

ZION NATIONAL PARK

Superintendent's Annual Report

Administration and Management

Zion National Park had the second largest number of visitors ever recorded for a single year. There were 1,209,649 visits to the Park recorded. This represents a decrease of one percent under 1976's record year. In the final analysis there was no real difference in work load. Both the spring and fall months continue to show increased use, which in turn places more pressure on park resources to meet demand required by visitor services.

The use of the campgrounds was up 11 percent with the total use for the year 196,302 campers. The increased use was felt throughout the year, but it did cause problems in maintenance work scheduling in the fall months. We were forced to keep maintenance crews on longer to accommodate the increased fall usage. Both campgrounds were used into October, and this was an unheard of situation. It appears that if this trend continues, we may well be looking for a reservation system within the next few years.

Southern Utah still maintains a strong growth posture economically. It appears that this cycle of growth will be with the area in general for some years to come. There are a number of proposals for large electric generating plants and coal development to supply the fuel. If the trend continues, we can expect this cycle of growth to go well into the twenty-first century.

A permit was issued to the Krishna Society to pass out literature at a number of locations. The two gentlemen who passed out the literature remained in the area for about three days and left. They caused no problems nor did they generate any complaints.

The Superintendent met with a group of California Automobile Club travel agents at the request of the Utah Travel Council on April 25. He spoke at a dinner meeting to the group explaining the resources available to the park visitor. Speaking engagements are not easy to obtain, and when ever the opportunity presents itself, we should take advantage of it. On October 12, the Superintendent gave a talk on the new Zion Master Plan to the St. George Chamber of Commerce. A lively question and answer period followed.

Portions of two motion pictures were filmed here at Zion in 1977.

Neither production presented any problems to the management of the Park while being filmed. The company filming "Winter Kill," a western drama, was taken in the Park for close to two weeks getting necessary footage. The second motion picture was for background shots for "Lassie, My Lassie."

Assistant Chief Park Naturalist Crawford performed the biennial inspection of the Joshua Tree Natural Area National Landmark, with officials of the managing agency, BLM, in July. This is the first time this inspection has been performed since 1972. The inspections program had been suspended for the intervening period.

The Park became involved in the Youth Conservation Corp this past year. We consider that the program was a success. The group was operated on a non-residential basis. We feel that the benefit received is most difficult to calculate. The program accomplished tasks that needed to be done but funding and staff limitation did not permit. The value that the young people who worked in the program received would be very difficult to evaluate but from the comments we received from them, they seemed to feel that it was a most worthwhile experience. We look forward for this program to continue.

The National Park Service worked with the Utah Division of Fine Arts in sponsoring a Southern Utah Folklife Festival over a three-day period of September 8 through 10. The Zion Nature School facilities were used to house the Festival. We feel that it was a success and we plan on having the Festival again in 1978. There were about 3000 people who attended. National Public Radio taped the Festival for later broadcast. This program is of great value from a historic standpoint in that many folkways have been recorded.

The Park continues to work with the Five County Association of Government in developing a Water Quality Inventory and Management Plan for southwestern Utah, as it pertains to Zion National Park. This plan is in compliance with the Section 208 provisions of the Federal Water Pollution Control Act amendments of 1972. We feel that this plan will provide benefits to the Park in that greater control will be exercised over waters flowing through the Park. In the long run, the waters of the North Fork and East Fork of the Virgin River will be cleaned up.

The Superintendent continues to attend and participate in the Technical Action-Natural Resources Committee of the Five County Association of Government. We feel this provides park management with information on proposed developments, studies being undertaken and the position of local governments and other agencies on issues that do or may not effect the Park's resources or operation. It also provides park management an opportunity to put forth our plans for development and operations. This is a most important avenue for the Service to get our position on issues to other agencies.

Mr. Duane Holms of the Bureau of Outdoor Recreation conducted a week long visitor use survey of park visitors as part of a national survey being accomplished by that agency.

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In order to eliminate confusion, the Utah Division of Transportation has changed the official designation of Utah Highway 15 to Utah Highway 8. Many problems were brought about by the confusion in the identification between Utah Highway 15 and Interstate 15.

On the 15th and 16th of June depositions were taken from the Superintendent, Chief Park Ranger Nicholson, Chief Park Maintenance Pollock and Park Dispatcher James Bellamy concerning the case Bieghler & Hoff vs. the United States. This case was dismissed by the Honorable Walter E. Craig, United States District Judge for the District of Arizona on October 6, 1977.

We have continued to work with the Town of Springdale towards development of a joint sewer system. A draft Cooperative Agreement was worked up and presented to the Town. A number of meetings with agents of the State Public Health Agency, EPA and other Federal and local agencies to plan the construction of this project were held. It now is awaiting financing, and once it becomes available, the project should become a reality.

The death of William R. Wood on July 30 while hiking in the Pine Creek Narrows brings up a problem for which we are still searching for an answer. Mr. Wood attended an employee orientation program for concessioner employees about ten days prior to the accident. One of the subjects that was covered was the need to inform park rangers before starting on backcountry hikes or any climbing attempts. Mr. Wood and his companion went on a very difficult hike which required the knowledge of ropes and their use. Because of not practicing safety and having a lack of knowledge of the area he was in, he became involved in an accident which caused his death. We have had a number of other minor problems with concession employees who disregarded our safety messages at these orientation-training sessions. This is an area of safety management where we shall try to come up with new ideas in getting a message across and then hope the individuals will use this information and knowledge in making their summer experience here at Zion safe and rewarding one.

On September 28 and 29 the Superintendent, Assistant to the Regional Director Isenogle, Assistant Chief Park Ranger Florea and Park Biologist McCutchen made an inspection of the Zion Canyon Narrows. Mr. Douglas Kirk of the Utah State Planning Office accompanied the Park inspection team. The condition of the Narrows in general was very good and did not show excessive use except for the Grotto area. It was felt that this area needs a complete ecological survey before travel increases over its present use in order to establish baseline data upon which to build any future management plan for this most unique area of the Park.

The final draft of the Master Plan for Zion was released in May and it created considerable public interest in the area of Wilderness and Public Transportation. It seems that this document is not getting a message across to a portion of the public, or there is considerable misunderstanding of it. There remains a great deal of

confusion concerning wilderness in that many people feel the Master Plan is establishing it. With Public Transportation, we are proposing a study of its feasibility and the public believes we are putting a system into operation. This confusion seems to be local in nature.

The Warner Valley Power Station proposal is nearing a final decision stage. We understand that the Environmental Impact Statement for this project may be issued within the year. We are presently gathering air quality data and we have raised some questions, which we feel will have to be answered concerning possible infringement upon the Park's Class I air quality status.

Personnel

As of December 31, 1977, Zion had a total of two permanent, part-time position vacancies; Cedar Breaks had no vacancies and Pipe Spring had two permanent, full-time position vacancies.

Staffing at the close of the year indicated a total of 30 permanent, full-time positions and 11 permanent, part-time positions.

There were no retirements or resignations from any of the three areas during the calendar year.

During the year, 330 personnel action requests were initiated at the Park level for the three areas served by this office.

Mr. Roy Williams accepted a position of Motor Vehicle Operator, WG-05, E.O.D. 04-24-77, vice Enrico Donaglia, who accepted a transfer to Yellowstone National Park.

Seasonal Park Ranger Wayne L. Hamilton accepted a permanent subject-to-furlough position, as a Physical Science Technician, GS-05, E.O.D. 04-24-77. This was a new position.

Mr. Gary J. McKinney accepted a position of Motor Vehicle Operator, WG-05, E.O.D. 09-26-77, vice Scott M. Ruesch, who accepted an Automotive Mechanic position at Glen Canyon NRA.

Supervisory Park Ranger Larry L. Hays, Olympic National Park, accepted a transfer and promotion to Zion as a Resource Management Specialist, GS-11, E.O.D. 10-23-77. This was a new position.

Clerk-Dispatcher James K. Bellamy accepted a transfer and promotion to Grand Teton National Park as an Intake Park Ranger Trainee, GS-05. The position he filled remains vacant at the end of the year.

Mrs. Patricia L. Fesler, Mail and File Clerk-GS-03/04, was reassigned to Administrative Clerk (Typing), GS-04, E.O.D. 11-06-77, vice Miss Katherine M. Plew who transferred to Glen Canyon NRA. The Mail and File Clerk position is presently vacant.

Mr. Mark Kelleher EOD 11-06-77 as a Park Ranger, GS-05, Intake Trainee. Mr. Kelleher transferred from a Park Technician GS-04 position at Great Smokies National Park.

Training

Training and orientation was provided by all Divisions for incoming seasonal personnel prior to the start of the main visitor season, where possible. A considerable amount of training was held on site at Zion during the year, exclusive of the annual seasonal employee orientation and training.

During the calendar year, the following personnel attended the training courses indicated:

Name	Course Title	Spons. By	Date
Davis, Ernest L.	Orient. to NPS Opns	NPS	1/77
Zaleski, Walter J.	Maint: Building Skills	NPS	3/77
Plew, Katherine M.	Admin Correspondence	USCSC	3/77
Wilkins, Keith M.	Maint: Advance Mgmt	NPS	4/77
DeMille, Ellen	Timekeeper's Training	NPS	3/77
Fesler, Patricia L.	" "	NPS	3/77
Crocker, Levi A.	Finance Workshop	NPS	3/77
Ballard, Lynn E.	Supv & Group Perform.	USCSC	3/77
Nicholson, M.S.	Chief Rangers' Conf.	NPS	3/77
Greenlee, Harold J.	Pesticide Use	USFS	3/77
McCutchen, Henry E.	Plans Chief II	BIFC	3/77
Delano, Frankie J.	Employee Relations	USDI	6/77
Davis, Ernest L.	Presenting Stat.	USCSC	6/77
McCutchen, Henry E.	Advanced EEO Coun.	USCSC	8/77
Cross, Merridy K.	Main & Records Mgmt	NPS	8/77
Robins, Maurine	Govt Bkkeeping & acnt	USCSC	9/77
Delano, Frankie J.	Basic Staff & Plment	USCSC	9/77
Nicholson, M.S.	EEO Training	NPS	9/77
Jackson, Victor L.	EEO Training	NPS	9/77
Ballard, Lynn E.	" "	NPS	9/77
Jackson, Victor L.	Interp: Childrens' Programs	NPS	10/77
Richey, Mark A.	Chain Saw/Small Engine Repair	NPS	10/77
Heyder, Robert C.	Issues of the 80's	USCSC	11/77
Ballard, Lynn E.	Explosive Handler's Wrkshop	NPS	11/77
Ramer, Debra D.	FWPC Workshop	USCSC	11/77
DeMille, Ellen	Intro to Park Prog Mgmt	NPS	12/77
Delano, Frankie J.	Personnel Staff Wrkshop	NPS	11/77
Nicholson, M.S.	Emerg Vehicles Oper	NPS	12/77
Ballard, Jeffrey E.	Asphalt Paving Sem	NPS	12/77
DeMille, Ardell	Water & Wastewater Wrkshop	UTAH ST.	12/77
Richey, Mark A.	Dobbs Detroit Diesel	NPS	12/77

The following personnel completed correspondence courses as indicated:

Plew, Katherine M.	Personnel Clrk Funct	USCSC
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DeMille, Ellen	EEO	USCSC
Plew, Katherine M.	EEO	USCSC
Ramer, Debra D.	Basic Personnel Mgmt	USCSC
Fesler, Patricia L.	Prog English Usage	USCSC
Fesler, Patricia L.	EEO	USCSC
Cross, Merridy K.	Prog English Usage	USCSC
Florea, Larry E.	EEO	USCSC

A Drivers' Examiner Training course was held in Zion sponsored by the Rocky Mountain Regional Office and the Civil Service Commission, and conducted by Paul Ellis of Yellowstone National Park. Participants were drawn from surrounding Parks with a total of seventeen, of which five attended from Zion.

The FBI presented an on-site course in Major Crime Scene Investigation for eleven personnel, six of which were from Zion.

James Dempsey, Safety Officer-Rocky Mountain Regional Office, conducted a Defensive Driver's Training course at Zion for the employees.

Wildland and Structural Fire Suppression training continued throughout the year for all employees involved in these activities.

The American Red Cross office in Salt Lake City provided instructors for a First Aid training course for twelve Zion employees.

The Department of the Interior approved a request by Zion National Park to hold the Supervisor's Job, Part C, training session in Cedar City, Utah, during November. The class totaled 30 participants, with four attending from Zion. The remainder of the participants were from Glen Canyon NRA, Cedar Breaks NM, Canyonlands NP, Bryce Canyon NP, Capitol Reef NP and the BLM Office in Cedar City.

Contracts were made with Southern Utah State College in Cedar City, Utah, to initiate plans for a Cooperative Education Agreement to be implemented in 1978 to place one candidate in Zion and one candidate in Cedar Breaks.

Employee Relations

Counselling of employees regarding their rights and responsibilities as Federal employees is a continuing program at Zion. The EEO Committee continues to be active. The leadership of the important committee changed hands during the year with Mrs. Maurine Robins, Fiscal Clerk, stepping down as Chairperson after two years of excellent leadership, and Miss Ellen DeMille, Maintenance Clerk and Mr. Robert Wood, Park Technician, both serving as Co-Chairpersons. We look forward to these two individuals providing fine leadership during the coming months.

Mr. Donald Heaton, Park Plumber, an EEO Counselor, resigned as counselor and Mr. Mark Richey, Park Mechanic, was selected to replace Mr. Heaton as an EEO Counselor. We intend to obtain the necessary training for Mr. Richey during the coming year.

Other

One group of Intake Trainees from the Albright Training Center visited the Park and were given an orientation of the Park's operations and a review of its problems. We feel that the groups of trainees who have visited this Park and Pipe Spring National Monument have gained a great deal from these visits.

Program and Budgeting

The operating budget allotment for Zion was \$882,500 for the operation of the National Park System Program and \$41,200 under the Fee Collection Program. The appropriations for the Park are not keeping up with increased visitor demands. Cost of operations, which have been under great inflationary pressures in recent years, have shown no signs of diminishing. The Park Staff now has 30 full-time and 11 part-time permanent positions.

In addition to the above allotments, three construction projects totaling \$339,000 and two cyclic maintenance projects for \$65,000 were administered during the past year. These five projects, along with the regular appropriations, gave the Park an overall budget and programming responsibility amounting to \$1,327,700.

Property and Procurement

The procurement actions continue to show a healthy increase over previous years. This continuing increase is attributed to additional operating requirements and construction projects.

Procurement transactions for Zion, Cedar Breaks and Pipe Spring for the period October 1, 1976 through September 30, 1977 are as follows:

<u>Area</u>	<u>No. of Actions</u>	<u>Dollar Amount</u>
Zion	554	\$376,588.00
Cedar Breaks	60	18,104.00
Pipe Spring Spring	<u>32</u>	<u>10,903.00</u>
Total	646	\$405,595.00

About 45 informally advertised contracts were issued to various vendors during the reporting period.

Disposal action has been initiated on two buildings in the Birch Creek Concessions Maintenance area.

Other

The Christian Ministry in the National Parks Program continues to be a

viable program here at Zion. Three young individuals were involved in the program this past year between May and September. They were all employed by TWA Services, Inc.

A Public Health Inspector, Mr. Lloyd Hahn, was headquartered at Glen Canyon NRA this past summer. He provided Zion, Cedar Breaks and Pipe Spring with fine service and assistance in public health matters.

Concessions

We have completed our first full year with a Concessions Specialist on duty at Zion National Park. We feel that the Concessions Specialist, Mr. E. Lee Davis, who spends a portion of his time working for the Superintendent of Bryce Canyon NP, has done an excellent job. By having this position we are now able to handle concession business on a daily basis. This situation has brought about considerable improvement in the management of concessions operating here at Zion.

In 1976 Adventure Expeditions went out of business during the summer season. This was a professional guide service for the Zion Narrows trip and there has been no demand for this service to again be reinstated. There has been a number of individuals who have inquired about starting a guide service here at Zion, but their interest has never gotten beyond the discussion stage. We question that such a service could be made profitable when one considers insurance and other requirements needed to operate such a business.

The horse concessioner, Bryce-Zion Trail Rides, Inc., continues to operate here at Zion National Park with business showing an increase this past year. In compliance with the new National Park Service requirements this year all the concessioners stock was tested for equine infectious anemia.

Zion Lodge continues under the operation of TWA Services, Inc. From our observation, the Lodge showed a business increase of approximately nine percent over 1976. The general facilities and service at the Lodge are improving and looking forward to additional gain in this operation in the future. Their on-site management staff did a fine job and were easy to work with. There is still considerable room for improvement in their total operation.

The evaluation of the Lodge for the season was satisfactory for the past year. We feel that our program comparability of service relating to overnight accommodations and food service resulted in many improvements. Guest complaints were significantly reduced from last year, indicating a much more acceptable level of service.

Written complaints were again reviewed and analyzed in order to pinpoint problem spots in the operation. There were eight complaints received and all included accommodations as a problem, food was only mentioned once and general administration/management once.

One of the major problems of the Lodge operation is the continued turnover of personnel. Until the Company can get a handle on this area of management, we feel that this will continue to cause complaints. This employee turnover has not allowed for the development of a really smooth operation. The management of TWA Services, Inc., is aware of this situation and we understand that they expect to cut this turnover problem next year.

In January of 1976, TWA Services, Inc., committed \$200,000 to provide improvements for the facilities of Zion Lodge by May of 1977. This was the condition upon which the seven year extension was granted for overnight accommodations. According to the figures supplied by the concessioner, they fell short by \$33,992 in meeting this obligation. We are presently in contact with the concessioner to ascertain when they expect to expend the remainder.

The National Park Service has expended close to \$300,000 in improving utilities which serve the concessioner. A new main trunk sewer line between the Lodge and the spray field has been installed, replacing the old line (50 years old). A new chlorinator house was installed above the water storage tanks and a waterpump and waterline were installed to pump water from the lower Grotto collection system into the Lodge storage tanks. Only one item remains to be completed and that is the installation of a plastic liner for each redwood storage tank.

An Operating Plan and a Maintenance Agreement were written and negotiated with the TWA Services, Inc., and signed on February 18, 1977, and January 14, 1977 respectively. A new EEO Affirmative Action Plan, which seems to be a good one, was written and implemented by TWA Services, Inc. in 1977. A Returnable Beverage Container Program was implemented in April to comply with the National Park Service Directive. We also requested that TWA Services, Inc., prepare and implement a new Safety Program. This program is good. Concessions Management Specialist Davis did an excellent job in pulling these plans and programs together and in gaining the support of the concessioner in them.

Interpretation and Resource Management

One of the major needs of the Service here at Zion is getting some development underway in the Kolob Finger Canyons portion of the Park. After 11 years of operation, the Taylor Creek road remains the only permanent facility yet constructed in that area of the Park. It is still open only on a seasonal basis and is only staffed for approximately three months. This area has a direct access off of Interstate 15, and by not being open or properly manned, we feel that the Service is open to strong criticism for the lack of development in this area. It is a criticism that is very difficult to defend. If this entrance was properly developed, it would be fair to say that visitation could reach a million or more in a few years.

There continues to be increased backcountry use. With this increased use, our management of the backcountry becomes more open to public comment and criticism, and for this reason it is important that funding and positions be obtained to meet the demands of more intensive management. A revised and updated Backcountry Management Plan presently being worked on by the Park Resource Management Specialist will give guidance which will provide for better management of these resources. The park law enforcement and visitor protection activities also continue under limited operational potential, when the number of visitors per year is considered. More adequate funding and staffing are required to provide the service that the public expects.

The Park interpretive program continues to operate as one of the best in the system, but with adequate funding we are sure we could provide even greater interpretive service to the public. The assistance provided by the SCA and VIP programs are difficult to place a true value on, for without their assistance, our program would not be anywhere close to what we are providing now.

There is little that can be said that has not already been said about the work of the Zion Natural History Association. The publication program which they are presently sponsoring is outstanding and without it, there would be very little to offer the visitor in the way of original literature on Zion. The Board of Directors has been a tower of strength to the interpretive program, and to the Superintendent in the management of this Park.

Interpretation

The Interpretive Division consists of two Park Naturalists and a Park Technician. These three individuals form the basis upon which the interpretive program for this Park is built. The program serves over one million visitors per year. It must be realized that during the heavy use season they provide the supervision and support to make the program work, and during the off-season they are the program. During the heavy visitor season, we had an interpretive staff (seasonal) of 7 seasonal naturalists, 4 VIP's, 8 SCA Volunteers and 6 Zion Natural History Association employees.

We feel that the Student Conservation Association Program has been of tremendous value to the interpretive program by providing excellent individuals who, for the most part, perform on a level with the seasonal naturalists. Hikes and guided walks are still a great drawing card that the public seems to receive great value from. In order to reach more Park visitors and to better utilize our staff, we concentrated on providing more service where the greatest number of visitors were. We eliminated the Rock Pasture and Checkerboard hikes as they received very little use and were not reaching the visitors who needed attention.

We continue to rotate a schedule of programs between the Watchman and South Campground Amphitheaters and Zion Lodge so that there are no repeat programs during a seven-day period at one spot. There is no doubt that this type of contact provides one of the best ways of reaching the public with the ideals of the Service and its message.

Environmental Education Program

The series of Outdoor Field Seminars developed by Southern Utah State College through a Cooperative Agreement with the Zion Natural History Association and the National Park Service got off to a good start this past summer. The academic supervision was provided by Dr. McRay Cloward, Dean of the School of Continuing Education and Public Service of the College. All instructors were full-time professors at the College. The National Park Service provided its facilities and their use was coordinated by Chief Park Naturalist Jackson.

Participation was a little less than expected, with 45 paid registrations for the eight courses taught. The most popular course was Field Geology. Each course was of one week in duration with three-quarter-hours of credit. There was a deficit of \$2851.16, which was covered by the Zion Natural History Association.

We feel that with more lead time the 1978 Seminar Program will be a complete success. The College has shown a great interest in the program and they feel they have to produce a program to attract students and that they have every intent to make it a success.

The National Park Service, the Zion Natural History Association and Southern Utah State College have entered into a new Agreement on December 3, 1977, for the 1978 season.

The Zion Nature School had an excellent summer's operation and we feel this was due in part to the Agreement we entered into between Southern Utah State College, the Zion Natural History Association and the National Park Service. In this Agreement, the Association paid the student teachers a salary which met the minimum wage. This enabled us to get on board three excellent individuals to operate the Nature School.

The response of both children and parents was excellent. We look forward to this arrangement to continue to provide an excellent service to the age group which it serves and to giving future teachers an opportunity to work out-of-doors and gain a greater understanding of the mission of the Service.

The filmstrip, "A Trip to Zion National Park," continues to be well received by schools using it. The strips were sent out to 31 institutions, which reported 1773 viewers. We feel that this is one vehicle that the Service should make greater use of in getting the story of National Parks over to the youth of this nation. We are in hopes of developing more of this kind of outreach material, and we shall work to this end.

We continue to have an environmental film program every afternoon and the film on the proposed Alaskan parks is shown each morning in the Visitor Center Auditorium. We feel that those two programs generate concern on the part of the visitor as to the environmental and conservation questions of this decade.

Cooperating Association Activities

The Zion Natural History Association continues to have a healthy growth in business which was 18 percent during the year. The total income for the year was \$187,412.

Aid to the National Park Service was \$43,857 in the '77 FY, and this raises the total contribution made through the years to \$249,819.

The Annual Meeting of the Board of Directors was held on December 3, at which time the Association program of the past year was reviewed and a new budget for FY 78 was approved in the amount of \$291,803.

Mr. Joel Fishbein continues as the Treasurer-Business Manager of the Association. Much of the growth that the Association has undergone in recent years must be attributed to his excellent management skills.

Chief Park Naturalist Jackson, as Executive Secretary, has developed an outstanding publications program, and the organization plans a number of fine publications that should be printed in 1978 that will continue to show other associations how to do it. During the year, the Association published a variety of items to assist the Park visitor to better understand Zion National Park. A new color poster of the Great White Throne by Allen Hagood was printed and is doing very well. The Association had a revised "Topographic Map of Zion National Park" printed, and this has served a great visitor and management need, as the previous U.S.G.S. map has been out of print for over two years. A new slide set titled, "Historic Places of Zion" was well received.

A major contribution of the Association was the donation of 2.39 acres of land at the South Entrance of the Park. The land had an appraised value of \$21,000.

Wilderness and Backcountry Management, Resource Management

With the authorization of a subject-to-furlough Resource Management Technician, GS-05, for the Park, which was filled on April 24, and the establishment of a Resource Management Specialist, GS-11, that was filled on October 23, the Park is now able to monitor the natural resources and thereby provide for their more efficient management.

Visibility observations were initiated just prior to the start of the beginning of 1977. Observations are being made twice daily up and down canyon on a continuing basis. We are now attempting to obtain a handheld telephotometer which will enable us to make much

better measurements of visibility. A three-stage air sampler was installed on October 14, and the filters are being sent weekly to the Crocker Nuclear Laboratory, University of California at Davis, for analysis. We feel it will be at least another year before we will have enough data upon which to project trends in air quality. This information will be very important to the future management of the Park and in providing future guidance concerning the maintenance of Class I Air Quality Standards.

The Park's Backcountry Management Plan is presently undergoing a complete revision and should be completed in 1978. Campsites will be selected for impact evaluation and an increased effort will be made to obtain registration data from backcountry users. It is planned to place register boxes at certain remote trailheads.

During the past year, backcountry permit registrations totaled 6821 person-nights. This is a five percent increase over 1976.

The Virgin River Narrows is still receiving heavy use during the summer months. There were 1395 hikers who obtained permits to traverse the Narrows between Chamberlain's Ranch and the Temple of Sinawava. Eight hundred and twenty-two of these hikers registered to camp in the Narrows. Despite new signing efforts, there are many individuals making the trip who do not obtain a permit. The research report, "Hikers of the Virgin River Narrows," by McCool and Haydock of Utah State University, was received and is being used to better estimate Narrows use.

Day-use estimates of walkers along the Gateway to the Narrows trail and the reaches of the Narrows approached 66,000 persons during the year.

The program to monitor stress in Gallery #3 of the Zion-Mt. Carmel tunnel was enlarged this past year. Individuals from the Regional Office and the Federal Highway Administration (FHWA) have assisted the park staff in formulating possible corrective measures for the problem. Federal Highways Administration completed a survey of the cliff face at Gallery #3, and produced a report with recommendations for correcting the situation. A representative of the Mining Enforcement Administration (MESA) started installation of a system for detecting potential danger of collapses at Gallery #3. The Regional Office provided funds to install a tunnel warning system. The Park is presently installing this system. A new strain gauge provided by MESA has been installed in the problem area, and we have been monitoring it since November. A meeting was held at the Regional Office on December 6 to discuss alternatives for alleviation of the failure problem and a working team was assigned the job of preparing a plan and estimating cost for exploratory drilling above the tunnel bore at Gallery #3. If drilling shows the roof rock to be sound, the alternative of moving the tunnel away from the face can be seriously considered.

Law Enforcement

Approximately 600 case incidents were reported and investigated during the year. This represents an increase of about 46 percent over the number of incidents for 1976. The number of Part I category offenses remained nearly the same with 19 reports of larceny.

Rangers continue to handle traffic offenses and other minor violations as county deputy sheriffs. Approximately 45 county citations were issued this year. Justice of the Peace S.K. Gifford of Springdale resigned his post last spring and the Park is now handling all Washington County depositions through Justice of the Peace Lyman R. Gubler in LaVerkin, Utah. This new arrangement has worked very well. In addition, all County Justices of the Peace are now able to handle many types of cases through the mail.

We have one hunting case from the 1975 hunting season still pending prosecution by the U.S. Attorney's Office. No Federal citations were issued this past year.

Violations of State Liquor Laws by local minors and juveniles were a problem during the summer. After several citations were issued, the problem diminished.

On the 28th of April, Park Rangers made contact with three suspicious subjects near the East Entrance. As a result of this incident, the Park Rangers were able to provide information to the Kane County Sheriff's Department which led to the arrest and conviction of the three subjects for burglary.

Labor Day weekend was relatively quiet with no organized motorcycle groups entering the Park.

Two local ranchers were sent letters requiring that they cease and desist from allowing their cattle to trespass on Park lands. Both individuals have inholdings which create a perpetual problem. Once the inholdings within Zion are obtained, problems such as this will cease.

The Law Enforcement Commission requirements created a few problems with our staffing efforts. Supervisory personnel were required to provide more routine patrol coverage than in the past.

Twenty-six motor vehicle accidents were reported and investigated in 1977. Four of these accidents occurred in the Zion-Mt. Carmel tunnel. None of the tunnel accidents involved motorcycles. Property damage resulting from motor vehicle accidents amounted to about \$13,700. There were four personal injuries. There were no accidents involving Government vehicles during 1977. One bicycle collided with the wall inside the Zion-Mt. Carmel tunnel. The cyclist was riding without adequate lighting and sustained injuries and approximately \$125 damage to the bicycle.

Search and Rescue

A total of 14 search and rescues occurred during the year at a cost of \$2027.

District Rangers Bonanno and Greenlee assisted Cedar Breaks National Monument on February 9 in a technical body recovery involving a 350 foot descent. District Ranger Greenlee sustained a minor injury from a falling rock during the operation.

Two deaths occurred from falls in the Park which required technical recovery operations. The two evacuations cost \$1456. The first death occurred on July 30 when a concession's employee, William Wood, age 22, fell 160 feet while hiking with a companion in the Pine Creek Narrows. The second death occurred on November 3 when Patrick Carrol, age 27, fell from tunnel gallery #6 (window), 140 feet into the Pine Creek Narrows. Both body recoveries required difficult raisings.

The Ranger Staff conducted two training sessions for employees in technical rescue techniques. Each session covered rope management, knots, litter systems and practical exercises in rappeling and litter raisings and lowering.

Climbing

Climbing activity in Zion National Park continues to gain in popularity, with the major portion of the climbs being made in Zion Canyon. There were 176 climbers registered with the Chief Park Ranger's Office during the year compared with 157 in 1976. This represents an increase of 11 percent. Sixty-four of the attempts were reported successful. There were only two minor accidents reported by the climbers.

An analysis of 1977 climbing season is as follows:

<u>Location</u>	<u>Date</u>	<u># in Party</u>	<u>Successful</u>	<u>Accidents</u>
Pulpit	6/25	3	yes	0
Red Arch Mtn.	5/29	3	no	0
Moonlight Buttress	2/19	2	no	0
	3/23	2	yes	0
	5/7	2	yes	0
	6/16	2	no	0
	11/23	2	yes	0
Angel's Landing	5/23	3	unk.	0
	9/29	2	yes	0
	9/30	2	yes	0
	12/31	2	unk.	0
Great White Throne	6/18	2	unk.	0
	7/14	2	yes	0
	3/25	3	no	0
	3/26	2	unk.	0

Great White Throne	4/23	2	unk.	0
(cont.)	5/22	2	unk.	0
	11/26	3	no	0
Lady Mtn.	1/5	2	yes	0
	3/29	3	yes	0
	6/7	2	yes	0
	6/8	1	yes	0
	6/15	2	yes	0
	6/21	2	yes	0
	8/18	5	yes	0
	8/24	1	yes	0
	10/9	2	yes	0
	10/12	2	yes	0
East Temple	4/8	3	yes	0
Patriarch	6/3	2	no	1
Bridge Mtn.	4/14	2	yes	0
Mt. Spry	4/15	3	yes	0
Checkerboard	2/1	3	yes	0
	4/30	2	yes	0
	5/16	2	yes	0
	5/18	2	yes	0
	8/18	6	yes	0
	10/17	2	yes	0
Crazy Quilt	4/30	2	yes	0
Misc. Climbs	1/77-	90	--	1
	12/77			

Fish and Wildlife Management

The deer herd in and around Zion appears to have reached a low point in the species population cycle. The herd is healthy and stable. Hunting pressure has continued to be high around Zion, especially near the Kolob Terrace area of the Park. With increased patrols and hunter contacts, poaching and other hunting problems have been reduced. Another important factor in maintaining a healthy and stable deer herd is the predation of the lions.

Blue grouse (pine hens) have been noted with increasing frequency at Lava Point and vicinity.

A monitoring plan for Grapevine Springs was approved in 1977. Frequent monitoring of this area has shown that there has been increased use of the Left Fork of North Creek. There have been no disturbances of Grapevine Springs.

The Peregrine Falcon nesting site on Cable Mountain was investigated by the Zion climbing team. A member of the team, Park Technician Jon Dick, was lowered approximately 350 feet to the nesting site. One of the two nesting sites was examined and one intact egg was recovered, along with samples of the nest and other material for study.

There continues to be an increase in beaver activity along the Virgin

River in Zion Canyon. Many trees have been girdled and felled during the past year. They are now invading the irrigation ditches which is causing considerable trouble. Control measures may become necessary in 1978.

The Desert Bighorn Sheep release into Parunuweap was only partially successful. Four sheep died in and around Parunuweap, while four returned to Zion Canyon and reentered the enclosure, and four are still free in the backcountry. Plans are now being formulated to release the remaining sheep in Zion Canyon in February, 1978.

Campgrounds

Campground use for 1977 totaled 196,302 campers. This represents an 11 percent increase over the previous year. There was a marked increase in use for the 1977 winter months as compared to 1976, possibly because of milder winter weather. The campground use increased in every month with the exception of April, June and August. The biggest increase in use appeared to be the month of February, which was 110 percent more than the previous February.

The Watchman Campground has been kept open all winter. The South Campground was closed on September 26, 1977.

The Park continues to operate a reservation system for organized group camping. This system has worked very well, resulting in near capacity use during most of the summer. Also, many tent campers have expressed an interest in the possibility of the construction or conversion of some campsites to walk-in type sites. This problem is a basic conflict between the types of users, that is, the tent campers vs. the recreational vehicle camper. There is a degree of non-compatibility between these two types of users.

Fee Collection

A total of \$423,276.40 was collected during 1977. This breaks down as follows: \$327,505.03 in entrance fees, \$95,686.37 in camping fees and \$85 in vehicle convoy fees.

Camping fees are collected year-round. The self-registration system is used only during late fall, winter and early spring, when use is light. With camping on the increase, particularly during the spring and fall, our collection efforts were extended for better coverage.

Entrance fees were collected from Easter through November 11 at the South Entrance Station and between May 29 through September 30 at the East Entrance.

Following the receipt of the new Service-wide fee collection guidelines, a fee collection manual was prepared for the Park's fee personnel. The manual was particularly helpful to new seasonal personnel and did improve the overall fee collection operation.

Additional funding for increased entrance station operation of both the East and South Entrances would, we feel, result in greater revenue collection. The operation of the stations over greater periods of time would benefit our visitor protection and resource management programs.

Special Use Permits

Nine Special Use Permits were issued during the year. The total revenue was \$406.39. Two of the permits were cancelled and one was a non-fee permit.

Two of the permits were issued for grazing. There was a total of 789 animal unit months (AUM's) for the year and these fees totaled \$306.39. One grazing permit was permanently retired following the death of Evan S. Lee of Virgin, Utah, on November 19, 1976. His heirs removed Mr. Lee's equipment in the spring. The two remaining active permittees are on a lifetime tenure permit, and one which will expire in 1980.

The one non-fee permit was issued for a one time cattle drive down Willis and LaVerkin Creek drainages through the Park.

The remaining six permits were issued to commercial backcountry operators. Two of these permits were cancelled before they were used. This past year again showed an increase in this type of use.

We feel that the Special Use permit remains the best method for us to retain control of type of use. We do not see the need to establish any one individual or group as a concessioner at this time as there is just not enough of this type of use to warrant such a step.

Fire Prevention and Management

Fire weather stations were maintained at both Lava Point and Park Headquarters. Daily reports were teletyped into the computerized system (AFFIRMS). This information was used for both long and short-term fire weather forecasts and emergency flash flood warnings.

All fire hydrants in the Lodge area were converted to National Fire fittings. All hose boxes were replaced and new hoses and nozzles were installed. New hoses and boxes were also installed at Headquarters and the employee housing areas.

The Park's structural fire brigade responded to five calls during 1977. Three of these responses were to structural fires in Springdale and Rockville. Two responses were in the Park's camgrounds. Property damage resulting from structural fires totaled approximately \$2700.

Twelve fires were Class A and B fires and three were Class C. Because of the isolated location of many of these fires, helicopters and fixed-

wing aircraft were used for observation and suppression.

A two day Forest Fire Suppression and Safety training was conducted for seasonal and permanent staff. The Step Test (physical fitness) was given to all prospective firefighters. Many new employees received actual experience in on-going and mop-up fire situations.

Park Biologist McCutchen was assigned to the LaMesa Fire at Bandelier National Monument in August for 11 days as a Plans Chief (trainee).

Youth Conservation Corps Program (YCC)

This past summer Zion National Park managed its first YCC Program under the supervision of District Park Ranger Harold Greenlee. This non-resident program was an outstanding success and accomplished many needed maintenance and conservation projects. The program provided a unique summer work experience for 20 local high school students, as well as improving their environmental awareness, and their understanding of the purpose of Zion National Park. A proposed budget request has been submitted for a similar program in 1978.

The following personnel participated in this worthwhile program:

Mason Stock	Bob Warrick
Mike Boggs	Don Cottam
Ron Fletcher	David Persinger
Robert White	Chip Higgins
Nolan Gray	Janice Sprague
Sheila Hansen	Sheri Keele
Colleen Warrick	Colleen Hacker
Judy Durfee	Misty Gibson
Judy Laub	Julie Spendlove
Tanya Wood	Alan Ralston

The staff included:

Tom Van Zoeren, Camp Director
 Alice Van Zoeren, Environmental Awareness Coordinator
 Elaine Gross, Work Leader
 Harold J. Greenlee, Project Manager (Kolob District Ranger)

Projects completed by the YCC Program included: fence removal, litter clean up, boundary survey and marking, trail maintenance and signing, fireplace grill installation, trenching for radio ground, construction of block foundation, eradication of poisonous milkweed, digging a trench for air quality system, repairing boundary fences and building a new horse corral at Taylor Creek.

Park Radio System

The Park radio system was upgrade further by the installation of a

higher gain (9db vs. 6 db) antenna at the repeater site, the installation of a new 35-watt base station at Taylor Creek, a new Headquarters base station control with a recording device, a new remote for the South Campground and 9 new portables with vehicular chargers.

The 25-watt solar powered repeater, which was installed last year, performs well and has met our expectations with only minor problems. The receiver/antenna sensitivity is necessarily high. This has apparently made our system susceptible to interference from Canyonlands National Park.

The 35-watt base station installed at Taylor Creek has improve our ability to maintain communications with the Taylor Creek Ranger. However, we still have a problem with the antenna location. We hope to resolve this prior to the summer season.

We are in the process of setting up a radio warning system for the Zion-Mt. Carmel tunnel. A new 10-watt unit with tone decoder has been purchased for this system. Unusual structural distress or tampering with the equipment will trigger the transmitter which then trips a telephone alert to our Ranger personnel.

We are pleased that a NPS radio technician's position has been established to service park areas in Southern Utah. This position should solve many of the maintenance problems we have experienced in the past.

Safety

The Park Safety Program continues to receive heavy emphasis and commitment from management. Weekly meetings are held each Monday morning with representatives from all Divisions. The Park Safety Committee holds regular meetings and reviews all safety related programs and problems in the Park as outlined in the documented Safety Program. The concession facility managers are also members of the Safety Committee and participate in the monthly meetings when facilities are open. A monthly safety meeting is held in the Visitor Center for all staff members.

One tort claim in the amount of \$31.82 was awarded when two individuals came into contact with an unsigned bench that had just been painted.

The Park ambulance made seven emergency runs to St. George during the year.

There were 14 injuries or accidents involving Government employees (including YCC) on the job during 1977. Seven of these incidents were lost time accidents. This is a significant increase over the eight injuries occurring in 1976. We were fortunate that most of the incidents were of a minor nature.

The abundance of Black Widow spiders and rattlesnakes observed in this area has been a concern to the Safety Committee. One employee injury was attributed to a Black Widow bite and required hospitalization.

There were no Government vehicles involved in motor vehicle accidents during the year. This is a significant improvement over 1976 when Government vehicles were involved in 4 accidents.

There were 51 visitor and employee accidents and incidents reported in 1977 as compared to 29 in 1976. Two of these were fatal falls (described under Search and Rescue).

During the summer, Regional Safety Officer James Dempsey conducted a Defensive Driving Course for all employees. This course was well received.

The Park staff conducted numerous structural fire training sessions throughout the year. Fire training sessions were also held for employees of Zion Lodge. District Ranger Anthony Bonanno attended a 40-hour Structural Fires course at the Albright Training Center in May.

New fire extinguishers were ordered for installation in the Zion-Mt. Carmel tunnel. The availability of the extinguishers could prove critical to the safety of persons involved in a motor vehicle accident in the tunnel.

Because of the increasing popularity of bicycling through the Park, a new bicycle escort policy was implemented. New signs were erected advising bicyclists to obtain a Ranger escort through the Zion-Mt. Carmel tunnel. Bicycles without a headlight and rear light are not permitted through the tunnel without an escort.

The annual fire and safety hazard inspection of all Park buildings and utilities was carried out in December. We feel that this annual program has been instrumental in keeping building fire incidents down and reducing accidents. A similar inspection of the Zion Lodge facilities was made prior to the opening for the season.

A hazardous tree survey was carried out by Park Rangers and members of the Maintenance crew.

TWA Services, Inc., the operators of Zion Lodge, instituted regular weekly safety meetings for their employees.

The Park's Visitor Safety Tips handout was revised and updated using a more eye-catching format. We feel that this program has been of value in warning the visitor of potential safety problems one could become involved in if they are not careful. We are also giving serious consideration to the use of informational radio transmitters to get the safety message over to the visitor along with general Park information.

The Park's sign system is continuing to be upgraded with new traffic regulatory signs in an effort to reduce potential accidents. The Park roads were also restriped during the year.

The gasoline and diesel pumps located in the Maintenance Area have been brought up to OSHA Standards by upgrading conduits, installing proper fittings, rewiring and sealing off all gasoline vapors.

The electric wiring in 14 Park buildings is presently being upgraded to meet code. Cinder block hearths were constructed in residences with fireplaces.

Safety glasses were purchased for maintenance employees subject to eye hazards and sonic ear valves were obtained for employees subject to high noise levels in their work.

An Advanced First Aid course was given for the Park Staff by certified instructors. Three employees were certified as instructors.

An Emergency Preparedness Plan for the Zion-Mt. Carmel tunnel was prepared and put into action during the past year.

Research Accomplishments

Park Biologist McCutchen utilized the great majority of his time in conducting research on the Desert Bighorn Sheep project here at Zion. He spent considerable time on other special projects and in coordinating independent and contract research projects here.

The Desert Bighorn Sheep project is moving towards a successful conclusion. We feel that in a few years, we will have accomplished the goal of returning this species to Zion.

The transplanting of the captive bighorns into the wild in the Park commenced in late January. A temporary 10-acre release enclosure was constructed at the release site at Steven's Wash in Parunuweap Canyon to hold the animals. It was hoped that the release enclosure would discourage homing and prevent excessive herd breakup.

Much of the Park staff was mobilized for the transplant operation. In addition, a number of personnel from the Utah State Division of Wildlife Resources were obtained through the cooperation of Floyd Coles. Dr. Robert Sigfrid, USDA Veterinarian, also volunteered his services. Susan Edelstein of the Regional Office helped in press coverage. On January 27, 1977, 8 of the 20 bighorns were trapped in the enclosure and transplanted by helicopter to the Parunuweap site. Four bighorns had radio-collars installed on them. The remainder became trap shy and an attempt to trap them on January 31 failed. On February 1, a third trapping attempt was made and 5 animals were obtained. These were held until February 3, when they were transported by helicopter to Parunuweap and released. The transplanting operation was carried out smoothly and safely. It received much favorable press coverage.

The bighorns were held in the Parunuweap release enclosure until February 27 in an attempt to habituate the animals to the area. One mature ewe died here from stress and an old injury. The animals were cared for and watched by the Ranger Division for several weeks. The bighorns settled down in about a week after the transplant. On February 25, the release enclosure was checked and it was found that a mountain lion had visited the area. One lamb disappeared and one had been killed in a rock fall. Due to the circumstances, the fence was opened and the animals were freed the next day.

For the first two months, radio-telemetry and observation indicated that the animals stayed within two miles up and down river from the release enclosure. They ranged on the contour just below the Navajo Formation and began to discover routes into the higher slickrock country. When lambing commenced, the herd began to break up and wander. One ewe separated from the others, homed back to the Zion Canyon enclosure, worked her way inside and immediately lambed.

During the spring and summer as the animals were radiotracked it became somewhat evident that their movements were being influenced to some degree by the presence of mountain lions, and to a lesser degree by human radiotrackers. In late summer, one radiocollared ram was killed by a lion. Also in late summer, over five months after release, three additional ewes homed to the Zion enclosure with two lambs and, after several days, worked their way back into it. In the fall the temporary release enclosure was taken down. In early winter the carcass of a second radiocollared ram was found, the cause of death could not be determined.

In November a meeting was held with the Utah State Division of Wildlife Resources regarding the bighorn project. As it stood then, 16 bighorns (including the returnees and their offspring) were present in the Zion enclosure and an estimated 7 were still in the wild. An anticipated increase of 9 lambs this coming spring would bring the total population to about 32 animals. It was decided, with the knowledge that the release was only partially successful, that the project and Cooperative Agreement should be revised. The original agreement indicated that about 12 bighorns would be released into Zion National Park from the holding-propagating enclosure and the others would be held until 12 were available for a release by the State at an area of their choosing. The revised agreement was aimed at improving the chances of reestablishing the population in the Park by increasing the numbers of animals released. The State agreed that all the animals now held in captivity should be released into Zion. The understanding was that after the wild population had established itself and had increased sufficiently, twenty plus animals (but not more than one-third of the population) would be captured by them and used for the other transplants. A new Cooperative Agreement was prepared and is now being circulated for review.

A fatal sinusitis disease syndrome has been discovered in the captive herd. Two ewes and a ram, which were very sick, were loaned to Dr.

Tom Bunch of the Veterinary Sciences Department at Utah State University. The ewes died but the ram has responded well to treatment. Preliminary research on the problem by Dr. Bunch indicates that a botfly larvae grows and becomes trapped in the bighorns' frontal sinuses. After the larvae die, their bodies create a medium for harmful bacteria, which multiply causing swelling, bone necrosis, blindness and finally death in the animals. Plans are being made to check the herd for this disease before any release. Any animals that are found to have it will be moved to Utah State University for treatment and study. If treatment is successful, the animals will be returned to the Park. The Utah State Division of Wildlife Resources is cooperating in this effort.

Considerable research effort was devoted this year to radio-tracking the released bighorns. This was a time consuming job with small amounts of data obtained compared to the amount of effort expended. This was believed necessary, however, in order to obtain some insight into how bighorns establish home ranges in a new area. Data on home ranges, movements, mortality and other behavior were obtained.

In April the Biologist presented a paper on the status of the Zion bighorns at the Desert Bighorn Council meeting in Las Cruces, New Mexico. In addition, a paper titled, "A Minimum Breeding Age for a Desert Bighorn Ewe," was published in the Southwestern Naturalist, (Vol. 22, March, 1977).

The Park is presently conducting research and updating our Management Plan for the Peregrine Falcon, the only established endangered species known to reside in the Park. A contract was given to Professor Richard Dotson of Southern Utah State College this year to monitor and study the Peregrines in the Park. The study revealed that the pair nested at the same location as last year. They made two attempts to produce clutches but were unsuccessful.

There was a need to obtain some ideas as to why the nesting was unsuccessful and members of the Ranger Division formed a climbing team to rappel down to the nest and examine it. Mr. Al Heggen of the Utah Division of Wildlife Resources and a member of the Rocky Mountain Peregrine Falcon Recovery Team supported this effort with the necessary permits and coordination. In November the climbing team rappelled about 500 feet down the face of the nesting cliff. At the nesting site, one unhatched egg was found; the egg and a number of prey items were collected. The rappel, an all-day effort, was carried out safely and successfully. The egg was turned over to the State to have it analyzed by the U.S. Fish and Wildlife Service for condition, egg shell thickness and pesticides. In addition to food habits, the prey items will provide clues to habitat use by the birds. Mr. Dotson's report is pending.

Several occupied and/or unoccupied peregrine falcon eyries in Utah have had a township or more of area delineated around the nest as critical habitat and published in the Federal Register. At present,

this has not been done for Zion. It is hoped that a more detailed critical habitat area designation for the peregrines in the Park can be developed through research.

Mr J. Dain Maddox and Dr. George E. Hart of Utah State University were contracted to conduct further bacteriological investigations of selected park waters this year. Their study included the North and East Forks of the Virgin River and LaVerkin Creek. Their report indicated that just before the North Fork enters the Park the waters are being contaminated by irrigation of meadows containing livestock (cattle). Baseline data was obtained for the other waters.

Drs. Neil West and Walter Loope of Utah State University were contracted to conduct research on the vegetative fire history of the Park. The \$3000 allotted to this study came from Park Resource Management funds. Twenty-nine sites were selected in the Park and sampled for plant composition, density and fire history. Fire-scarred trees in the sample plots were analyzed for frequency of historical burns. Park records were examined to help determine the magnitude, vegetative type and location of fires. The preliminary report indicated that a number of vegetative communities, such as ponderosa pine, pinyon and oak, have been influenced by fire in the past. Some vegetative communities such as blackbrush are not fire adapted and will decrease under the influence of fire. The study was, of necessity, too broad to provide statistically reliable data. It was noted that the best areas for future fire research were in the northeast and Kolob sections of the Park. We are in the process of delineating management needs for the future fire research.

The Biologist conducted another survey of the two pastures used by livestock at Pipe Springs National Monument. The study revealed that over the past year since the initial survey, an accelerated downward trend in vegetation was evident. This was due to drought and continued livestock use. A report with management alternatives was prepared and submitted.

Ms. Alice Lindahl of Utah State University, who conducted the ecological study of Grapevine Spring and discovered the unique species of snail there, has indicated that considerable confusion exists concerning the taxonomic status of the snail. Apparently other demes of this snail have also been found in several isolated springs between the Park and St. George. These populations, including the one in the Park, are being considered a new species of Fontelicella. Ms. Lindahl is attempting to resolve the species' taxonomic status in cooperation with Mr. James Landye and other malacologists. She is also making an effort to have the Park established as the type locality for the species. This is important to management because at present the Grapevine Springs snail is being considered as the rare and endangered St. George snail (Amnicola deserta). If the Park's snail is named as a new species, it may be established as rare and endangered.

Mr Paul Gardner of Brigham Young University has completed his Master's Thesis on "Mammals of Zion National Park, with Emphasis on the Ecology and Distribution of 12 Species of Rodents." The Zion Natural History Association financially supported Mr. Gardner's research here, and also supported current research on the Zion hanging gardens being conducted by Mr. George Malanson of the University of Utah.

Maintenance

Buildings

A routine maintenance program with special cyclic-type maintenance was accomplished throughout the year as follows:

All buildings were checked for maintenance needs and corrections made as time and funds permitted.

The following additional buildings were insulated, which completes the insulation of all Park buildings: Visitor Center, fire house and mens' dormitory.

All windows in the Visitor Center were measured for storm windows and bids are currently being advertised for installation.

Storm doors were installed on Residences #3, 8 and 26 to help conserve energy.

Installation of new fixtures in the bathroom of Residence #21 was accomplished and new floor coverings were placed in the living room, kitchen, bath and utility rooms. New floor coverings were installed in the living and utility rooms of Residence #8.

New 500-gallon burner oil tanks were installed at Residences #8 and 9. Free-standing fireplaces were installed in Residences #9 and 39.

A brick hearth and brick wall facer were installed in Residences #34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 46 and 47 to protect floors and walls from excessive heat generated by Franklin-type fireplaces. Work will continue on the remaining fireplaces until all are fire-proofed.

Exterior painting was accomplished on Residences #32, 34, 35, 36, 37, 38, 39, 41 and 42 and the two restrooms at Grotto Picnic area. Interior painting was accomplished on Residences #21, 26, 31, 32, 40 and 46.

Utilities

New electrical power service and new main disconnects plus rewiring for electric heat were accomplished at Residences #31 and 32. Both of these houses are now being used year-round for the first time in many years.

Other electrical work consisted of rewiring B Loop restroom in the Watchman Campground for electric heat and possible winter usage.

New electrical automatic controls were installed to control the deep-well pump at the East Entrance.

Removal of unnecessary wiring, installation of a new tile floor and painting of the restrooms were accomplished at Zion Nature School.

Approximately 600 feet of underground electrical cable were installed near the Visitor Center to provide power for an air quality monitoring device and assistance was rendered in constructing and placing a welded, steel support for the air quality monitoring instruments. The Y.C.C. group, which worked at Zion during the summer, assisted in digging the trench.

Some electrical work has been done in the long tunnel with additional work planned to start in January, 1978, when additional supplies arrive. The purpose of this project will be to monitor the stress, movement etc., at a fractured area in Gallery #3. Safety devices will also be operated by this equipment which should provide a greater safety factor to those using the tunnel.

Additional electrical circuits were installed in the Dispatch Room of the Visitor Center to provide efficient service for additional equipment recently installed.

The following plumbing improvements were made:

All large six-inch valves, including the equalizer valve on the culinary water main, were repacked and repaired as required.

Replacement of 350 feet of lead calk joint pipe at Zion Nature School with galvanized iron pipe was accomplished. The plumbing inside the Nature School and the sprinkler system outside were both upgraded. The fire hydrant was relocated.

Replacement of 150 feet of sewer line was accomplished at Residence #10, thus eliminating a constant root problem which existed in the old line.

Additional four-inch valves were installed in the Oak Creek Residential area to facilitate isolation of the concrete storage reservoir and to better control the water system when needed repairs are required.

Installation of a short section of four-inch pipe will complete this project. It will then be possible to determine whether or not the two springs which appeared in the Oak Creek area during the past two years are actual springs or leaks from the storage reservoir.

New meters and new sprocket chains were installed on the primary and secondary skimmers at the wastewater treatment plant. New automatic controls were installed in the deepwell sewage lift station. Several new motors and pumps have been ordered for the treatment plant for standby purposes.

The treatment plant has operated quite satisfactorily during the past year; however, extensive repairs and upgrading will be required if use is continued beyond 1980.

One of the 25-ton chiller compressors for the Visitor Center cooling system failed during the summer, requiring the purchase and installation of a rebuilt unit. Plans are now to purchase an additional compressor for standby as these compressors have been in operation for 17 years.

Upgrading of the heating system in the Visitor Center is also planned in the near future. We have had excellent support both from the Rocky Mountain Regional Office and the Denver Service Center on this project and other projects throughout the year.

The construction of four concrete vaults for pit privies have been completed with plans for several more. The vaults will then be pumped as required.

The concrete and rock grout dam and apron, which protect the water system where it crosses under the river at the Temple of Sinawava, has been reconstructed. Large rocks were used, filled in with smaller rock and covered with concrete. The dam should last for approximately seven to ten years.

Grounds

Grounds work was generally routine with other accomplishments as follows:

Installation of culverts and concrete head gates at various locations was effected.

Removal of 20 large hazardous trees and pruning of approximately 50 other trees (mainly in the campgrounds) was accomplished.

Mowing of weeds and grass continues to require many person days each year in the campgrounds and along roadsides.

The Maintenance Division assisted with the Desert Bighorn Sheep project. In Parunuweap Canyon, 3000 feet of fence were constructed and later removed after the transplant of the sheep was accomplished. Assistance is still being rendered to this project by feeding the sheep, repairing the fence, etc.

Park Signs

Assistant Chief Park Ranger Florea and members of the Sign Committee put together an excellent sign program for the Park trails. Routed one-quarter inch aluminum trail signs with a dark bronze anodized finish were adopted for backcountry use. One-half inch letters of sixty thousandths width were used in the text design. The signs were manufactured at Glacier National Park and will be installed in 1978. "No Pets" and "No Trailbikes" symbols are incorporated on those signs to be placed at trailheads.

In June a traffic and safety engineer from the Federal Highway Administration Office in Salt Lake City inspected Zion road signs for compliance with standards and made recommendations. One recommendation was the replacement of outdated hazard markers. These have been ordered. Most of the recommendations were fairly minor in nature, and the inspector was reasonably satisfied with the overall adequacy of our approach to road signing. After all wooden signs, which are scheduled for replacement with metal ones, is accomplished the Park should be at compliance with the sign guidelines.

"Pets on Leash" signs were installed in the campgrounds during the summer. This action appeared to reduce the number of free-roaming dogs in the campground. This has been a significant problem and the placement of these signs has been a step towards the elimination of this aggravation.

Signs requiring an escort for bicycles without lights in the long tunnel were installed at the East Entrance and near the Canyon Junction on the Zion-Mt. Carmel Highway (U-8) in late summer.

Roads and Trails .

Road and trail work has been mainly routine during the past year with the usual amount of fallen rocks, mud slides and ditches to be cleared.

Snowfall was very light and required a minimum of time for removal. However, the switchbacks required considerable ice control as this section of road is shaded from the sun and the air temperature is seldom high enough to melt the ice during the three coldest months of the year.

Spring opening of Kolob Canyons road was effected on February 28, 1977, an exceptionally early opening date due to light snowfall.

All roads came through the winter season with a minimum of damage. The two-inch asphalt surface applied to the Kolob Terrace road during 1976 received very little damage through the winter, and with the aid of cyclic maintenance funds, sealcoating of the entire ten-mile stretch was made possible.

Most of the road patching, aside from potholes and small blade patches, was concentrated on Road Route #2, the Zion Canyon Scenic Drive. This road is in dire need of a leveling course followed by a two-inch compacted surface. Approximately three miles of this road were patched with a leveling course and two heavily-used parking areas, which were sealcoated only, also received a two-inch compacted asphalt surface. If funds are available, plans are to complete a leveling course on the remaining three miles and sealcoat the entire six miles during the 1978 F.Y.

The switchbacks required considerable patching since this section of

road seems to continually settle in certain areas. Plans are to sealcoat five miles of road route #1 during the 1978 F.Y., which will include the switchbacks.

All roads in the Park were center line striped, which now brings all roads in compliance with the new standard striping. All parking areas and crosswalks along road route #2 were restriped.

Stone columns were constructed at both the entrance and exit roads at Zion Lodge. Welded pipe gates were attached to support pins in the stone columns. A gate of this type was also constructed in the Watchman Campground. The new gates will provide improved control and security in these areas and certainly look more fitting and attractive than those previously installed.

A four-inch course of shale was placed on the roads serving the Lava Point Campground to provide a better all-weather road. A section of damaged cattle guard on the Lava Point road was also replaced.

All trails currently in use were checked and repaired periodically. Most trail work was concentrated in the high-use areas with a minimum of maintenance on the backcountry trails.

The S.C.A. and Y.C.C. crews, who worked in the Park during the summer for a short period of time, contributed much toward backcountry trail and sign maintenance. Were it not for these two programs, Zion would be unable to work on these trails due to a shortage of person power.

Soil cement was applied to one of the photo points for the Great White Throne. This has been needed for some time and was the only soil cement work accomplished this year.

The pit toilets, hitching rail and rest area on the Sand Bench trail were relocated and rehabilitated. This trail is the most popular horseback trail in the Park and requires considerable attention.

All wooden portions of foot-bridges crossing the Virgin River were sealed with two coats of linseed oil. Some of the bridges were painted except for their decks. Replacement of the foot-bridge at the West Rim trailhead is planned for the spring of 1978 as it is in very poor condition.

Most of the high-use trails, bridges, roads and tunnels were checked weekly in an attempt to keep them as safe as possible for the Park visitor.

Construction

Rehabilitation of Zion Lodge utilities continued with the following accomplishments:

A concrete cover was poured on the concrete water storage tank which

is supplied by Wylie Springs. The springheads were recessed into the solid rock and covered with concrete grout. The sandtrap on this system was also rehabilitated. The entire supply line from the Wylie springheads to the storage tank was repaired and/or replaced as necessary.

A new chlorinator was installed above the Lodge storage tanks for more efficient chlorination of drinking water. A new chlorinator was also installed on the Lower Grotto water supply.

A pumphouse with pump and automatic controls was installed on the Lower Grotto water system to supplement the Lodge supply.

The Lower Grotto water was also piped from the new pump house down to a connection with an existing line which continues on to the NPS one-million gallon storage tank. This supplemental source of water eliminated the usual request for extreme water conservation during the summer months even with the existing drought conditions.

Several water meters, and cross connections between water sources at the Lodge were installed to provide accurate water flow and to supply the Lodge from a possible three different sources in the event of pipeline damage, inadequate supply etc.

An additional 425 feet of leach field pipe was added to the new day-use septic tank below the Lodge and new sewer lines were installed from the boys' dormitory and the chalet to the main trunk line below the Lodge.

A new underground powerline was installed from Zion Lodge to the Grotto Picnic area to supply power for the water pump station, the house and comfort stations in that area.

The remainder of the old aerial powerline between the Birch Creek substation and the Lodge has been removed.

Lining and reroofing of the redwood water storage tanks above the Lodge remain to be completed.

In the Kolob Canyon area the installation of a larger culvert was completed in the Taylor Creek Road where floods buried the existing culvert several years ago under more than twenty feet of debris. The job was accomplished under the supervision of the Federal Highway Administration.

Other

Public Relations

Monthly travel news releases were made to newspapers, news agencies and radio and tv stations. Releases of special items of interest are made from time to time as required.

Speaking engagements are accepted whenever requests are received or the opportunity arises. During the past year a number of talks were given about the park Master Plan and other facets of park management along with the usual talks on the interpretive aspects of the Park. Even though opportunities are few, we should try to meet all requests so that we can get the ideas of park management and policy to the largest possible audience.

Cooperative Activities

The Park continues to work closely with the U.S. Forest Service, the Bureau of Land Management and other federal and local governmental agencies in forwarding park programs. During the past year we have developed a very good working relationship with Southern Utah State College in the operation of the Zion Nature School and Zion Seminars. A good working relationship is also maintained with the Four County Association of Governments through its Executive Director and our participation in the Technical Action Committee.

The Park continues its working relationship with the Utah Department of Wildlife Resources concerning wildlife research, Peregrine Falcon management and the joint project with the Desert Bighorn Sheep.

Energy Conservation

This is becoming an extremely hard problem to get on top of. With increased visitation and the large amount of resource development proposed near the boundaries of the Park, it has become next to impossible to cut back on vehicle use. The use of energy for heating depends upon the variable weather patterns of the area, which so far this winter have been warmer, which should result in some energy savings. The use of energy for lighting has just about been reduced as much as possible and still provide a healthful and safe working environment.