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ASSESSING ELK TRAIL AND WALLOW IMPACTS
IN MOUNT RAINIER NATIONAL PARK

Quarterly Progress Report
For the Period 1 August to 31 October 1985

Submitted to
National Park Service
Pacific Northwest Region

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I. INVESTIGATORS

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II. SUMMARY OF OVERALL PROGRESS

There is concern that the apparent population growth of Mount Rainier's north elk herd may be subjecting several Park ecosystems to overuse, damage, and substantial alteration. The purpose of this project is to develop a system to inventory and monitor trails and wallows caused by elk in the northeastern part of Mount Rainier National Park. One objective of this project is to determine if trail and wallow impacts to vegetation and soils can be documented as elk impacts using remote sensing and other analytical techniques. The task of establishing an inventory and monitoring system was started in August 1985. Two approaches have been initiated: 1) complete enumeration of elk trails conducted in the field for forested areas with the aid of topographic maps and resource aerial photographs; and 2) mapping of trails and wallows in non-forested areas from large scale aerial photographs conducted in the laboratory and field checked for accuracy. The following is a summary of the progress from August 1 through October 31, 1985.

Field Enumeration and Mapping

Methods were developed to map and quantify elk trail impacts in areas covered partially by forest canopies. This elk trail enumeration and mapping is sensitive to both the number and location of trails. This procedure identifies elk trails and provides statistics showing the areal extent of vegetation loss to elk trails.

The methods involved enlarging Park resource aerial photography from a scale of 1:24,000 to a scale of 1:6,000. Topographic contour lines and stream locations were transferred from 7.5' topographic quadrangles to clear overlays on the enlarged photography. The mapping of elk trails was conducted in the field using the topographic overlays on the photographic enlargements. The areas selected for trail enumeration were completely canvassed by hiking each enumeration area. All elk trails that were discovered in enumeration areas were delineated on the photo enlargements. Oblique 35mm photographs were acquired from the end of each trail. Trail width measurements were taken at points five meters from the ends of each trail and at approximately the midway point between the two ends of each trail. The line intercept method was used to record the extent of any green vegetation that intercepted the tape measure as it was laid across the trails for the width measurements.

The enumeration areas were located in areas with

significant elk impacts and in areas with little or no present impacts. Five elk trail enumeration areas were established at the following locations:

<u>Location</u>	<u>Number of trails enumerated</u>
1) South of Clover Lake	45
2) West of Sunrise Lake	6
3) West of Bear Park Lake	16
4) Lower Huckleberry Basin	42
5) Upper Huckleberry Basin	0

Aerial Photographic Interpretation

185 natural color aerial photographs were obtained from flights on August 6 and August 12, 1985. The flight lines are located over a selected area in a region extending from Elysian Fields to Bear Park. The scale of the 9"x9" color negatives is approximately 1:6,000. See the attached flight specifications sheet and flight map for additional information.

Standard aerial photographic interpretation methods were used to delineate elk trails and wallows for five non-forested areas selected for preliminary analysis. The photographic interpretation and mapping work was performed in the laboratory on enlarged prints at a scale of 1:2,400. Elk trails were delineated in four areas and elk wallows were mapped in one wet meadow. The following is a list of areas selected for preliminary interpretation and field

verification:

Elk Trails

- 1 - Bear Park Ridge (west aspect)
- 2 - Bear Park (north of Bear Lake, north aspect)
- 3 - Bear Park (southeast of Bear Lake, east aspect)
- 4 - Green Park Ridge (south aspect)

Elk Wallows and Trampled Areas

- 1 - East Bear Park (wet meadow)

Field checking for elk trail and wallow mapping accuracy was accomplished in September of 1985. The preliminary interpretation overlays of delineated trails and wallows were removed from the enlargements before the field trip. The field checking consisted of a complete canvassing of each of the five areas. All trails and wallows were delineated on photographs in the field for each area using methods described in the elk trail enumeration and mapping section of this report. An accuracy assessment will be conducted by comparing the results of the laboratory mapping to the results of the field mapping. Both omission and commission errors for trails and wallows will be identified for each of the five areas.

Rationale for Two Data Collection Methods

The reason for selecting two methods for identification of elk impacts was to allow for data collection in both forested and non-forested areas. The field enumeration and

mapping can be conducted in areas covered partially by forest canopies, while the aerial photographic interpretation method can only be used in non-forested areas. The final output products will be similar for both methods.

III. INDICATION OF CURRENT PROBLEMS

Since this was a very dry year, the color of some of the herbaceous vegetation is brown instead of green on the aerial photography taken in August 1985. This can result in little contrast between the vegetation and the elk trails causing some omission mapping errors. This may be especially true on slopes with south aspects.

IV. WORK FOR SUCCEEDING QUARTERLY PERIOD

Aerial Photographic Interpretation

1) Conduct an accuracy verification using the results of the preliminary aerial photographic interpretation and field checking.

2) Select non-forested areas for additional elk trail and wallow mapping and obtain corresponding enlargements of selected frames from the August 1985 photography.

3) Begin delineating elk trails and wallows on the selected enlargements in non-forested areas.

Field Enumeration and Mapping

1) Begin the process of developing final maps and

corresponding spatial statistics (areal extent of elk impacts) for elk trails within the five field enumeration and mapping areas.

V. SALIENT FINDINGS

Overall, the preliminary results look encouraging in that it should be possible to monitor elk trail and wallow impacts using remote sensing techniques. It seems that a large aerial photographic scale of at least 1:2,400 is required for the delineation of elk trails and wallows.

FLIGHT PLAN SPECIFICATIONS

LOCATION: Northeast part of Mount Rainier National Park, Washington

FILM TYPE: Natural Color negatives/prints

CAMERA FOCAL LENGTH: 12" (304.8mm)

NEGATIVE FORMAT: 9" x 9" (228.6mm x 228.6mm)

DESIRED NEGATIVE SCALE: 1:5,000

ENDLAP: 60%

SIDELAP: 30%

SCALE OF BASEMAP: 1:50,000

AVERAGE TERRAIN ELEVATION: 5,850' above sea level

FLYING HEIGHT ABOVE TERRAIN: 5,000'

FLYING HEIGHT ABOVE SEA LEVEL: 10,850'

SIDE TO SIDE COVERAGE PER PHOTO: 1,143m x 1,143m on ground
22.86mm x 22.86mm on map

DISTANCE BETWEEN FLIGHT LINES: 800.1m on ground
16.00mm on map

NUMBER OF FLIGHT LINES: Seven lines (Two long, Five short)

WIDTH OF STUDY AREA (North/South): 4,800.6m on ground
96.012mm on map

DISTANCE BETWEEN PHOTO CENTERS: 457.2m on ground
9.144mm on map

NUMBER OF PHOTOS ON TWO LONG LINES: 35 Photos

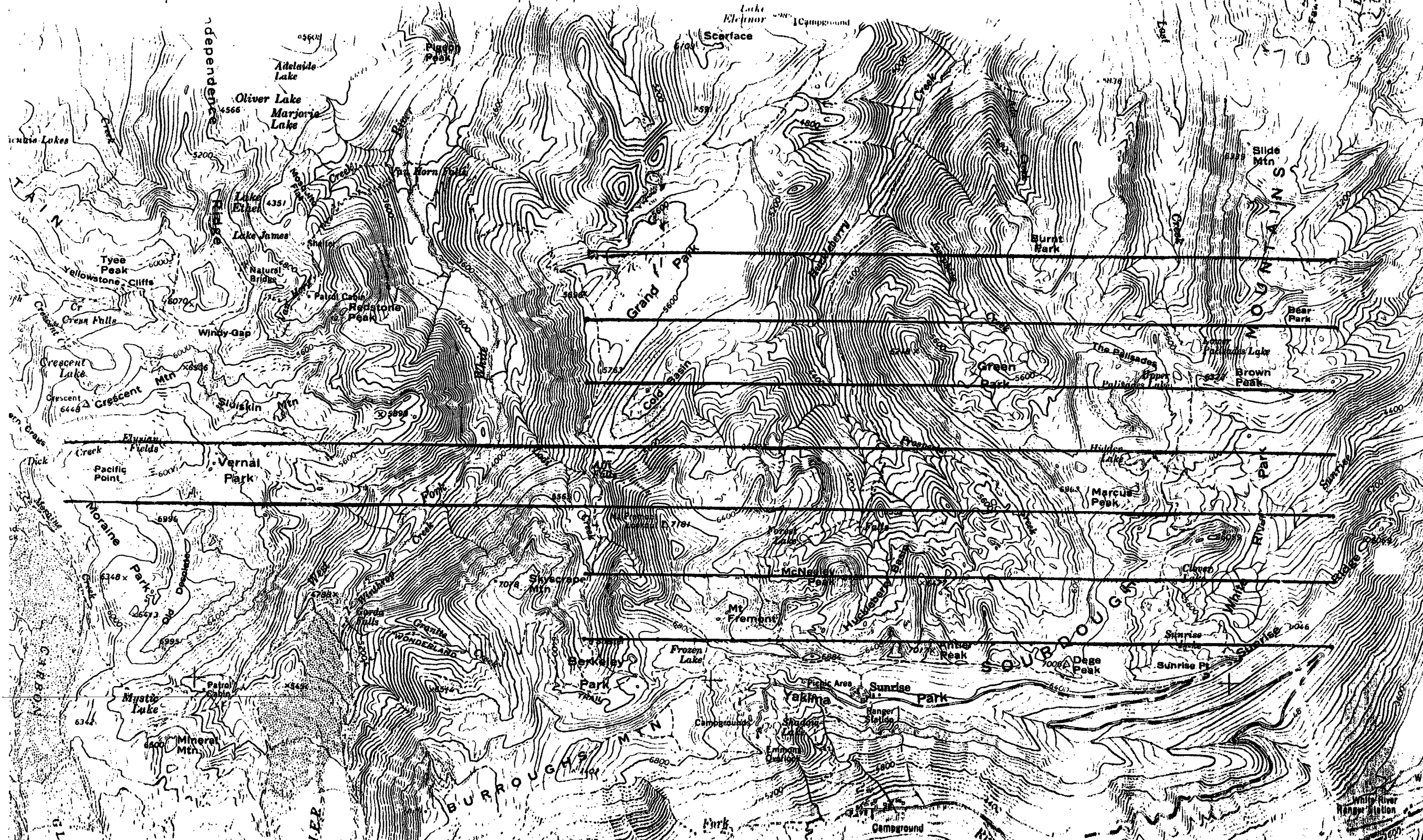
NUMBER OF PHOTOS ON FIVE SHORT LINES: 21 Photos

LENGTH OF TWO LONG LINES: 15,544.8m on ground
310.90mm on map

LENGTH OF FIVE SHORT LINES: 9,144.0m on ground
182.88mm on map

ESTIMATE OF TOTAL NUMBER OF PHOTOS: 175 Photos

DESIRED FLIGHT DATE(S): Mid-August, 1985



Independence

Adelaide Lake
Oliver Lake
Marjorie Lake

Scarface

Lake Elmer
Lake James

Grand Peak

Slide Mtn

Tye Peak

Windy Gap

Burst Park

Crescent Lake

Sluiskin Mtn

Green Peak

Brown Peak

Vernal Park

Marcus Peak

Noaine Park

Skycraper Mtn

McNess Peak

My Fremont

Mystery Lake

Berkley Park

Yakima

Sunrise Park

Sunrise Pt

Mineral Mtn

BURROUGHS MOUNTAIN

SOUTH BOUGS

White River Ranger Station