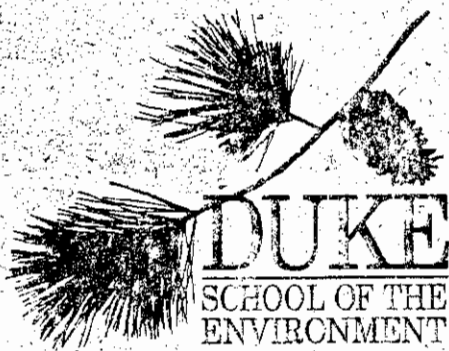


W-6 Silver Creek

RECREATIONAL USE ANALYSIS  
OF  
SILVER CREEK PRESERVE  
BLAINE COUNTY, IDAHO

by

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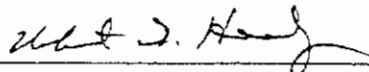
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Christopher J. Wasser

Date: Dec. 15, 1993

Approved:



Dr. Robert Healy, Advisor

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of the requirements for the Master of Environmental Management degree in  
the School of the Environment of Duke University

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## ABSTRACT

Recreational use of wildland areas is rapidly increasing and nearly all studies predict further increases. This increase in recreational use has not been accompanied by a corresponding expansion of the available recreational land base, thus recreational impacts to these wildland sites have been increasing rapidly. At some of the more popular recreation sites this increase in impacts has led to serious degradation of the resources. To mitigate the impacts of recreational users, managers of wildland recreation sites need quality information about the level and types of impacts that are occurring. Recreational impacts can be separated into two broad categories: ecological impacts and social impacts.

This master's project investigates the ecological and social impacts of recreational use at The Nature Conservancy's Silver Creek Preserve in south central Idaho. Over 7000 recreationalists visit the 825 acre Silver Creek Preserve annually, primarily for fly-fishing. To measure the ecological impacts of recreation, eight paired plots were established in four target plant communities. The paired plots consisted of an experimental plot which was open to trampling and control plot which was excluded from trampling. To measure the social impacts of recreation, a survey was developed to measure visitors' preference for the desired type of recreational experience and to determine the social carrying capacity of Silver Creek Preserve. Questionnaires were personally distributed to 205 recreational users throughout the months of May, June, July, and August.

The results of the vegetation study indicate that all of the target plant communities are below carrying capacity. However, the wetland sites exhibited a significant amount of vegetative cover loss (19%) and should be monitored in the future. The results of the survey indicated that preserve managers were currently providing the desired recreational experience. Additionally, since recreational use levels and number of encounters between users were not correlated, a carrying capacity could not be established. This suggests that limiting use should not be considered in solving problems associated with social impacts at Silver Creek Preserve. The analysis of the vegetation and survey data indicates that a strategy based on information and education would be most appropriate for managing current and future recreational use at Silver Creek Preserve.

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## INTRODUCTION

### Recreational Use

Wildland recreation can best be defined as recreation that is dependent on the natural resources of an area (Hammitt and Cole 1987). Recreational use of this type has increased dramatically over the last fifty years and nearly all studies predict further increases. For example, the Forest Service estimates that land-based outdoor recreation will increase by 53 - 80% by the year 2030 (USFS 1990). Any amount of wildland recreational use will have some amount of impact associated with it, whether it is ecological or social. A recreational impact itself is not good or bad, but rather takes on value when placed in the context of management objectives. Thus, the question is not whether or not people should recreate in wildland settings, but rather how much use is acceptable and how much protection is required. Therefore, it is critical to establish management objectives as to the type of recreational experience to be provided.

Frissell and Stankey (1972) argue that in setting these management objectives, managers also define the limits of acceptable change. The concept of acceptable change suggests that there is some natural stochasticity inherent in any system and that changes beyond this level are the result of human uses, in this case recreation. If recreation is to be permitted, some amount of impacts must be considered acceptable (Hammitt and Cole 1987). Therefore, the limit of acceptable change is a management judgment of what impact level is unacceptable. The limit of acceptable change is usually viewed by managers as an ecological concern, but other factors such as political, social, and economic concerns must also be included when setting acceptable limits of change.

When managing for acceptable levels of change, it is important to consider the Visitor Impact Management process developed by the United States National Parks and Conservation Association. This process suggests that resource managers need to consider both ecological impacts and social impacts as equal parts in the analysis of recreation areas

## *The Questions*

(Graefe 1989). Recreation ecology attempts to address the first half of the equation - the effects of recreationalists on natural environments. Social scientists have attempted to determine the latter half of the equation - the effects of recreationalists on each other.

### **Ecological Impacts**

Recreation ecology seeks to understand the relationship between amount of use and amount of ecological impact. Recreational users can have significant ecological impacts on vegetation, soils, water, and wildlife (Hammitt and Cole, 1987). Conventional wisdom would have us believe that amount of impact increases linearly as amount of use increases. In wildland settings this is rarely the case because the effects differ depending on the system in question, the activities of the recreational users, and the timing and distribution of activities (Hammitt and Cole 1987). Frissell and Duncan (1965) found that the relationship between vegetation cover loss and amount of use is curvilinear and asymptotic. That is, lightly used sites are almost as highly impacted as heavily used sites.

One field that has received considerable attention by recreation ecologists is the effect of trampling. Of particular interest are 1) the relationship between amount of trampling and vegetation response and 2) the relative vulnerability of different plant communities (Cole and Bayfield 1993). To effectively manage within the limits of acceptable change, managers need information about vegetation response to the current level of trampling stress. Vegetation trampled to bare ground may lead to more severe impacts such as erosion and gullyng. Thus, controlling trampling impacts should be foremost in the resource manager's mind.

### **Social Impacts**

Social impacts related to recreational use generally involve the number, type, and location of encounters with other recreational users and the way these encounters affect the recreational experience (Shelby and Heberlein 1986). Social scientists have used a

variety of methods to try and grasp the "elusive concept" (Graefe et al. 1984) of measuring social impacts of recreation. Broadly these methods can be grouped under three models : satisfaction, perceived crowding, and contact preference standards.

The satisfaction model is based on the assumption that as use levels increase, recreational users' satisfaction will decrease. The primary problem with this approach is that user satisfaction depends on many factors other than the number of people present at a recreational site. For example, satisfaction may be determined by the personal benefits gained by the experience, the social aspects of the experience, the character of the experience, or the weather (Shelby and Heberlein 1986). The perceived crowding model relies on subjective evaluations of visitor density. The perceived crowding model is better than the satisfaction model because it specifically refers to numbers of people, a parameter management can control. However, this model suffers from fact that the perception of crowding is a complex psychological process that can be influenced by many factors other than the number of people. In fact, many people feel crowded even in low density settings due to the personal standards they bring with them and their expectations about what the particular setting should provide (Stockdale 1978).

The contact preference standard model, developed by Shelby and Heberlein (1986), focuses more specifically on impacts in terms of actual encounters between people. This integrated approach attempts to estimate the optimum level of encounters between recreational users and then use this optimum level as the standard with which to determine social carrying capacity. This model is superior to the satisfaction and perceived crowding models because it relies on the relationship between encounters and use levels, a management parameter that can be adjusted. When visitors agree on the type of experience to be provided, the contact preference standard model represents the best approach for establishing social carrying capacities.



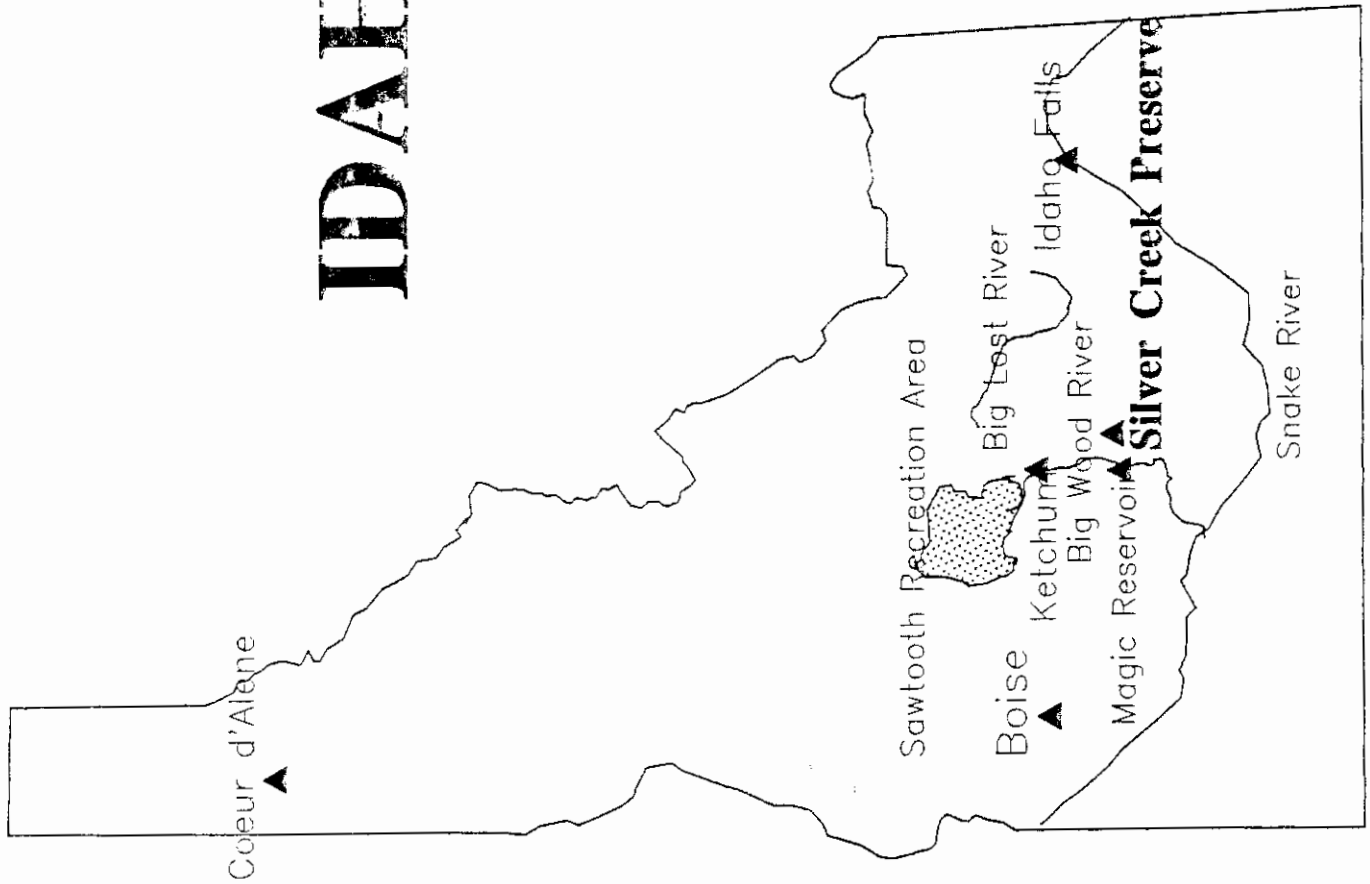
## Study Site and Recreational Use Impacts

The Nature Conservancy's Silver Creek Preserve is located at the northern edge of the Great Basin desert in south-central Idaho (Map 1). Silver Creek Preserve represents one of the last free-flowing, spring-fed, high desert ecosystems remaining in the western United States. Because Silver Creek is spring-fed, the water temperature remains relatively constant throughout the entire year. This is critical for many local animal populations that depend on this riparian corridor during the winter months and for the wild trout which inhabit its year round cold waters. In fact, the growing conditions are nearly ideal for rainbow, brown, and brook trout, which grow to trophy length in Silver Creek Preserve's waters.

These trophy trout are the one of the main recreational draws to Silver Creek Preserve. Annually, over 6300 fly-fishing anglers journey to Silver Creek Preserve to try their luck. Also approximately 700 hikers, bird watchers, boaters, photographers, and cross-county skiers visit the preserve annually. Over <sup>61-66%</sup> half of this recreational use is concentrated during the summer months of June, July, and August. Additionally, since approximately 80% of the visitors are anglers, nearly all the recreational use is concentrated in the aquatic and riparian areas of the preserve.

While these recreational users provide a large support base and an effective outreach group, they do have negative impacts at Silver Creek Preserve. Most of the ecological impacts can be attributed to the anglers, since most other visitors use the maintained trail system. The impacts due to fishing can be divided into two groups: ecological impacts and social impacts. The most significant ecological impacts at Silver Creek Preserve are trampling of vegetation and the creation of social trails. Since anglers spend a considerable amount of their time in the riparian corridor searching for the "perfect fishing hole" and entering/exiting the creek, much of the fragile riparian vegetation receives high levels of trampling. This has resulted in structural damage and

# IDAHO



loss of cover in some areas, which damages the structural integrity of stream banks and may lead to erosion.

This process of searching for the "perfect fishing hole" also often leads to a phenomenon known as social trailing. Social trail building occurs when different users leave maintained trails and create new trails to their favorite spots or in search of the "perfect fishing hole." As use has increased at Silver Creek, social trail building has become a serious problem because once social trails become established other people tend to utilize these trails and then create new social trails. This has led to the removal of large areas of vegetation cover in specific locations.

The most significant social impact of recreation at Silver Creek is crowding on the creek. Since fly-fishing is a solitary sport for many anglers, the presence of many other users can significantly reduce the quality of the recreational experience. This is magnified when other users are loud or move about frequently, scaring the fish.

### **Project Goals and Objectives**

The primary goal of this project was to determine if current levels of recreational use are exceeding the social and vegetational carrying capacity of Silver Creek Preserve. This involved determining the current amount of trampling and social trail creation and evaluating how the current level of crowding affects the recreational experience. Secondary objectives included: determining the susceptibility of different plant communities to current levels of trampling and determining visitor preferences which will guide future visitor management. The final objective of this project was to use this information to help develop a management strategy to solve the current problems related to recreational use at Silver Creek Preserve.

## BACKGROUND INFORMATION

### Site Description

*Geology:* Four separate geologic events have determined the present structure of the Wood River - Silver Creek basin. The foundation was laid 250 million years ago by a huge inland sea which deposited large quantities of sediment which eventually compacted into beds of sedimentary rock. 180 million years later the Idaho Batholith, an enormous body of magma, intruded through this sedimentary floor forming jagged granite peaks and cliffs. Next, about 17 million years ago, a hot spot began to surface at Crater Lake, Oregon. As the North American continental plate moved west, the hot spot carved an arc through Oregon and Idaho, and is currently located in Yellowstone National Park. Lastly, when the last Ice Age ended, the retreating glaciers sculpted the valley into its current geologic state. Thus, the Wood River - Silver Creek basin is composed of large alluvial deposits of coarse stones and aggregates with a bedrock structure of permeable limestone and fissured lava (Schweibert 1977). All four soil series found on Silver Creek Preserve (Molyneux loam, Picabo loam, Kilpatrick loam, and Hayspur loam) are alluvial in origin (TNC & BCSCS, 1978). The erosion potential by water is low except on steep hillsides where erosion potential is moderate (TNC & BCSCS, 1978).

*Hydrology:* The hydrologic regime of the Silver Creek Watershed is largely determined by the Big Wood River that flows south from the Boulder mountains. Each spring, snow melt causes the Big Wood River to swell and about 15 miles north of the preserve some of this water seeps into gravel formed from ancient glacial outwash. This water flows underground for several months until it is forced to the surface by underlying layers of impermeable clays and the rising barrier of the Picabo Hills. Since the water travels underground for several months, the high water at Silver Creek occurs in the late summer. The water emerges in the form of hundreds of small springs scattered throughout the

Silver Creek basin. These many small tributaries eventually merge to form the headwaters of Silver Creek, within preserve boundaries. Average historical flows at Silver Creek Preserve are approximately 150 cfs.

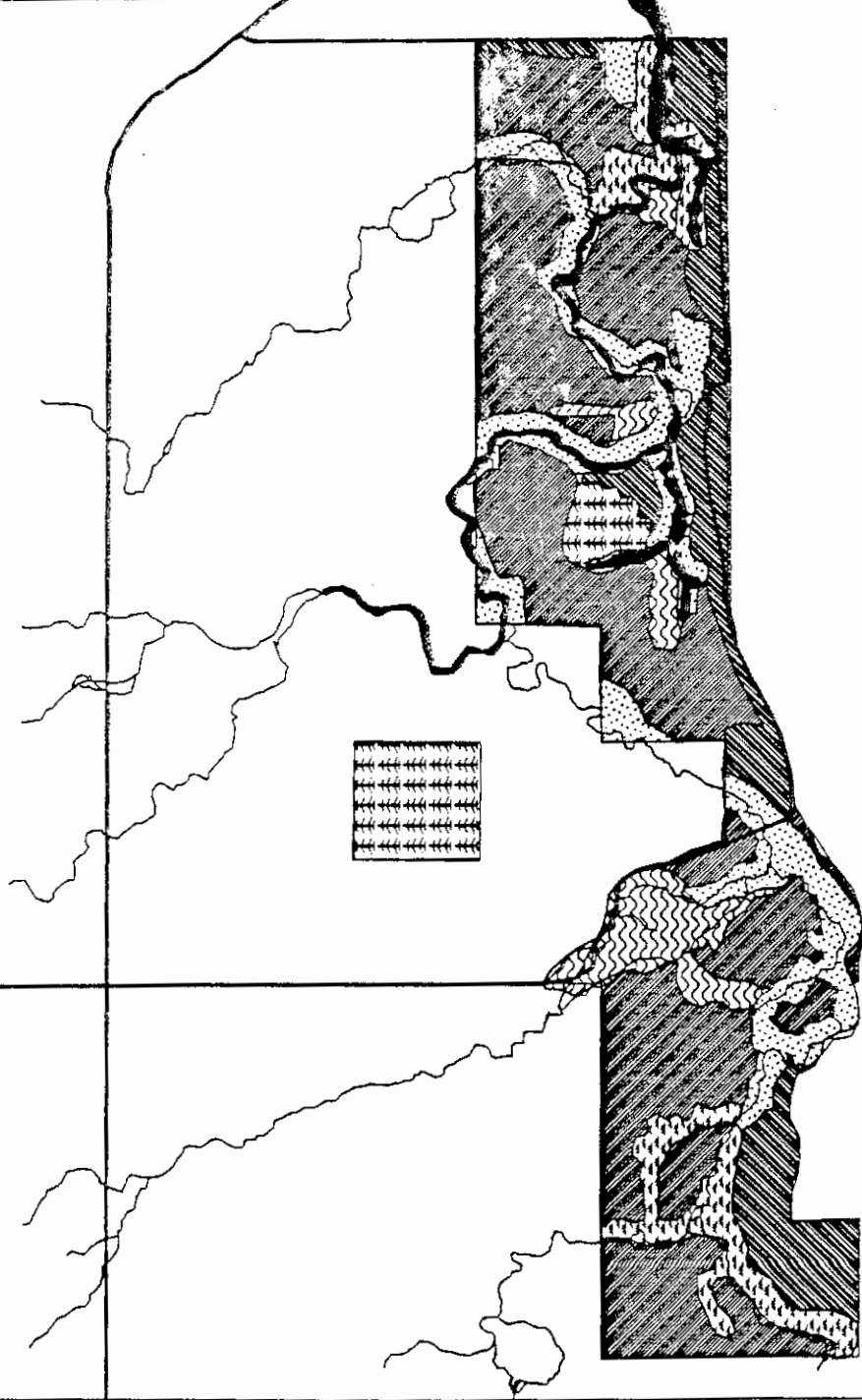
*Ecology:* The preserve lies at an elevation of approximately 5000 feet, with average annual precipitation of 14 inches. This 825 acre preserve protects several important vegetation communities, including wetland species such as reed canary grass (*Phalaris arundinacea*), sedges (*Carex* spp.), and bull rush (*Scirpus validus*). Surrounding these aquatic communities is a riparian shrub/tree corridor consisting of willow (*Salix* spp.), water birch (*Betula occidentalis*), and red stem dogwood (*Cornus stolonifera*). Further away from Silver Creek, the preserve is dominated by sagebrush/grasslands composed of big basin sagebrush (*Artemisia tridentata* subsp. *tridentata*), great basin wildrye (*Elymus cinereus*), bluebunch wheatgrass (*Agropyron spicatum*), and needle and thread grass (*Stipa comata*). Two stands of aspen (*Populus tremuloides*), with an understory composed primarily of woods rose (*Rosa woodsii*), exist on the preserve (Map 2).

The plant communities that currently exist represent a fairly "natural" (pre 1800) mix of species that would typically occur. The species composition is "natural" in most places, but fire suppression has resulted in the dominance of sagebrush over perennial grasses where they exist together. This has resulted in the late successional stage of many of these individual sagebrush and grassland islands. However, on a Preserve-wide scale the mix of sagebrush and grasslands is roughly appropriate for this bioregion. In addition, several exotic species have established populations at Silver Creek Preserve, most notably cheatgrass (*Bromus tectorum*) and Canada thistle (*Cirsium arvense*).

*Historical Land Use:* When the Silver Creek Basin was homesteaded, much of the land was intensively grazed by cattle, sheep, and horses on small ranches. Evidence of grazing is still visible today on sections of the Preserve which had easy livestock access. Many of

# SILVER CREEK PRESERVE

## Vegetation Communities



### Silver Creek



BOUNDARY



STREAMS



VEGETATION



COUNTYROADS



STATEROADS



STREAMS

### Plant Communities



ASFEN



GRASS



SAGE\_GRASS



ROSE\_CINQUE



SEDGE\_RUSH



WILLOW\_BIRCH

Feet



0 2000

these areas have little or no native flora remaining. During the early 1940s many of the smaller ranches were purchased by the Union Pacific Railroad Company, which used the lands primarily as a hunting and fishing retreat. Around 1950, other landowners began farming some of the land now within the current preserve boundaries. Evidence of this past intensive agricultural use is still visible today. In places where past owners farmed to the creek's edge, the riparian corridor vegetation is still absent. In 1976, The Nature Conservancy, a national, non-profit conservation organization, was contacted by several hundred anglers and interested individuals from around the country in the hope that The Nature Conservancy would purchase the 479 acre Sun Valley Ranch to ensure continued public access to this blue ribbon trout stream. In 1980, The Nature Conservancy added the Stalker Creek Ranch, a contiguous upstream parcel, to bring the Preserve to its current size of 825 acres.

The design of Silver Creek Preserve is derived mainly from existing property lines, but more or less follows the course of Silver Creek in a linear fashion (Map 2). The Preserve is surrounded to the east, west and north by agricultural fields and rangelands. To the south of the preserve lies extensive Bureau of Land Management (BLM) rangeland, consisting of sagebrush/grassland communities and scattered aspen groves. The Preserve is surrounded by county and state roads and is bisected by a power line. The Silver Creek basin is a rural landscape consisting of agricultural fields and rangelands, with minimal development.

*Current Land Use:* Since acquisition, the Nature Conservancy has reduced the amount and extent of agriculture within the preserve and prohibited all high-impact forms of recreation. In the last two years, the Nature Conservancy has begun restoration efforts in the degraded sections of the riparian corridor. The majority of human use at Silver Creek is through recreational activities. The number of recreational visitors at Silver Creek Preserve has increased tenfold since 1976, with over 7000 visitors arriving in 1992.

Educational outreach programs with local schools form the second major type of visitor use at Silver Creek. In addition, some preserve lands are currently leased to local farmers for barley production. Since recreational, educational, and farming activities form the basis for interactions with the surrounding communities, they will be preserved in some form indefinitely.

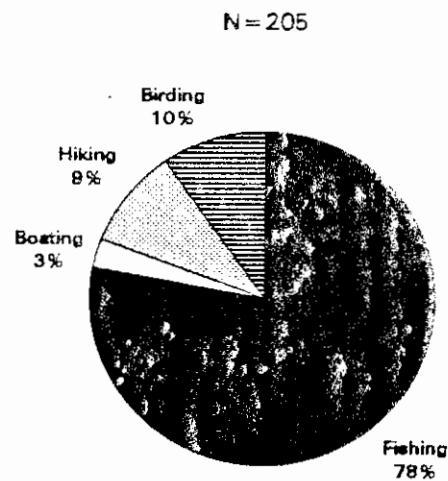
*Management of Silver Creek Preserve:* Silver Creek Preserve is managed entirely by the staff of The Nature Conservancy, which includes an area manager, a Preserve manager, three seasonal interns, and numerous volunteers. The Nature Conservancy is a non-profit, conservation organization dedicated to protecting rare and threatened habitat. Since Silver Creek has been declared navigable waters, the Idaho Department of Fish and Game is responsible for enforcing regulations related to the aquatic resource, including fishing regulations and boat access.

*Recreational Activities and Use at Silver Creek Preserve:* Currently, approximately 80% of the recreational use at Silver Creek Preserve is fly fishing for trout. Other uses include wildlife viewing, hiking, boating, photography, cross-country skiing, and limited waterfowl hunting (please see Figure 1).



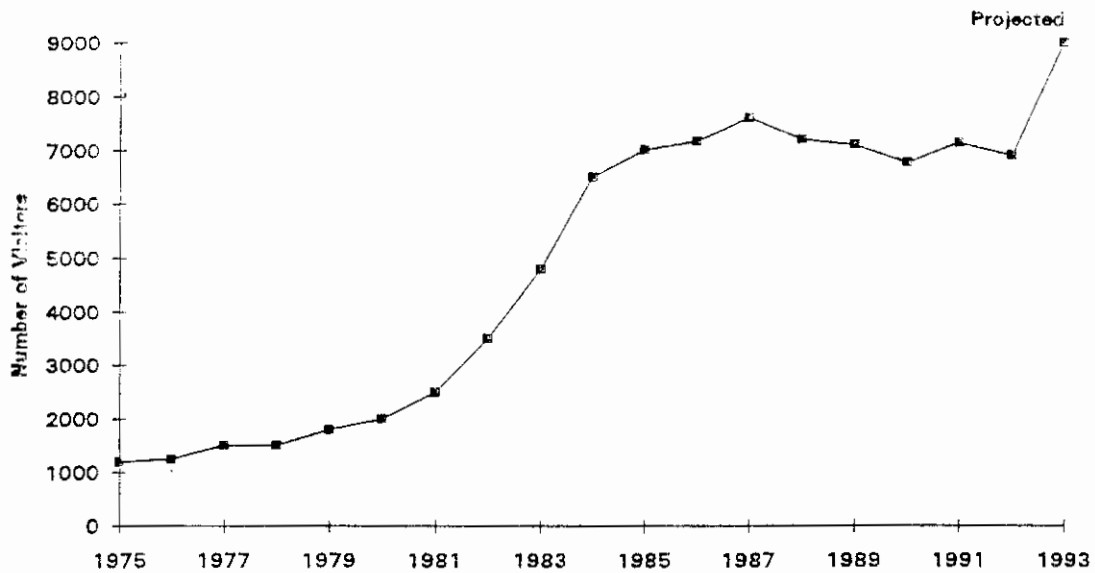
**Figure 1: Recreational Uses at Silver Creek Preserve**

Source: Author's survey, 1993



When Silver Creek Preserve was first established in 1975 approximately 1000 people visited the preserve. The number of visitors slowly increased during the late seventies, but rose dramatically to over 6000 by 1984. Since then, use levels have remained relatively constant at or near 7000 visitors per year. However, estimates for 1993 project the number of visitors to approach 9000 (P. Todd, personal conversation). This recent surge is probably due to heavy winter and spring precipitation which raised the water level in many other nearby rivers to a level that precluded fishing for the better part of May and June. Since Silver Creek is a spring creek, its water level fluctuates much less than nearby rivers, allowing anglers to fish its waters from opening day of fishing season. Additionally, the sport of fly-fishing is currently experiencing significant growth, especially with recent movies like *A River Runs Through It*.

Figure 2: Annual Visitors to Silver Creek Preserve, 1975-1993



*Substitute Activities:* Substitute locations for all recreational uses at Silver Creek abound in south central Idaho. Idaho Fish and Game manages several downstream miles of Silver Creek for essentially the same activities that occur at Silver Creek Preserve. Several popular trout streams are also nearby, including the Big Wood, Lost, and Salmon rivers. Canoeing opportunities exist at Magic Reservoir and on the above named rivers. Substitute locations for other recreational uses, such as hiking, cross-country skiing, photography, and wildlife viewing, exist throughout the Big Wood river valley and in the Sawtooth National Recreation Area one hour to the north (Map 1).

### Objectives

*The Nature Conservancy:* The Nature Conservancy's mission statement is to "preserve plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and water they need to survive." The Nature Conservancy's primary preservation goal at Silver Creek is to ensure that the globally endangered desert spring aquatic system and its associated plants and animals are protected. Protection of this riparian corridor is critical to the Nature Conservancy's efforts in Idaho since 50% of

Idaho's wetlands have been lost to development and many plants and animals depend on these corridors for their existence. Preservation efforts have been largely focused on the aquatic regions and associated riparian corridor. Other community level objectives include restoring the natural diversity of the sagebrush/grasslands that exist within preserve boundaries and controlling exotic species that have established themselves on the preserve.

*Recreational Use Objectives at Silver Creek Preserve:* The primary objective regarding recreational use is to provide undeveloped, non-motorized recreation, assuming such use does not conflict with The Nature Conservancy's primary preservation goal at Silver Creek Preserve. Secondary recreational use objectives include the following:

- provide year round access to the preserve for catch and release fly fishing (during legal season), hiking, wildlife viewing, canoeing, limited waterfowl hunting , and cross-country skiing. No motorized vehicles, bicycles, or pets are allowed on the preserve.
- maintain a marked trail system to concentrate and minimize visitor impacts and to provide access to major fishing and hiking areas of the preserve.
- operate a visitor center seven days per week from Memorial Day through Labor Day and 3-4 days per week from Labor Day through October. Visitor center should provide knowledgeable staff, TNC sale items, educational displays, picnic areas, and outhouse.
- allow limited duck hunting 3 days per week during state regulated season. Allow boat access only; no carrying of firearms above high water mark; dogs allowed for retrieval of downed waterfowl only.
- annually evaluate visitor use levels and the resulting ecological and social impacts.

## METHODS

### Impacts on Vegetation

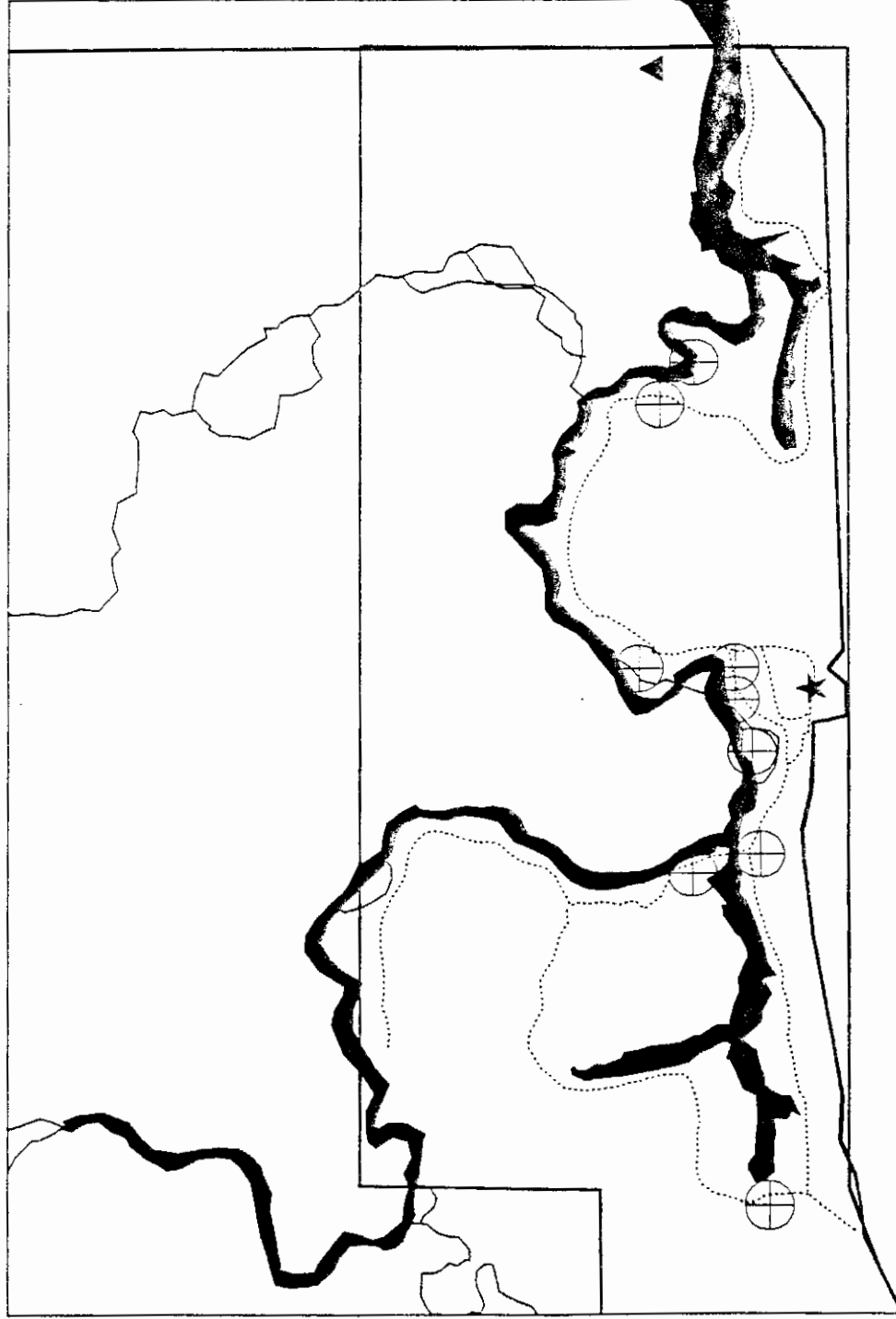
*Study Plots:* Four vegetation types were selected as the plant communities of Silver Creek Preserve that receive the most use by recreationalists. These sites represent the spectrum of vegetation, from xeric uplands to wetland sites. The upland sites are characterized by xeric soils away from the riparian corridor and are largely composed of sagebrush, cheatgrass, thistles, and mustards. The riparian grass sites and sedge sites are mesic stream bank communities, which can receive seasonal flooding. These sites are fairly homogenous, with grass and sedge dominating the respective sites. The fourth vegetation type, rush and cattail, occurs in wetlands, where the soils are flooded the entire year.

*Field Methods:* Four replicates were placed in each vegetation type. Each set consisted of two 1m x 1m plots - one enclosure plot (control) and one open plot (experimental). The control plots were delineated by connecting four corner stakes with blaze orange twine and flagging. Experimental plots were not marked in any manner. Each pair of plots, control and experimental, was located by placing two tapes of equal length perpendicular to each other and then choosing coordinates using a random number table. If the coordinates fell outside the target vegetation community, a new set of random coordinates was generated. All eight plots do not need to be in the same location (Map 3). However, plots must be established in pairs - an open plot must have a control plot in the same location.

Measurements of coverage of vascular plant species and bare ground were visually estimated on all plots using a 1m x 1m quadrat, which is divided into 25 sections. Only green photosynthetic material was included in estimates. Vegetative cover was recorded

# SILVER CREEK PRESERVE

## Study Plot Sites



⊕ Study Plot

Silver Creek

BOUNDARY

STREAMS

COUNTYROADS

STATEROADS

STREAMS

TRAILS

BUILDINGS

VISITOR\_CENTER

Feet

0 1000

as follows: 0 if there is no cover, or as the closest of the following values: 1, 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, or 100%. Vegetation height was measured to the nearest 1cm, utilizing 25 replicate measurements in each plot, one in each of the quadrat sections. Initial measurements were taken on May 26-28 and final measurements were taken on August 16-18. Photographs were taken at each plot during the August measurements.

*Data Analysis:* The two primary response variables used to measure impacts to the four vegetation types were relative vegetation cover and relative vegetation height. In both cases, conditions after trampling are expressed as a proportion of initial conditions, adjusted for spontaneous changes on the control plots (Bayfield 1979). Relative vegetation cover was calculated as follows:

$$\frac{\text{surviving cover on trampled plots}}{\text{initial cover on trampled plots}} \times cf \times 100\%$$

where  $cf = \frac{\text{initial cover on control plots}}{\text{surviving cover on control plots}}$

In the absence of any change in cover caused by trampling, relative cover would be 100%. Therefore, the extent to which relative cover deviates from 100% provides a measure of damage response to trampling (Cole and Bayfield 1993). Relative height was calculated using the same method, substituting height for cover in the above equations.

### **Social Impacts**

*Survey Methods:* Before the survey was administered, a focus group, consisting of both recreational users and management, was assembled to assess the effectiveness of the questions. Several revisions were made before the survey was handed out to recreational users. A random sample of the recreational users received a questionnaire upon leaving Silver Creek Preserve (Appendix C) and was asked to complete the survey. The author was present to answer any questions and to ensure completion of the entire questionnaire.

Most people were excited to voice their opinions about Silver Creek Preserve. Only one recreational user refused to complete a survey.

*Data Analysis:* The method utilized by this report for estimating social carrying capacity levels for recreational levels was developed by Shelby and Heberlein (1986). First, use levels are determined for the resource in question. Next, using the responses to the questionnaire, contact preferences are developed for Silver Creek recreational users. These contact preferences reflect the number of encounters (defined as any interaction with another recreational user - visual, verbal, or physical) a recreational user will tolerate, given an expectation for a certain type of recreational experience. Additionally, actual encounter levels are also determined using responses to the questionnaire. Lastly, by determining the relationship between use and encounter levels a social carrying capacity is established, based on contact preferences.

## RESULTS AND DISCUSSION

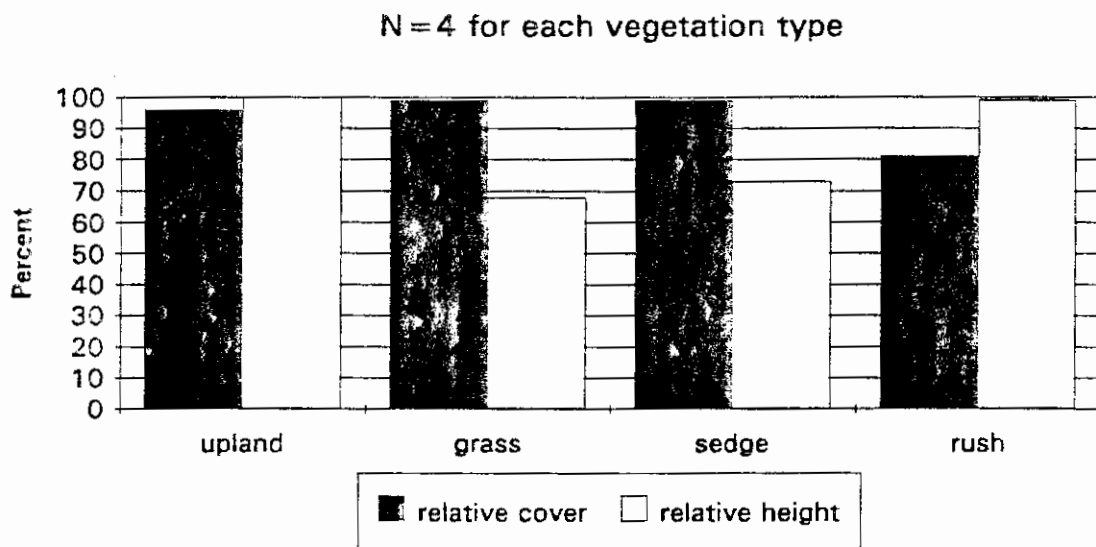
### **Impacts on Vegetation**

*General Responses:* The mean values for relative cover and relative height for the four vegetation types are illustrated in Figure 3. These values represent the relative change in experimental plots, due to summer recreational use, adjusted for changes on the controls. For all vegetation types, relative cover declined at current use levels. However, only the rush and cattail sites, with a mean relative cover of 81%, were seriously impacted in terms of lost cover. According to Liddle (1975) relative cover values of 50% or lower signify that use is above carrying capacity. Using this definition, current use levels are below the carrying capacity for all of the plant communities sampled.

Changes in vegetation height, due to recreational use, represent a structural change to the plants. With the exception of the upland sites, relative height was lower than 100%

at current use levels for all vegetation types. The riparian grass sites, with a mean relative height of 68%, suffered the most height loss, followed by sedge sites in which relative height was 73%. All of the mean values were above the 50% threshold - a key level of response in this procedure (Cole and Bayfield, 1993). This suggests that current use levels are below the carrying capacity for all four communities.

**Figure 3: Mean Impact Response Values for all Vegetation Types**



*Specific Responses:* The least affected vegetation type was the upland, composed primarily of sagebrush and cheatgrass. This vegetation type probably receives the least amount of traffic, due to three factors: 1) it is the furthest vegetation type from the creek, where most of the recreational use occurs, 2) trails are well established, and most importantly 3) these parts of the preserve are used mainly as thoroughfares, not destinations. Thus, nearly all of the use is concentrated on the well defined trail system, resulting in little impact outside the trail corridor. The common perception at Silver Creek Preserve is that upland plant communities are very susceptible to human impacts, but in



general does not receive much impact (Todd, personal communication). Thus, current use levels and patterns are below the carrying capacity of the upland plant communities.

The responses of the riparian grass and sedge sites were essentially the same: a negligible amount of cover loss (1%), with a serious reduction in height. The relative height on riparian grass sites was 68%, while for sedge sites relative height was 73%. Since these vegetation types receive the most traffic throughout the fishing season, it is interesting that only structural changes to the vegetation are occurring, not loss of cover. Thus, we may conclude that riparian grass and sedge sites are relatively tolerant to trampling. This is critical, due to their function as stream bank stabilizers. While the response of most sites is similar to the mean values reported above, severe overuse has resulted in significant loss of cover in specific locations. Thus, on a preserve level the current level of impacts is below the carrying capacity of riparian grass and sedge communities. However, management should monitor the overused sites carefully to determine if rehabilitation or other measures are needed to protect the vegetation.

The response of the rush and cattail sites is the most troubling. The relative cover value of 81% suggests that this vegetation type is not very tolerant to trampling. When this is combined with the relative height value of 99%, a picture emerges where the vegetation response is of the extreme - there is either full grown vegetation or loss of cover. Personal observations of these sites confirm this line of reasoning. In places where there is any impact the vegetation is trampled to the bare ground, while on either side of the impacted areas, there is no appreciable impact. While a relative cover value of 81% itself is not critical, the bulrush and cattail communities are sensitive to the current use levels and should be closely monitored in the future, since these wetland sites are important to the effective functioning of the entire Silver Creek system.

## Social Impacts

*Encounter Preferences:* Between May 21 and August 15, 1993, two-hundred and five questionnaires were completed by Silver Creek Preserve recreational users. The responses to the survey questions form the basis of the social impact analysis. The first two questions (see Appendix C) attempt to gauge the difference between visitor expectations and actual conditions at Silver Creek Preserve.

**Table 1: Expected and Actual Encounters**

N= 205	Anglers	Boaters	Other Recreational Users
Expected Encounters	11.8	0.9	2.4
Actual Encounters	10.2	0.4	1.3

Since expected and actual encounter levels are essentially the same, we can assume that, in general, the recreational users of Silver Creek Preserve know what to expect. In fact, all of the expectations were higher than the actual values. This is important because often the perception of crowding is more important than the actual number of people. Fortunately at Silver Creek Preserve expectations are similar to actual conditions. Thus, no effort is necessary in educating recreational users on encounter levels.

The next sequence of questions (see Appendix C) tries to describe the type of recreational experience visitors would prefer at Silver Creek Preserve. Because the "right" number of encounters at Silver Creek Preserve depends heavily upon visitors' perception of the experience provided, four hypothetical experience types are presented. The four experience types are: wilderness ( a place generally unaffected by the presence of humans), semi-wilderness ( a place where solitude is not expected), undeveloped ( a place where a natural setting is provided, but meeting other people is part of the experience),

and developed ( a place where the natural setting has been altered and meeting many other people is part of the experience) (Shelby and Heberlein, 1986). The respondent indicates the highest number of encounters they would tolerate before their experience changed to a different experience type. Analysis of these responses produces estimates of the degree to which recreational users' preferences are being met by the current recreational experience. Following Shelby and Herberlein's (1986) model, the range of tolerable encounters was defined as between zero and the median response. The optimum encounter level was defined as the mode, the encounter level that received the greatest number of responses.

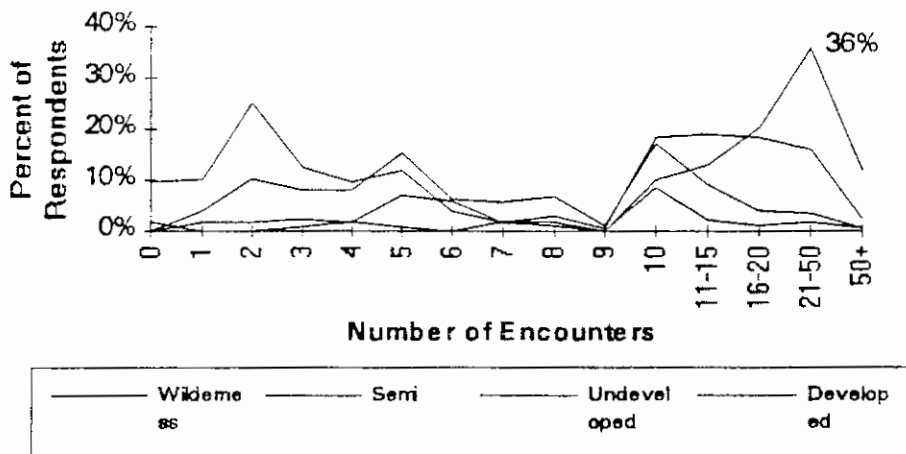
For wilderness experiences, the range of tolerable contacts is from zero to three encounters, with an optimum of two encounters. Ninety percent of the respondents need ten or fewer encounters to have a wilderness experience. The range of tolerable contacts for semi-wilderness experiences is from zero to six encounters, with an optimum of ten encounters. With semi-wilderness the use of the mode is suspect, due to respondent bias toward perceptually round numbers. Fifteen or fewer encounters would satisfy ninety percent of the respondents. For undeveloped experiences, the range of tolerable contacts is from zero to twelve encounters, with an optimum of ten encounters (the same as the optimum for semi-wilderness encounters). For ninety percent of the respondents thirty or fewer encounters is necessary for undeveloped experiences. The range of tolerable contacts for developed experiences is zero to twenty, with an optimum contact level of twenty. Sixty-five or fewer encounters would satisfy ninety percent of the respondents. The responses of visitors is summarized in Table 2.

**Table 2: Encounter Preferences**

	Wilderness	Semi-Wilderness	Undeveloped	Developed
Range of tolerable encounters	0-3	0-6	0-12	0-20
Optimum encounter level	2	10	10	20
90% Agreement encounter level	10	15	30	65

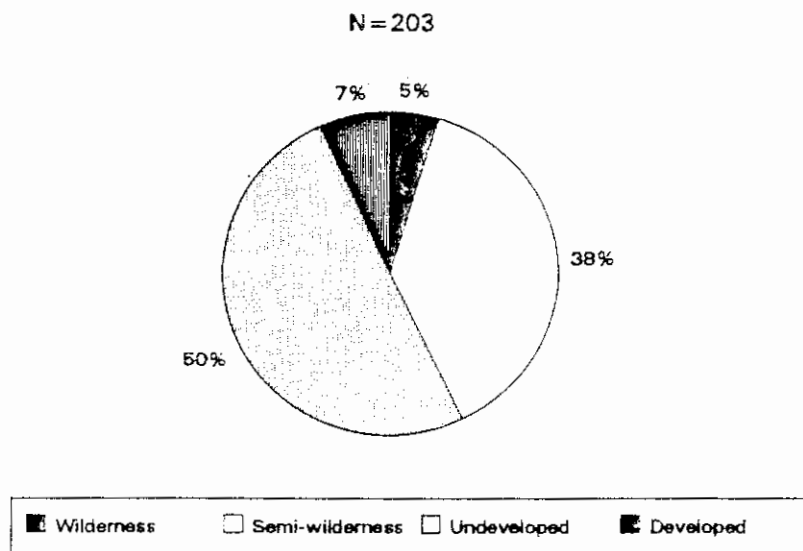
Another way of looking at these results is a graph of the encounter norms, that is plotting percentage of respondents versus encounter levels. This graphically represents the data in Table 2. The highest point on each curve is the optimal encounter level and from the shape of the curves one can get a sense of the preferences of recreational users. For example, the curve for wilderness encounter norms is highest towards the origin and declines as you move to higher encounter levels. It is interesting to notice the large response for all four experience type at ten encounters. This suggests a respondent bias towards perceptually round numbers.

**Figure 4: Encounter Norms for Silver Creek Preserve**

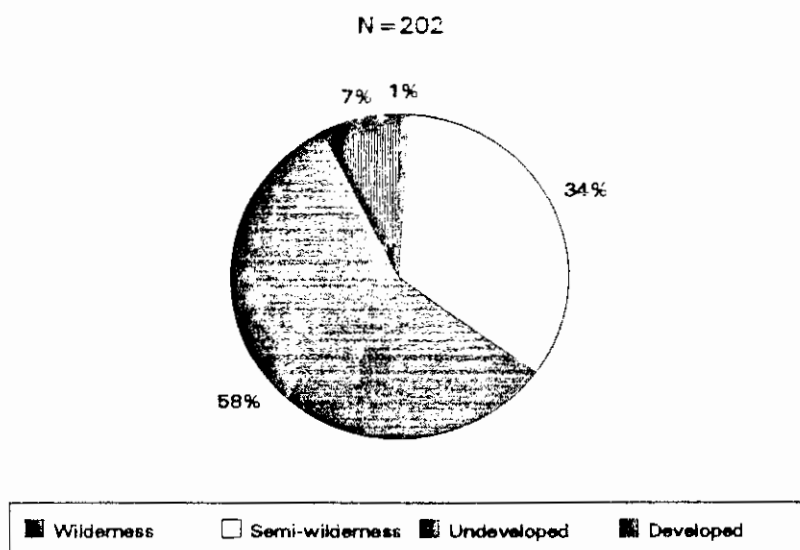


Next we combine the above results with the preferences for which type of recreational experience Silver Creek Preserve currently provides and which type managers should provide. The type of recreational experience that managers should provide will determine which set of encounter preferences managers should use when attempting to set the social carrying capacity of Silver Creek Preserve.

**Figure 5: Recreational Experience Currently Provided**



**Figure 6: Recreational Experience That Should be Provided**



It is clear from the above graphs that the majority of recreational users feel that managers currently provide an undeveloped recreational experience (50%) and should continue providing this type of experience (58%). When these preferences are combined with the above encounter data the range of tolerable contacts for Silver Creek Preserve becomes 0 to 12, with an optimum contact level of 10. As an upper limit, managers at Silver Creek Preserve should strive to assure that contact levels do not consistently exceed 30, the level of 90% agreement.

These derived encounter preferences compare favorably with the actual encounter conditions at Silver Creek Preserve. Survey results show that actual encounters this summer averaged approximately 12 encounters. This value is within the tolerable range of encounters derived from visitors' demand. Thus, Silver Creek Preserve is currently operating within its user-defined capacity for encounters. This suggests that as a first-cut, Silver Creek Preserve managers can use current visitor numbers as a value close to the upper limit for social impacts of recreation.

Improving recreational experiences is often hindered by the fact that visitor preferences are not echoed by management, due to differences in values and perceptions of impacts (Jim, 1989). A survey of managers (n=5) showed that four felt that they currently provided an undeveloped recreational experience and three felt they should continue to provide this type of experience. The remaining two managers felt that they should provide a semi-wilderness experience. Since both management and users believe that an undeveloped recreational experience is currently provided and should be provided in the future, implementing management strategies should be considerably easier.

*Relating Use and Encounters:* The next step in calculating a social carrying capacity is to relate use levels and encounter levels. During the 1993 summer months, use levels, measured as total number of visitors who signed-in at the Visitors' Center each day, ranged from a low of 13 to a high of 145. The mean use level was 67.5 visitors per day. During the same period, encounter levels, based on survey data, ranged from a low of 0 to a high of 31, with a mean of 13.6 encounters per day.

These data can be combined to develop a tentative relationship between use levels and encounter levels. First, the ranges of use and encounters were divided into three ranges: low, medium, and high. Then the three values for visitor use were aligned with the corresponding values of encounters to develop the matrix shown in Table 3 below. Based on the prior analysis of recreational experience preferences which defined the optimum contact level as 10, we can estimate that the optimum number of visitors for undeveloped recreation at Silver Creek Preserve would be 57. The last row represents how many visitors would be satisfied at each use level. These values suggest that in order to satisfy a majority of the visitors, Silver Creek managers should attempt to keep visitor numbers below 100 visitors per day.

**Table 3: Use and Encounter Levels**

Range of Use Levels				
	Low	Medium	High	Mean
Visitors per day	13-56	57-100	101-145	67.5
Encounters per day	0-9	10-20	21-31	13.6
Mean Encounters	4.5	15	26	
% of Visitors Satisfied with Experience	88	52	34	

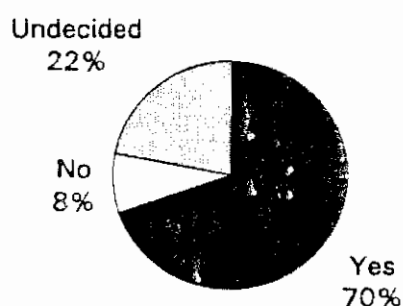
However, the correlation coefficient for daily visitor numbers and daily mean number of encounters is 0.09, suggesting no significant relationship between use and encounter levels. There may be several factors which may explain this phenomenon. First, due to the nature of fishing at Silver Creek Preserve several locations are used on a consistent basis. Thus, it might be possible to have only a few anglers on the preserve, yet they may all encounter one another. Second, there may be significant differences between user definitions of encounters, which would stress this relationship. Lastly, there may be deficiencies in the research method. Specifically, this methodology was developed for use mainly by river floating parties (Shelby and Heberlein 1986), and perhaps it does not translate well to this type of experience. Or perhaps the Silver Creek experience needs to be defined with other variables in addition to encounter levels. The lack of a relationship between use and encounter levels suggests that a decrease in use levels would not significantly reduce encounter levels, at least not within current usage levels. This suggests that the Silver Creek management should utilize management strategies, other than limiting use, to manage social impacts of recreation at Silver Creek Preserve.



*Methods of Limiting Use:* First, recreational users were asked whether they support the current policy of unlimited access. Not surprisingly, a large majority of respondents replied positively.

**Figure 7: Support for Policy of Unlimited Access**

**Do You Support Unlimited Access?  
N = 202**



The responses show that most recreational users (70%) at Silver Creek Preserve do not want use limitations placed upon them. This is yet another reason to suggest management strategies other than use limitations.

The 1993 results differ significantly from a survey conducted in 1988 where only 59% of the respondents supported the policy of unlimited access. This may be the result of several factors in isolation or combination: 1) changing preferences, 2) smaller sample size (82 versus 205), or 3) different survey methodology (magazine mail-in versus personal interviews).

Respondents were queried about four different methods of limiting access to Silver Creek Preserve: an entrance fee, a reservation system, a first-come/first-served system, and a combination of limited reservation spots and limited first-come/first-served. None of the methods received majority acceptance, further supporting the aversion to use

limitations. The combination and entrance fee approaches received the highest approval, 45% and 42% respectively, suggesting these two as the most appropriate. However, due to the response to the unlimited access question above and the lack of a relationship between use and encounters, limiting use should only be considered as a last resort.

*Verbatim Summary:* In response to the prompt: Please add any additional comments about the management of Silver Creek Preserve, 121 recreational users responded (please see Appendix A for full comments). These responses are subdivided into four main categories: Management, Crowding, Resource, and Additional Comments. According to replies, respondents prefer the use of reservation systems and entrance fees over other methods of limiting use. Five respondents suggested limiting use to The Nature Conservancy members, or supporters of Silver Creek Preserve. Two respondents favored limiting the number of professional fly-fishing guides who enter the preserve. In terms of other management issues, the general sentiment appears to be that recreational users feel The Nature Conservancy has done an "excellent" or "good job" in managing Silver Creek Preserve. Six of the seven comments about the staff were positive. Lastly, four respondents would like to see The Nature Conservancy ban boats on Silver Creek Preserve.

A majority of respondents (9 of 15 who commented on the subject) found the preserve to be too crowded, however six people did not feel that crowding was a problem. Three users felt that recreational use at Silver Creek Preserve is self-limiting. That is, as the number of visitors increases some people will not return, with the number of visitors leveling out when the number of new visitors equals the number of people who choose not to return. Three people suggested trying to redistribute the use seasonally, utilizing the fall months when the Preserve has significantly fewer visitors.

Resource damage seems to be noticeable to some recreational users, as six complained of damages. The general feeling seemed to be that although there were

impacts from anglers, they were not severe enough to merit the use of limits. However, most agreed that if angling impacts began to severely impact the resource they would support limiting use. Only one respondent in this section felt that present use was not affecting the Preserve.

Most (24) of the additional comments were general statements about how well The Nature Conservancy is doing at Silver Creek Preserve. Comments like "Keep up the good work. Thanks." were common. Lastly, another trend was the suggestion that the management should just "leave it [management of visitors] alone".

## MANAGEMENT ALTERNATIVES

### General Observations

The effective selection and implementation of management alternatives depends first upon taking the pulse of visitor preferences. By matching visitor preferences with management actions, the potential for future conflicts can be reduced (Jim 1989). As Lime (1974) aptly points out, the main principle that managers should strive towards is to be guided by, and not to contradict or worse yet, ignore user preferences. Obviously, managers cannot satisfy every nuance of users' needs (particularly since they are often contradictory), but gaining a better sense of the general behavioral instincts and inclinations can be very helpful. Differences between management and users' perceptions of the type of recreational experience to be provided can often lead to disaster, thus communication of each groups' preferences is critical. Silver Creek Preserve is fortunate in this regard since Silver Creek Preserve management and recreational users agree on this most basic preference.

With visitor preferences in mind, visitor management serves two goals: 1) reduction of impacts and 2) enhancement of the recreational experience. Often these goals may conflict with one another, but a carefully planned visitor management plan can usually

achieve both goals. However, visitor management is still more of an art than a science, since changeable human behaviors are involved (Stankey 1980). It is important to recognize that visitors are relatively amenable to different management techniques, as long as the rationale is clear and reasonable (Lime 1976; Cole et al. 1987; Stankey and Schreyer 1987).

In general, effective management of visitors requires that managers first specify the objectives of the management plan, then inventory the sites to be managed, next compare inventory results to objectives, and lastly take action where necessary (Hammitt and Cole 1987). In taking action, management should always strive (if possible) to be subtle, unobtrusive, and allow as much freedom of choice as possible (Jim 1989). Therefore, authoritarian regulations should be used only as a last resort. Information dissemination, persuasion, and education are generally considered superior management tactics, in view of their voluntary nature, long-term benefits, and cost effectiveness (Jim 1989). The spectrum of management alternatives for consideration at Silver Creek Preserve consists of: information and education, redistribution of use through concentration and dispersal, site reinforcement, and limiting use.

### **Information and Education**

While the establishment of education programs may be challenging to management (Stankey 1979a) these measures have many positive aspects. Education is light-handed, non-regulatory, requires minimal expenditure, does not modify the natural environment, and is long lasting. Perhaps most important, however, is the fact that education is self imposed and does not diminish the opportunities for recreation. The reduction of per capita impacts can often be more effective than reducing visitor numbers and in many cases the prospect of maintaining high quality recreation sites for the long term requires the conscious effort of individual users to reduce impacts (Jim 1989). Therefore, low

impact education should be the foundation upon which to build a complete visitor management program (Hammitt and Cole 1987).

Often the root cause of many impacts are incorrect perceptions of behaviors and impacts, or even ignorance of impacts. For example, fly fishing is a solitary sport, and thus the user is as likely to be affected by the behavior and activities of neighboring anglers as by sheer numbers alone. Therefore, changing perceptions should be one of the main functions of information and education. However, management must be certain that information overload does not occur. The key is to choose a few critical problems, raise users awareness of the problems and their shared responsibility in solving them. Often solutions are best generated by the users themselves, therefore Loomis and Garnard (1986) suggest strategically placing comment and log books at exit points, where the chance of receiving candid opinions is high.

In general, successful information and education programs have a clear, well defined message that defines the problem, what types of behavior aggravates the problem, and how a change in behavior will help to alleviate the problem (Hammitt and Cole 1987). In addition the message should convey the management's rationale for their actions. The next step for manager is to select the appropriate communication method, attempting to deliver the message before users reach Silver Creek Preserve (Lime and Lucas 1977). According to Hammitt and Cole (1987) the best method is to conduct off site programs concentrating on teaching concepts of low impact recreation.

Education at Silver Creek Preserve could be effectively conveyed through participation and involvement in preserve activities such as tree planting, trail construction or rehabilitation, and evaluation of resource conditions. The preserve manager could hold a low impact workshop for guides that bring clients to Silver Creek Preserve. Critical issues such as the creation of social trails, the susceptibility of bulrush communities, and angler etiquette should be covered. Utilizing the Visitors' Center staff will also be central to any education programs at Silver Creek. Another effective educational technique that

could be successfully applied at Silver Creek Preserve is the use of educational signs at all the entrance points. Several survey respondents commented on the impacts to vegetation and stream banks, suggesting that a large segment of the user population is aware of the impacts. Since the first two steps of the education process are already completed with these individuals, management should capitalize on this awareness and empower this group with appropriate methods of reducing impacts. If concepts are communicated well, visitors should be capable of developing the capability of reducing impacts, and their level of commitment to these efforts should be high (Hammitt and Cole 1987).

### **Redistribution of Use**

In more fragile plant communities trampling, even by low impact users, can severely alter the soil and vegetation conditions. In cases like the bulrush communities at Silver Creek, the distribution of use must also be managed. Since the distribution of recreational users at Silver Creek Preserve is uneven over both space and time, some method of redistributing use would most likely benefit the resource. However, uniform spread of visitors is undesirable and probably impossible (Jim 1989). Managers should seek to address the imbalances, taking into account resource differences and visitor preferences. Redistribution of use can satisfy several management objectives at once, including: 1) reducing conflicts between users, 2) raising or lowering use to match the carrying capacity of plant communities, and 3) matching preferences and settings (Lucas 1981).

Perhaps the most troubling question of visitor management is that managers must choose between the reduction of impacts on specific sites and the reduction of the total number of sites impacted. Dispersal attempts to solve the first problem, while concentration strategies attack the latter. As discussed earlier, the relationship between use and vegetational impacts generally involves an initial period of fast changes, followed

by a leveling off after passing some critical threshold (Cole 1987). The main problem with dispersal strategies is that dispersing use must reduce use levels below this threshold level. This is usually not possible, especially in higher altitude places like Silver Creek Preserve, where vegetation may be more fragile. Therefore, in general the dispersal of use substantially increases vegetational impacts on lightly used areas, without much improvement in the more popular places (Hammitt and Cole 1987). However, in terms of social impacts of recreation, dispersal can be an effective method of reducing impacts, especially given the solitary nature of a sport like fly-fishing.

One promising method for redistributing use at Silver Creek Preserve is the use of information dissemination at the Visitors' Center. The staff can act as a guide to new visitors with an emphasis on the level of crowding and resource damage at certain sites and during certain times on the year. Several survey respondents suggested that managers should attempt to redistribute use temporally, utilizing the fall months when far fewer visitors arrive. Additionally, the staff could attempt to redirect current users whose inertia repeatedly returns them to popular areas. Managers must however, guard against giving too much information which can take away from the fun of exploration and discovery that are such a large part of fly fishing.

Concentration strategies, which attempt to confine damages areally, should be pursued on moderately impacted sites which are above the critical threshold, but yet still below over-use levels. At Silver Creek Preserve, riparian grass and sedge communities would fall within this category. Obviously then, concentration should not be pursued on over-used sites or semi pristine sites, such as the bulrush communities at Silver Creek Preserve. The careful use of trails is an excellent method for concentrating use. This could include closing and rehabilitating overused trails, while constructing new trails over more resistant communities. Since people generally follow the path of least resistance (McCurdy 1985), vegetation barriers can also be used to channel visitor use. The key is to make staying on the trail the easiest option. Concentration of use on well constructed

trails, in the rush and sedge sites at Silver Creek, can also alleviate the problem of braiding and social trail creation. Since social trail creation an important concern at Silver Creek Preserve, trail closure combined with concentration on existing or newly constructed trails could be an effective alternative in managing visitor use.

### **Site Reinforcement**

Site reinforcement seeks to mitigate or remove trampling impacts by providing a more resistant site which can withstand a greater amount of use. Site reinforcement involves engineering solutions which artificially harden the impacted sites or remove the impact by constructing elevated trails. Since engineering can create an artificial atmosphere, several guidelines should be followed in an attempt to reduce obtrusiveness. Reinforcement should only be pursued where impacts are so heavy that natural rehabilitation is not possible. Thus, the obtrusiveness of site reinforcement should be weighed against the nature of the impacts and other means of solving the problem. However, in certain cases where fragile plant communities can be significantly damaged by even infrequent use, the use of site reinforcement may be unavoidable. This is especially appropriate in riparian corridors where removal of vegetation can lead to erosion of stream banks. In these cases natural materials should be used whenever possible to reduce the visual impact of reinforcement. The extent of reinforcement should be confined to only those areas where it is necessary - over surfacing should be avoided (Hammitt and Cole 1987).

Any trampling of water-saturated soils can lead to churning and compaction of the soil, resulting in a quagmire that lengthens and widens over time (Hammitt and Cole 1987). In such cases, bridging may be the only means of avoiding serious resource damage. Where drainage problems are the most severe, walkways can be used to elevate the trail above the problem areas without disrupting drainage. At Silver Creek Preserve



this is especially true in wetland areas where social trails can cause significant damage. In the bulrush and cattail communities, walkways could be constructed which would concentrate use and protect fragile plant communities by removing trampling impacts.

### Limiting Use

Essentially, rationing use is a tradeoff between improving the quality of the recreational experience and limiting the benefits to fewer people. Often limiting use can be a convenient method of reducing impacts without examining the real causes of resource damage or getting actively involved in the management of problems (Hammitt and Cole 1987). Therefore, it is imperative for management to consider their objectives, the amount of resource damage, the user reactions and side effects, and administrative costs before deciding to limit use.

According to Hammitt and Cole (1987) most visitors will accept the implementation of use limits if they are necessary to prevent severe resource damage. From conversations with visitors at Silver Creek it was clear that most would accept use limitations if necessary, but few felt that current impacts warranted such a drastic policy change. Often there will be more than one solution to a given problem, and in these cases the least authoritarian approach should be adopted first. Rather than anchoring on one option, managers can often combine several methods to achieve the same results and equalize the costs to users (Jim 1989).

Limiting use would involve significant costs to both the management and the users. The additional administrative workload required by many of these systems could overwhelm the current staff of Silver Creek Preserve, requiring the addition of more staff members. The cost to users represents the loss of freedom and spontaneity involved with any limitation method. From conversations with anglers at Silver Creek, it appears that many people view this freedom of choice as a right rather than a privilege. Additionally,

70% of the visitors support the current unlimited access policy, suggesting a very strong attachment to their freedom of choice. Another significant problem with limiting use is the question of enforcement. Silver Creek has several access points which would make effective implementation of rationing strategies more dependent upon voluntary compliance than enforcement by preserve staff.

Current survey results demonstrate that reducing the total number of visitors may have little effect on reducing social impacts suggesting that limiting use may not solve the social problems associated with recreational use. Furthermore, the results of the vegetation sampling indicate that all of the target plant communities are below carrying capacity, suggesting that the current recreational impacts to vegetation are not severe enough to limit use. However, at some point in the future use limitations may be necessary to prevent resource damage. The following sections provide guidelines for that future possibility.

The use of fees to limit use appears to be the best method for limiting use at Silver Creek Preserve. Several spring creek property owners in the northern Rockies charge upwards of fifty dollars per day. While it would be inappropriate for Silver Creek to charge fees that high, it demonstrates that the demand exists for this type of fly-fishing experience. According to survey results charging a fee was rated the second highest (42% approval) among limitation methods. The use of fees is a flexible strategy which can be fine tuned to limit or redistribute use, while raising supplementary income to defray operational and maintenance expenses. However, pricing penalizes the poor and those who are unwilling to pay for recreation. One option which may alleviate this problem is the use of volunteer hours in exchange for dollars. One survey respondent suggested that perhaps one hour volunteering could equal ten dollars towards fees at Silver Creek Preserve. Another option could be the creation of "season passes", so that frequent users would not be unduly burdened. Another option suggested by several survey respondents was limiting use to those who financially support The Nature Conservancy or Silver Creek

Preserve through memberships or donations. However, all of the pricing methods described above may not have the desired effects of reducing impacts, because the relationship between the fee charged and use levels is unknown (Hammit and Cole 1987).

The next method Silver Creek Preserve managers should consider for limiting use is a reservation system. The advantage to a reservation system is that it fairly allocates the use to all user groups. The Nature Conservancy has effectively used reservation systems in many of their other preserves across the country. However, results of the Silver Creek Preserve survey indicate that nearly three quarters (74%) of the recreational users would not support the use of a reservation system. Furthermore, reservation systems require long planning horizons and can reduce the spontaneous nature of angling (Jim 1989). Some rejects may become embittered, frustrated, or angered, especially if they arrive at the site without advance notice of regulations. The workloads and costs to management of the Preserve would be significantly increased with the use of a reservation system. Lastly, the problem of "no-shows" can lead to under-utilization in some cases.

Another method for limiting use is the use of a queuing, or first-come, first-served system. It is similar to pricing, except the cost of entry is time spent waiting in line, or arriving first. Since Silver Creek Preserve is located in a somewhat remote area, the time cost of traveling can be significant. This method favors locals and those with plenty of leisure time, thus discriminating against non-local users. Since nearly two thirds of the visitors to Silver Creek Preserve are not from Idaho, a first-come/first-served method would discriminate against a majority of the visitors. This method of limiting use also received a very low level of acceptance (26%) by recreational users at Silver Creek Preserve. Again the problems of angered rejects may be encountered and costs to management will increase.

Combining the reservation and first come/first served systems may alleviate the problems associated with each method alone and may tend to distribute the costs more evenly. Silver Creek Preserve survey results indicate that this method received the most

support (45%) from visitors. While the costs to users may be minimized, the implementation of a combination system would burden the managers with the costs of administering both systems.

**Suggested Visitor Management Strategy for Silver Creek Preserve**

The responsibility of the development and implementation of an effective visitor management strategy lies with the management of Silver Creek. However, the following suggestions, which are based on survey and sampling results should be considered in developing Silver Creek Preserve's recreational use strategy. First and foremost, the results from both the vegetation and social impact analyses clearly show that **limiting use should not be implemented at current use levels**. At current use levels, approximately 82% of the visitors are satisfied with their experience at Silver Creek Preserve. The following table outlines suggested actions in Silver Creek Preserve's visitor management strategy.

**Table 4: Visitor Management Strategy**

	<b>Impacts to Sensitive Plant Communities</b>	<b>Creation of Social Trails</b>	<b>Crowding</b>
<b>Information and Education</b>	<ul style="list-style-type: none"> <li>• Low impact education workshops for users and guides</li> <li>• Signs at entrance points describing the problem and solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Low impact education workshops for users and guides</li> <li>• Signs at entrance points describing the problem and solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Signs describing proper fishing etiquette</li> </ul>

<p><b>Redistributing Use Concentration</b></p> <p>Dispersal</p>		<ul style="list-style-type: none"> <li>• Trail closure and rehabilitation</li> <li>• Use of vegetation barriers</li> </ul>	<ul style="list-style-type: none"> <li>• Information for first time visitors</li> </ul>
<p><b>Site Reinforcement</b></p>	<ul style="list-style-type: none"> <li>• Construct boardwalks in areas with unavoidable impacts</li> </ul>		

By adopting the above guidelines Silver Creek Preserve managers can ensure that future recreational use is not compromised by current recreational use.

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APPENDIX A

VERBATIM RESPONSES

RECREATIONAL USE SURVEY

MAY - AUGUST, 1993

SILVER CREEK PRESERVE

PICABO, ID

## MANAGEMENT (50)

### Methods of Limiting Use (28)

Minimize the numbers of anglers per mile, perhaps \$10-20 fee.

Limit access to creek at certain areas, don't just let trails develop anywhere.

Reservation system.

Advanced reservation could be used also.

Maybe limit to The Nature Conservancy members only.

Buy a punch card for a fee (\$20). Good for 10 days or so per year so access is limited on a yearly basis.

Consider whether you are a Nature Conservancy member.

Adult fishing only.

Issue Silver Creek Cards to supporters of the preserve. These people would have priority to fish the waters.

Limit to a certain number of people per area.

Money would exclude those who can't afford to pay.

Reservation system favors outfitters and it would result in loss of public access.

Annual fee?

Limit visitors to Nature Conservancy members. You should sell coffee at the visitor's center ( Espresso would be nice) as a means to defray conservancy maintenance expenses.

Higher entrance fee.

Limit use based on some maximum number of fishing days per angler per season using an honor system.

Reserved \$15 per day, walk-in \$10 per day - not to exceed 50 rods per day.

Must be a contributor to the Nature Conservancy. Not sure about minimum, but at least \$100 per year.

There should be a limit to the number of anglers allowed per day. As one already has to sign in before fishing, it seems natural that a caretaker could monitor the numbers of anglers present at all times. Perhaps a small (under \$5) entrance fee could provide a salary for this position.

Limit number of rods on stream and pay \$40 per day.

Many private spring creeks charge \$40-50 a day to fish. I believe the preserve could easily instigate an entrance fee for fishermen of \$10 per day. At this price you would not eliminate the problem of overuse, but would set a policy that reminds users that up keep does have a cost. For local anglers there should be a cap of \$100 per year which equals ten visits, or the preserve could offer free visits for anglers who donate time. Each hour of labor donated equals a \$10 visit. Thus, one ten hour day could provide a local angler with unlimited free fishing.

Though limiting angler entry through reservations, or first come first served may seem logical, it creates an "opening day" mentality in fishermen. Reservations mean exclusion and this is too marvelous a place to do that. Restriction to certain areas or certain methods ( non-wading, on-path navigation only, etc.) is far preferable (if it will help).

Have an A section and a B section. Good management.

Perhaps a reservation system would work best for those of us traveling from out-of-state to get here to our "Mecca." First come, first served scares me.

I would like to see the preserve limit the amount of fishermen a day, but allow as many hikers and bird watchers as possible.

Limit use by professional guides by limiting guides and number of clients.

Why not limit non-anglers?

Should stop some of the guide service, not all, but limit them.

### **Canoes, Boats, etc. (4)**

Ban boats.

No canoes in fishing season please.

I don't feel canoeing should be allowed.

I don't care for canoeists disrupting fishing.

**Staff (6)**

Visitor Center personnel helpful and friendly.

Too many non-local interns, use the local talent.

Pleasant friendly personnel.

Friendly, knowledgeable staff.

Very nice, polite.

Very knowledgeable and friendly.

**General (12)**

I appreciate the improvements made over the years: removal of barbed wire, boardwalks, additions of land.

Have been very pleased with current management. The creek has improved over the last 5 years.

I don't support limited entry at this point.

Possibly limit brown trout population.

Should allow kill for some brown trout.

I appreciate the restoration projects that are ongoing. Working with ranchers is critical. Education plays a key role in preserving the place. Field trips and the Big Wood/Silver Creek education curriculum are great for kids and teachers! Keeping open communication with the local ranchers and encouraging them to incorporate best management practices are important.

The management has always done a great job!

So far [management is] excellent.

Well managed.

I can't help but feel that the management is looking for a reason to limit access. In one way or another this issue surfaces every year. As long as the resource is not being overly impacted or user days on the stream increase dramatically, don't consider limiting access.

The decision to limit access will eventually have to happen to protect this resource - I will support this.

Excellent management system!

### **CROWDING (24)**

I expected other anglers to be always in sight.

When hatches and fishing are good there is still plenty of room for everyone.

I have found my "encounters" at Silver Creek, even on opening day, to be serene and peaceful. Because of the nature of fly-fishing, anglers do not impact my bird watching or hiking. They are quiet and unobtrusive.

Overcrowding spooks the fish. One too many anglers spoils the experience for all. Thus, one of the management techniques would probably be worthwhile.

Seems like something is needed, because there are too many people and I see a negative effect - but I don't know what to do. Philosophically, I believe that the preserve should be open to all - no limits, no payments, but I also notice the increase in use causing habitat degradation. So what does one do?

It doesn't seem terribly over-crowded to me at this point, although I could imagine it becoming so.

One would hope that if conditions get unbearable, people would naturally disperse or find alternative times to visit. Increased publicity obviously does not help this to occur. I do have a concern about guides exploiting Silver Creek. They obviously know the water well, and bring their client to the best places. They then "camp" on these spots, not allowing others access. While I appreciate the financial support the guides contribute, perhaps there should be a limit to the number of guides and clients on the stream. While I like Silver Creek for its "free" access (even poor people can fish it) the guides cater to rich clients who can afford to fish places like Armstrong's and DePuy's Creeks in Montana. The guides are there every day, but to many of us non-guided fishermen, Silver Creek is a unique fishery with its own personality. We savor a few days of it each year, and compare the experience to savoring a unique wine. Enjoying the specific personalities of various streams is the way of a fisherman's life. But the guides make a business out of it, and I wonder if the people

they guide appreciate the stream's unique character. I'll wager that many have bucks to spend, and have heard that Silver Creek is blue ribbon water. So they "buy the best," but are dilettantes at best.

Good job. The difficulty of fishing will naturally limit the numbers of people. Early season and late season will have less human traffic.

Enjoy being able to come, but seems to be too much pressure.

I believe that fishing pressure self-regulates. Sure there are days when there are a lot of fishermen, but there are other days when I can have the preserve to myself. Take Henry's Fork for example, the day Harriman Ranch opens, there are 75 fishermen, two days later there are 3. Fishing pressure self-regulates. Part of this pressure complaint comes from people who want to catch 25 fish a day. I listened to one man who said that he used to catch 30 fish per day in the old days. Now he only catches 8. The beauty of Silver Creek is not the number of fish you catch. One other reason I would not like to see limited access is that I often come by, fish for an hour, on my way to and from Oregon. You cannot do this with limited access. The Nature Conservancy has a beautiful thing going here, please do not turn this into another Armstrong's Spring Creek.

Too many non-anglers.

Would not support limiting access until pressure increases approximately 25% over today's use. (visitors = 136)

Visitor use will only increase to Silver Creek as the human horde grows exponentially and overruns Earth. When it becomes necessary to limit access to preserve the preserve, you should reward those who have demonstrated their commitment to the Earth by deciding not to create more of themselves. These people should have the first crack at enjoying Silver Creek. Overly fecund people should be banned from the place.

I treasure the fall, when fewer people are around, even November. At some point you might need to decide what the capacity is and work within that limit.

From what I experienced today, there weren't many people. I can't imagine why there would be a policy to limit access.

I believe the type of fishing at Silver Creek is a type of limiting system for the creek. Only a certain number of fisherman are willing to put up with the difficulty and many only fish it once upon a rare occasion. Keep it heavily regulated and charge an entrance fee and I believe it will always be a quality spot for those who appreciate it for what it is.

Seem to do a good job, however there were a few too many people.

Too many folks, but worth visiting the preserve. The general reaction would be to avoid August for fishing, rather than any restrictions under the assumption that it is not like this in other months.

Not a wilderness experience, but didn't expect one in a few acres in the middle of a farming valley. But that's okay. Too many fishermen, but I would be loath to restrict fishing unless the fishery or the environment is adversely impacted by the numbers.

You can see an angler just about anywhere on the stream.

Anglers need to keep their distance.

I would not limit access.

After realizing the quality of the preserve and the fishing I'm surprised at how few people I have seen.

### RESOURCE (11)

People seem to be making new trails to get to quiet waters. Heavy wading boots seem to be taking their toll.

The Preserve is an ideal setting for all recreationalists, however in the last ten years I have sadly become used to seeing overuse of the resource. I believe all recreationalists should have the opportunity to enjoy this preserve, yet a more restricted entry should be enforced to limit the use.

Anglers definitely impact the stream. Other summer uses are definitely minimal. Excellent management, I've birded Silver Creek since 1975. There seems to be new emphasis on non game wildlife - Bravo!

If the fishing pressure got to the point that the aquatic and riparian habitat was being damaged then I would support some sort of rod limit based on a combination of reservation and first come. Obviously the habitat is the main focus of the preserve and needs to be protected. I do love the fishing here and would like to be able to keep fishing here.

Regulate streamside travel to restricted paths - preserve bull rushes and other vegetation.

Presently, daily use not so great as to destroy area.

Trampling seems problematic. Improve and enforce trail usage.

Is the unlimited access to the creek damaging the marsh? the bank? It looks like it is to me.

If the creek is suffering under current policies/rate of use, I would definitely support a change.

I would only support these conditions [limits on entry] if the preserve becomes over-used.

The Nature Conservancy should definitely take into account the considerable impact of anglers on this unique preserve.

#### ADDITIONAL COMMENTS (36)

Thank you for the hard work to preserve this land.

I have seen a lot of positive changes since the Nature Conservancy purchased the site.

This type of survey should have been done when the preserve was first opened to the public. My answers might have been different.

Very good!

Excellent! Preserve should remain undeveloped.

Great place!

I thoroughly enjoyed the fishing - I'm not sure that you need to fix anything if its not broken.

Because of the Silver Creek program I joined The Nature Conservancy. Hope more similar programs will be developed throughout the country.

Beautiful spot.

Open at all times.

You do a fantastic job of preserving one of the truly unique ecosystems of the world - I greatly appreciate it.

Nice place, but muddy creek.

Very enjoyable.

I like it just as it is.



The wildness, birds and animals are wonderful.

Beautiful and peaceful.

Despite seeing and encountering lots of fishermen, the natural beauty of Silver Creek and the activity of the bugs and fish make it a great experience every time. Rod limitations, in my opinion must eventually happen on Silver Creek.

It's a good fishing experience. Don't change much.

Keep up the good work. Thanks.

Don't screw with a good thing!

It is a very special place. Please make sure it stays that way. I've seen other beautiful rivers ruined by dams, litter, etc.

I don't know enough about the fishery to know if it is possible - but access and information about other stretches of the river so everyone doesn't funnel to one area.

I want to bring my dog.

This is a fabulous place. Silver Creek is a national treasure. Please help preserve it.

Doing great. Don't change.

Nice, first time out.

Seems to be working fine now.

Very thoughtful expansion of the visitor's center. Try to gain control of the cattle and irrigation just adjoining the visitor's center. The smell is a bit much and isn't very natural.

Leave it alone.

I do not believe that change is necessary.

Just right as it is.

Great fishery.

Real nice as it is.

I feel you've done a great job! .

Super job - during the week the number of people is acceptable.

I was surprised and a little "put off" by a bus full of children.

**APPENDIX B**

**QUESTIONNAIRE USED IN  
RECREATIONAL USE SURVEY**

**MAY - AUGUST, 1993**

**SILVER CREEK PRESERVE**

**PICABO, ID**

# SILVER CREEK PRESERVE RECREATIONAL USE QUESTIONNAIRE

The purpose of this questionnaire is to help The Nature Conservancy better understand the preferences and opinions of the people who visit Silver Creek Preserve. The preserve was established to protect Silver Creek and the numerous plant and animal species that depend upon it. Over the years Silver Creek Preserve has also provided excellent recreational opportunities for a growing number of people. More than 7000 people visit Silver Creek annually and your answers to the following questions will be helpful as we plan for the future. Thank you for your time and cooperation!

Date: \_\_\_\_\_

Name: \_\_\_\_\_

Address - City: \_\_\_\_\_ State: \_\_\_\_\_

Sex: M F

Recreational Activity(ies) at Silver Creek Preserve: Fishing Boating Hiking  
Bird Watching Other (please describe): \_\_\_\_\_

## Encounter Information

1. Before you came to Silver Creek Preserve today, about how many times each day did you expect to see other recreational users?

I expected to see anglers \_\_\_\_\_ times per day.  
\_\_\_\_\_ I didn't know what to expect.

I expected to see boaters \_\_\_\_\_ times per day.  
\_\_\_\_\_ I didn't know what to expect.

I expected to see hikers/bird watchers/other \_\_\_\_\_ times per day.  
\_\_\_\_\_ I didn't know what to expect.

2. During your day at Silver Creek Preserve, about how many times did you actually see another recreational user?

I actually saw anglers about \_\_\_\_\_ times per day.

I actually saw boaters about \_\_\_\_\_ times per day.

I actually saw hikers/bird watchers/other about \_\_\_\_\_ times per day.

3. Different people have different ideas about recreation at Silver Creek Preserve. We are asking you to think of the "Silver Creek Preserve experience" in four different ways. You can then indicate which one you think is most appropriate.

A. Imagine Silver Creek Preserve as a "wilderness," a place generally unaffected by the presence of humans. If Silver Creek Preserve were this kind of area, indicate the **highest** number of encounters you would tolerate before the trip would no longer be a "wilderness" experience.

OK to have as many as \_\_\_\_\_ encounters per day.  
\_\_\_\_\_ makes no difference to me

B. Now imagine Silver Creek Preserve as a "semi-wilderness," the kind of place where complete solitude is not expected. In this case, indicate the **highest** number of encounters you would tolerate before the trip would no longer be a "semi-wilderness" experience.

OK to have as many as \_\_\_\_\_ encounters per day.  
\_\_\_\_\_ makes no difference to me

C. Now, imagine Silver Creek Preserve as an "undeveloped recreation area," the kind of place where a natural setting is provided, but meeting other people is part of the experience. In this case, indicate the **highest** number of encounters you would tolerate before the trip would no longer be a "undeveloped recreation" experience.

OK to have as many as \_\_\_\_\_ encounters per day.  
\_\_\_\_\_ makes no difference to me

D. Lastly, imagine Silver Creek Preserve as a "developed recreation area," the kind of place where the natural setting has been altered (buildings, recreational structures, etc.) and meeting many other people is expected. Indicate the point at which there would be too many people for even this kind of "developed recreation" experience.

OK to have as many as \_\_\_\_\_ encounters per day.  
\_\_\_\_\_ makes no difference to me

E. Of the four kinds of experiences described above, which do you think Silver Creek Preserve **currently provides?** (circle one)

wilderness                      semi-wilderness                      undeveloped                      developed

F. Of the four kinds of experiences described above, which do you think Silver Creek Preserve **should provide?** (circle one)

wilderness                      semi-wilderness                      undeveloped                      developed



The Nature Conservancy and Idaho State University are currently conducting research on trout populations in Silver Creek. This research will compare results from past fishery studies with present populations to help us in evaluating changes in the fishery and the effects of our management efforts. As a group, the anglers of Silver Creek know a great deal about the trout fishery and your answers to the following questions will be a valuable asset to our study. Any additional comments or suggestions would be greatly appreciated. Thanks again.

1. How would you rate the fishing at Silver Creek Preserve **today**?

Outstanding                  Good                  Fair                  Poor

2. During your day at Silver Creek Preserve, how many fish did you catch in the following categories?

	<10"	10-16"	16-22"	>22"
<b>Rainbow</b>				
<b>Brook</b>				
<b>Brown</b>				
<b>Whitefish</b>				

3. How would you rate the fishing at Silver Creek Preserve **overall**?

Outstanding                  Good                  Fair                  Poor

4. How many days have you fished at Silver Creek Preserve in the past 5 years?

1-5 days                  6-25 days                  >25 days

5. In what year did you first fish at Silver Creek Preserve? 19\_\_\_\_\_

6. Since then, how do you feel the rainbow trout fishery has done?

Declined                  Improved                  Remained about the same

7. Which species of trout do you prefer to catch?

Rainbow                  Brook                  Brown                  No Preference

8a. Are you satisfied with the current species composition of the Silver Creek Preserve fishery?

Yes                  No                  Undecided

b. If No, what changes would you like to see?

9. In recent years, have you noticed an increase in brown trout in the preserve's waters?

Yes                  No                  Unsure

10. If more brown trout led to fewer rainbows at Silver Creek Preserve, would this concern you?

Yes                  No                  Undecided

11a. Have you personally observed trout preying upon other fish?

Yes                  No

b. If Yes, what type of trout?

Rainbow          Brook                  Brown                  Unsure

12a. Are there any specific stretches of Silver Creek Preserve waters where you have noticed significant changes in the fishery?

Yes                  No

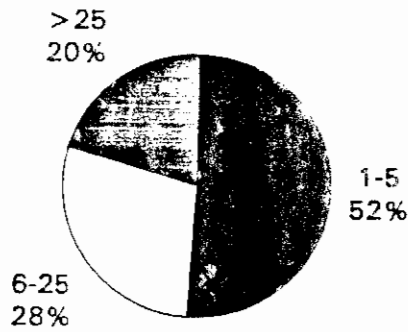
b. If Yes, please explain the changes below.



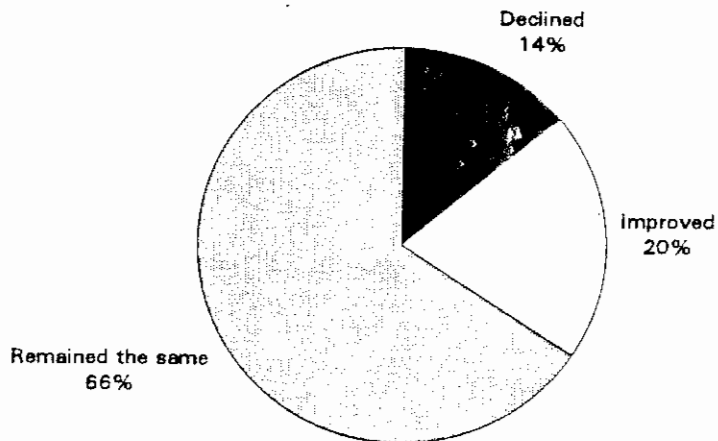
APPENDIX C

SUMMARY OF RESULTS  
FROM FISHING QUESTIONS

1. How Many Days Have You Fished at Silver Creek Preserve in the Last Five Years? N=183

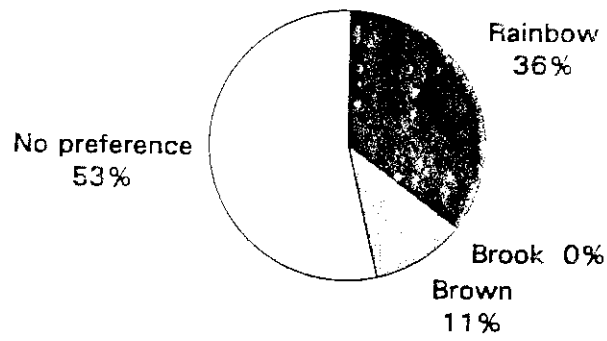


2. Since You First Came to Silver Creek Preserve, How Do You Feel The Rainbow Trout Fishery Has Done? N=122



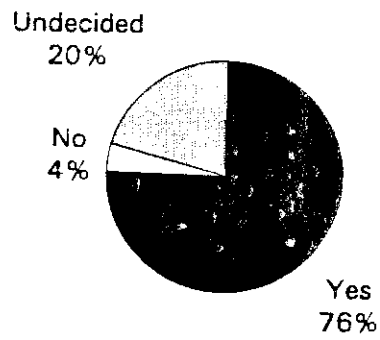
Average first year = 1986

3. Which Species of Trout Do You Prefer to Catch? N=183

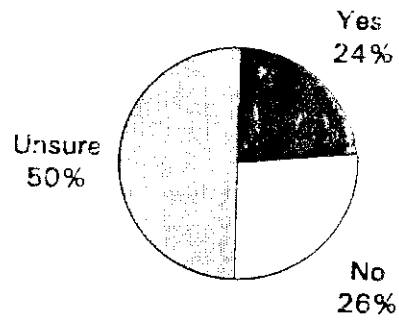


4. Are You Satisfied With the Current Species Composition?

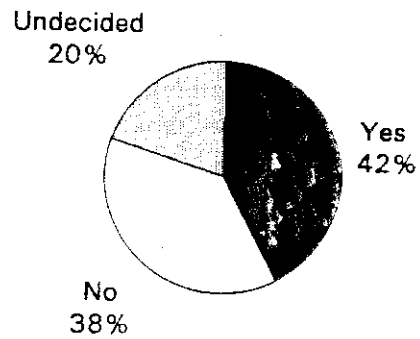
N=177



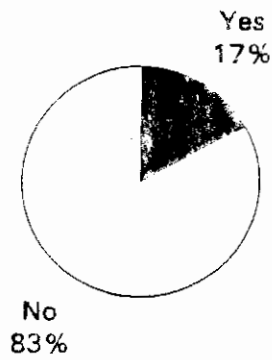
**5. Have You Noticed an Increase in Brown Trout in the Preserve's Waters? N=151**



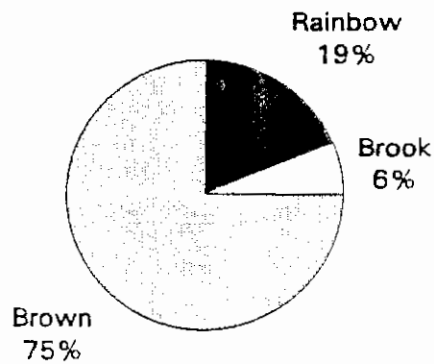
**6. If More Brown Trout Led to Fewer Rainbows at Silver Creek Preserve, Would This Concern You? N=174**



**7a. Have You Personally Observed Trout Preying Upon Other Fish? N=175**



**7b. Type of Predator Trout N=32**



**Fishing Satisfaction**

Scale 1=poor 2=fair 3=good 4=outstanding

How would you rate the fishing at Silver Creek Preserve **today**? Average = 2.52 (N=183)

How would you rate the fishing at Silver Creek Preserve **overall**? Average = 3.15 (N=183)

## Verbatim Responses

### Silt

Increased sediment in lower waters, Loving Creek and downstream

Increased siltation from wooden bridge to Visitors' Center

More silt from Visitors' Center to grove creek. More brook trout

Upper stretch seems more silted than in the past

More silt

More silt

Need more silt management

More silt upstream

More silt, but more vegetation along banks

Upstream from the Visitors' Center more silt, less fish

### Fish

Slough is not as good

Brook to rainbow to brown in Sullivan's lake

More streamside vegetation

Fishery has declined above Visitors' Center

Silver Creek above Visitors' Center has less adult fish; vegetative cover in Kilpatrick pond has increased greatly

Smaller fish above Visitors' Center

Below Visitors' Center fewer large fish

Lower S turns have more browns; less fish above Visitors' Center

More browns upstream

Confluence of Grove and Stalker has experienced a drastic decline in numbers and size of rainbows

Silver Creek above Visitors' Center has less adult fish and less fish altogether

Not as many large rainbows

Slough vegetation damaged by trampling