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The Functional and Aesthetic Uses of Two Cache Valley, Utah, Canals

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THE FUNCTIONAL AND AESTHETIC USES OF TWO CACHE VALLEY, UTAH, CANALS

by

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A thesis submitted in partial fulfillment
of the requirements for the degree

of

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Approved:

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James S. Culberson

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The Functional and Aesthetic Uses of Two

Cache Valley, Utah, Canals

by

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Utah State University, 1975

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This report is a local supplement to a wider-focused report on multiple uses of irrigation canals (Kennedy and Unhanand, 1974), primarily concerned with recreational uses. Increasing magnitude and variety of use generated several use conflicts, and the need for a closer look at canal-oriented activities arose. The intent of the study is to show local residents and planning officials the present physical condition of local canals and canal corridors, their present multiple uses, the importance of Cache Valley irrigation canals as recreation systems, and some possible future canal use alternatives.

(64 pages)

INTRODUCTION

Reasons for Selection of Study Area

The method used to evaluate the situations and use of the canals was a case study involving two major canals, the Logan-Hyde Park-Smithfield Canal, or "upper canal," and the Logan Northern Canal or "Logan-Richmond Canal." These two canals were chosen because both have a full range of multiple uses, both recreational and irrigational. Through previous observation these canals were found to have the most recreation of all the local canals. Both flow through residential and rural lands, and both originally have high quality water at their source (Logan River). They are also the largest two canals in terms of width, length, and lands irrigated. Also, because of their close proximity and almost parallel relationship to each other, they have a potential for forming a recreational system (see Figure 1).

Irrigation Canals and Their Present Role in the Logan Area

Irrigation canals have four basic uses in the Logan area:

1. Agricultural irrigation--the dominate use of irrigation canals is still irrigating crops. This is the only use of canals that has been designed, and all other uses are incidental. This is the only use that brings money to the canal companies.

2. City drainage system--the canals also serve as the storm drainage system for Logan city and the surrounding farmlands. This

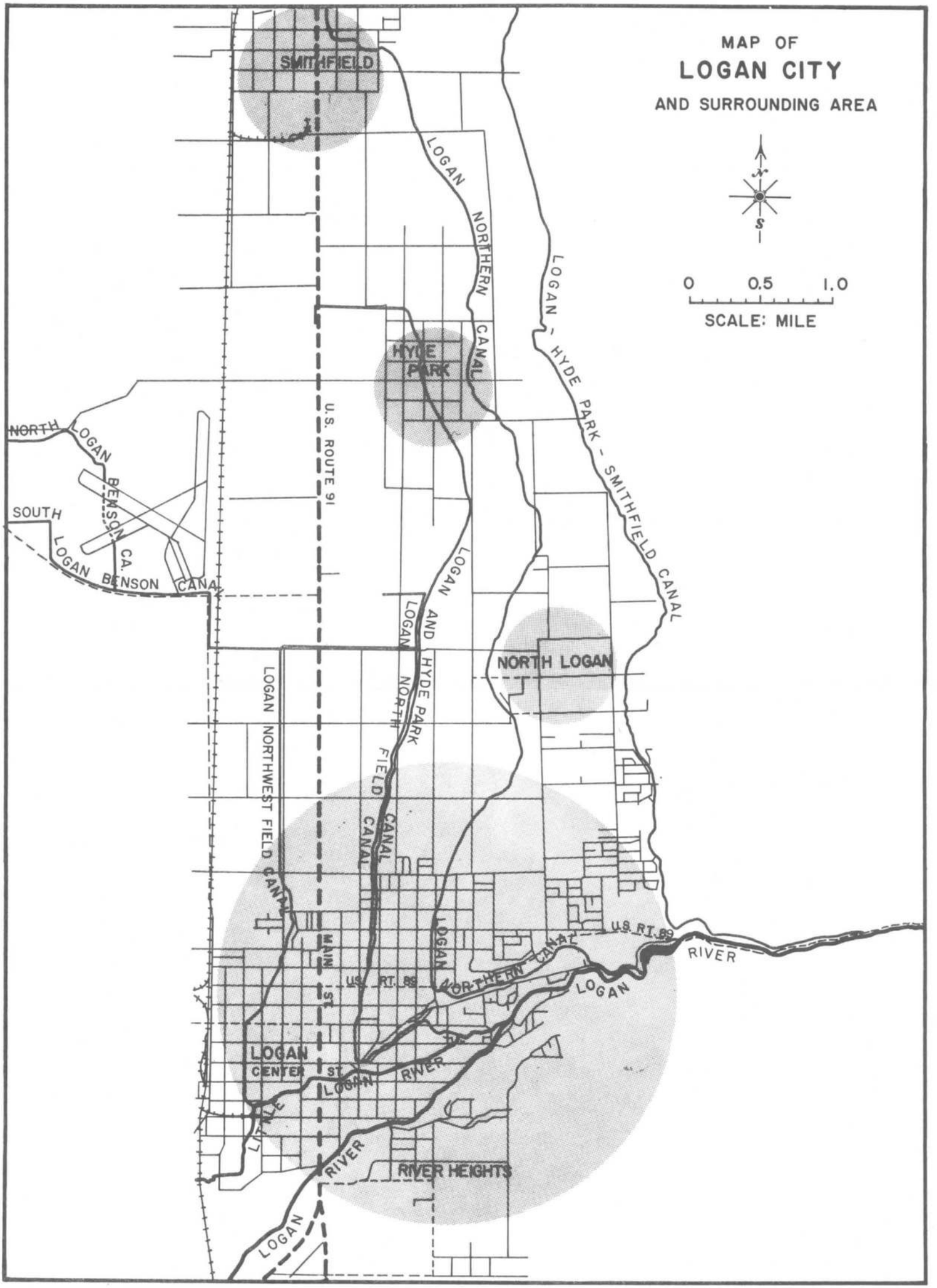


Figure 1. Canal locations.

saves Logan city the cost of installing storm drains.

3. Active recreation--many varied recreational uses are accommodated by the canals. Included are fishing, swimming, wading, innertubing, bicycling, walking, horse riding, hiking, and miscellaneous child's play.

4. Passive use--some people enjoy the atmosphere created by the flowing water and vegetation offered by the canals, both in public parks and private yards.

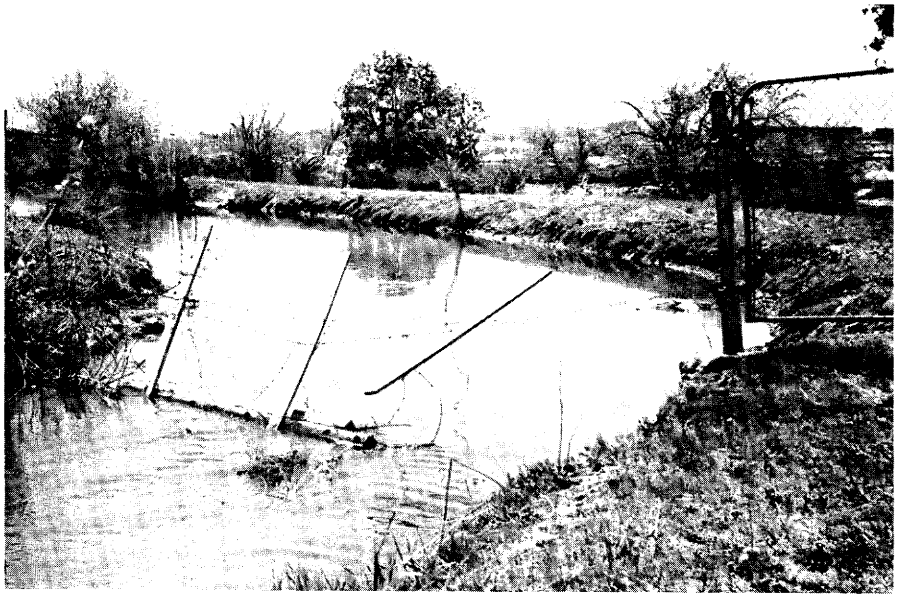
Single Use to Multiple Use

The early settlers made a tremendous effort to establish an irrigation system. Canal construction in the 1870's and 1880's required many man years of hard labor, but by the end of the 1880's both the Logan-Hyde Park-Smithfield Canal and the Logan Northern Canal were irrigating croplands (Nyman and Gilgen, 1966). Irrigation put much land into agricultural activities and brought more people into Cache Valley. As the local population increased, a subsequent division of labor gave residents more leisure time, increasing recreational activities. Some of the recreation occurred in the mountains surrounding Cache Valley, but the canals have accommodated much of local recreation in the forms of walking, riding, innertubing, and fishing.

There are three groups who now use the canals, (1) the irrigation companies and farmers, (2) adjacent landowners, and (3) recreationists. The unrestrained evolution of their activities has formed user conflicts. Recreationists pass through the land of adjacent landowners, invading

their privacy and sometimes littering, while the landowners sometimes fence the canal banks thus prohibiting recreationists from using the canals. Adjacent landowners and recreationists sometimes litter the canal causing increased maintenance for the irrigation companies. And, some recreational activities that are basically incompatible occur on the same land. These competing interests have been grouped into three categories for problem identification: I. Recreationists vs. Adjacent Landowners; II. Recreationists and Adjacent Landowners vs. Canal Companies; and III. Recreationists vs. Recreationists.

This adjacent landowner was caught in the act of dumping his trash into the canal.



This barbed wire fence erected across a popular tubing section of the Logan-Hyde Park-Smithfield Canal is both a dangerous obstacle to recreationists and an impediment to canal maintenance.

After riding down the canal, these people rest beside one of the greens of the Logan Golf and Country Club, unaware of the danger to themselves, and the inconvenience to golfers.

There are four basic reasons why the conflicts occur:

1. Single use conception--most communities have yet to abandon their conception of their irrigation canals as single use, irrigation only structures, even though their canals generate considerable recreational use, and could play major roles in fulfilling local recreational needs.

2. There is a failure by the communities to realize their need for local recreation and to plan and construct adequate facilities. (For example, the Logan Hyde Park-Smithfield Canal, as it flows out of Logan Canyon, is used extensively by local residents for tubing, yet there is no way to end the tubing ride without walking through the golf course.)

3. There is an inequitable burden of cost. At present, the entire burden of cost and maintenance falls upon the canal companies. Both of the canal companies have expressed fear of liability suits from personal injury sustained by recreationists or from flood damage (the canals also serve as storm drains for Logan, surrounding communities, and rural lands). These threats are such that the Logan-Hyde Park-Smithfield Canal Company discourages recreation wherever they can.

4. Some activities intrinsically clash with one another (i.e., golfing requires quiet, relative isolation, and considerable land area). People walking through the course, or sitting beside the greens, are both a safety hazard and an interruption to play.

SECTION 1: STRUCTURE AND FLOW OF CANALS

Stream Description

The width, shape, and depth of the canal beds vary considerably (see Table 1), but generally the canals have a U-shaped configuration (see Table 2 and Figure 2). Both canals have problem areas, either rapid water seepage areas or landslide areas, where the banks and beds are concrete lined, but generally the banks are earthen and the beds are gravel, sand, and silt.

Ownership and rights of way of canal bed and banks

The ownership of the irrigation canals through the city of Logan is a perplexing situation. The canal companies behave as if they own and operate the canals and actually claim parts of the canal corridor as their own. Interviews with the water masters of the Logan-Hyde Park-Smithfield Canal Company and the Logan Northern Irrigation Company yielded this information: The Logan-Hyde Park-Smithfield Canal Company claims ownership of twelve feet of canal and "sufficient R.O.W. for maintenance." The Logan Northern Irrigation Company claims fourteen feet of canal and "R.O.W. to maintain the canal." In a survey taken in a neighborhood adjacent to the canal (Kennedy and Unhanand, 1974, p. 30) with 36 responses totaled, 6 thought Logan City owned the canal, 23 thought the canal company owned the canal, 1 thought adjacent landowners owned the canal bank, and 6 did not know. Many adjacent landowners act as if they own the canal bank.

Table 1. Canal statistics

Canal	Elevations	Acreage Irr.	Length	Avg. Grade	Water Loss	Max. Flow
Logan-Hyde Park-Smithfield	Origin 4836.9' Terminus 4728'	1971 acres[a]	9.7 mi.	1.12%	29.6%	116 c.f.s.
Logan Northern	Origin 4670' Terminus 4586'	3256 acres[a]	12.2 mi.	0.68%	29.7%	100 c.f.s.

[a]Unpublished data prepared by Soil Conservation Service, Logan, Utah.

Table 2. Canal configurations

Canal	Width of Top		Width of Bottom		Depth	
	Range	Mean	Range	Mean	Range	Mean
Logan-Hyde Park-Smithfield	9'-28'	17.3'	9'-20'	13.3'	1.6'-3.0'	2.3'
Logan Northern	12'-24'	17.9'	10.5'-17'	14.4'	1.6'-3.7'	2.8'

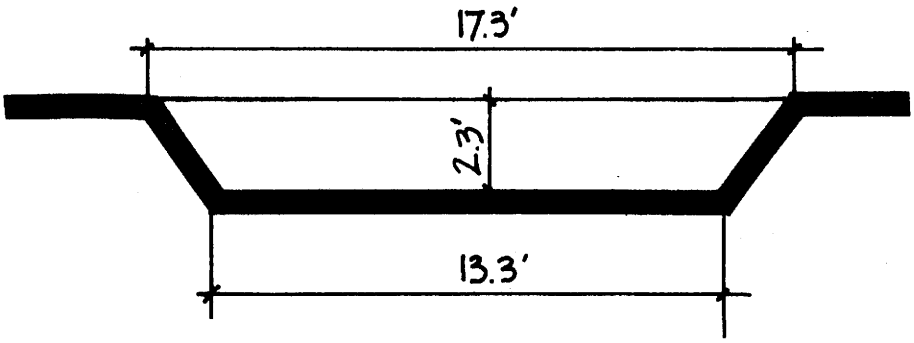


Figure 2. Cross section of mean dimensions--upper canal.

Extensive research disclosed an old deed where certain canal lands were purchased by Logan city in 1872 (Cache County Records, Book B of Deeds, Vol. 2, pp. 538-44). The legal descriptions of some of the canal lands follows:

> The Land occupied by the Logan and Hyde Park Canal Nine hundred and forty (940) rods long by two and a half (2 1/2) rods wide in Sections Twenty seven (27) and Thirty four (34). Township (12) North of Range one (1) east containing fourteen (14) acres and one hundred and fifteen rods (115).
>
> The Land occupied by the Logan and Richmond Canal Two hundred and Seventy (270) rods long by two (2) rods wide in Sections Twenty seven (27) and Thirty Four (34), Township (12) Twelve North of Range one (1) east containing three (3) acres and sixty (60) rods more or less.

This decree parallels the practice of deeding streets, or land occupied by the Logan River to the city for management purposes. In our opinion, canals and their rights of way covered in this deed belong to Logan city, even though adjacent landowners use the canal and its banks. Adverse possession laws are not applicable against a public agency like Logan city. However, ownership of county lands may still be

questioned because of adverse possession rights of both canal companies and adjacent landowners (Kennedy and Unhanand, 1974, p. 19).

Through the snarled and tangled legal web of ownership, two facts remain obvious. One, certain sections of the canals in Logan City and Cache County are encroached upon so extensively that access is a critical problem for canal maintenance and use. Two, other sections, both urban and rural, still remain open, and if they are to remain that way, then restrictions need to be placed on the use of the canal rights of ways.

Quantity and quality of canal waters

The quantity and quality of irrigation waters are vital to the agriculture of Cache Valley. Both canals have a maximum capacity slightly greater than 100 cubic feet per second (c.f.s.), but when their source, the Logan River, begins to fluctuate, so does the water level in the canals. Whenever the Logan River delivers less than 400 c.f.s. of water, the amount diverted to each canal is governed by law and the water gates are locked and regulated by a state official.

Few, if any, water systems are static. They evaporate, flow, circulate, percolate, discharge, and are recharged. An earthen irrigation canal is no exception, being very similar to a stream. It collects runoff and drains in a cyclic manner as does a stream. The dynamic nature of canals makes the water quality dependent upon the surrounding land uses. The amounts of polluting substances that enter the canal are related to the type, proximity, and intensity of these land uses.

"These pollution levels are highly variable and depend largely upon land management practices in the specific area." (Meyers, Porcella, and Middlebrooks, 1972)

Water quality studies have not been done on these canals, but a valuable study was done on Summit Creek in Smithfield, Utah, and the upper canal flows into this creek. The land uses affecting water quality are very similar for Summit Creek and the canals of this study, and some correlations may be made.

Summit Creek is initially a mountain stream of high quality water originating in National Forest lands from limestone formations and forested areas (Meyers, Middlebrooks, and Porcella, 1972). This closely parallels the Logan River, the source of canal water. The land uses surrounding Summit Creek and the canals are agriculture, livestock feed lots and grazing, very low density housing in the farmlands, moderately high density housing in the urban centers, and urban activities located in Logan and Smithfield. The results and conclusions reached by the Summit Creek study are:

> Of the four potential sources of pollution investigated (1) septic tank use, (2) feedlot runoff, (3) urban runoff, and (4) rural runoff, agricultural activities including livestock feedlot operations were identified as the major source of pollutants to Summit Creek. No significant pollutant inputs could be attributed to septic tank use, urban runoff, or rural runoff. The average coliform counts in Summit Creek as it flows through Smithfield were well above minimum values recommended for swimming and bathing waters in Utah. (Meyers, Middlebrooks, and Porcella, 1972)

These results may be projected to the canals. At their source the water is very high quality. As the canals flow through farmlands, especially where livestock feeding and grazing are present, the

coliform count and presence of organic nutrients and suspended solids probably increases. The levels that the pollutants reach is unknown, and their presence is suggested by correlations of similar circumstances to Summit Creek.

The canal corridor

The canal corridor crosses many roads and streets and it may be entered at these points. Encroachment of houses causes difficulty in entering the canal corridor in many places, yet along certain canal sections a suitable pathway has been maintained.

Travel down the canal corridor itself is restricted in many places because of physical structures such as bridges, fences, houses, etc. In the city of Logan, segments of the Logan Northern Canal have an unrestricted trail, while other segments are criss-crossed by bridges and fences, and so tightly surrounded by houses that pedestrian passage is impossible. However, outside of Logan, the service road beside the canal is unrestricted all the way to Smithfield. The upper canal has a service road along most of its length, but numerous fences restrict travel along this canal (see Figure 3).

The canal corridor supports a dense stand of vegetation, some planted for effect in yards, golf courses, and parks, but most of it grows unattended. The vegetation thrives along the canal banks because of the seepwater from the canal stream. The cover provided by the vegetation is a haven for birds and small animals throughout the city and rural farmlands. Some residents have referred to the canal corridor as a "link with nature." (Kennedy and Unhanand, 1974, p. 30)

Access to the canal is difficult in some places ...

... But on some sections, a reasonable pathway has been maintained.

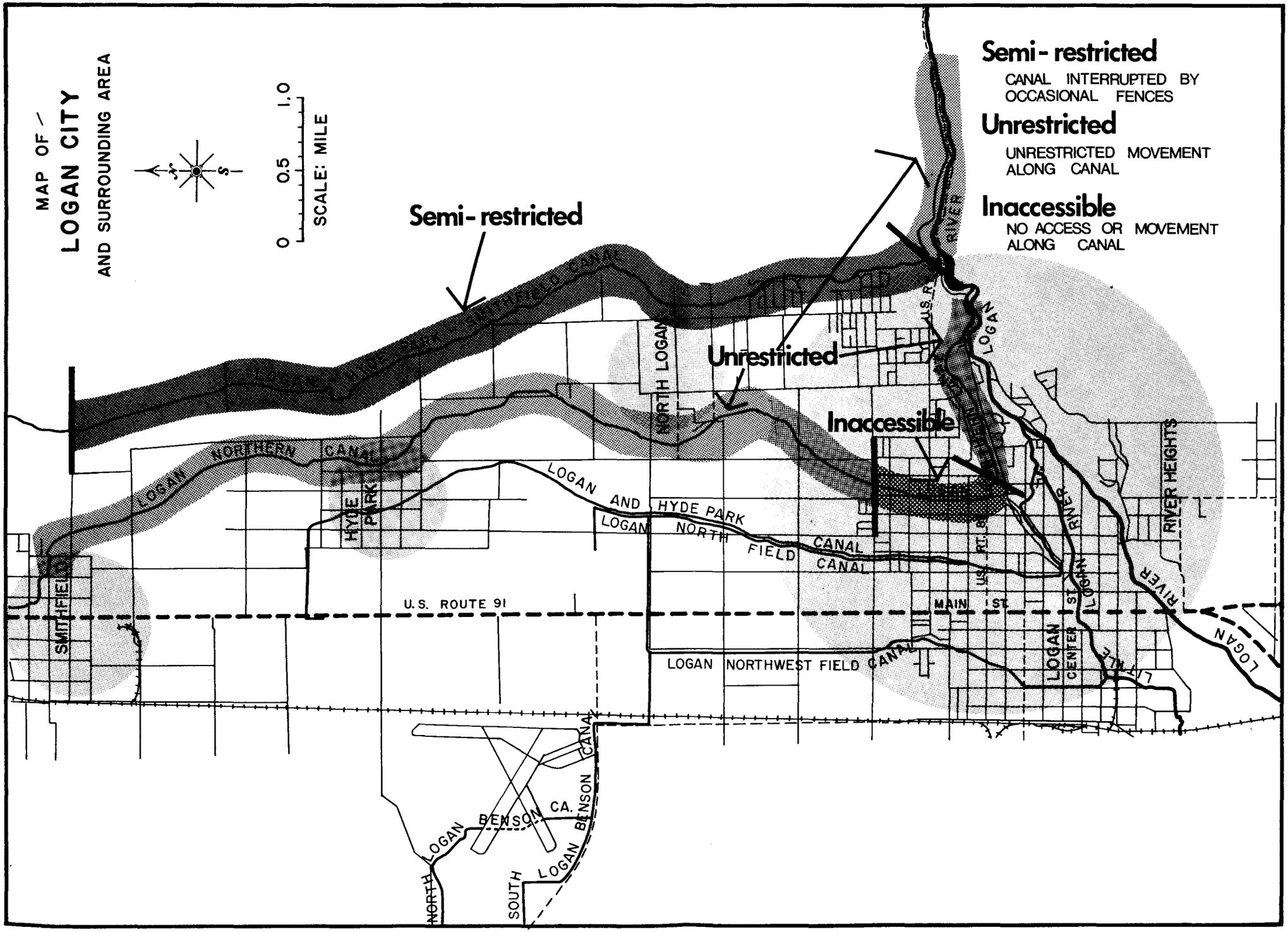
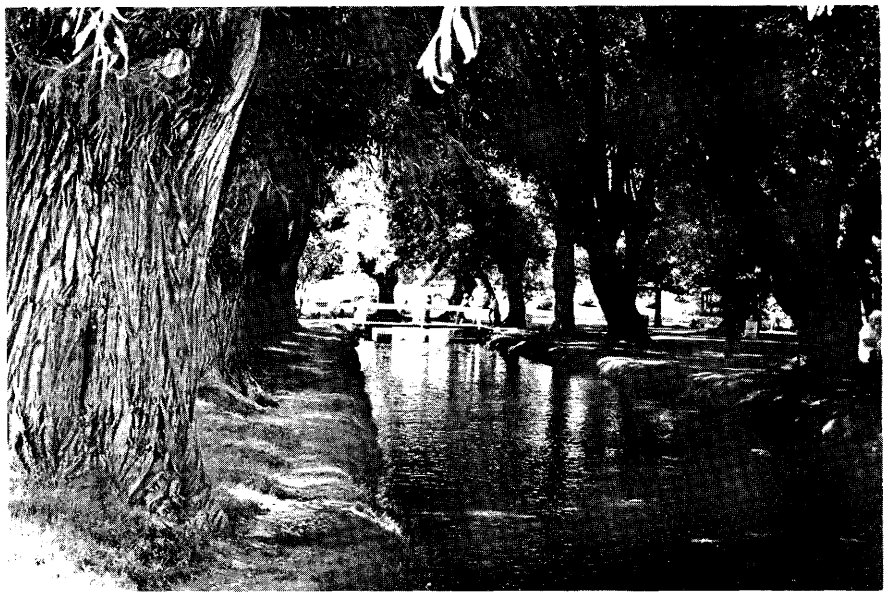


Figure 3. Access map.

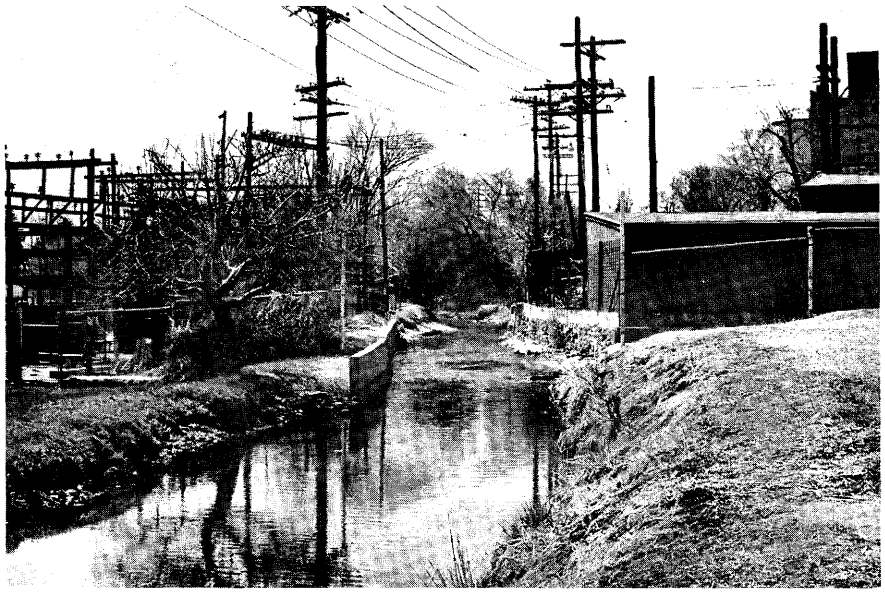
Associations of water seeking plants are formed by native cottonwoods, willows, box elders, wild roses, Red Osier dogwoods, and numerous species of herbacious plants. These plants border the canal banks and service road to form an attractive spatial corridor, and offer shade from the summer sun to recreationists.

Visually, these vegetation corridors appear as sinuous strands on the landscape, and visually speaking, they are an important component of the local landscape.

Under the existing policies of management of the canal system, the aesthetic quality of the canals is dependent upon the uses of lands through which they pass. For example, the Seventh Ward Canal as it flows through Central Park contrasted as it flows between a utility station and a processing plant a short distance downstream is astounding. The canal is the focus of the park, with its wading pool and clear stream passing under the foot bridges. It waters the trees that line its banks, and the most desirable places in the park seem to be along its shady banks. And yet, a few hundred feet downstream, the canal is a dumping place for old tires, broken glass, discarded toys, and other trash.



This is a canal as it flows through Central Park ...



... And this is the same canal a short distance downstream.

Certain portions of the canals have a high aesthetic value even outside of parks. Native vegetation grows readily and forms a cool, shaded corridor which is one of the few places a pedestrian does not have to compete with automobiles. Some canal adjacent landowners have taken advantage of the flowing water and shade and developed their yards beside the canals to enjoy the effect that the canals offer.

The canal can be used to enhance the beauty of homes.

Others throw their leaves, grass clippings, and yard debris into the canal, causing maintenance problems for the canal company and irritation to recreational users.

Irrigation Methods

Both canals function as gravity flow systems, except for pumps used to drive sprinkler systems uphill from the canal, or to pump water from auxillary wells to supplement flow in severe droughts. The force necessary to push the water through the miles of lands irrigated comes from the elevation drop from the Logan River to the farmlands. Irrigation of benchlands requires originating the canals a considerable distance upstream to obtain a sufficient elevation for the gravity flow system (see Figure 4).

To use water from the canal, one must buy water shares. These shares allow the user to drain a certain volume of water from the canal during a determined time interval. Two types of irrigation systems are used locally, surface and sprinkler irrigation. Surface irrigation requires building furrows to direct the flow of water. Slopes must be kept to a minimum to eliminate erosion. Using surface irrigation, the soil absorbs more water at the beginning of the furrow than at the end. Surface irrigation is approximately 60 per cent efficient, but it requires little initial investment so in water rich areas, such as Cache Valley, it is a suitable irrigation method. Sprinkler systems may be used to irrigate lands above or below the canal level by using pumps to provide water pressure. Sprinklers may also operate on gravity pressure if the farmlands are far enough below the canal level. Landforms are not required to direct the flow of water, and relatively steep slopes may be irrigated. The distribution of water is more even, and sprinkler systems are about

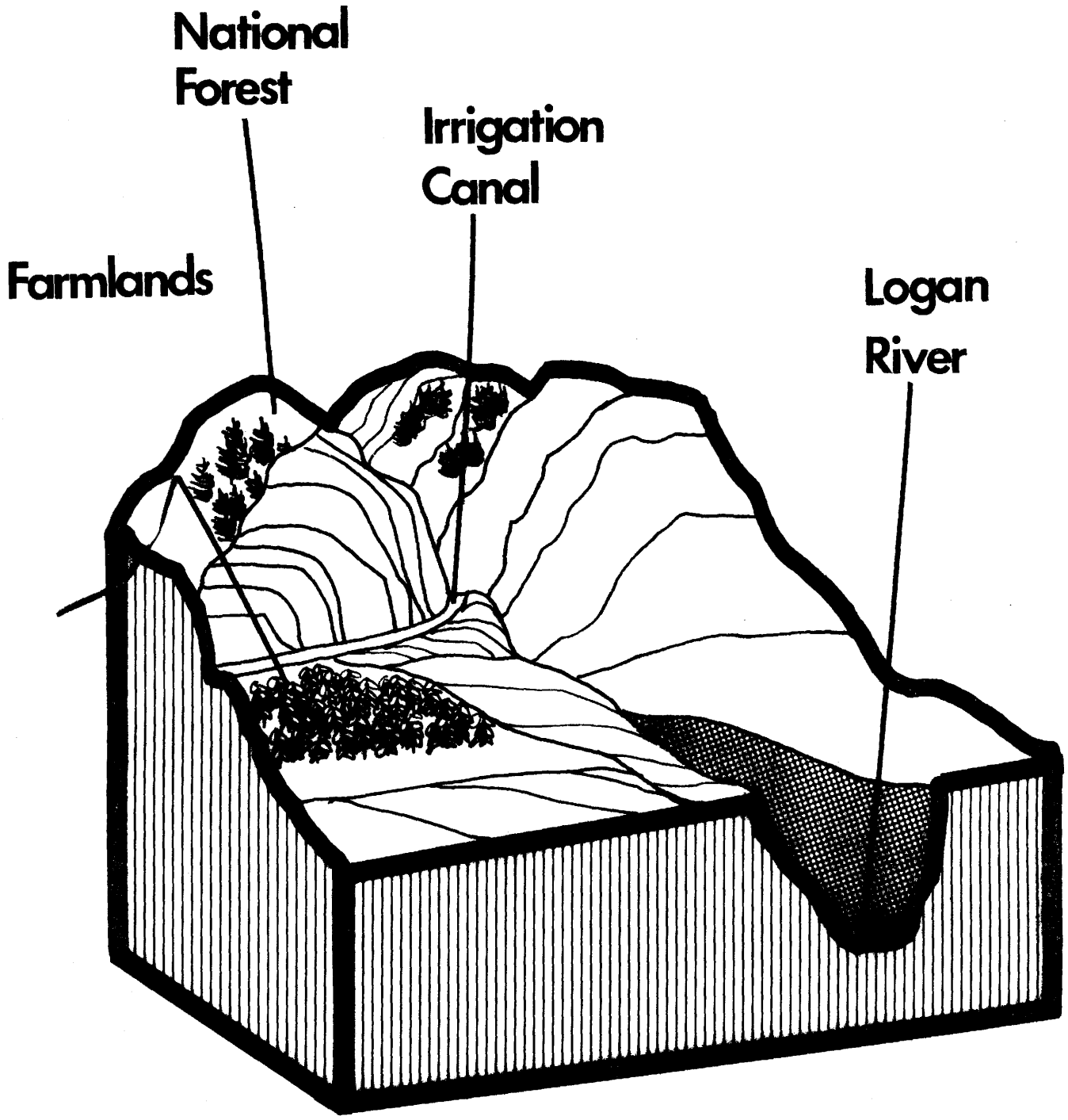


Figure 4. Land use block diagram.

75 percent efficient (Merriam, 1968). The initial investment is much higher, but savings in water and maintenance eventually compensate for the money invested, especially in areas where water is scarce.

Most of the canal water is used rurally for watering pastures and crops, but water is available in Logan City for irrigating lawns and gardens. Both the Logan-Hypde Park-Smithfield Canal and the Logan Northern Canal flow through suburban or urban areas of Logan, where their waters are often used by city residents. The use of canal water on lawns and gardens rather than city water saves residents money and conserves culinary water.

Additional Canal Functions

Another function the canals fulfill is stock watering. The upper canal allows direct watering of stock from the canal. Here stock owners have a very cheap means of watering their animals. The canal companies allow a small flow of water for the stock after the irrigation season. The Logan Northern Irrigation Company does not allow fences across their R.O.W.; therefore, stock owners use small holding ponds filled with canal water for their animals.

During spring thaws and rain showers, the canals are used as the drainage system for Logan City and much of the surrounding land. The same curb and gutter portion of the city streets used to distribute irrigation water gathers runoff water and dumps it into the canal. Many block interiors have irrigation ditches that drain runoff from gardens and back yards into the nearest canal. This ready-made drainage system has saved Logan City the cost of installing storm drains.

SECTION 2: RECREATIONAL USES OF THE CANALS

The canal corridors running through the towns and farmlands of Cache Valley offer a land area adjacent flowing water that children and adults often utilize for their pleasure. The linear quality of the canal corridor often generates travel-oriented recreation, such as walking, exploring, bicycling, motorcycling, horseback riding, tubing, etc. The type and frequency of recreation varies tremendously along different sections of the canals, probably due to differences in the canal stream flow, access trail, and surrounding land uses. Certain activity groups were specified for study purposes. These include tubing, bicycling, walking, fishing, playing (treehouses, rope swings, swimming, exploring, etc), and miscellaneous activities. Recreation along the canals also spreads to the surrounding lands in places. Youngsters may start a hike by taking a bike ride to a certain spot, then leave the canal for a hike in the foothills.

Four study sections on three different canals were chosen for recreational use analysis. Previous observations showed considerable recreation on these sections. The size of the study area was limited so it could be adequately covered in one hour (refer to Figure 3). (For details of study sections and sampling procedures, refer to Kennedy and Unhanand, 1974, pp. 79-80; and Gast, 1974.) Basically, a twelve hour day, from 9:00 a.m. to 9:00 p.m., was measured on each canal for the months of June, July, and August, measured in one hour increments distributed randomly throughout the month, yet stratified by weekday, weekend, holidays, and individual months.

These youngsters rode their bicycles along the canal trail to their favorite spot on the canal.

Use Analysis

The use analysis of the four canal sections was designed to measure the following information: (1) activities as a percentage of total use for each canal section, (2) user hours versus time of day, (3) total user hours, and (4) total number of users.

1. Activities as a percentage of total use for each canal section show the relationships of the intensities of different types of recreational uses and changes in the intensities of these uses on each canal segment. Section 1-A had 100 percent tubing probably

because the canal flows along a steep canyon wall and is accessible only to tubing. On sections 1-B and 2-B, playing was the dominate activity, followed by tubing and bicycling, miscellaneous activities, walking, and fishing in order. Section 3-A showed fishing to be the most popular activity followed by playing, tubing, walking, miscellaneous recreation and bicycling (see Tables 3 and 4).

2. User hours versus time of day determines the hour of day that the greatest intensity of recreation occurs, and shows the patterns of use intensity throughout the day. Most of the use occurs between 12:00 and 6:00 p.m. with peak use during the 4:00 to 5:00 p.m. interval (see Figure 5). Inferences from this data might assure that maximum use of the canal corridor occurs during the warmest hours of the day. Users probably seek shelter from the summer heat in the cool canal stream or in the shade of trees that grow along the canal banks.

3. and 4. Total user hours and total number of users show the magnitude of recreation on the canal segments, and develop a basis for comparison to other recreational facilities. Approximately 16,500 people used these sections for approximately 22,000 hours, averaging 1.32 hours per individual.

Comparison with Malibu Campground

Comparison of total summer use of the four canal segments with another popular, local recreational use was necessary to give some meaning to the canal use totals. Because of its popularity, proximity, and previous use statistics, Malibu Campground in Logan Canyon was

Table 3. Summer recreational use on select segments of Logan area canals

Type of Activity	Activity by Month: June 1973 Number	June 1973 Hrs.Use	July 1972 Number	July 1972 Hrs.Use	August 1972 Number	August 1972 Hrs.Use	Total Number	Total Hrs.Use
Tubing	1,186	1,282	5,952	8,302	5,304	7,395	12,442	16,979
Play	374	369	412	462	1,518	1,436	2,304	2,267
Walking	145	162	421	441	238	473	624	1,076
Bicycling	267	300	193	309	026	318	666	927
Fishing	32	32	145	137	61	61	238	230
Misc.	44	52	127	149	208	220	379	421
TOTAL	2,048	2,197	7,070	9,800	7,535	9,903	16,653	21,900

Table 4. Summer recreational use estimates by type for each canal section (sample totals)

Type of Activity	Recreational Use by Canal Sections: Sec. 1-A Hrs.	Sec. 1-A Per Cent	Sec. 1-B Hrs.	Sec. 1-B Per Cent	Sec. 2-B Hrs.	Sec. 2-B Per Cent	Sec. 3-A Hrs.	Sec. 3-A Per Cent
Tubing	565.2	100	73.3	41	16.9	19	5.8	16
Play	0	--	55.0	31	40.2	46	8.8	25
Walking	0	--	7.9	4	21.4	25	3.4	9
Bicycling	0	--	32.9	18	3.2	4	3.4	9
Fishing	0	--	0	--	0	--	11.4	32
Misc.	0	--	10.5	6	5.3	6	3.3	9
TOTALS	565.0	100	179.6	100	87.0	100	36.1	100

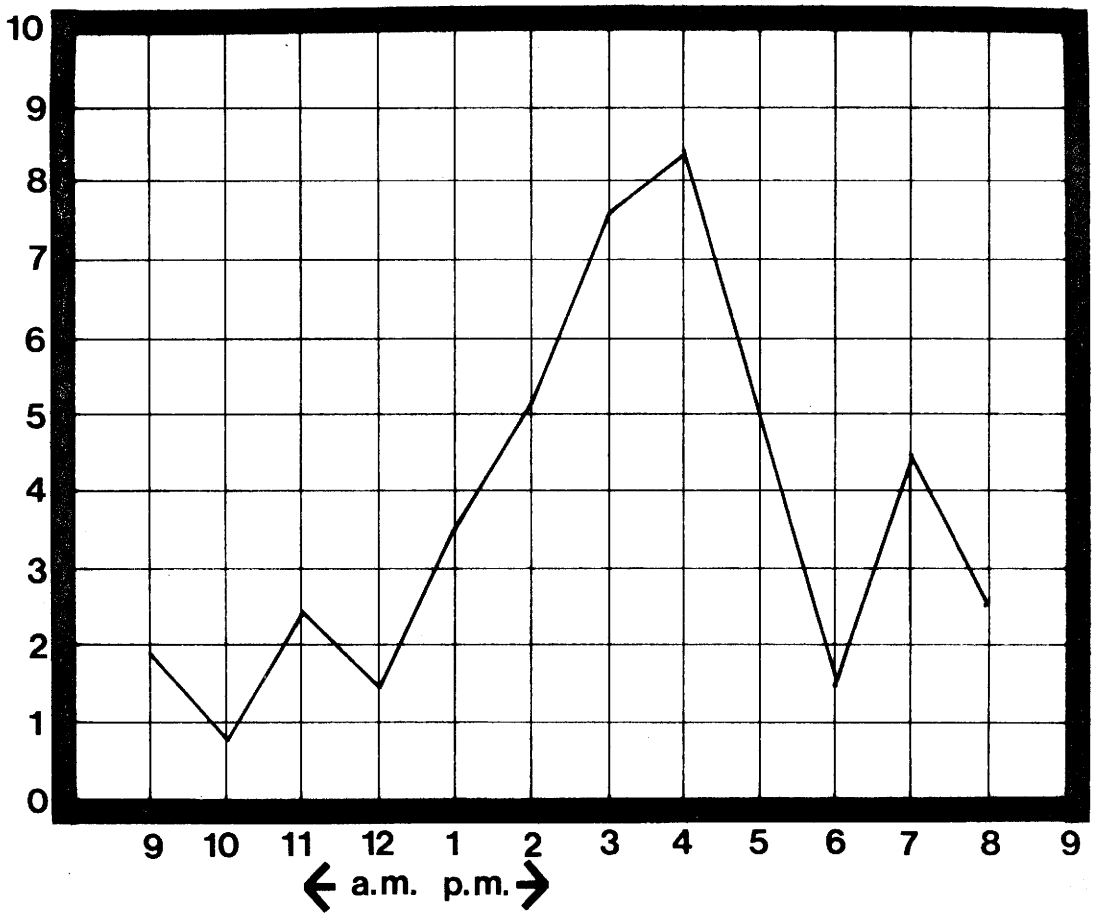


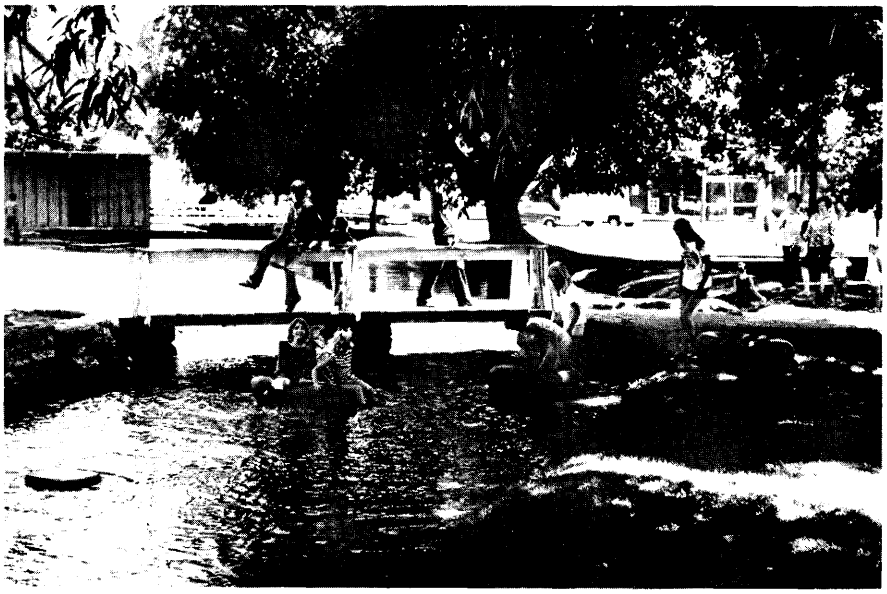
Figure 5. Distribution of weekday canal use by time of day.

chosen. Malibu Campground was open 139 days for the 1973 summer season. The facilities there could potentially accommodate 52,820 visitor days for this season (U.S. Forest Service, 1972). Actual use was 12,400 visitor days for the season of 2,695 visitor days per month which was 23 percent of the potential use. Malibu Campground is well maintained by the United States Forest Service, and has facilities for picnicking and camping.

A visitor day is one person using the facilities for 12 hours, or 12 people using them for one hour. The unit for the use studies of the canal segemtns was the user hour, and equating this unit with a visitor day has some problems. The user of the campground spends more time per individual than the user of the canal; therefore, a user day on the canal serves more people than a visitor day at the campground. The four segments of the canal studied totaled 21,900 user hours for the summer. This was 7,260 user hours per month or 605 user days per month, or 22.2 percent of the use at Malibu Campground. This amount of use is considerable even in comparison with such a high use facility as Malibu Campground. Perhaps a more realistic comparison would be the number of users of each facility. The canals accommodated 16,600 users during the months of June, July, and August, while approximately 20,000 visits were recorded during the 139-day season for Malibu Campground, so actually the total number of users accommodated are nearly equivalent. The canals have no facilities or improvements for recreation, and the only cost of canal recreation is an increase in maintenance for the canal companies.

Canal Recreation in City Parks

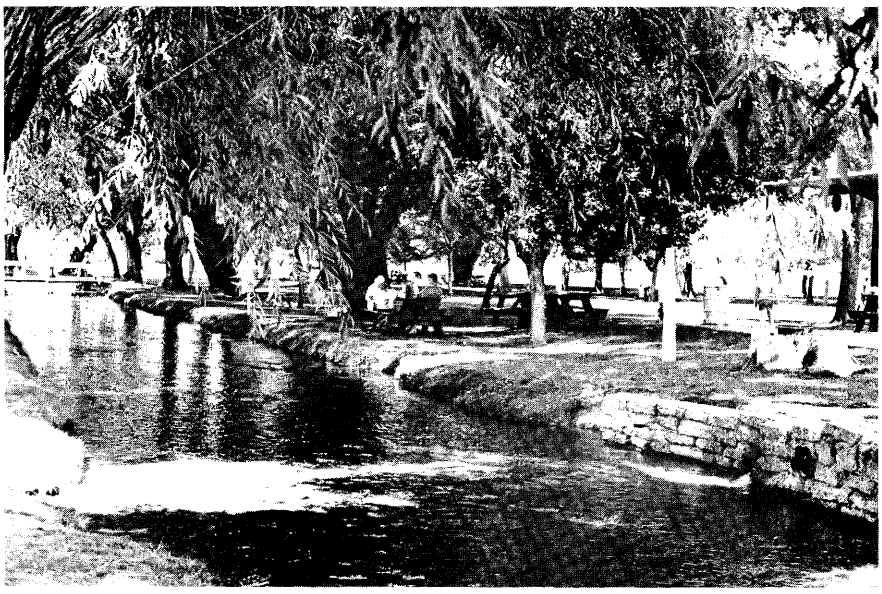
The canal flowing through Central Park generates considerable activity. It seems to bring people to the park, especially in the summer time. Families arrive with their inner tubes, bathing suits, and picnic baskets. The shallow wading pool serves the younger children, while the older ones play on the entire length of the canal. Multiple use is obvious here. Irrigation waters are flowing to the farms, yet being tremendously enjoyed by park visitors.



Youngsters enjoy the canal waters while their parents picnic beside the canal.

Passive Use

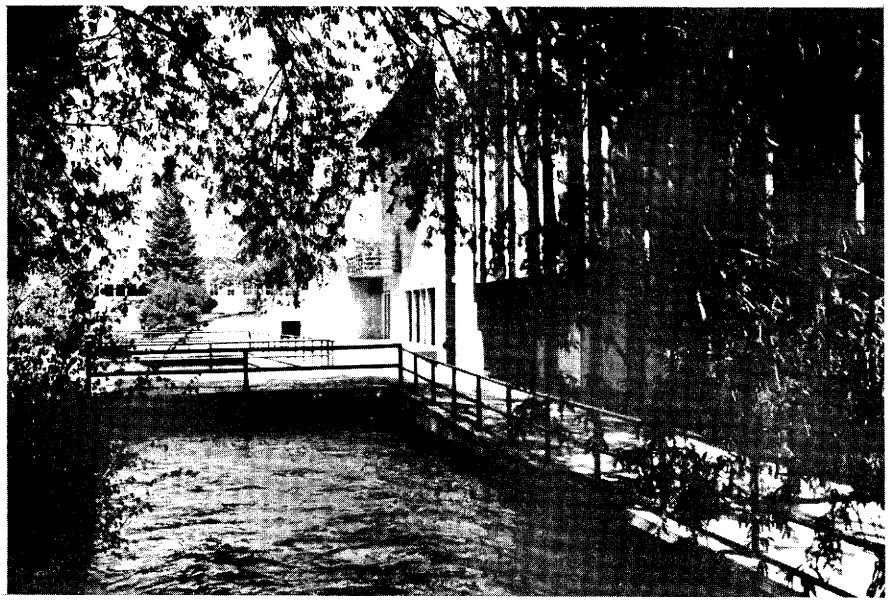
Many uses of the canal are not directly measurable in terms of cubic feet per second or hours of activity, yet they are a bona fide use of the canals, and they must be considered. These are the passive uses, the enjoyment gained from being near the flowing water, enjoying the shade and sounds. Flowing water attracts people and appears to be psychologically stimulating. It is constantly changing, floating objects before the viewer, reflecting sunlight filtering through the shade trees, and also creating stimulating auditory patterns. The total effect is often entrancing, and brings many people to the canals to picnic or sit beside them both in public places and at their homes.



The atmosphere of a picnic is enhanced by this canal.

The quiet setting created by the canal and the trees is often enjoyed by passers-by.

An enjoyable effect has been created at the home of this adjacent landowner.



The space created beside this canal is an important congregating spot for students of Logan High School.

SECTION 3: MULTIPLE USE ALTERNATIVES FOR FUTURE CANAL USE

When the cost of building a separate storm drainage system, a separate stock watering system, a separate crop irrigation system, a separate water oriented recreation system is considered, multiple uses of the irrigation canals seem to be an excellent way for a community to maximize its benefits and minimize its dollars spent. The canals of Cache Valley serve five major functions: (1) crop irrigation, (2) stock watering, (3) city storm drainage system, (4) active recreation, and (5) passive uses. Though a certain amount of efficiency of use exists because of spontaneous multiple use, certain confliction interests have also arisen between these user groups. Essentially, the other uses compete against each other, and the primary use, crop irrigation, on a canal built with the single intention of irrigating crops, and with no design changes to accommodate the newer uses. However, the community value of the canal system has appreciated with the number of functions it serves, and the potential of the canal to accommodate these functions could be greatly improved and the use conflicts minimized by proper planning and design.

These conflicts may originate from the presence of two incompatible activities located on the same land, or from the territoriality of an adjacent landowner resenting others passing through or near his land, or from extra costs to canal companies in cleaning after recreationists and adjacent landowners. In this chapter, the use alternatives indicated are designed to minimize user conflicts and

shape the existing multiple uses into a safe and more pleasant recreation system.

The use alternatives are designed to address the problems of all parties concerned. Presently, there are three major types of user conflicts, recreationists and adjacent landowners versus canal companies, adjacent landowners versus recreationists, and recreationists versus recreationists. These conflicts could be minimized by a carefully planned recreation system that carefully groups compatible activities, segregates incompatible activities, and minimizes remaining conflict situations through design.

Conflict Situations and Alternative Solutions

1. Recreationists and adjacent landowners versus canal companies--the canal companies spend money to clean up debris and litter dumped into the canal by recreationists and adjacent landowners. During spring cleanup, people who live along the canal banks often dump leaves, sticks, and other trash into the canal, sometimes clogging grates and headgates (see photo on p. 4). Abuse of the canals could be minimized by placing the canals in proper perspective, by recognizing the canals as a positive resource to be protected rather than abused. If the canals are incorporated into a local recreation system, they would probably be under jurisdiction of local governments who could work with canal companies to establish and enforce regulations to defend the canals as public lands.

2. Adjacent landowners versus recreationists--canals flow through many residential districts, abutting sideyards and backyards of

residences. Some of these yards are sadly neglected, while others are beautifully maintained. Houses, garages, fences, and other structures built by adjacent landowners often physically restrict travel along the canals, while other canal sections maintain an unrestricted path alongside the canals. Many residents develop territorial feelings and resent recreationists passing through their yards as they move along the canal corridors. The presence and noise made by these recreationists is an invasion of their privacy, and, consequently, recreationists are sometimes bothered by confrontations with irate landowners. Dogs of adjacent landowners are also a problem at times.

The interests to both landowners and recreationists would be served by designation of appropriate segments of canals (i.e., those having unrestricted paths along the canals) for recreation. Screening and fencing of the paths would be necessary in places, and recreation on sections with access problems should be discouraged to avoid trespassing.

3. Recreation versus recreation--various recreational activities often interfere with each other physically and psychologically. For example, a land activity such as motorcycling destroys the quiet atmosphere needed for a walk or picnic. Hunting could not be allowed on or near the same lands where children play.

Two activities that interfere directly with each other are tubing and golfing. The upper canal flowing through Logan Canyon generates a tremendous amount of use, especially on warm weekend afternoons. These afternoons are also the favorite times to be

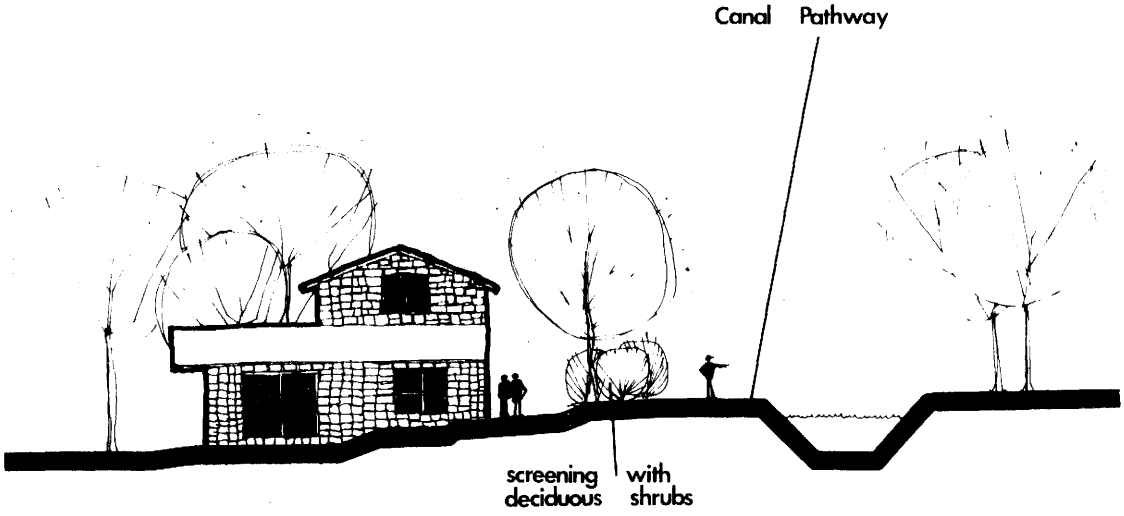


Figure 6. Screening diagram.

golfing, so both activities are at a maximum at the same time and in the same place. Because of the steep canyon walls, there is no access trail adjacent to the canal until it leaves the canyon and enters the golf course, so people who are tubing have no ooportunity to leave the canal until they are inside the golf course. The ride from canal origin to the golf course lasts about 40 minutes and the majority of people tubing leave the canal at this point. No exit has been provided for them here, so they walk through the course, out to the highway to their cars, braving flying golf balls, and interrupting play on the golf course.

Other recreationists who do not wish to stop tubing at the entrance to the golf course must leave the canal and walk around the low bridges and the small dam across the canal, also exposing themselves to flying golf balls and interrupting play. Some of these recreationists live in houses adjacent to the canal below the golf course, and they enjoy floating down to their homes.

There are two possibilities for minimizing conflict at the golf course. Establishing an exit trail for the majority of tubers to leave the canal before they enter the golf course would keep the majority of tubers off the course and away from flying golf balls. It also would join them with city lands at the power plant and provide parking off the busy highway. The other possibility is to raise the low bridges blocking the canal and modify the dam so that tubers may remain in the canal and float through the golf course in relative safety. Some screening of the canal by landforms or dense hedges is required at danger points, like fairways crossing or closely paralleling the canal (see Figure 7).

A Canal Recreation System

Presently, recreational use of canals is often fragmented or interrupted by activities or structures that restrict movement along the canals. Though many canals flow parallel to each other, linkage from one canal to another is only through the use of streets. An alternative to present canal use would be consolidation of two or more canals into a recreational system utilizing bicycle, pedestrian,

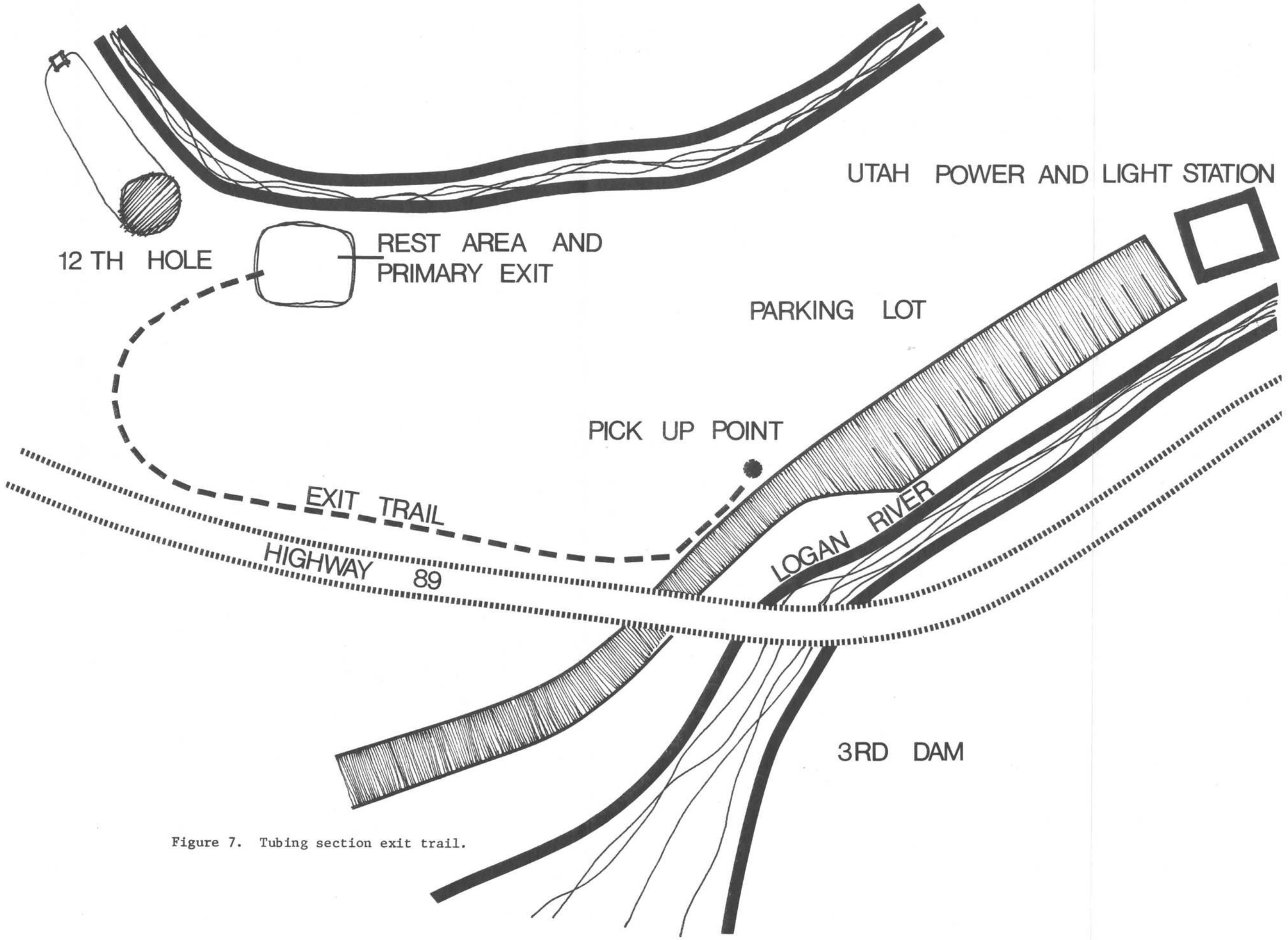


Figure 7. Tubing section exit trail.

and horse trails linking individual recreation sections and communities. This proposed recreational pathway system would join parks, schools, shops, and offices, thus becoming a highly functional, nonmotorized circulation system as well. These could be used as a primary route to school or work, and they would separate pedestrians and cyclists from auto traffic. The pathways would also serve as excellent canal maintenance roads for the canal companies. The pathways passing through residential areas could also serve as pedestrian routes to shops and offices.

Bicycle pathways

The linear, sinuous corridor formed by irrigation canals, and the service road adjacent to the canal generate travel oriented activities (tubing, walking, and bicycle riding were measured in use studies). These activities are inhibited in many places by fences, encroaching suburban and urban developments, and by adverse land uses. To establish a bicycle pathway or horse trail along the Logan-Hyde Park-Smithfield Canal, fences would have to be removed in several places, and some land uses on the canal banks would need to be relocated, especially feedlots. The Logan Northern Canal has an unobstructed path from Logan to Smithfield and would be much easier to develop However, even certain sections of this canal are tightly surrounded by houses, yards, and fences. Conflicting interests between recreationists and landowners, plus access, encroachment, and construction problems make location of a pathway along certain sections of the canals unfeasible.

Trails are needed in Cache Valley where recreationists can minimize their present conflicts. Demand for such trails was established previously by measuring existing use on canal segments (refer to Section 2) and by an earlier study (Thompson, 1972, p. 39). Thompson indicated the appropriateness of canals for bikeways. "Specifically, the bicycle pathway system within Logan proposes to utilize irrigation canal easements and service rights-of-way to a great extent." (Thompson, 1972, p. 107)

The bicycle trail itself needs to be constructed of some hard surface material, and be of sufficient width to handle traffice it will receive (see Figure 8). A trail 8.52 feet wide can handle three

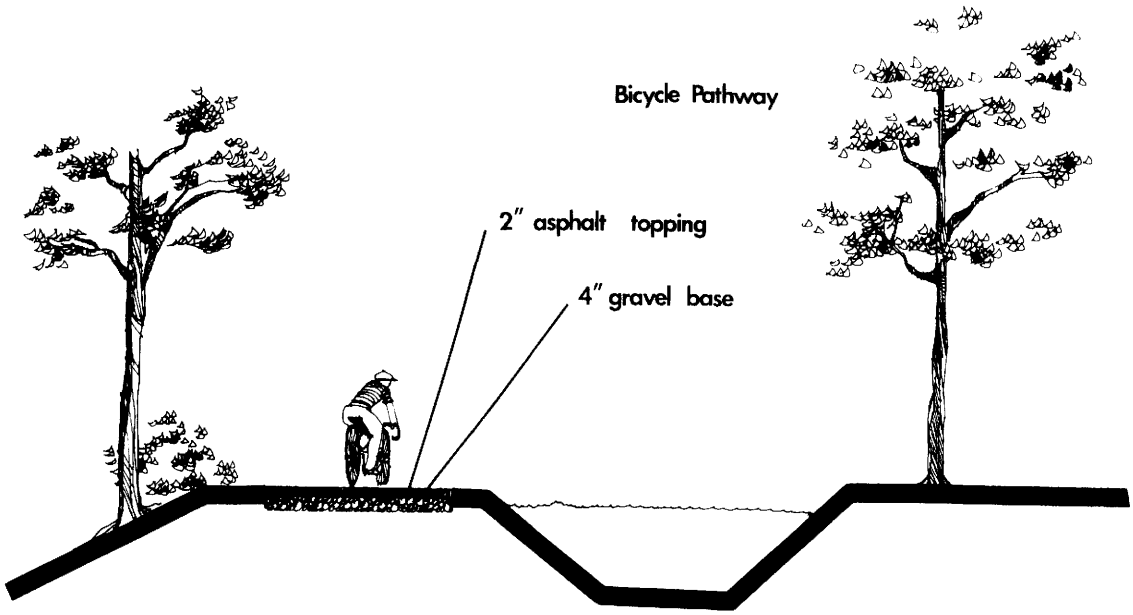


Figure 8. Bicycle pathway.

lanes of traffic (State of California, 1972). Thompson (1972) recommends an eight foot trail, and his estimate of construction costs of such a trail is $12,100 per mile for an asphalt trail. Maintenance costs are approximately 10 percent of construction per year.

Canalside parks

Incorporation of canalside parks into the recreation system provides residents with local parks and their amenities plus a pathway for traveling to the parks. Two types of parks are suggested for use along the pathway. One is a smaller neighborhood park for informal play activities and passive use. Local residents could walk to the park for a picnic, to sit beside the canals and relax, wade in the canal or even possibly fish (see Figure 9). This type of park would

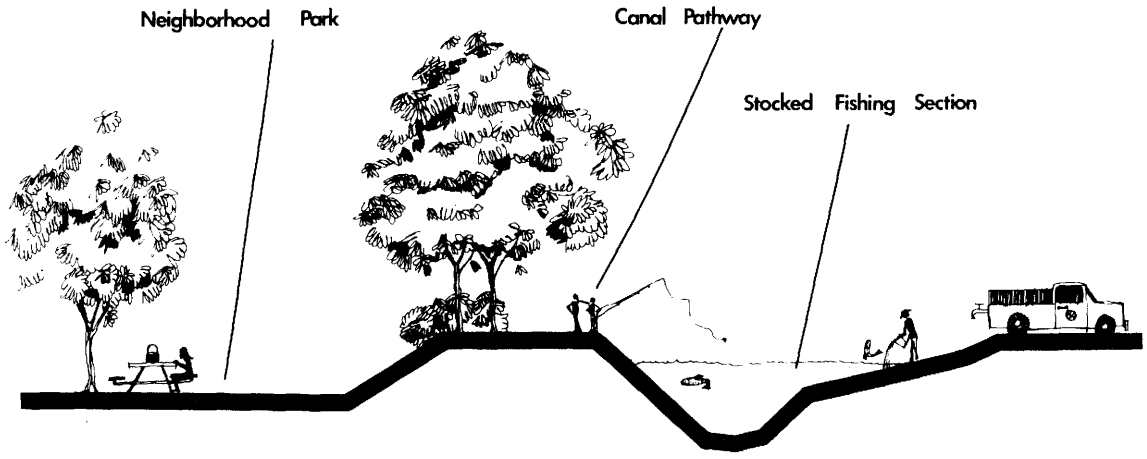


Figure 9. Neighborhood park and fishing section.

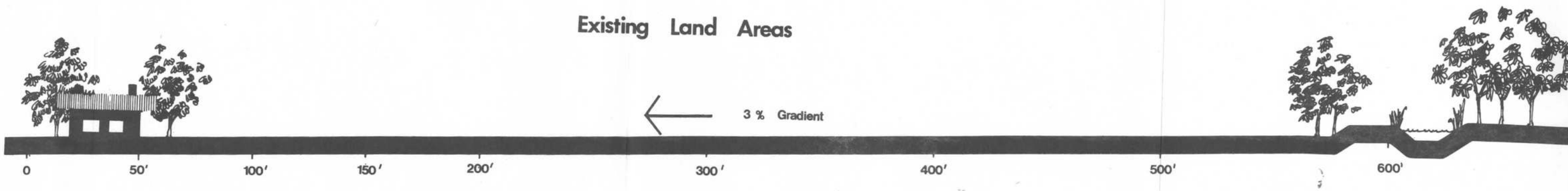
double as a resting place for other recreationists riding bicycles or walking along the canals. The other is a community park with activities requiring more land area and facilities. Activities to be included here are softball, football, tennis, basketball, volleyball, picnicking, and also various informal play activities such as frisbee, chase, etc. (see Figure 10). Certain alterations in canal bank design could enhance recreation in the parks without interfering with water flow (see Figure 11).

Hiking trails

Hiking is popular in the national forest lands, especially in the benchlands along the Wasatch Front. Many hikers walk along the service road of the upper canal, then wade across the canal and take their favorite trail up into the national forest lands. This local pedestrian trail into the national forest lands is an exciting idea. Since the canal flows through many residential neighborhoods, it serves as an excellent feeder trail for other trails leading into the mountains. Pedestrian bridges at key crossing points would encourage this kind of use.

Horse trails

Horse riding is another popular travel-oriented recreational pastime that could be well served by the canals. Horse riders, like hikers, could use the canal trail as a feeder trail to ride to the other trails leading up into national forest lands. The upper canal flows near popular riding areas along the bench lands, especially



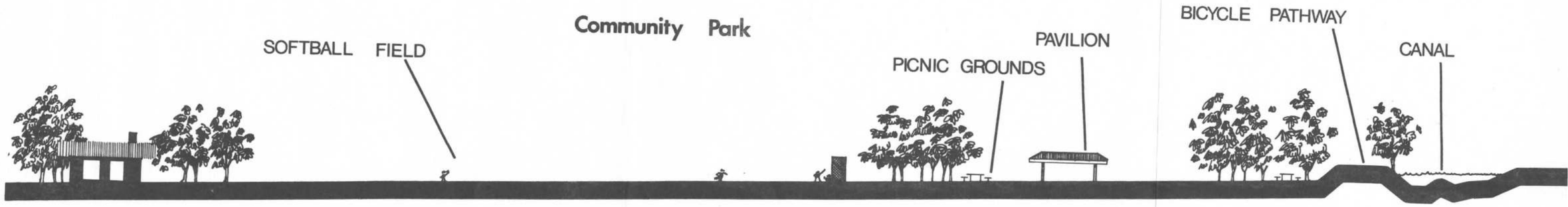


Figure 10. Community park.

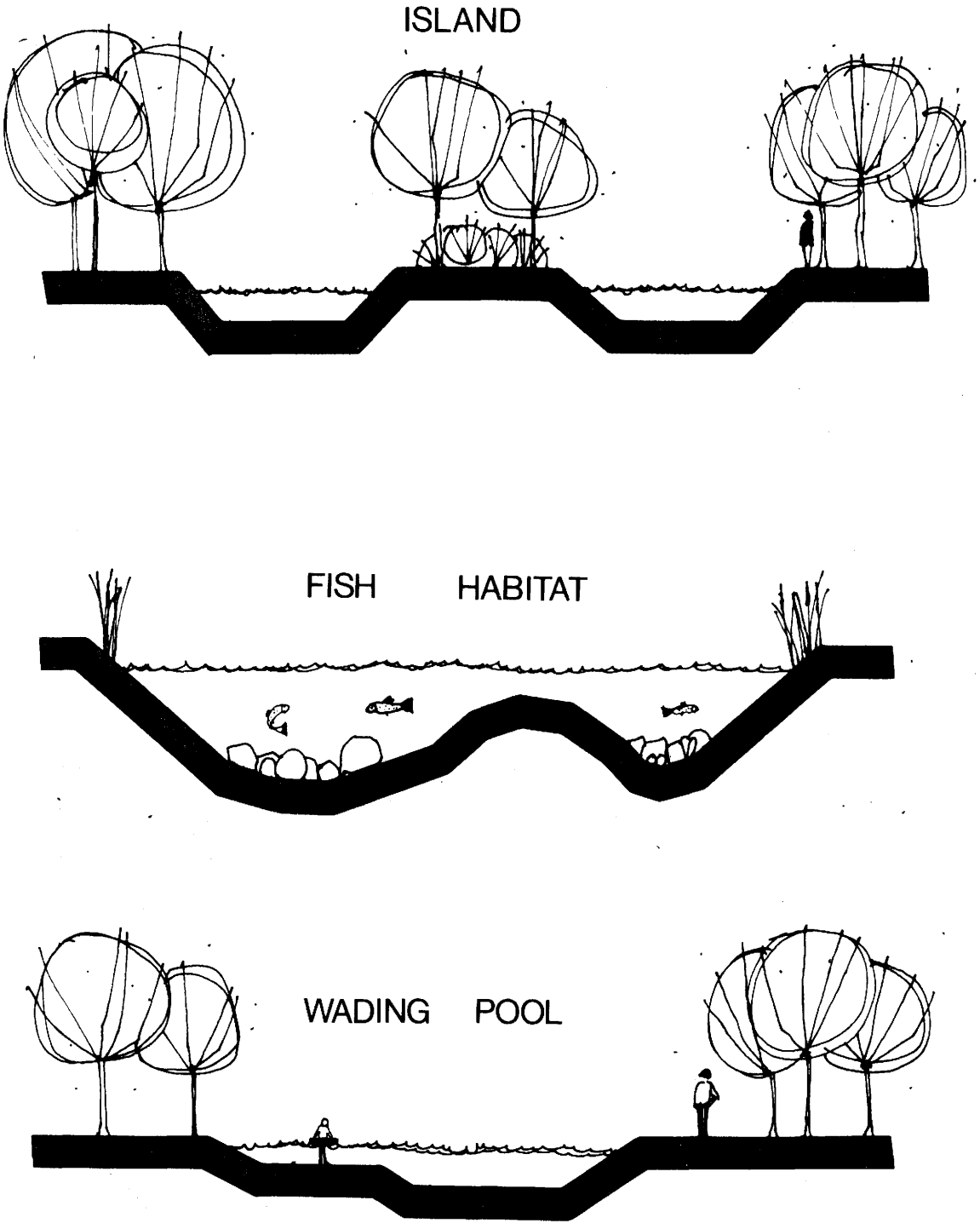


Figure 11. Canal bed alterations.

Green Canyon. The experiences of other trail systems, specifically Maricopa County Sun Circle Trail, Maricopa County, Arizona, and the Highline Canal Trail of Aurora, Colorado, have shown that horse riding and bicycling are incompatible on the same trail, so these activities are separated. Sections of the canal trail used for horse riding should not be used for bicycle or motorcycle riding.

Canal fisheries

During July and August of 1972, fishing was 31.2 percent of the recreational use (approximately 180 hours) of canal section 3-A, a section of the North Field Canal. The average age of the users was 11 years, and they lived an average of four blocks from the canal. Large fish populations had developed on this canal because of its year round flow. The canal had flowed after irrigation season to provide water power to the Central Milling Company, which switched in the winter of 1973 to electrical power. Subsequent interruption of canal flow destroyed the fish population that had developed over the previous years. Sampling studies show drastic reductions in fish population from 1972 to 1973 (Kennedy and Unhanand, 1974, table 2).

Local residents of Cache Valley could have prime trout fishing on their irrigation canals. Populations of native brown trout seem to thrive in the canals when given the chance by allowing the canals to flow year-round. The August, 1972, trout population in the canal was 1,962 trout per mile, considerably higher than the Logan River with 342 trout per mile (Bridges, 1963) and the Blacksmith Fork River with 1,206 trout per mile (Gosse, 1970).

If year-round flow could not be maintained in the canals, suitable segments could be stocked yearly for the enjoyment of local residents, especially children. This policy would encourage more local recreation, and would be especially effective in conjunction with the proposed canal recreation trails and parkway development.

Criteria for Location of Recreational Activities

To establish the criteria for locating the activities, one must first consider the specific objective of the activity and its relationship to the overall recreational system.

Bicycle pathways

Pathways must be trails that can be constructed, used, and maintained with a minimum of physical and social conflict with surrounding land uses. Factors here include:

1. Type and intensity of surrounding land use.

2. Degree of encroachment on the canal corridor by these uses (see Figure 3).

3. The canal corridor itself. Does a reasonable trail exist or can one be built?

Pathways must be functional, both as recreational features themselves, and as linkage elements joining neighborhoods with schools, parks, and national forest lands. They must also be of sufficient size and strength to accommodate canal company maintenance trucks.

Canalside parks

Neighborhood parks are intended primarily to serve local residents by offering such activities as picnicking, fishing, bicycling, tubing, and others, plus serving as rest stops and interest points for recreationists moving along the pathway system. Factors to consider are:

1. Location to and proximity to a neighborhood.

2. A land area adjacent to the canal and of sufficient size to locate the activities.

3. Access to the park by the canal pathway and from neighborhood streets.

4. Existing vegetation, especially large trees for shade.

Community parks are designed to serve a collection of neighborhoods, offering activities requiring considerable land area (i.e. softball, football, large group picnics, etc.) plus activities that that are found in the smaller neighborhood parks (i.e., fishing, frisbee, family picnics, etc.). Considerations for location of these activities are:

1. Sufficient land area for softball or football fields and the other necessary activities.

2. Access to the park from the canal pathway and local streets.

3. Location and proximity to several neighborhoods or a sufficiently large population.

4. Use of existing vegetation where possible.

Tubing sections

Tubing sections are designated sections along the canals where people ride inner tubes. They require dropoff and collection points, and they are ideally located in association with other recreational activities. Primary considerations are:

1. Water quality and associated land use (should not be located near or downstream from cattle feedlots).

2. Existing recreational use patterns.

3. Quality of the tubing ride on each particular section (scenery, rate of stream flow, obstacles such as fences, bridges, and dams).

Equestrian trails

Equestrian trails are sections located in rural areas along which people may ride horses. Horseback riding is incompatible with bicycling and innertubing (this was discovered by the Aurora Parks and Recreation Commission on the Highline Canal Trail), so these activities may not occupy the same sections. Ideally, the equestrian trails function as routes to national forest lands (and other rural lands) from farms that neighbor the canals. Primary considerations are:

1. Obstacles to horse and rider (fences, busy streets, gates, etc.).

2. Access to national forest and other rural lands.

3. An earthen trail adjacent to the canal.

4. Sections of the canal not used for bicycling or tubing.

Fishing sections

These are canal sections to be stocked with trout and used by recreationists. Entire sections may be stocked, but in neighborhood and community parks fish will be stocked in contained pools. Primary considerations are:

1. Water quality.
2. Sufficient year-round flow to sustain the trout.
3. Proximity to existing population.

Overall plan

The proposed recreational system originates at the origin of the Logan-Hyde Park-Smithfield Canal with the existing tubing run (see Figure 12). At the entrance to the golf course, a pedestrian path allows tubers to exit to the parking area near the power plant. People wishing to continue tubing through the golf course may do so. Passing through the golf course, tubers discover the origin of the bicycle pathway, an eight-foot wide, hard surface bicycle trail. Both the secondary tubing section and the bicycle pathway intersect the community park at about 1400 North. The pathway and the tubing section continue to the neighborhood park at 1900 North, and from there they continue to 2100 North, which is the entrance to Green Canyon. Here the tubing run ends because of reduced water speed and increasing possibilities of health hazards due to cattle feedlots that drain into the canal.

The bicycle pathway becomes a class II pathway (see State of California, 1972) as it shares a road with cars, turning west until

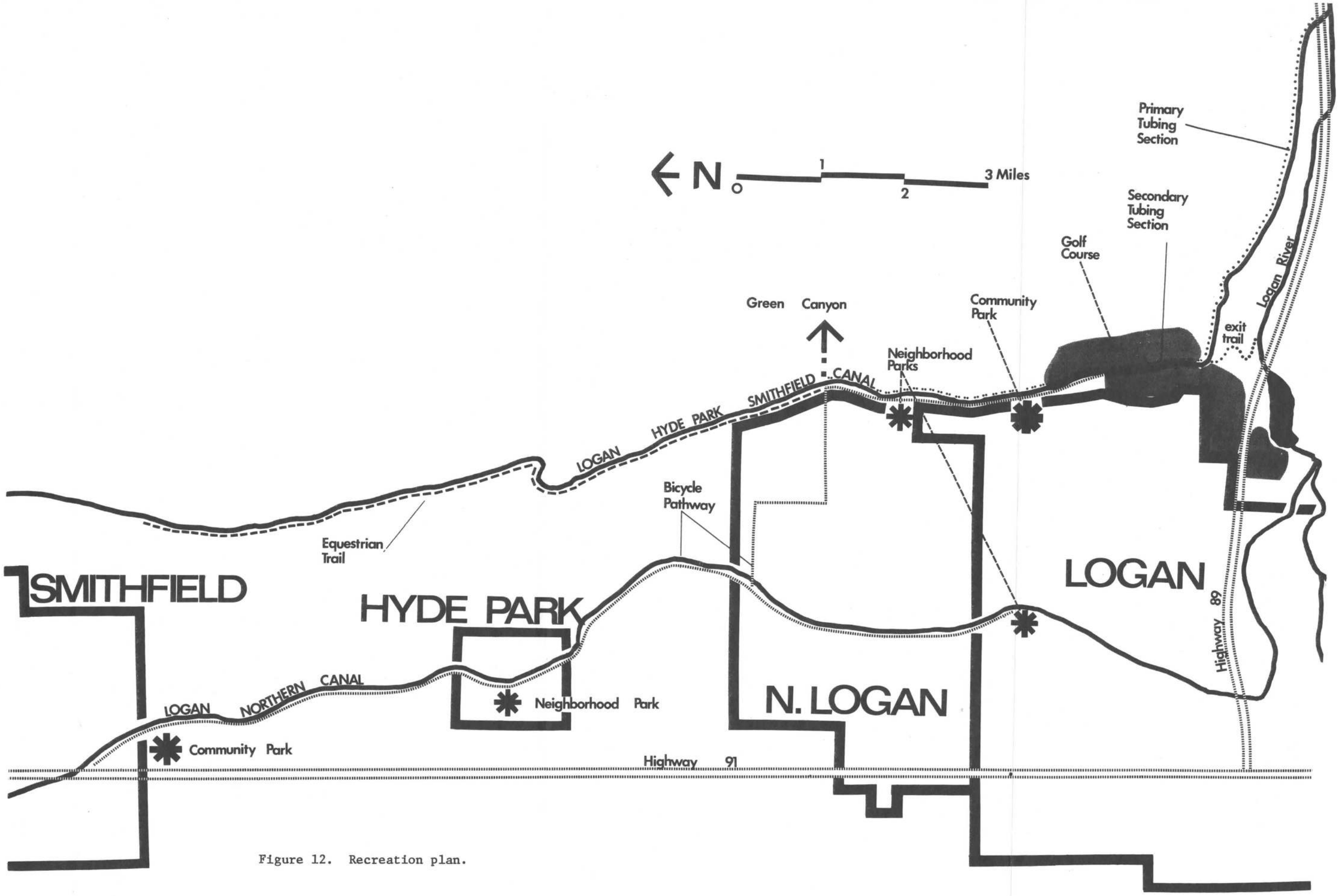


Figure 12. Recreation plan.

it joins the pathway on the Logan Northern Canal. This pathway originates at 1000 North and continues all the way to Smithfield, joining several communities along the way. It terminates about a block from Skyview High School, and would serve the school as a major pedestrian and bicycle route from neighboring communities.

Financing Canal Development

The cost of financing a canal trail system is considerable, especially when installing an asphalt or other hard surface trail. An estimate for construction of an eight-foot asphalt bike trail totaled $12,100 per mile with a 10 percent per annum maintenance cost (Thompson, 1972). But, a recreation system is vital to the interest of a community in order to assure people a place to exercise and play. Land costs are rising and establishment of recreation lands now assures that these lands will not be engulfed by urbanization in the future. Canalside trails planned and constructed to meet the proper criteria may qualify for federal matching funds through the Bureau of Outdoor Recreation. Sections of such a federally funded trail have been completed in Aurora and Littleton, Colorado (U.S. Department of Interior, 1972). Both EPA and the Department of Transportation also have construction aid grants for bicycle pathways.

Construction of bicycle pathways is the greatest expenditure in installing a canal trail system. Establishing horse trails is not as expensive, for existing earthen trails are suitable. However, every fence that crosses the canal has to be removed to allow travel

along the canal corridor. The Logan Northern Canal right of way is clear of fences, and one may travel along the canal service road from Logan to Smithfield. However, the upper canal is blocked by fences in numerous places, and stock often are free to graze and drink in the canal bed. Refencing of the canal bed on each side seems to be the most suitable solution. Added to the considerable cost of refencing the canal bed would be the cost of constructing watering ponds for stock barred from the canal. Both refencing and construction of ponds would have to be completed before a trail system could be built on the upper canal.

SECTION 4: SUMMARY

Importance of a Canal Oriented Recreation System

The canal corridors are very important as nonmotorized pathways linking national forest, rural, suburban, and urban lands. As multiple use systems, they serve several functions of agriculture, irrigation, drainage, and recreation. Certain sections of the canal corridor generate considerable year-round recreational use, but only a fraction of their potential because of lack of access due to fencing and restrictive land uses.

Construction of the proposed canal recreational system would have many recreational-functional benefits. Children could walk or ride their bicycles to school along the pathways. People wishing to walk or ride bicycles or horses to neighboring communities or parts would have a trail separated from street traffic. Hopefully, local recreation in the pathway and parks system would tremendously increase, shifting away from recreational activities requiring long auto rides, saving gasoline and reducing pollution. The bulk of Utah's population lives along the Wasatch Front, and they travel over one billion recreation related passenger miles per year (1972 estimate, see Utah Department of Natural Resources, 1974, p. 4) to attractions in different regions of the state. Progressive communities should consider these long term energy savings, especially during present and future energy crises situations.

Management of Present Multiple Uses

Presently, there is a need for recreational planning, setting forth guidelines for recreational uses of the canal system. Through proper planning, safety hazards such as barbed wire fences across the canals and danger from flying golf balls to people tubing could be eliminated. Other areas of conflict, like invasion of privacy of adjacent landowners, could be minimized by design. Generally speaking, the quality of the extensive present recreation would be enhanced, and dangers decreased or eliminated by proper recreational planning. Designation of the canal as an official recreation system to be used by the community should encourage people to refrain from littering or dumping trash into the canal, thus reducing maintenance problems.

Proposed Highline Canal

A proposal to consolidate three local canals into one large concrete highline canal has been made by a few members of irrigation companies. Water loss due to seepage (approximately 30 percent) and increased water pressure in the valley below the canals are the reasons for the proposal. From an engineering point of view the proposal is logically sound. Consolidation of several earthen canals into one larger concrete canal of higher elevation would certainly decrease seepage loss considerably and provide enough water pressure to drive sprinkler systems of farms and homes a sufficient level below the canal.

However, the logic for constructing a highline concrete canal ends with the engineering point of view. Economically, one must look at the cost of construction of 9.7 miles of concrete canal versus the long term rewards of such construction. Are the millions of dollars spent worth the increased efficiency? First one must take a closer look at irrigation efficiencies and the water demands of Cache Valley. Compared to many of the surrounding arid landscapes, Cache Valley is certainly a water rich area. Water demands have marginally exceeded water supply in only a few drought years, and water excess is common. Average excess was 11,220 acre feet for the upper canal and average deficit was 228 acre feet. The same 30 year period showed an average excess of 15,184 acre feet for the Logan Northern Canal with no deficit (U.S. Department of Agriculture, 1972). Construction of the concrete canal would only reduce seepage loss within the canal itself. Significant water losses occur in conveyance from the canal to the crops, especially through gravelly or sandy soils. This loss would still occur even with a concrete canal. Present surface irrigation practices also waste much water in the fields because of uneven distribution. Crops at the head of a row receive excess water while crops at the end often do not get enough water. Sprinkler irrigation distributes the water more evenly and uses less water (Merriam, 1968). An interview with a canal official of the Logan-Hyde Park-Smithfield Canal showed that farmers using surface irrigation are required to call and get permission to irrigate, while farmers using sprinklers may irrigate anytime because

they use less water. The problem of water deficit could be minimized by using trickle systems.

Concrete canals present safety hazards not found in earthen canals. Danger of drownings would increase significantly with the increased water flow, a danger particularly on the upper canal because of intensive recreational use and proximity to residential areas. Concrete canals are death traps to deer, whose hooves slip on the slick concrete walls (Latham and Verzuh, 1971). The canal flows by benchlands populated with deer.

The 30 percent water loss should not be considered all wasted. Seepage water supports trees and other dense stands of vegetation, which attract birds and other wildlife to the canals. Termination of this seepage water would kill much of the vegetation now thriving along the canals, destroying much of the natural beauty of Cache Valley's communities and landscape. The natural atmosphere of the earthen canals would be lost, and surrounding land uses would be affected.

Construction of a concrete canal or pipe system along the Wasatch Front would also have a considerable effect upon the visual quality of the benchlands, an area immediately visible to most of Cache Valley.

Due to these reasons, proper impact evaluation and cost effectiveness should be required before any serious efforts towards construction of a highline canal system are made.

Areas for Additional Research

The quality of the water in the irrigation canals has not been determined, even though there is considerable recreational use and water contact sports. Specific water quality studies need to be done on the canals, identifying both point and nonpoint pollution sources. This information is needed before construction of any recreational system.

The proposal to build a highline canal also raises questions that need to be answered. Would consolidation of several small earthen canals into one large concrete canal or pipe be a good thing to do? Are the irrigation deficits that critical, or would the construction costs outweigh the benefits gained? Would sprinkler irrigation in Cache Valley be a more efficient irrigation system? What would the construction costs be? What would the social, environmental, and visual impacts be? What would happen to the old earthen canals? All of these questions need to be answered.

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