area. It evaluates total forage production, but does not determine the relative contribution by individual forage species. Jesse Creek meanders for approximately 5,300 feet (1615 m) through the restoration project area. The creek was stratified into ten separate 500-foot (152 m) segments for sampling purposes. Forage estimates were based on comparative yield data collected along two transects within each 500-foot segment. Estimates from different years can be compared to monitor changes in forage production over time.

Photo-points

A total of 14 photographs are taken at each of the Jesse Creek plots. One photo is taken of each of the six transect. Four landscape photos are taken from the fencepost stake marking the location of the plot using azimuths of $0^0$, $90^0$, $180^0$, and $270^0$. In addition, four photos of Jesse Creek are taken. Two are taken from the 3 m footmarker stake on the right side of the channel and two from the 3 m footmarker stake on the left side of the channel. Upstream and downstream photos are taken on both sides. Six-foot rods placed 10 m and 20 m from the footmarker stake serve as distance reference points along the channel.

## RESULTS

All but two of the original plots were resampled between July 30 and August 9, 2001. Plot 95FR011, located within the Henrys Fork riparian exclosure, and plot 97FR017, located north of the Preserve, were not revisited due to a lack of time. Results in this report are based on analysis and comparison of the 1996 versus 2001 datasets.

### *Nested plot frequency and plant community monitoring*

Frequency data for each nested plot size, for both 1996 and 2001, was entered into CALCFREQ (Patton and Nyren 1992), a statistical software program designed to calculate percent frequency and test for significant differences in frequency between two different sample periods. The probability of a Type I error (falsely concluding that two frequency values were significantly different when they actually were not) for each comparison was calculated using a 2X2 contingency table analysis based on Cochran's corrected chi-square statistic at the 0.05 alpha level. Appendix 5 contains copies of completed 2001 Nested Plot Frequency Data field forms. Field forms from 1996 were in an earlier report (Mancuso 1996). Appendix 6 contains a spreadsheet of the 1996 and 2001 nested plot frequency datasets. A spreadsheet file in Appendix 7 lists the frequency percentages and significance values for all species in each plot. Appendix 8 summarizes frequency changes for all species by community type.

Copies of the 2001 Plant Community Plot field forms are in Appendix 9. Plant community field forms from 1996 were in an earlier report (Mancuso 1996). Plant community information for 1996 and 2001 is compared in spreadsheet format in Appendix 10. Vegetation monitoring results based on nested plot frequency and plant community plot sampling are summarized below for each community type.

Tufted hairgrass community type

The tufted hairgrass community type was sampled at three plots: 95FR003, 95FR004, and 95FR009. Tufted hairgrass, sedge species, and Baltic rush are key indicator graminoids for this community. Important forbs include meadow cinquefoil, longstalk clover, and western aster.

95FR003 - Frequency for tufted hairgrass and clustered field sedge declined significantly, while Nebraska sedge and the introduced grass, redtop, increased significantly at this plot. In addition, plant community data for this plot showed a substantial increase in the cover of beaked sedge and short-beaked sedge that was missed by nested plot sampling. Total graminoid cover increased, while total forb cover decreased within the plot. Dandelion was one of the forbs that significantly decreased in this plot.

95FR004 - Significant increases in the frequency of tufted hairgrass and clustered field sedge occurred in this plot. In contrast, meadow foxtail frequency decreased, as did the cover for timothy. Meadow cinquefoil and western aster frequency increased significantly, compared to longstalk clover which decreased.

95FR009 - Timothy was the only graminoid species to show a significant decrease in frequency within this plot. No graminoids showed an increase. Western aster and litter significantly increased in frequency. In contrast, frequency for yarrow and moss ground cover decreased.

Pasture grass community type

The pasture grass community type was sampled at four plots: 95FR002, 95FR007, 95FR008, 95FR010. A variation of this type was sampled at 95FR013. Timothy and Kentucky bluegrass are the key indicator species for the pasture grass type at the Flat Ranch Preserve. Important forbs include meadow cinquefoil, dandelion, whitehead mule's ears, longstalk clover, and yarrow. Each of these forbs tends to increase in areas heavily grazed by livestock, although dandelion is the only non-native in this group.

95FR002 - Plant community sampling showed a substantial increase in Kentucky bluegrass cover, even though its frequency did not change. No significant changes occurred in the frequency or cover of timothy, or other graminoid species within the plot. Plant community sampling also showed that the total graminoid cover within the plot increased. Meadow cinquefoil frequency increased significantly, as did the frequency and cover of bare ground. The cause of this increased bare ground coverage was unclear. The frequency of longstalk cover decreased within the plot. Frequency and cover of whitehead mule's ears was unchanged at this and all of the other pasture grass plots.

95FR007 - No significant changes occurred in the frequency or cover of timothy, or other graminoid species within this plot. Meadow cinquefoil frequency decreased significantly, as did the frequency for two other common forbs, longstalk and white clover. Plant community cover for dandelion was substantially reduced, although its frequency did not change significantly.

95FR008 - No significant change occurred in the frequency or cover of timothy, but Kentucky bluegrass frequency did decrease significantly in the plot area. Despite its decreased frequency, plant community sampling showed Kentucky bluegrass cover remained high. The frequency of mat muhly increased within the plot, and sedge cover also appeared to increase. Dandelion, yarrow, and longstalk clover all showed significant decreases in frequency.

95FR010 – Plant community sampling showed a substantial increase in Kentucky bluegrass cover, even though its frequency did not change. This increase corresponds to an increase in the total graminoid cover tallied for the plot. No significant changes occurred in the frequency or cover of timothy, or other graminoid species within this plot. Although it remained common, plant community sampling showed a reduction in dandelion cover within the plot.

95FR013 – The protocol for this plot includes plant community plot sampling, but not nested frequency. Willows are present in this variation of the usual pasture grass type, and their cover

increased compared over baseline values. Cover of timothy has remained about the same, while Kentucky bluegrass cover increased. Several native graminoids absent in 1996 were present in 2001, including tufted hairgrass, clustered field sedge, and mat muhly. The amount of bare ground cover has increased and the amount of litter decreased in the plot area.

Mixed pasture grass/tufted hairgrass community type

The mixed pasture grass/tufted hairgrass community type was sampled at four plots: 95FR001, 95FR005, 95FR006, and 95FR012. Timothy, Kentucky bluegrass, tufted hairgrass, and clustered field sedge are the key indicator graminoids for this community type. Important forbs include meadow cinquefoil, dandelion, yarrow, longstalk clover, and western aster.

95FR001 – This plot is located within the Jesse Creek restoration project area and has become subirrigated from water reintroduced into the channel. The vegetation changed dramatically between 1996 and 2001. Both timothy and tufted hairgrass decreased significantly. In fact, timothy has apparently been extirpated from the plot area. Nested plot and plant community sampling suggest that Kentucky bluegrass has also been lost from the plot area. In contrast, clustered field sedge and Nebraska sedge increased significantly within the plot area, which now supports a Nebraska sedge community type. All five of the important forb species declined significantly, with dandelion and yarrow apparently being extirpated from the plot zone. Plant community sampling indicated total graminoid cover has approximately doubled since 1996, while total forb cover has decreased.

95FR005 - Clustered field sedge frequency increased significantly at this plot. Plant community sampling revealed timothy increased greatly in cover, even though its frequency did not significantly change. This increase in timothy was the main reason the total graminoid cover within the plot approximately doubled between 1996 and 2001. Significant decreases in the frequency of yarrow, longstalk cover, and bare ground were also recorded for this plot.

95FR006 - A significant decrease in the frequency of clustered field sedge was one of the few changes to the vegetation at this plot. The frequency of litter also decreased significantly, a change substantiated by plant community sampling. This sampling also suggests an increase in bare ground cover within the plot.

95FR012 - This plot occurs within the Henrys Fork riparian exclosure. Clustered field sedge increased significantly, a change substantiated by plant community sampling results. Although the frequency for timothy did not change significantly, plant community sampling indicates this species has increased in cover and become much more abundant in the plot area. Both dandelion and yarrow frequency declined significantly. This decline was especially dramatic for dandelion. Plant community sampling clearly shows Fendler's meadow-rue cover has greatly increased since 1996. Overall, the total cover for both graminoids and forbs increased substantially since 1996.

Jesse Creek restoration area

Vegetation within the Jesse Creek restoration area is sampled more intensely than elsewhere in the Preserve. Each plot had six (instead of three) nested frequency transects. In addition to nested plot frequency and plant community sampling, shrub line intercept, greenline, and comparative yield monitoring methods are also part of the monitoring protocol for the restoration area. Vegetation along Jesse Creek is sampled at three plots: 97FR014, 97FR015, and 97FR016. In 1997, plot 97FR014 supported a tufted hairgrass community type; plot 97FR015 a pasture grass community type; and 97FR016 a mixed pasture grass/tufted hairgrass type.

97FR014 - There was no significant change in the frequency of awned sedge, the dominant species at the plot site. However, plant community sampling indicated an increase in cover for this species between 1997 and 2001. The frequency of beaked sedge and short-beaked sedge increased significantly at this plot, as opposed to clustered field sedge and tufted hairgrass, which decreased significantly. The frequency of several forbs, including meadow cinquefoil, yarrow, and longstalk clover also declined significantly. Plant community sampling showed that total forb cover decreased substantially in the plot area. In addition, a low percentage of bare ground was tallied in 1997, but none was observed in 2001. These vegetation changes indicate the site has become considerably wetter relative to baseline conditions.

97FR015 - Timothy remained the most abundant grass within the plot in 2001, even though its frequency has decreased significantly since 1997. In contrast, frequency increased significantly for tufted hairgrass, Nebraska sedge, and clustered field sedge. Plant community sampling indicated beaked sedge and water sedge have become established in the plot since 1997. This sampling has also shown the low cover of silver sagebrush to be persisting in the plot area. Significant decreases in the frequency of dandelion, longstalk clover, and several other forb species have occurred within the plot. These vegetation changes indicate the site has become wetter compared to baseline conditions, although not as wet as the other two Jesse Creek plots.

97FR016 - Significant increases in frequency were tallied for awned sedge, water sedge, Nebraska sedge, and beaked sedge in 2001. In contrast, tufted hairgrass, clustered field sedge, timothy, meadow foxtail, meadow barley, and Kentucky bluegrass all significantly declined in frequency. Meadow cinquefoil, dandelion, yarrow, and longstalk clover were some of the forb species that declined. These vegetation changes indicate the site has become considerably wetter compared to baseline conditions.

Shrub line intercept

The three Jesse Creek monitoring plots (97FR014, 015, and 016) contain six transects, each 12 m long. This equates to a total transect length of 72 m (7,200 cm). The total possible maximum shrub canopy intercept within the plot is therefore 72 m. Scattered individual or small patches of silver sagebrush were the only woody species I observed in the restoration area in 2001. It was present at low density (cover class = 3) in plot 97FR015, similar to 1997. Silver sagebrush was absent from the other plots in the restoration area. Slightly less (6% less) silver sagebrush canopy intercept was recorded in 2001, compared to 1997 at plot 97FR015. A comparison of the shrub canopy intercept results is presented in Table 2. Shrub line intercept data forms for 2001 are in Appendix 11.

Willows occur in a localized band along Jesse Creek upstream of the point where the creek gets diverted, north of the Preserve boundary. A plot (97FR017) was established within this willow band in 1997 to serve as a reference for possible willow re-establishment in the restoration project area. I saw no evidence that willows were establishing within the Jesse Creek restoration area in 2001.

Table 2. Comparison of 1997 and 2001 silver sagebrush shrub canopy intercept at Jesse Creek plot 97FR015.

| | **Transect #** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **Total** | **Transect total** |
| **1997** | 25 cm | 32 cm | 0 | 0 | 43 cm | 85 cm | 185 cm | 2.5% |
| **2001** | 22 cm | 24 cm | 0 | 0 | 43 cm | 85 cm | 174 cm | 2.4% |

Greenline monitoring

Prior to sampling, I walked the entire length of Jesse Creek within the project area to compile a list of greenline plant community types. The greenline type names are meant to be descriptive and do not follow any formal classification scheme.

Greenline types for greenline transects:
1. Sedge species mix – a dense mix of two or more sedge species with no consistent, clear dominant. The ratio of the mix and presence of individual species varies from one channel segment to the next, and at a local scale, any one of the several sedge species can be much more abundant than the others. Beaked sedge, water sedge, wooly sedge, and awned sedge were the primary sedges in the mix at plots 97FR014 and 97FR016. Nebraska sedge was uncommon or absent at these two plots. In contrast, Nebraska sedge was much more prominent, and in many cases the dominant sedge in the mix at plot 97FR015. Another difference for plot 97FR015 was the absence of awned sedge in the mix. Mesic native grasses such as meadow barley, western reedgrass, and tufted hairgrass may or may not be present in the sedge mix. Except for western reedgrass, which was locally common in a few places, all of the mesic graminoids occurred at low cover when present. Forbs such as field mint, Fendler's meadow-rue, and marsh yellowcress were also at low cover when they occurred within the mix. This greenline type most closely matches the "Sedge species" type described for baseline greenline conditions in 1997. The 2001 version differs by being less consistently dominated by awned sedge and having overall denser sedge cover. In 2001, awned sedge was often the dominant sedge in the mix a short distance away from the channel bank.

2. Timothy-native graminoid mix – this type contains timothy intermixed with Nebraska sedge, clustered field sedge, and tufted hairgrass. Timothy tends to dominate the vegetation in adjacent areas a little further away from the channel. It most closely resembles the "Native graminoid-pasture grass mix" type described for baseline greenline conditions.

In 1997, eight types were observed along the greenline transects. Counterparts to six of the types (clustered field sedge/forb type, tufted hairgrass type, Baltic rush type, timothy-forb type, forb species type, and silver sagebrush/timothy type) were not observed along the greenline in 2001. The other two baseline types (sedge species type and native graminoid-pasture grass mix type) were present, but in somewhat different amalgamations. Table 3, summarizes the 1997 and 2001 greenline monitoring information. Greenline data forms for 2001 are in Appendix 12.

Forage production

Reference quadrats dry weights listed in Table 4 were used to generate a comparative yield productivity graph. Figure 1 is a copy of the graph. Yield data in kg/ha and lb/ac of forage for each of the ten transect stations were estimated using this graph and the ratio estimate technique. Appendix 11 has additional information concerning the calculations used to generate the forage production estimates.

Yields calculated for the transect stations in 2001 ranged from 3,150 kg/ha (2,811 lb/ac) to 5,478 kg/ha (4,889 lb/ac). The average estimated yield for the project area was 4,173 kg/ha (3,724 lb/ac). Every transect had a higher yield compared to 1997 estimates. The amount of forage more than doubled at some transects. The smallest increase was 20%. Forage production at the transect with the lowest estimate in 2001, was greater than production at the highest yielding transect in 1997. Productivity estimates for 1997 and 2001 are compared in Table 5. Comparative yield field data forms are in Appendix 13.

Table 3. Comparison of 1997 and 2001 Greenline monitoring transects results.

| **Greenline type name** | **Greenline type length in feet (%)** | | | | | | **% combined greenline type length** | |
|---|---|---|---|---|---|---|---|---|
| | **97FR014** | | **97FR015** | | **97FR016** | | | |
| | **1997** | **2001** | **1997** | **2001** | **1997** | **2001** | **1997** | **2001** |
| Sedge spp mix | 383 (53) | 726 (100) | 255 (35) | 696 (96) | 12 (2) | 726 (100) | 30 | 99 |
| Timothy-native graminoid mix (2001); Native-pasture grass mix (1997) | 34 (5) | | 37 (5) | 30 (4) | | | 3 | 1 |
| Clustered field sedge/forb | 218 (30) | | 117 (16) | | 316 (44) | | 30 | |
| Tufted hairgrass | | | | | 132 (18) | | 6 | |
| Timothy/forb | | | 290 (40) | | 103 (14) | | 18 | |
| Silver sagebrush/timothy | | | 20 (3) | | | | 1 | |
| Forb species | 89 (12) | | | | 154 (21) | | 11 | |
| Baltic rush | | | | | 8 (1) | | <1 | |

Table 4. Dry weight averages for clipped reference quadrats.

| Reference No. | Dry weight (grams) |
|---|---|
| 1 | 10.2 |
| 1.5 | 14.8 |
| 2 | 18.9 |
| 2.5 | 21.9 |
| 3 | 24.4 |
| 3.5 | 28.2 |
| 4 | 32.5 |
| 4.5 | 38.3 |
| 5 | 42.3 |
| 5.5 | 46.3 |

Table 5. Comparison of 1997 and 2001 forage production estimates for the Jesse Creek restoration area.

| **Transect Station** | **Dry weight yield (kg/ha)** | | **Dry weight yield (lb/ac)** | | **% increase in 2001** |
|---|---|---|---|---|---|
| | **1997** | **2001** | **1997** | **2001** | |
| 1 | 2,608 | 4,656 | 2,328 | 4,155 | 78 |
| 2 | 2,481 | 5,478 | 2,214 | 4,889 | 120 |
| 3 | 2,171 | 4,793 | 1,937 | 4,278 | 120 |
| 4 | 2,280 | 3,562 | 2,035 | 3,178 | 56 |
| 5 | 2,298 | 4,684 | 2,051 | 4,180 | 103 |
| 6 | 1,970 | 3,615 | 1,758 | 3,227 | 83 |
| 7 | 2,317 | 3,698 | 2,068 | 3,300 | 59 |
| 8 | 2,700 | 4,054 | 2,409 | 3,618 | 50 |
| 9 | 2,627 | 3,150 | 2,345 | 2,811 | 20 |
| 10 | 2,517 | 4,040 | 2,246 | 3,605 | 60 |
| Average yield | 2,402 | 4,173 | 2,144 | 3,724 | 74 |

**Figure 1.**
**Comparative yield productivity graph**

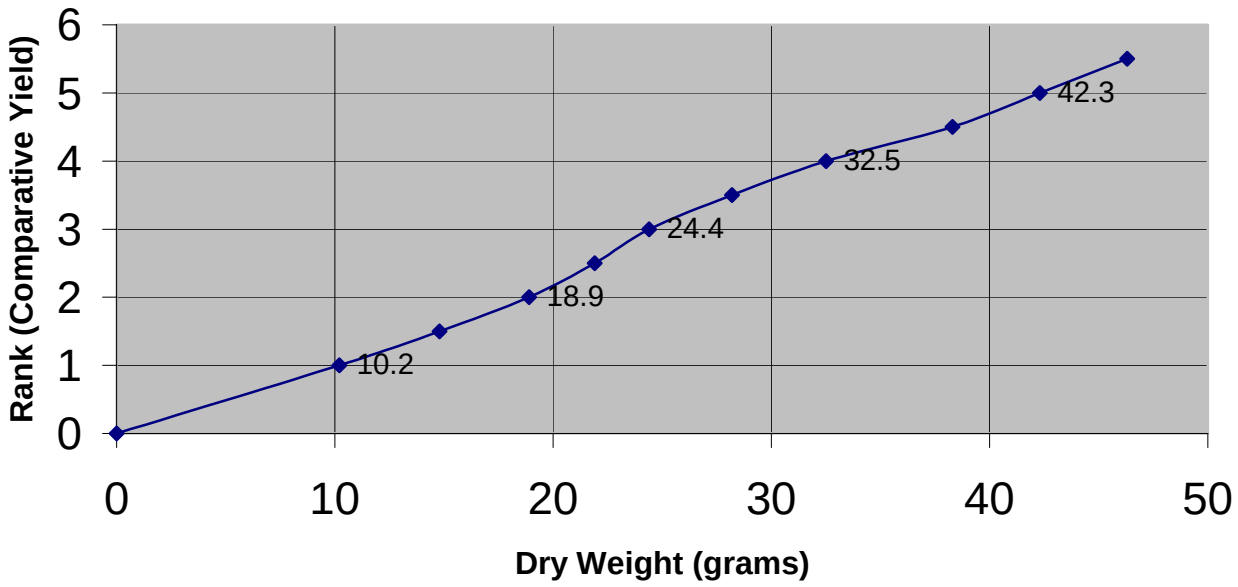


Photo-points

All photos taken in 2001 are labeled and placed on file with TNC. A duplicate set of digital images is on file at the CDC office in Boise.

**DISCUSSION**

Tufted hairgrass community type

The vegetation at plot 95FR003 may be in transition to a wet sedge habitat. The vegetation has shifted from tufted hairgrass and timothy, to dominance by several wet sedge species. Timothy and redtop are still common though, indicating this transition is proceeding relatively slowly. The large apparent increase in redtop is somewhat puzzling. Without inflorescences this grass is easy to miss or misidentify when so many other graminoid species are present. It's possible one or both of these sampling mistakes occurred when baseline information was collected. The large decrease in dandelion abundance further suggests an increased moisture regime at the site.

Although timothy is still common within plot 95FR004, the vegetation in the area has become more clearly dominated by native graminoids compared to baseline conditions. For plot 95FR009, a decrease in the abundance of timothy, but not native grasses, indicates conditions may have improved slightly. Areas around both plot 95FR004 and 95FR009 continue to support the tufted hairgrass community type.

Vegetation changes indicate that each of the three monitoring plot areas are wetter compared to 1996. The general trend for this type is one of increasing or stable native graminoid abundance, and decreasing abundance of pasture grasses. Monitoring results indicate TNC management

has benefited the native vegetation characterizing this type, at least in the areas sampled. This community type was spotty and limited in extent when vegetation within the Preserve was originally mapped (Jankovsky-Jones 1995). The tufted hairgrass type probably still occurs in limited quantity, but its quality appears to be improving in the Preserve.

Pasture grass community type

Approximately 20 graminoid species were tallied in one of more of the pasture grass plots in 1996 and 2001. Of all these, only one species at one plot (mat muhly in 95FR008) had a significant increase in frequency between sampling periods. None had a significant decrease. Although frequency did not significant change, plant community plot information indicated an increase in Kentucky bluegrass cover at two of the four pasture grass plots. This may be due to reduced livestock grazing, especially at plot 95FR010, located within the Henrys Fork riparian exclosure. Most plots had decreases in the frequency of one or more forb species. This may be partly related to changes in grazing management or perhaps greater competition associated with increases in Kentucky bluegrass cover. The limited number of changes in the frequency or cover of most forb species provides further evidence the vegetation has remained relatively stable in areas with this community type. The community type has not changed for the four pasture grass plots.

The one pasture grass plot that had a willow overstory may slowly be getting more wet. The occurrence of tufted hairgrass and several other mesic graminoids, even though at relatively low cover, suggests the water table may be rising at the plot site. However, any change in the water table has not been enough to alter an understory still dominated by timothy and high forb cover. Increased robustness and cover of willows may be related to reduced livestock grazing in the area. The increased bare ground and decreased litter cover seems puzzling at this plot.

Monitoring indicates TNC management has resulted in minor vegetation improvements such as reduced dandelion cover and increased total grass cover at some of the pasture grass plots. In addition, willow cover has increased at the one plot containing shrubs. Native grasses remain uncommon within this type, and there is no indication native wetland graminoids are becoming established or increasing, except at plot 95FR008 and the one willow plot. Monitoring indicates water table and other soil moisture conditions are basically unchanged. Trend for these plots is stable. A rise in the water table will be necessary for managers to see a conversion of this type to vegetation dominated by native graminoids. The pasture grass community type remains widespread at the Preserve.

Mixed pasture grass/tufted hairgrass community type

Monitoring results for this community type are mixed. The change of plot 95FR001 to a Nebraska sedge-dominated wetland community shows how dramatic and swift the vegetation can respond when moisture conditions are fundamentally altered. The reintroduction of water into Jesse Creek resulted in the apparent elimination of non-native pasture grasses and a large increase in native graminoid cover in the plot area. The increase in native graminoids and decrease in pasture grasses is an improving trend at this plot.

Vegetation changes are much less dramatic at the other three mixed pasture grass/tufted hairgrass plots. Native graminoid composition and abundance are largely unchanged at these plots. Increases in total graminoid cover reflects a greater abundance of timothy at plots 95FR012 and 95FR005. The increases may be related to reduced grazing pressure and a slight increase in available soil moisture in these areas. Plot 95FR012 is located within the Henrys Fork riparian exclosure, and 95FR005 is in an area where only minimal evidence of grazing was observed. Vegetation at 95FR006, the other plot supporting this type, has not changed since

1996. Vegetation trend seems to be more or less stable for this community type outside the Jesse Creek restoration area. TNC management has in some cases increased the overall lushness of this vegetation type, but has neither increased nor decreased the native vegetation component except at Jesse Creek. This community type remains widespread throughout the Preserve.

Jesse Creek restoration area

Prior to restoration efforts, a mix of native and pasture grass species dominated the dry to semi-wet meadow vegetation within the Jesse Creek restoration area. The ground was moist, but flowing water was absent from the Jesse Creek channel when baseline monitoring was initiated. Narrow bands of wet sedge species occurred along or near the creek channel in several places, but in many sections drier vegetation grew right up to the channel edge. In less than five years, the restoration area has developed into a large wetland meadow mosaic. Patches of drier vegetation persist, but the majority of the area now supports vegetation indicative of saturated soil conditions. Vegetation monitoring shows an increase in wet sedge abundance and a complementary decrease in pasture grasses less tolerant or adapted to saturated soil conditions at all plot sites. In most cases, monitoring shows these changes are not restricted to a narrow band close to the creek, but extend outwards 25 m or more.

Monitoring and general observations show that habitat improvement has not been uniform or complete within the restoration area. Outside meanders along the channel tend to support greater wetland development than some inside meander areas. Some inside meander sections appear to be receiving minimal, if any, subirrigation. This is most clear towards the downstream end of the project area. Although it has reduced density and cover compared to baseline measurements, timothy remains common in the area around plot 97FR015. The persistence of silver sagebrush in amounts about equal to baseline levels indicates the water table has not risen enough to eliminate this shrub from downstream sections of the restoration area.

The amount of water flowing in the channel in 2001 was only a few inches in many sections. Instead, most of the water reintroduced into the channel appears to spread out and raise the water table of the surrounding meadow. This extensive sub-irrigation process has resulted in the development of a more extensive and complex wetland than a simple, narrow riparian strip along the channel. Greenline monitoring results show that pasture grass and other drier vegetation types have been almost entirely replaced by wet sedge species along the edge of the Jesse Creek channel. If the goal was to create a more extensive wetland, than the restoration project has been a success. Habitat improvement, including an increase in wetland area and an increase in bank stabilizing sedges along the channel, indicate ecological trends are improving.

Forage production at Jesse Creek

Forage production within the Jesse Creek restoration area has increased dramatically since 1997. Comparative yield results demonstrate the increase in plant biomass and lushness of the vegetation obvious to the naked eye. Although the elimination of livestock grazing within the restoration area cannot be ruled out as an important factor, re-watering the channel is the main reason production has increased. Re-watering has resulted in increased coverage by plant community types that produce greater biomass compared to replaced types. It has also resulted in greater production in areas where the community type has not changed. Together, these are probably the main reasons production measurements increased so much in the restoration area.

Soils around the restoration project area have been mapped as the Bootjack unit; semi-wet meadow range site (Soil Conservation Service 1993). Rangeland productivity for this soil unit is listed as 2,500 lbs/acre during favorable years; 2,000 lbs/acre during normal years; and 1,500 lbs/acre for unfavorable years. Meadows further upstream along Jesse Creek are mapped as the Sawtelpeak unit; semi-wet meadow range site. Productivity for this soil unit is 3,000 during favorable years; 2,250 lbs/acre during normal years; and 1,600 lbs/acre for unfavorable years. Since reintroducing water into Jesse Creek, much of the restoration area is now a wet meadow range type and may be comparable to the Chickreek soil unit, a wet meadow range site mapped elsewhere in Fremont County. Productivity for this unit is listed as 4,440 lbs/acre during favorable years; 3,600 lbs/acre during normal years; and 2,800 lbs/acre for unfavorable years. Production estimates at Jesse Creek in 2001 were comparable to normal or favorable years for this soil unit.

Wetlands with greater above ground biomass are better at filtering sediment, and the accumulation of this biomass over time contributes to the development of organic soils that can store water for longer periods of time. Wetland improvements within the restoration area have very likely improved the quality of water Jesse Creek contributes to the Henrys Fork.

## FLORISTICS

The Flat Ranch Preserve supports a diverse vascular plant flora. The checklist in Appendix 4 contains 153 species in 36 plant families. The grass family is the largest at the Preserve with 29 species. Also well represented, are the aster family with 24 species, and the sedge family with 19 species. In contrast, 16 families are represented by only a single species. *Carex* (sedge) is the largest genus with 17 documented species. *Poa* (bluegrass) has six species. No other genus has more than three species.

The checklist is based on several sources. Elzinga (1993) conducted a botanical survey of the Flat Ranch area in 1993 and compiled an initial list of approximately 110 plant species. I made additions to this list during monitoring visits to the Preserve in 1995, 1996, and 1997 (Mancuso 1995; 1996; 1998). Many species were vouchered by a TNC intern during the summer of 1997, and are on file at the Preserve. Additions to the Preserve checklist will undoubtedly be made in the future.

Plant identification was not a problem for most species while monitoring. The main exception was sedges in the Ovales group. Several factors contributed to identification problems with this group: (1) plants were often only in vegetative condition, with little or no flowering/fruiting material; (2) when inflorescences were present, they were often filled by fruits that failed to mature; and (3) some apparent hybridization of sedge species in the area. I believe clustered field sedge (*Carex praegracilis*) was the main Ovales group sedge encountered while sampling in 2001. This contradicts what I though in 1996, when I called this same entity thickheaded sedge (*Carex pachystachya*). Everything I called thickheaded sedge in 1996 was changed to clustered field sedge for data comparison and analysis purposes in 2001. At this time I am unsure if thickheaded sedge actually occurs within the Preserve. What I called clustered field sedge in 2001, may in actuality include one or more other similar looking species. This does not change any of the results or their interpretation because most of these similar looking sedges are more or less ecological equivalents.

## RECOMMENDATIONS

1. Vegetation monitoring should continue on a periodic basis at the Preserve. Intensive monitoring approximately every five years is probably sufficient if no new projects are undertaken at the Preserve. I recommend the collection of location-specific baseline vegetation

information for any new projects that may result in changes to the vegetation. The Jesse Creek project shows the importance of documenting conditions before, as well as after a project is completed.

2. Less intensive monitoring can be scheduled at more regular intervals if TNC mangers need to assess vegetation trends more frequently. A less intensive protocol would entail most of the methods except the nested frequency sampling. A less intensive version of the nested frequency sampling could perhaps be substituted.

3. It is important that Preserve managers do not destroy or remove any of the monitoring plot witness markers. It will be very difficult to precisely relocate plots in the future if these markers are lost.

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