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The role of weather in influencing tourist-recreation visitation to the Oregon coast during the six-month summer season of May through October has been investigated by this research. In addition, the normal day-to-day fluctuations in coastal visitation has been determined.

Based upon the normal visitation, the tourist-recreation season on Oregon's coast can be considered in five phases. Phase I, the pre-Memorial Day period, is characterized by low weekday visitation, but high weekend visitation. Phase II, following the Memorial Day weekend, is a period of increasing weekday visitation. This phase lasts until after the Fourth of July holiday. Phase III, the height of the tourist-recreation season, begins seven weeks after Memorial Day, or about the 10th to the 15th of July. This phase contains a sudden upsurge in activity during the first two weeks of August as

visitation reaches the highest values of the year. An abrupt decline in weekday visitation during the days before Labor Day brings an end to Phase III. Phase IV, the period of declining visitation, continues from Labor Day until well into October. It is characterized by a slight increase in visitation during mid-September when many retired people go on vacation. Low winter visitation begins after mid-October and can be considered as Phase V. The beginning of this phase constitutes a logical conclusion to the summer tourist-recreation season.

Relationships between daily weather and tourist-recreation along the Oregon coast were investigated by both graphic analysis and techniques of quantification utilizing auto-regression and multiple regression analysis. The results from these two methods of analysis were somewhat in conflict with each other. Graphic analysis reveals strong correlations between weather conditions and visitation under certain circumstances. In some cases, traffic volumes were found to vary by as much as 40% of their summer weekday mean values in response to weather. Other types of visitation, such as motel occupancy, also showed response to weather.

The attempt to quantify the overall seasonal effect of weather was successful in that the results were highly significant at the 1% level. However, the total variation in visitation found to correlate with weather was small, not more than 15% of the variability remaining after removal of the weekly cycle from the visitation data. This small figure, however, is not completely indicative of true weather-visitation relationships because of numerous complicating factors.

Thus, this research demonstrated a significant correlation between weather and coastal recreation visitation. This relationship is strongest on weekends and in certain phases of the tourist-recreation season--particularly in Phases I and IV.

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Weather as an Influencing Factor in the Use of Oregon's Coastal Recreation Areas

by

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PREFACE

The summer of 1816 in Europe, according to Ladurie (1971, p. 64-65), was unusually cold and wet. In the Alps, along the shores of Lake Geneva, a group of writers had planned to spend a summer of outdoor activity. Instead, days of rain often confined them inside and, to pass the time, Lord Byron (one of the group) suggested that each should write a ghost story. The result was two classics of Western literature, Mary Shelley's Frankenstein and Polidori's The Vampire. Furthermore, writes Ladurie (p. 65), "although that summer may have been fertile in monsters it was not so fertile in cereals." The cold, wet weather so reduced grain harvests that the following Spring (1817) brought food shortages and rioting. Yet, this was not an isolated case in European history, Ladurie describing a number of similar ones since medieval times. But there are some who deny that weather plays an appreciable role in the course of human destiny...

Of all Man's activities, few stand so much at the mercy of the physical environment as outdoor recreation and tourism. Indeed, many recreation areas depend entirely for their existence upon some element of the physical landscape, whether this be a climate that produces snow for skiing, sun for sunbathing, a lake for fishing and swimming, or wild, rugged scenery to provide aesthetic stimulation and emotional satisfaction. Oregon's natural environment is such that many fine possibilities exist for recreational development, particularly along the coastline--widely regarded as one of North America's most scenic. Thus, given today's cultural and economic conditions in the United States, it is not surprising that a large and economically viable tourist-recreation industry has developed in Oregon.

Yet, the existence of a fine physical base for tourism-recreation is not the only criterion for development. A host of cultural, economic and physical factors come into play. So it is that some of the potentially finest lands in the world for recreation lie undeveloped due to inaccessibility, intervening opportunity, remoteness, local poverty or some other influencing factor. Furthermore, even in regions of highly developed and sophisticated tourist-recreation industries, economic variability is expected, many factors operating either subtly or openly to "make or break" a season. Among these factors is weather.

It is perhaps with hesitation that geographers today admit to a substantial influence by physical environmental factors over human activity and development. The presumed "spectre" of environmental determinism still seems to hang over the profession and, in compensation, geographic philosophy has rushed to the opposite end of the spectrum where, at its most extreme recent position, it even proclaims that only cultural factors guide human society and development. But, to deny that the physical environment exerts a strong control over human activity seems, in the writer's opinion, as unwarranted as saying that the ideas of the Apostle Paul had no control over Christian philosophy. The physical environment alone sets the ultimate bounds of reality, no matter what the perceptual values or technological achievements of a people. Thus, one can stand in the middle of a room and not perceive the walls as existing--one can deny their existence! But, when one begins to move forward, sooner or later the wall will be encountered and reality can no longer be ignored; the direction of advancement must be altered.

WEATHER AS AN INFLUENCING FACTOR IN THE USE OF OREGON'S COASTAL RECREATION AREAS

CHAPTER I

INTRODUCTION: MAN AND WEATHER

Purpose

This dissertation directs itself toward the problem of weather and Man as they interact in a tourist-recreation region. Its purpose is to objectively consider weather as a factor influencing the tourist-recreation industry of the Oregon coast during the summer season, May through October. It is hypothesized that by correlating daily weather conditions with numbers of recreationists, some measure of the actual, rather than assumed, importance of weather to the tourist-recreation industry during the principal season can be determined.

The influence of weather over tourist-recreation in general, and outdoor recreation in particular, is taken for granted, it being almost axiomatic that these influences are of some importance. Weather, as it affects the planned bar-b-que or round of golf, is indeed important to the individuals concerned, but assumes a far greater significance when its possible influence over an entire recreation-based economy is considered. Thus, in Oregon, a rainy weekend in May apparently causes thousands of people to remain home with consequent loss of considerable revenue to recreation-oriented business enterprises along the Oregon coast. Conversely, unusually fine weather sends people to the coast in abnormally large numbers, to the delight of every cash register from Astoria to Brookings.

It is surprising, considering its apparent influence, that little study has been made of the effect of weather on the tourist-recreation industry. Does the level of tourist and recreation activity along the Oregon coast in fact respond to variations in weather as is generally supposed? If so, how strong is this response, in what locations is it most keenly felt, and what broad sectors of the tourist-recreation industry are most responsive? This dissertation addresses itself to these basic questions and thus fulfills its two goals:

(1) To determine the normal daily trend of tourist-recreation visitation along Oregon's coast during the May through October summer season;

(2) To quantify the influence of daily weather variations on the total tourist-recreation visitation to the Oregon coast.

Conceptual Background

In Oregon, the tourist-recreation industry is economically significant, out-of-state tourists spending directly some $460 million in 1972 (Travel Advisory Committee, 1973, p. 2). A study by Oregon State University in 1969 indicates that in-state "tourism" contributes an amount perhaps twice that of the out-of-state (Travel Advisory Committee, p. 5). Although tourist and recreation activity occurs throughout Oregon, the coastal zone is the most important. According to the 1969 Oregon State University study, about one-half of all tourist expenditures in Oregon were in coastal counties (Travel Advisory Committee, p. 6). In terms of total expenditure per county, three of the leading five were coastal with Lincoln County having the highest expenditure in the state, a value almost twice that of the second ranking county. In some coastal counties, tourist-recreation revenue accounted for 20-25% of the total personal revenue and as much as 50% of the covered payroll (p. 7). Thus, any variation in the number of tourists-recreationists could have direct and immediate repercussions in the Oregon economy. Locally, as in some coastal counties, the impact would be of vital concern. Yet, short term variations seem to be the rule rather than the exception in the tourist-recreation industry, some seasons being characterized with less activity, others with more. This variation extends as well to individual months, weeks, and even days. Because of this variability most facility operators seem to become philosophically complacent toward variation in their business, adopting the attitude that "you can't out-guess the public."

Weather and Recreation

Much of the variability in the tourist-recreation industry is a result of cultural and socio-economic factors such as school vacation periods, traditional holidays and the five-day work week. Superimposed on the cultural-socio-economic elements it is hypothesized that variation of weather phenomena causes significant variation in the industry. This concept is reflected in the work of Maunder (1970, p. 165-168) and Paul (1972, p. xxiv), but has received very little scholarly attention. Maunder expresses himself clearly on the point (1970, p. 165):

> It is generally believed that the tourist industry is highly sensitive to weather conditions. It is not known in any detail, however, as to what extent any particular tourist region is affected by the weather in that region, by the weather in another tourist region, or by the weather in the tourist's areas of origin.

Continuing, Maunder (p. 166) says: "Regrettably, little specific information of exactly how weather affects the tourist industry is readily available, and little, if any, research on the topic has been published in the professional journals."

Paul (1972, p. xxiv) began his investigation of weather influence on outdoor recreation in Canada due to personal interest in what he terms the largely ignored subject of predicting daily attendance at various facilities. He (1972, p. 7) expresses the opinion that his work is the broadest yet to be prepared on the subject of recreation response to weather conditions.

Just how economically important are changing weather conditions to the tourist-recreation industry? Until further research is done, it is impossible to say for certain and, as Paul (1972) discovered, the influence of weather varies from region to region and, particularly, from one activity to another. Nevertheless, despite the limited availability of concrete information, the influence of weather appears sufficiently significant for Maunder (1970, p. 167) to state that ". . . the effects of weather and climate should be primary considerations in economics and planning for the tourist industry. . . ." However, much of the basic research has yet to be carried out (Maunder, 1970, p. 167).

Actually, it appears that little research has been done on the entire tourism-recreation system, an observation moving Gunn (1972, p. 17) to comment that ". . . virtually all facets of all components are now functioning upon popularly accepted opinion of fact, policy, and practice rather than upon the results of objective research." It is the hope that this dissertation will provide some of Gunn's "objective research" on one facet of the tourism-recreation system.

Possible Benefits from this Research

Several benefits could accrue to Oregon's coastal tourism-recreation industry as a consequence of increased knowledge concerning its response to weather conditions (see, also, Maunder, 1970,

p. 168, and Paul, 1972, p. xxiv). Obviously, traffic enforcement agencies could better anticipate traffic volume, thus achieving better disposition of personnel and equipment for regulation and control of possible congestion near recreation areas. From a more economic viewpoint, businessmen and facility managers could better anticipate demand; advertising and promotion could be more productive if the influence of weather were kept under consideration; weather forecasts could be tailored to the needs of the tourist-recreation industry; and planners and investors could evaluate proposed recreation development in light of the influence of weather factors, even to the point of providing alternatives to current facilities. Increased accuracy in forecasting weather would allow the recreation industry to cope more efficiently with weather conditions while the possible effect of weather modification opens up entirely new and interesting roads of inquiry.

Thus, an investigation into the influence of varying weather conditions over the number of recreationists present along the Oregon coast is seen to help fill a void in the existing knowledge of the tourism-recreation system and could have practical application. It is believed that this study will contribute to knowledge of variation inherent within coastal Oregon's tourist-recreation industry and thereby be of use to affected parties in both the public and private sectors.

In focusing throughout the investigation on an extensive tourist-recreation region, the Oregon coast, and by drawing data from sources believed to be broadly reflective of the tourist-recreation industry, this study attempts to reveal the influence of weather over the industry as an entity, not merely on a few selected activities or locales. In this manner, this investigation differs from Paul's (1972) detailed study in Canada in which attention was directed to the response of participation in selected activities to weather factors.

Applied Climatology

From a more academic viewpoint, this dissertation is envisioned as contributing to the body of knowledge in applied climatology, a field largely ignored by recent geographic research. In the May, 1972 edition of The Professional Geographer (p. 137-142), Dr. John R. Mather of the University of Delaware makes a forthright statement concerning the significance of applied climatology and the need for work to be done in this field. He stresses the value of geographic training to applied climatological research and states that the applied climatologist ". . . should seek to specialize in certain limited aspects such as weather and health, weather and particular industries or utilities, or weather and site location. . . " if significant contribution to knowledge is to be made (Mather, 1972). This study of the influence of weather on Oregon's coastal tourism-recreation industry would seem to fit precisely into Mather's conceptual framework.

By stressing, as he does, the utility of climatological research, Mather (1972) indirectly raises an interesting question: Is the atmosphere, including weather and climate, a natural resource? Curry (1966, p. 127) certainly thought so and was vociferous in asserting his opinion: ". . . I want to insist in passing, that weather or climate is a resource, a factor of production, like labor or land." Curry reports that the imminent geographer, Isaiah Bowman, believed the same (p. 127), although, he continues, some prominent economists do not agree. Maunder (1970), in his broad treatment of the influence of weather over human activity, states his opinion at the outset, on page 1, paragraph 2: "But the atmosphere is a resource . . . ." The writer must concur with these several scholars.

The Atmosphere as a Resource

"Resources," said Zimmerman (1964, p. 21), engaging in a bit of pedantry, "are not. They become." Elsewhere, he expressed this idea more lucidly (1964, p. 18): "The word 'resource' does not refer to a thing nor a substance but to a function which a thing or a substance may perform or to an operation in which it may take part." He was thus attempting to break the tradition which held that a physical entity alone was considered as a resource and to emphasize instead that it is the use of something which defines that object as a resource, not the object itself. A mineral, a water supply, or a forest is a physical entity capable of being put to functional use and thereby turned directly into an economic commodity. The fact that atmospheric conditions may make possible the existence and exploitation of that forest, water supply, or mineral, or that the atmosphere itself can be utilized for economic gain is a condition beyond the immediate perception of many individuals.

To judge from the attitudes expressed by scholars through text-books, even the academic community ignores the functional and economic capabilities of the atmosphere. Most meteorological and climatological texts concentrate on the physical processes of the atmosphere and a few look on it as a resource. Critchfield (1966), with the entire third section (p. 225-382) devoted to applied clima-tology, is an exception. Conservation texts are not better. Highsmith, Jensen, and Rudd (1969), for example, devote only four paragraphs to climate (p. 30), and then consider it only as a portion of the total land-base resource. Yet, the atmosphere has often been developed and exploited for economic purpose in the same manner as have mineral deposits and forests. Ullman, in his now classic article on amenities as agents in regional growth (1954, p. 123), suggests that the most important amenity is climate. Studies of the atmosphere and agriculture are legion (Thornthwaite and Mather, 1954; Maunder, 1968), and numerous other articles exist in which the economic impact of weather and climate is investigated (Sargent and Stone, 1954; Sewell, 1966; Terjung, 1966; Ackerman, 1966; Maunder, 1970).

The atmosphere--weather and climate--allows and even encourages certain types of human development; it is the factor used as the basis for defining ecological climax. Thus, the atmosphere is a resource, capable of being utilized for economic purposes. It is, however, an active "commodity," constantly exerting influence over human endeavors--if not to the degree envisioned by scholars such as Ellsworth Huntington, it at least operates subtly in the background.

Philosophical Foundations of this Research

This dissertation on Resource Geography is considered to represent a study in climatology as well as recreation. The focus here is on the influence of the atmosphere as a resource over human activity--the fact that the activity happens to be recreation is of secondary importance to the philosophical framework of the research. However, the writer does not wish to give the impression of over-stressing the role of daily weather. Certainly, seasonal, economic, and cultural factors generally appear to be more important to the tourist-recreation system on the Oregon coast. The writer only wishes to consider weather as a factor--as one of many influencing factors--and measure the actual degree of its influence.

However, by promulgating a central hypothesis of environmental control--that weather conditions affect the volume of tourist-recreation visitation to the Oregon coast--this dissertation places itself within the philosophical tradition of Ellsworth Huntington. Thus, the research leaves itself open to criticism because of its environmentally deterministic viewpoint. It must stand in its defense on the logical development of its arguments and tightness of methodology. However, in light of the continued hostility directed toward environmental precepts by many geographers, it is felt that some comment on Huntington's basic hypotheses is warranted. Indeed, one cannot investigate the topic of human interaction with the atmosphere and not eventually turn to the works of Ellsworth Huntington. Widely criticized since his death as well as before, Huntington's prodigious studies of man-environment relationships are deserving of more consideration than they have lately received from the geographic profession. Significant publications on Huntington's doctrines include those of Platt (1948a, b), Spate (1952), Lewthwaite (1966), and Chappell (1968, 1970).

Ellsworth Huntington

Ellsworth Huntington was among the last of the outstanding environmental determinists; geography was already turning in other directions well before the publication of his last and best known work in 1945, Mainsprings of Civilization. As early as the 1920's, and then more frequently throughout the next three decades, there was a steady barrage of criticism dedicated to bringing down the structure of deterministic doctrine (Barrows, 1923; Platt, 1948a, b). These attacks were largely successful.

One must ask why geography underwent such a reversal of position, from an environmental viewpoint to a largely cultural one? The reason may lie in the prevailing materialistic philosophy of social and economic development which began to gain recognition during the 1920's and '30's. In the Communist countries the concept of central planning was utilized extensively as a means of overcoming all developmental obstacles and, during the depression of the 1930's, similar ideas dominated the recovery schemes of the Roosevelt Administration. In the field of resource development, Erich Zimmerman was perhaps unwittingly the foremost spokesman of the new materialism. With his emphasis on function and the importance of human factors rather than physical existence as the principal basis of resource evaluation, Zimmerman helped foster an attitude favoring growth and development, thus creating the crass disregard of nature that has led to the environmental crisis of the early 1970's in the United States.

Yet, Huntington was not the extreme determinist that he is usually considered; trees and rocks did not whisper into his ear, as they did into the ears of others. Huntington's attitude toward human development is well summarized in Mainsprings of Civilization (p. 8-9):

> The factors which cause variation in the rate at which culture and civilization advance include biological inheritance, physical environment, and cultural endowment. All three play a part in every human action. . . . Nevertheless, the fact that cultural activities loom so large must not make us forget that they are dependent upon inheritance and environment. The main purpose of this book is to bring out the way in which variations in inheritance and physical environment are related to the growth of culture and course of history.

This is certainly no "extremist" speaking and such phraseology as ". . . are related to the growth of culture. . . "smacks of Possiblism, or perhaps of no "ism" at all--merely a healthy, inquiring intellect stating a problem for investigation.

Huntington was a prolific writer and, if his style lacked polished artistry, it nonetheless was appealing in its clear, straight-forward, though choppy character. He had a knack for selecting intriguing titles (i. e., Mainsprings of Civilization) and who, reading Season of Birth: Its Relation to Human Abilities, can resist such chapters as "Temperature and Reproduction" or "Optimum Temperature for Conception."

Huntington's first book, The Pulse of Asia, was published in 1907 and set the pattern that his research was to follow for the next four decades--the influence of weather and climate factors on the course of social development. Here, he espoused the doctrine that much of the history of Inner Asia can be explained by climatic variation. Similar themes recur consistently in his later works, the book

Civilization and Climate being devoted entirely to the topic of atmospheric influences over Man.

It is not surprising that these theories on climatic change in Asia were widely criticized at the time, but they have weathered the storm, so to speak, and Chappell (1970) defends them in light of current knowledge. Indeed, they seem perhaps even more tenable today than they did in 1907.

Elsewhere, Huntington studied the effect of weather and climate on a wide variety of human activities. Typical of these studies were those showing the relationship between library circulation in various cities of the United States in relation to incursions of Polar or tropical air masses (Mainsprings, p. 369+) or, of perhaps greater significance, the effect of temperature and other meteorological factors on work efficiency (Civilization and Climate, Chapter 6) and students' examination scores (Mainsprings, p. 377). Some of his studies on work efficiency involved 15,000 people (Civilization and Climate, p. 14).

One of Huntington's most celebrated and criticized doctrines, the relationship between civilization and climate, was first detailed as early as 1924, in Civilization and Climate (Chapter 9). Having become convinced by his research in Inner Asia that climate had influence over the development of civilization, he set out to define those areas of the world that were climatically most suited for development of civilization. In order to accomplish this he needed to map the distribution of civilization on the earth, then correlate this distribution with various "geographical" factors, especially climate (Mainsprings, p. 225).[1] This was accomplished and is described in Civilization and Climate (Chapter 9). The resulting maps of civilization and climatic efficiency have been widely reproduced--and roundly denounced in some quarters.

Although best known for his work on environmental influences, Huntington also did considerable study of a purely physical nature into the causes of climatic change and variability in weather. His investigations of extra-terrestrial (especially sunspots) influences on weather and climate are classic. This work is presented in numerous articles and books (i. e., Climatic Changes: Their Nature and Causes; and Earth and Sun: An Hypothesis of Weather and Sunspots)

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[1] Huntington's definition of civilization is, in the writer's opinion, excellent. It appears on p. 242 of Civilization and Climate:

> . . . those characteristics which are generally recognized as of the highest value. I mean by this the power to initiative, the capacity for formulating new ideas and for carrying them into effect, the power of self control, high standards of honesty and morality, the power to lead and control other races, the capacity for disseminating ideas, and other similar qualities which will readily suggest themselves. These qualities find expression in high ideals, respect for law, inventiveness, ability to develop philosophical systems, stability and honesty of government, a highly developed system of education, and capacity to dominate the less civilized parts of the world, and the ability to carry out far-reaching enterprizes covering long periods of time and great areas of the earth's surface.

and was closely tied to an interest in cyclicity. Indeed, it was a tenet of Huntingtonian doctrine that climatic cycles had a great effect on history (Mainsprings, p. 529).

How much of this work is accurate? In recent years, it has been popular to dismiss, for example, the existence of such correlations as those between weather and sunspots (Roberts, 1965). Yet, Soviet investigators, among others, have detected such correlations in recent studies (Dzerdzeevskii, 1963), and Chappell (1970, p. 349) makes the following observation:

> The practical aspects of sunspot studies are indicated by the application of correlations between sunspot intensity and planetary positions to the task of predicting ionospheric radio storms. It happens that one of the major investigators of such correlations, whose results are now being used with consistently better than 90 percent accuracy, was Ellsworth Huntington.

Huntington's views on inheritance occupy as prominent a place in his writings as do those on climate, but they have received less attention. "Heredity runs like a scarlet thread through history," says Huntington (Mainsprings, p. 37), and later states that it is co-equal with physical environment in importance (p. 42). His belief in basic genetic differences of races, and especially of various intra-racial groups which he called "kiths," forms a core of his social philosophy. He became a deep believer in eugenics, expressing this in Mainsprings of Civilization (p. 410) when, after speaking of such major events in human development as control of fire and the development of agriculture, he states:

> The next revolution of this sort may arise through the biological effect of Eugenics. That nation which best and soonest learns to improve the innate quality of its people seems to have the best chance to inherit the earth.

However, it must be emphasized that Huntington was not a racist. In Mainsprings of Civilization (p. 42) he attempted to sever himself from an extreme racial viewpoint by insisting that his is a theory in which heredity, not race, is the important factor.

Nonetheless, it is not surprising that Huntington's theories of genetic influence have provided considerable ammunition to his critics. Platt (1948a) smugly equates environmentalism with a belief of racial difference due to mental capacity, insinuating that both ideas are as out-moded as the concept of a flat earth. But, an examination of Jensen's (1972) modern and convincing research on genetics and education makes it appear that it is Platt, not Huntington, who should be relegated to that curveless surface.

There is, of course, much to criticize in Huntington's work. He certainly gives the impression of over-stressing environment, particularly climate and heredity, despite his own admonition that these are co-equal with culture (Civilization and Climate, p. 387). However, his principal weakness seems to be one of apparent over-simplification and excessiveness in his conclusions, as when he claims that the evolution of Monotheism is more likely in a desert and steppe than a jungle (Mainsprings, p. 292), or some of his statements concerning Man's physical and mental response to season of birth and conception (Season of Birth: Its Relation to Human Abilities). Furthermore, there are times when a reader is left with vague doubts concerning the validity of statistics and information used by Huntington to support his arguments.

Elsewhere, Huntington is guilty of occasional misinterpretation in his reasoning, as when he points to the greater winter-time circulation of library books in various North American cities as evidence supporting his contention that lower temperature leads to greater mental activity. He completely overlooks the fact that in mid-latitude climates people tend to utilize the summer for outdoor recreation and plan indoor activities (such as reading) for the more confining winter months. (Of course, this is, in itself, a form of environmental determinism!)

But, after this, what is left to the critic? That Huntington is an environmental determinist? Lewthwaite (1966) seems to be addressing this question when he comments that many of Huntington's critics dismiss his hypotheses by the simple expedient of labeling them as environmentally deterministic. Name-calling has no place in scholarship, Lewthwaite goes on to imply, and the only legitimate question is "Is it true?" It is only in this spirit that Huntington should be examined and his theories evaluated.

Huntington has been refuted by most geographers educated since the 1940's, yet his doctrines still remain and new research begins to vindicate some of his precepts. As Spate (1952) comments, "It can hardly be denied that there are many sections of 'Mainsprings' and Huntington's other books where he makes a strong case, " and that there is much in his analysis of short term weather cycles and their effects on human activity which cannot be lightly discounted. Chappell (1968) has even written a dissertation in Huntington's defense. Platt (1948a), in his crusade against environmentalism, seems only able to muster undocumented generalizations in support of his attacks.

Too often, it seems, we view culture as a separate entity, as something with a will of its own that appears out of nowhere to encompass a people in its fold. Indeed, we forget that culture does not beget people, but rather that people beget culture. Man is a biological phenomenon, thus culture must ultimately reflect the biological aspects of Man--the behavioral psychology of the people themselves and the physical environment in which those people exist. Huntington grasped and understood this fundamental concept. Geography is a more powerful discipline because Huntington wrote and, when current "faddist" geography has run its course, the basic environmental and genetic precepts of Huntington will hopefully come to again occupy a prominent position in the philosophical and applied foundations of the discipline.

Review of Literature

There is a paucity of published research on the subject of weather's influence over the tourist-recreation industry. A frustrating search of the tourist-recreation literature, including the geographical and meteorological journals, produces few references. Maunder (1970, p. 166) summarized the situation: "Regrettably, little specific information of exactly how weather affects the tourist industry is readily available, and little, if any research on the topic has been published in the professional journals." Maunder (1970, p. 167) extensively consulted the expanding body of literature on tourism and tourist industries, and found that virtually none of it gave significant consideration to meteorological or climatic factors, the emphasis instead being placed on economics and planning, or with market and advertising analysis. He concluded (1970, p. 167) that much of the basic weather-recreation research has not yet been done.

Maunder is one of the few researchers to give considerable attention to the subject of weather and recreation. He devoted a section of his book, The Value of Weather, to this topic (1970, p. 165-168) and did further research (unpublished) in Canada (Maunder and Halkett, 1969).

Clawson turns his prolific pen to the topic, "The Influence of Weather on Outdoor Recreation" (1966), but the result is generalized and vague, more a discussion of what might be the case rather than a presentation of known conditions. More specific articles are those of Perry, "Weather, Climate, and Tourism" (1972), and Heurtier (1968), whose article is in a French journal.

The last three years have seen several theses written on the subject of weather and recreation. One of the more significant is that of Paul, Relationships of Weather to Summer Attendance at Some Outdoor Recreation Facilities in Canada (1972), in which he looks at the regional influence of specific weather factors on selected outdoor activities during the summer season in three different areas of Canada. Dowell's thesis, The Relationship of Reservoir Pleasure Boating to Selected Meteorological Factors (1970), is also important, but concentrates on only one activity in a single area--pleasure boating on Arkansas reservoirs. A few other theses exist on the topic of weather and recreation, but have not been examined by the writer. With the exception of Paul's, none have apparently been published.

The massive report of the Outdoor Recreation Resources Review Commission (ORRRC) appeared in 1962 and is probably the most comprehensive study of outdoor recreation yet done in North America, if not the world. It covers almost every facet of the outdoor recreation phenomenon. Yet, weather receives only scanty and haphazard mention. Only the study report on Alaska (ORRRC, 1962, Study Report #9) recognizes that weather may have a sufficiently strong influence over recreation development to warrant detailed investigation. This report specifically recommends that a study be prepared on the climatic suitability of Alaska's several regions for recreation development. The report recognizes that climatic conditions may exert a limiting influence over certain types of recreation activity and that Alaska's recreation resource potentials should be evaluated in light of climatic criteria.

Terjung, "Some Thoughts on Recreation Geography in Alaska from a Physio-climatic Viewpoint" (1968), has published the only article dealing with recreation and weather (climate) appearing in recent geographical literature. Apparently responding to the recommendations of the ORRRC Report, he investigated the suitability of Alaska for tourism in light of a physio-climatic system developed a few years earlier (Terjung, 1966). Terjung concluded that much of Alaska is at best marginal for tourist development from a climatic viewpoint.

Elsewhere, the recreation literature is characterized by an omission of atmospheric considerations, an omission that exists not only in terms of articles *per se*, but extends even into articles where a consideration of weather would seem to have a definite place. For example, in Shafer, Hamilton, and Schmidt's study, "Natural Landscape Preferences: A Predictive Model," a series of 100 8 x 10 inch black and white photographs were shown to groups of people in an attempt to determine what landscapes were generally preferred. The effect of perceived weather and climate was not even considered in the analysis of the responses! Thus, the desert scene, which ranked lowest in position among all 100 photographs, may have done so not because of landscape form, but of the respondent's perception of desert weather and climate. Thompson, "Recreational Travel: A Review and Pilot Study" (1967), in his study of recreation traffic flow in Canada, discussed the various models which have been used in traffic analysis. While factors of population size, socio-economic structures, and aesthetic qualities are given prominent position in these models, there is absolutely no mention of the place of weather.

Sparse as it may be in terms of recreation, the literature is much broader when the effect of weather and climate on other activities is examined. Again, reference must be made to Maunder's The Value of Weather. This book summarizes the influence of weather on almost every common human activity and each chapter is followed by an extensive bibliography. Sewell et al., "Human Response to Weather and Climate; Geographical Contribution" (1968), looks at the geographical contributions to the literature of human response to weather. Also, a publication of the World Meteorological Organization, Weather and Man--the Role of Meteorology in Economic Development (1964), provides a broad, generalized over-view of

Man-weather economic relationships. An additional body of literature exists relating weather to such specific topics as agriculture, transportation, utilities, business and human physiology.

The sociological and physiological aspects of weather are treated widely. Ellsworth Huntington wrote prolificly on these topics, but more recent studies include Bates, "The Role of Weather in Human Behavior" (1966); Sargent and Stone, "Recent Studies in Biometeorology" (1954); Ullman, "Amenities as a Factor in Regional Growth" (1954); Haas, "Sociological Aspects of Human Dimensions of the Atmosphere" (1968); and Tromp, "Human Biometeorology" (1963).

Thus, it can be seen that the weather has received not an inconsiderable amount of attention from scholars concerned with its influence over human activity. In light of this, it remains something of an enigma that so little study has been done on the relationship between weather and the tourist-recreation system.

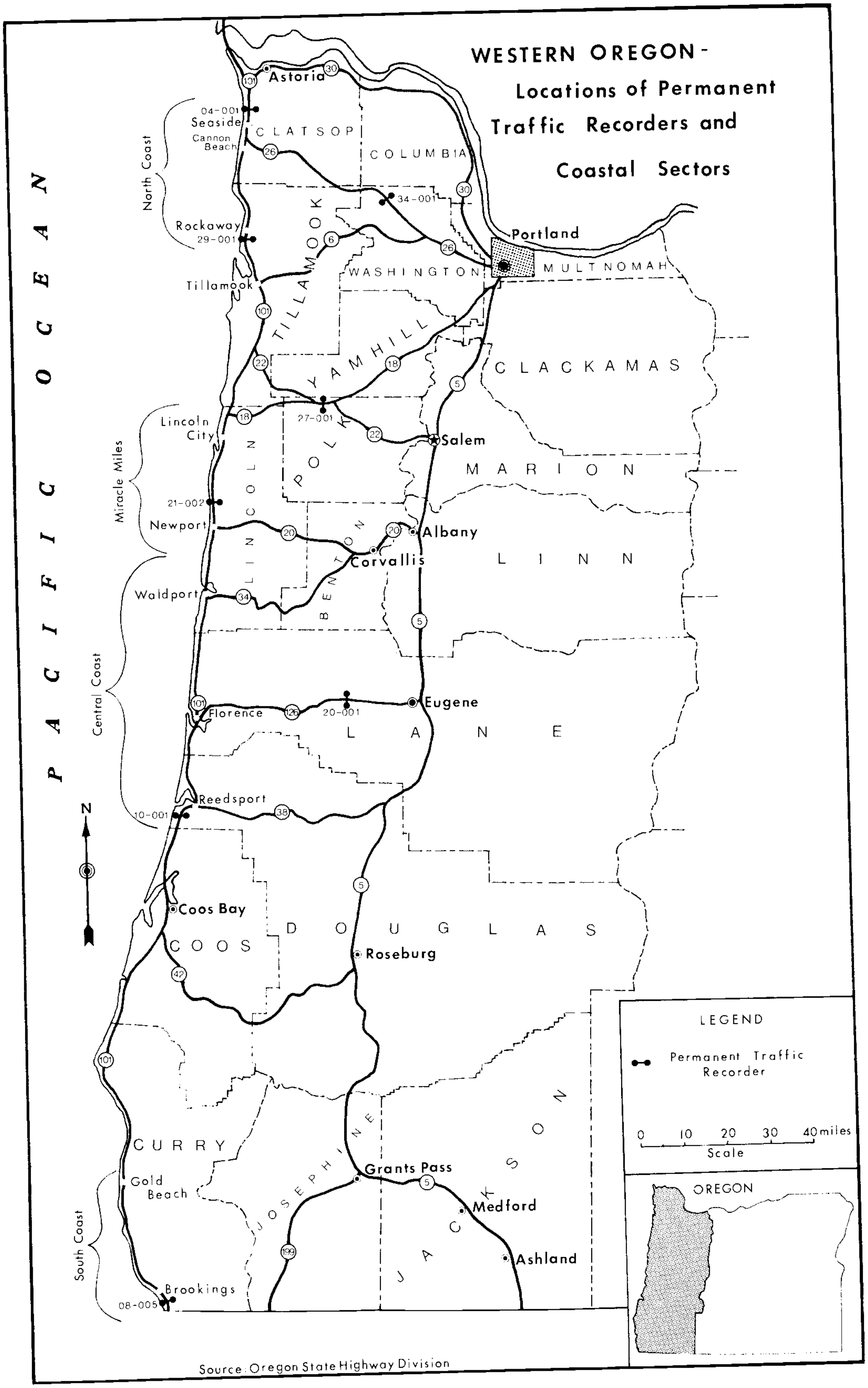
CHAPTER II

THE ENVIRONMENTAL SETTING AND RESEARCH METHODOLOGY

The Oregon coast faces the Pacific Ocean and is a wild, rugged area of recognized aesthetic quality (Figure 2. 1). Backed closely by the hills of the Coast Range, it is a zone of conflict in the eternal struggle between land and sea--a coast thrusting boldly seaward with rocky headlands and bluffs. The eroded remnants of coastal rock formations add to the visual attractiveness. Copious winter rainfall and mild temperatures provide for a lush vegetation.

Environmental Setting

The climate of the Oregon coast is generally temperate being modified by the prevailing marine influence. Rainfall is substantial, 60-100 inches or more per year, and is concentrated in the winter months. Summer is relatively dry with most sections of the coast averaging less than an inch per month in July and August. Autumn rains begin in September as cyclonic disturbances break the generally sunny weather of summer. The rains increase throughout October until, by November, the coast is plunged into the clouds and gloom of winter with less than 30% of the possible total sunshine. Measurable rain falls on an average of about 20 days per month during the period



WESTERN OREGON - Locations of Permanent Traffic Recorders and Coastal Sectors
PACIFIC OCEAN
North Coast
Miracle Miles
Central Coast
South Coast
Astoria
04-001
Seaside
Cannon Beach
CLATSOP
COLUMBIA
34-001
Rockaway
29-001
Tillamook
TILLAMOOK
WASHINGTON
Portland
MULTNOMAH
YAMHILL
CLACKAMAS
Lincoln City
27-001
POLK
Salem
MARION
LINCOLN
21-002
Newport
BENTON
Albany
Corvallis
LINN
Waldport
Florence
20-001
Eugene
LANE
Reedsport
10-001
Coos Bay
COOS
DOUGLAS
Roseburg
CURRY
JOSEPHINE
Grants Pass
JACKSON
Medford
Ashland
Gold Beach
Brookings
08-005
LEGEND
Permanent Traffic Recorder
0 10 20 30 40 miles
Scale
OREGON
Source: Oregon State Highway Division

Figure 2. 1

from November through March, but daily totals are often the result of brief showers. Snow and freezing temperatures are rare on the immediate coast. Winter is generally stormy and there are occasional storms of epic proportions with winds in excess of hurricane force.

The storms and rain diminish into the spring with not an infrequent number of mild, sunny days. By mid- to late-June the rains have essentially ended. Summer, however, can bring unpleasant weather with stratus clouds, fog, strong northerly winds and temperatures in the 60's. These conditions result from cold water and prevailing high pressure offshore.

Some of the year's finest weather, according to coastal residents, comes in September and October when high pressure over inland areas of the Northwest drives continental air masses westward across the Cascade Mountains and onto the coastal district, a condition resulting in low humidity, little cloudiness or fog, and temperatures into the 80's. But, occasional periods of fine, clear weather can also occur with some regularity at any time beginning as early as February.

Because of the cold water and unsettled weather, the Oregon coast tourist-recreation industry is based on factors other than the usual beach activities of swimming and sunning--factors such as aesthetics which take advantage of the existing physical environment. Thus, it is a coast where beachcombing, fishing, and "nature appreciation" are dominant activities. Anderson (1973, p. 58), in his thorough study of user perception of the Oregon Dunes area of Florence to Coos Bay (Figure 2. 1), found that sightseeing, relaxing, hiking/walking, and fishing are the four most common activities, some 57-73% of the people engaging in at least one of these as a principal form of their coastal recreation experience.

Resident Population and Transportation

Permanent population in the coastal zone is not large, the major cities being Coos Bay (population 13, 200), Astoria (10, 400), and Tillamook (4, 000). Elsewhere, cities and towns are rarely larger than 1, 000 to 2, 000 permanent population (Figure 2. 1). U. S. Highway 101 provides a link connecting the entire coast, but interaction is generally less between the various coastal sectors themselves than with larger population centers farther inland. Thus, the coast is connected by several access highways to inland cities and important transportation routes. These access highways, in turn, create an economic and cultural interconnection between the areas of the coast they serve and a particular inland population center. In this manner, cities along the northern coast are interconnected with Portland, Salem, and the population clustered in the lower Willamette Valley. Farther south, as at Florence, the connection is inland to Eugene. But, beyond Florence or Reedsport, along the southern coast, there are no larger interior population centers, and the coastal district must turn to its own secondary centers, such as Coos Bay in Oregon or Eureka in northern California. The Gold Beach-Brookings area (Figure 2. 1) in particular seems to lie within the hinterland of Eureka.

Coastal recreation visitation frequently conforms to the established highway interconnections. Many coastal recreationists are relatively local, probably living within 100 miles of their recreation destination. Thus, the largely urban population of the northern Willamette Valley is funneled across the Coast Range toward Astoria, Seaside, Cannon Beach, Tillamook, Lincoln City, and Newport (Figure 2. 1). The southern Willamette Valley, however, looks toward the Newport, Waldport, Florence, and Reedsport areas for recreation. The lesser population around Roseburg utilizes the Reedsport, Coos Bay, and Bandon area while Medford-Grants Pass people go to Gold Beach, Brookings, or the beaches of northern California.

The movements of out-of-state tourists are less well known, but there must be considerable travel in a north-south direction along U.S. Highway 101. This would appear to be particularly the case for Californians, who compose more than 40% of Oregon's out-of-state tourists (Oregon State Highway Division, 1972).

Methodology

Due to the lack of published work on recreation-weather relationships, no established methodology exists for such studies and this investigation had to "feel" itself along during the initial stages. The basic methodology, however, was rather simple: A section of Oregon significant for tourist-recreation activity was selected and data gathered for this area in order to reveal the pattern of day-to-day tourist-recreation visitation. These daily figures were then compared and correlated with certain meteorological parameters. The complicating factors were (1) what area to select for investigation; (2) what types of visitation data would be available and useful; (3) how could these data be collected; (4) what meteorological parameters should be selected for correlation; and (5) how should the visitation and meteorological data be correlated. The manner in which these and related questions were answered is discussed in the remainder of this chapter.

Spatial and Temporal Limitations

It was decided to limit the spatial scope of this study to the coastal strip immediately along U. S. Highway 101 (Figure 2. 1) as the coast is the most important recreation resource in the state. Furthermore, not every part of the coast was considered. As formulated, the basic objective of this study was to identify the measure the influence of daily weather on the total visitation to a tourist-recreation region, not on specific activities. Thus, those sections of the coast where relatively large local population concentrations might effect these measurements, or where economic activities other than tourism-recreation seemed important, were eliminated from consideration. These sections consisted of the areas around the cities of Astoria, Tillamook, and Coos Bay. A further refining of spatial criteria through field observation led to the identification of four separate coastal sectors where tourist-recreation activity seemed to be of particular importance. These sectors, identified on Figure 2. 1, have been termed the North Coast sector, around Seaside and Cannon Beach; the Miracle Miles sector, centered on Lincoln City and extending south to Newport; the Central Coast sector, from Waldport through Florence and Reedsport to beyond Winchester Bay; and the South Coast sector encompassing the area from the California state line northward through Brookings and Gold Beach. All data utilized in this investigation were drawn from these four sectors.[2]

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[2] Obviously, significant tourist-recreation activity occurs in other places along the coast, but the four sectors identified for analysis include the more important areas and probably have visitation conditions that reflect those of adjacent areas not studied.

In addition to the spatial restraints, a temporal limitation was felt to be in order. In light of this, the study was confined to a six-month period extending from approximately May first to the end of October. These months include the traditional summer vacation period and therefore constitute the most important part of the year so far as the tourism-recreation system on the Oregon coast is concerned.

An initial analysis of data revealed a strong connection between the levels of tourist-recreation visitation and the Memorial Day weekend. Additionally, it was found that Veteran's Day, near the end of October, seemed to mark the approximate beginning of low winter activity. Thus, the week containing Veteran's Day was selected as the end of the study period while its beginning was to be placed at some point prior to Memorial Day.

The selection of Veteran's Day week to conclude the study period has a logical basis supported by an analysis of data. No such logic exists for the beginning of the study period other than the assumed necessity to commence at some point in time before the Memorial Day weekend. It was finally decided to establish the temporal beginning of the investigation on the fourth weekend before Memorial Day. Such a date would lie near the first of May and allow the pre-Memorial Day visitation patterns to be investigated. The specific selection of this fourth weekend, however, was arbitrary.

Therefore, a 26-week period forms the basis for this investigation and is referred to for simplicity as the "summer" or "summer season." For purposes of the research each week was considered as extending from Friday through Thursday. This unorthodox definition was in consideration of the fact that much recreation activity occurs on weekends, there being a recognizable unity between each Saturday and Sunday. Friday, in turn, has more in common with the two succeeding days than with preceding weekends. Thus, a week in which the unity of Friday, Saturday, and Sunday is maintained is desirable for day-to-day recreation visitation analysis.

Therefore, the analysis of the Oregon tourist-recreation system is based upon the defined 26-week summer season and the Friday through Thursday weekly subdivision. On the various graphs and charts utilized in these discussions, the Saturday of each week is identified by number.

Selection of Data

It was not known, at the onset of this study, what types of information would be available for analysis. The desire was to collect data mirroring the total number of tourists and recreationists present on the coast, not merely those engaged in specific activities. That such information exist on a day-to-day basis was critical to this study as weekly or monthly summaries could not be expected to reveal daily weather influences. It was, therefore, in this context that a search for data began with an attempt to tap those sources which were thought to be especially useful. Obviously, there was a tendency to collect whatever information was available, the result being a somewhat motley assortment of sources. However, most of these sources proved to be highly revealing of visitation patterns.

The problems of data collection stemmed mostly from the fact that this investigation had no official support and the provision of information, especially from private sources, was dependent upon the courtesy of the individuals involved. Furthermore, a remarkable lack of organized daily information was found to exist; many agencies and private operators maintain visitor data only in monthly or seasonal summaries.

Three possible sources of data presented themselves as being potentially useful--daily traffic volumes on coastal and coastal access highways, daily motel occupancy figures, and daily overnight attendance at Oregon State Parks. The first two of these sources, traffic volumes and motel occupancy, proved to be obtainable, but such was not the case for the state parks. According to an employee of the Oregon State Parks Department, records of daily overnight attendance at state parks are not kept in an organized manner. As a result of a special study, such information was maintained during a three-month period (June-August) in 1972, but this period was considered as too short for inclusion in the current investigation.

Other sources of data eventually presented themselves: registration at visitor centers, records of inquiries at various Chamber of Commerce Tourist Information Offices, records of inquiries at a Forest Service Ranger District, the number of arrests by a police agency, signatures in a gift shop guest register, and the number of people on permit in a winderness area.

Traffic Data

The Traffic Survey Unit of the Traffic Engineering Division, Oregon State Highway Department, maintains computerized print-out records of daily traffic volumes at all permanent traffic records in the state. These records are held for five years, then destroyed one full year at a time. Therefore, an actual five-year record is available only at the end of each calendar year. When the traffic data were sampled for this study in February and March of 1973, all of the 1968 records had been thrown away. Thus, daily traffic data were available for the four summers of 1969 through 1972.

Permanent traffic recorders are maintained by the Oregon State Highway Department at six locations along the coast on U. S. Highway 101 and on most coastal access highways. It is readily apparent that data from all of these recorders could not be analyzed as the volume of information would be unmanageable. Therefore, some selectivity was necessary. Five of the six coastal recorders on U.S. Highway 101 were chosen and their locations appear in Figure 2.1. These five, Gearhart (# 04-001), Rockaway (#29-001), Otter Rock (#21-002), Winchester Bay (#10-001), and Winchuck (#08-005) are well distributed along the coast and are located within or near important tourism-recreation sectors. The sixth coastal recorder, near Bandon (#06-004) was not utilized because a visual analysis of its information did not reveal apparent significant variation from Winchuck. It would be preferable to have utilized data from this recorder also, but the exigencies of limiting the volume of data precluded such a course of action.

Of the coastal access highways, many do not carry sufficient volumes of traffic to warrant investigation--these highways are of only local significance. In other cases, several access highways connect the same urban center to the coast and their records appear repetitious of each other. Therefore, the permanent traffic recorders on three access highways were finally selected for detailed analysis (Figure 2.1). These highways, seemingly especially significant in terms of traffic volume in their respective areas, are the Sunset Highway (U.S. Highway 26) connecting Portland with the North Coast sector, the Salmon River Highway (Oregon Highway #18) serving the

Miracle Miles sector from both Portland and Salem, and Oregon Highway #126 between Eugene and the Central Coast sector.

Problems Related to Traffic Data. Several problems immediately arise in the use of traffic volume data that would appear to leave this research open to criticism. First, and of most importance, it can be charged that permanent traffic recorders measure traffic, not recreationists. Therefore, to equate variations in traffic volume with variations in the numbers of tourists-recreationists would be questionable. On closer examination, however, this criticism appears less significant and a logical argument in favor of traffic volume analysis can be demonstrated.

The highways selected for volume analysis all lie within or connect with important tourist-recreation areas, sectors of the coast where other types of economic activity are often of secondary importance. Such a situation would immediately indicate that a significant proportion of the traffic on these highways would be of a recreational nature. Additionally, most of the highways selected for analysis exhibit much greater traffic volumes on weekends than on weekdays, a pattern almost exclusively belonging to recreation as opposed to business highways (Wolfe, 1969). Therefore, it can be assumed that most weekend traffic in excess of the weekday volume is for recreational purposes and, as business travel is less on weekends than weekdays, the actual amount of recreation traffic is even greater than would appear. On weekdays, of course, recreational traffic volume near urban centers is smaller and business traffic is greater. Nevertheless, all of the highways selected for analysis in this study carry a high proportion of weekday recreation traffic as revealed by various Oregon State Highway Department origin and destination studies in the summer of 1972 (Thomas Schwab, personal communication). These studies, done between mid-July and late August, reveal the following percentage of trips for recreation purposes: 39% on U. S. Highway 101 near Lincoln City; 46% on U. S. 101 between Florence and Reedsport; 36% on U. S. 101 near the California border; 32% on the Sunset Highway (U. S. Highway 26); 31% on the Salmon River Highway (State Highway 18); and 23% on State Highway 126 between Eugene and Florence. These figures were collected on weekdays--the weekend percentages would be considerable higher.

Therefore, it can be demonstrated that a high proportion of the traffic on the highways analyzed is of a recreational nature. Furthermore, it would appear logical that business traffic is less susceptible to external influences, such as weather, than is recreation travel and, for this reason, non-cyclic variations in traffic volume are probably in large part related to the number of tourist-recreation vehicles.

A second criticism of traffic volume analysis is that two-way traffic is measured by the recorders and there is no way of telling how many times an individual car may pass the counter on the same day nor in which direction the predominance of traffic was moving. As there is probably a tendency to both go and return on the same highway, especially on the coastal access highways, it could be argued that the actual number of vehicles moving toward a destination is one-half the indicated volume. Collectively, however, recreationists may tend to drive to the coast on one highway and return on a second. More significantly, traffic varies in dominant direction from one day to another. On Saturday, for example, it is probable that more traffic is moving west toward the coast on the access highways than is moving east. On Sunday, the situation would be reversed. A similar reversal of flow may exist on portions of the Coast Highway, U. S. Highway 101, itself.

The current investigation takes cognizance of this criticism and makes no pretense of claiming that a certain number of people correspond to a particular volume of traffic. It is believed, however, that a certain percentage of the variation in a highly recreation-oriented traffic flow can be explained by various weather factors and that it is not therefore illogical to assume that the number of recreationists on the coast varies by an amount proportional to the traffic.

Motel Data

The collection of motel occupancy data was strictly dependent on the courtesy of the motel managers themselves. Thus, statistically sophisticated sampling techniques could not be employed and the procedure was simply to collect whatever information was provided. However, certain broad guidelines were followed.

The attempt was made to collect daily occupancy data from motels with similar characteristics, the belief being that variations in occupancy from one to another would then be a result of fundamental variations in the tourist-recreation system rather than factors applying only to an individual motel. Each sector of the coast was visited one or more times and large numbers of motel managers approached with requests for cooperation. By far the largest number of managers refused to provide daily occupancy figures for previous summers (May through October). In some cases such figures were not available, the records being sent directly to accountants or else maintained only in weekly or monthly summaries. In other cases, the managers would not provide data due to a natural suspicion of the investigator's motives and a desire to keep to themselves what is, after all, very personal information.[3]

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[3]The writer has come to the conclusion that occupancy is a jealously guarded secret in the motel business because, as one manager in the Central Coast sector so honestly put it, "We always want our competition to think that we have higher occupancy than they have."

However, with few exceptions, the motel managers were friendly and more than anxious to comment on their business and give their opinions on the influence weather might have on their occupancy. Several inferences have been made in this study on the basis of their observations.

Due to the personal nature of motel occupancy, the names of individual motels in later sections of this study are concealed, identification being only to city of location. Specific references, for example, appear as "Lincoln City A," "Lincoln City B," and so forth. Such vagueness is at the request of the managers, most of whom expressed a desire to maintain anonymity because occupancy figures are direct measures of their business success. Because these occupancy figures were provided only through the courtesy of the motel managers, their request has been strictly honored throughout this investigation and the names of cooperating motels will not be revealed.

A basic type of motel can be identified on the Oregon coast and has been defined in this investigation as "standard." Such a motel is not more than 10 or 15 years old, or else thoroughly remodeled. It has about 20 units, is clean, neat, and offers such touches as TV (possibly color) and perhaps coffee. It does not generally offer special frills such as swimming pools or dining facilities, other than perhaps being associated with a cafe. The rates are moderate by local standards.

In the current investigation an attempt was made to collect data only from motels of this "standard" type, but such a restriction could not be adhered to without eliminating a significant portion of what meager data did become available. However, all the motels sampled were readily accessible to the traveling public and were located on U. S. Highway 101 or else between this highway and the beach. Many of them had a beachside location.

Motel data accumulated in a scattered and random manner. Ten, 15, or more motels might be visited before one could or would provide information. More than 50 motels were approached and only 13 provided occupancy figures. Most commonly, the data provided were for a single summer, 1972, and only 5 of the 13 motels could supply a record of more than one year's duration. Thus, it is admitted that the motel occupancy figures are of limited volume and may not truly mirror occupancy rates along the coast as a whole. However, the basic similarity in occupancy patterns between separate motels in the various coastal sectors would indicate that a realistic condition is being presented. Nonetheless, it must be stressed that conditions will vary from one motel to another for a variety of reasons and that the conclusions drawn in this study are thought to be broadly representative of the entire Oregon coastal motel industry, not of every individual motel.

Finally, it must be noted that neither equal nor proportional representation exists in the motel data from all sectors of the coast. Thus, conclusions from the North Coast are based upon analysis of three motels, two of which provided more than one year's occupancy data. No fewer than six motels, however, were willing to cooperate in the Miracle Miles sector and two had more than a single year's records. Of these, one in particular seemed diagnostic of coastal occupancy conditions and its five years' data have been especially useful for analysis. The central coast contained three motels which contributed information, but only one of these could supply a record for more than one year. In contrast, no motels were found in the South Coast sector which were willing or able to release occupancy figures. Thus, occupancy conditions in this last sector must be based on inference.

Other Data

Continuous investigation produced other measures of daily tourist-recreation visitation to the Oregon coast besides traffic volumes and motel occupancy. Among these other measures were the records of Tourist Information Offices. These offices, maintained by local chambers of commerce, exist primarily for the convenience of tourists and recreationists. Many of them keep a daily count of the number of people seeking information from the office. Therefore, these daily office counts would appear to be realistic measures of the number of tourists-recreationists present in an area. At Lincoln City, Florence, and Gold Beach these daily records were opened to the investigator, but only one or two year's information was available.

Another important source of information was the Cape Perpetua Visitor Center operated by Siuslaw National Forest. A daily count is maintained of total visitation and these figures were available for three years, 1970-1972.

The Chetco Ranger District office at Brookings was yet another source of information. The reception desk at the Chetco station maintains a record of the daily total number of people seeking information about the Siskiyou National Forest. As most of these inquiries are from recreationists, it was felt that this source would reflect total visitation in the South Coast sector, a sector where fewer sources of data existed than was the case elsewhere along the coast. Additionally, the Chetco Ranger District provided a record of the total number of people on permit in the nearby Kalmiopsis Wilderness during the summer of 1972.

In the search for additional data sources, the guest register at a popular gift shop in the Miracle Miles sector was examined and the total number of signatures by day extracted for the four summers of 1969-1972. Finally, a unique source of data was provided by the Cannon Beach Police Department--the total number of arrests daily over a period of four summers, 1969-1972. It was hoped that the number of arrests would prove to be an indirect measure of the number of tourists-recreationists present in the North Coast sector.

These various additional information sources proved interesting but, in general, were not as useful as the traffic volume or motel occupancy data. There are various problems inherent to these other sources, problems discussed in detail during analysis of these data in forthcoming chapters.

Collection and Assimilation of Data

Data were collected during the late winter and spring of 1973. Several trips were made to the Traffic Survey Unit offices of the Oregon State Highway Division in Salem for the collection of traffic volume data. Other trips were made at regular intervals to coastal locations in order to obtain data from motels and the other sources. All visitation data used in this study were collected from original, unpublished sources by the investigator and he alone is responsible for their compilation and presentation.

Determination of Climatic Parameters

A fundamental question to this research was which weather parameters to use in the correlation with visitation data. Human response to weather factors is certainly complex and undoubtedly the physical and psychological reaction to a given situation is a result of all factors interacting with each other. Such complexity is recognized by the old adage that "It's not the heat, it's the humidity." On a more scholarly, if no less perceptive level, certain investigators have recognized this complex interaction and have devised what Terjung (1966) calls "physiological climates" based on parameters significant to human comfort.

A number of weather parameters could be selected for use in this analysis, factors such as temperature, humidity, rainfall, wind, and sunshine. Paul (1972), in his Canadian study of weather's influence on participation in selected outdoor activities, used comfort indices as part of his analysis. However, for the current study it was decided that necessity dictated the selection of only a few simple parameters because the availability of data for certain factors, such as sunshine or wind, was limited to only a few locations whereas daily temperature and rainfall was widely available. Furthermore, nothing was known about the relationship between weather and visitation on the Oregon coast. In such situations when knowledge is scanty, it is often best to utilize simple parameters since the results are often uncertain during initial investigation. Thus, it was tentatively decided to use daily maximum temperature and daily rainfall as the parameters for correlation.

Actually, these two factors--maximum temperature and rainfall--reveal a great deal about a day's meteorological character. Both factors are readily observable by people and have a direct impact on physiological and psychological comfort. Also, in the Pacific Northwest, discomfort due to high temperature generally results from the daytime readings, nights usually being "cool" with temperatures in the 50's or low 60's, even during heat waves. Thus, daily maximum temperature is an important physiological parameter. Also, the daily maximum indirectly reveals conditions of cloudiness, unusually high temperatures in the period May through October being associated with clear, sunny weather whereas low daily maxima often indicate the presence of clouds, at least during part of the day. Furthermore, in Canada, Paul (1972) found that daily maximum temperature was consistently one of the more important factors in determining the degree of use of various outdoor recreation facilities.

As for rain, it is clearly one of the most distinct forms of weather phenomena and additional comment on its obvious significance to human perception would be superfluous (although the nature of that perception would make a fascinating study in what might be termed psychological meteorology). The problem with utilizing a daily rainfall parameter is that the specific time of the rain's occurrence is not known, except at those few locations where hourly observations are maintained. For example, a record of 0.33 inch on a particular day does not indicate whether than rain fell before breakfast, as a single hard shower, after dark, or continuously throughout the daylight hours. It would have been possible to have determined the time of rainfall occurrence at major climatological stations, such as Portland, but this would not be the case for the smaller cooperative stations. Moreover, the use of hourly data would have added to an already complex situation in terms of data manipulation during analysis. Therefore, only daily rainfall totals were used. It is readily admitted that the use of daily totals is a methodological weakness dictated in part by expediency and that further research utilizing the time of rainfall occurrence could be used to refine the correlations delimited by this investigation.

Data utilized in this study were drawn only from stations recognized by the Environmental Data Service, National Oceanic and Atmospheric Administration, and published in the official publication, Climatological Data: Oregon.

Selection of Climatic Stations

One of the hypotheses put forth at the onset of this investigation (see Chapter I) was that weather conditions in locations other than the immediate coast might be the most important in determining coastal visitation. For example, fog and low temperature on the North Coast may not appreciably reduce visitation if sunny, warm weather prevails inland at Portland. Therefore, it was decided that correlations of tourist-recreation visitation with both coastal and interior weather conditions would be performed.

From the North Coast sector, climatological information was taken for Seaside and, to represent the interior, Portland. Newport was selected for the Miracle Miles sector with Portland again serving as the interior station. For the Central Coast, climatological data for Reedsport were utilized and, from the interior, Eugene. The South Coast sector was represented by Brookings with Medford selected as the interior station. Additionally, daily maximum temperature was taken from several California locations--Sacramento, San Jose, Los Angeles--for correlation with visitation in the South Coast sector.

Data Usability

Much of the raw data collected were in a form unacceptable for analysis or orderly presentation. Therefore, some reduction and conversion of the material into a more useful form was necessary.

Chronology. One of the first problems was to establish a chronological correspondence between different years. There is a strong weekly cycle inherent to most of the data and this prevented a cirect date-to-date correspondence from one year to another. For example, May 15th fell on a Saturday in 1971, but on a Monday in 1972. Therefore, a vast difference in the traffic volume, motel occupancy, and other measures of tourist-recreation visitation could be expected on that date between the two years. To correct for this phenomenon, all data were organized on the Friday through Thursday weekly basis as outlined previously in this chapter, each day of the week (Monday, Tuesday, etc.) being placed in proper chronological relation to Memorial Day weekend, defined as the fifth weekend of the summer. Thus, reference is made to the third Saturday of the season, this being May 15th in 1971 and May 13th in 1972, and is not made to a specific date. In such a manner a day-to-day correspondence was maintained between various years and several years' data could be averaged together in a meaningful relationship, as Monday with Monday, Tuesday with Tuesday, and so forth.

Traffic Averages. A second problem of data usability was the averaging of traffic data over a series of years. Traffic volumes have increased steadily between 1969 and 1972. Thus, merely to average corresponding daily volumes together would not be meaningful as the resulting figures would bear scant resemblance to traffic volumes of later years. The obvious solution was to convert the traffic data into some form of constant units that would not be dependent on variations in annual volume. The following technique, a "percent of unity" approach, was utilized. The average weekday traffic volume for the entire six months summer season was computed for each traffic recorder. Then, each day of the summer could be expressed as a percent of this summer weekday mean. Finally, by establishing chronological correspondence, each day over a period of years could be averaged together. The result is that each day's normal traffic volume is expressed as a percent of the mean summer weekday volume.

This approach gives great flexibility to the traffic volume data. For example, the weekly and seasonal cycles are accentuated for graphic analysis. By computing weekend values in terms of the weekday "unity," the significance of weekend recreation traffic is emphasized. It was felt that the weekday traffic volume provided a "base level" at any time during the summer, it being composed at least in part of business travel, against which the magnitude of weekend recreation volumes could be compared. Additionally, if the assumption is made that business travel remains stable throughout the summer, not being appreciably higher in August than in May or October, then any increase in weekday volume during mid-summer may principally be a result of tourist recreation vehicles.[4] Therefore, all graphs of this study are constructed such that volume is expressed as a percent of the average summer weekday volume.

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[4]That there is some validity to this contention is borne out by the origin and destination (O & D) studies performed by the Oregon State Highway Division in the summer of 1972. If the recreational traffic volume is subtracted from the total volume on the day of the O & D study, the resulting figure is approximately that of the weekday traffic in May or October.

Conversion to actual volumes was done by utilizing the average 1972 summer weekday volume (1972 was the most recent year available) and expressing each day's traffic as the appropriate percent of this unity value. Thus, all references in the text or figures to "1972 traffic levels" indicates that the volume presented is what would be expected given "average" traffic flow and a total weekday volume equivalent to that of 1972. Such a statement does not mean that the indicated traffic actually passed the recorder in 1972.

This "percent of unity" approach to traffic volume has been utilized in all graphic analysis. However, the statistical analysis used actual volumes.

Treatment of Holiday Periods. Certain holiday periods did not fall into chronological correspondence. For example, only in 1971 and 1972 did Memorial Day and Veteran's Day occur on the same day of the month (a Monday), as set by law. Prior to 1971, Veteran's Day occurred in November and Memorial Day, affixed to May 30th, fell on various days of the week. For these holidays, only data from 1971 and 1972 were utilized in the averages. The Fourth of July, occurring during the 10th week, presented the problem of occurring on a different day of the week from one year to another. Thus, it was ignored in the creation of the normal traffic volume graphs displayed in forthcoming chapters, but the individual "Fourths" from all four years (1969-1972) were averaged together and indicated on the graphs by a series of small x's.

Labor Day usually falls in the 19th week, but it occurred in the 18th in 1969. Thus, the entire 18th week in 1969 was averaged with the 19th week of the other three years when the normal traffic volume figures were computed; the 19th week from 1969 was dropped from the record.

Averaging Motel and Other Data. The problem inherent to motel occupancy analysis is simply that not all motels are the same size--one may have 40 units and another less than 10. Thus, for purposes of comparison, to speak in terms of total rooms occupied is meaningless. The size discrepancy, however, is easily overcome by expressing occupancy on a percentage basis. Thus, all motel occupancy used in this investigation is based upon percentage figures. The other data presented no problem of analysis. Some of them were used and are presented in actual value, others converted to percentages, but the units used are clearly distinguished during the analysis.

Influence of Hunting and Fishing Seasons. Fishing is one of the more important forms of recreation in Oregon's coastal districts and hunting is a significant activity for a limited period in autumn. Thus, it was felt that the possible influence of these activities on total tourist-recreation visitation should be considered. No marked effect of fishing or hunting seasons could be detected in traffic volumes, where any influence would most probably be felt. The opening of fishing season along the coast apparently does not effect total visitation so much as does the occurrence of good fishing conditions. Thus, although fishing certainly contributes to the total variability of coastal visitation, its impact occurs randomly throughout the season. A similar situation exists for shellfishing, when high visitation for this purpose would coincide with an unusually low tide. The impact of hunting in the immediate coastal zone would appear to be relatively slight, most activity apparently being concentrated farther inland, on the back roads of the Coast Range and elsewhere in Oregon.

Specific Methods of Analysis

Two methods of analysis were utilized in order to correlate daily weather conditions with tourist-recreation visitations. The first of these methods, graphic analysis, was used to delimit the basic weekly and seasonal variations of visitation inherent to the tourist-recreation system on the Oregon coast. This technique also allowed an initial understanding of the correspondence between factors of temperature and rainfall with tourist-recreation visitation. The second method, multiple regression analysis, was used to measure the actual variation in visitation that could be correlated to weather parameters.

Graphic Analysis. The use of graphic techniques is one of the most effective means of presenting the distribution of one variable against another, particularly if a chronological sequence is involved.

The human eye, at least when connected to a responsive brain, has a tremendous capacity for assimilating information. Therefore, all data collected in the course of this investigation were graphed prior to being subjected to any further analysis. In this manner, the primary seasonal and weekly relationships could be delimited and, by comparing one graph with another, the corresponding relationships between different types of information were revealed. It was through such a technique of graphic comparison that the first significant correlations between weather conditions and tourist-recreation visitation on the Oregon coast were perceived.

Graphic analysis has been utilized extensively in this investigation. In Chapter III the normal daily fluctuation of tourist-recreation visitation to the Oregon coast during the summer season is presented. This chapter is based almost exclusively upon graphic analysis. Chapter IV continues this dependence on graphic interpretation, in this case to illustrate certain basic correlations between weather and coastal tourist-recreation visitation. The graphs are explained more thoroughly in the respective chapters. Careful consideration should be given to the graphs because the conclusion and theory of this investigation is largely derived from them.

Statistical Analysis. Chapter V summarizes the results of an extensive statistical analysis of the visitation data which utilized the computer facilities at Oregon State University. The statistical technique, outlined briefly here, is discussed in greater detail in Chapter V. Basically, the technique eliminates the weekly cyclicity, then subjects the residuals to multiple regression analysis. In this manner, the most significant variable affecting the residuals can be determined and the percent of the variability due to weather factors can be measured within statistical limits of significance.

Normal Daily Visitation

An inspection of tourist-recreation visitation data from the Oregon coast reveals a considerable amount of day-to-day variability. The primary hypothesis of this investigation is that some of this variability is a result of daily weather conditions. Therefore, a thorough knowledge of the normal daily, weekly, and seasonal changes in tourist-recreation visitation to the Oregon coast would be necessary before the true significance of weather factors could be understood. In light of this consideration, attention was directed toward developing a knowledge of the normal day-to-day fluctuation in coastal Oregon's tourist-recreation visitation during the May through October season. The characteristics and temporal delineation of this fluctuation, and the techniques by which the normal pattern of visitation was determined, forms the subject of Chapter III.

CHAPTER III

NORMAL DAILY TOURIST-RECREATION VISITATION TO THE OREGON COAST

There is a remarkable lack of understanding concerning the daily patterns of participation in outdoor recreation and tourism. Paul (1972, p. xxiv) comments on this situation in Canada and a similar condition seems to exist in the United States. The state of Oregon, for example, does not even maintain records of daily attendance at state parks. Yet, it would appear that such understanding of daily attendance is vital to the organization of any facility catering to the recreating public. A detailed analysis of user participation through time would seem pursuant to proper planning, but at best, only seasonal or monthly attendance figures are kept by many public and private facilities and, where daily figures are available, they are rarely utilized. In addition, such information is frequently kept for only a few years (one to four), then destroyed without analysis. Nonetheless, sufficient data are available to allow a reasonably accurate delineation of the daily pattern of visitations along Oregon's coast during the tourist-recreation season. Therefore, the purpose of this chapter is to demonstrate and discuss the normal day-to-day fluctuation of this visitation. Weekly and seasonal trends during the period May through October are thus placed in proper chronological relationship and, although Oregon's tourist-recreation season somewhat conforms to the classic Memorial Day to Labor Day dates, the many nuances to the pattern will be emphasized in forthcoming sections of this chapter.

Guidelines

The following discussion is somewhat extended and complicated with numerous graphs interspersed throughout the text. Therefore, a few guidelines will make this body of material easier to comprehend.[5]

Each sector of the coast--North Coast, Miracle Miles, Central Coast, South Coast--is treated separately. After a brief introduction, the visitation patterns of each sector are analyzed with specific reference to accompanying graphs. Traffic data are analyzed first, then motel data and, finally, any other material that may apply to the particular sector. The pattern of daily visitation is described in chronological sequence from May through October. When significant, similarities or differences between the various sectors or types of data are indicated in the text.

The graphs themselves are generally self-explanatory. Most of them are averages of several years' data. These graphs adhere to the chronological correspondence discussed in Chapter II and are thus

[5] Questions concerning methodology and basic assumptions may be answered by reference to Chapter II.

numbered from 1 through 26, that is, the 26-week summer season as defined for this investigation. Each week, considered to extend from Friday through Thursday, is identified by both appropriate number and a thin vertical line corresponding to Saturday. The occurrence of Memorial Day, Labor Day, and Veteran's Day is shown on the graphs, as is the "location" of July 4, 1973. The general relationship between the 26-week season and the various months is also indicated.

Where the graphs refer only to an individual year, the actual dates of that year corresponding to the 26-week season are shown and the weeks are not numbered. Again, the dates and thin vertical lines indicate Saturdays; pertinent holidays are included in most cases.

Graphic Units

To recapitulate from Chapter II, various units of measure have been used on the graphs. All traffic volume data have been converted from actual volumes to an expression corresponding to a percent of unity. Specifically, each day has been expressed as a percent of the average weekday traffic volume for the entire summer. Thus, in Figure 3.2, it can be seen that, over the four-year period of 1969-1972, the third Sunday of the summer averages 189% of the mean summer weekday value. In 1972, mean summer weekday volume at Sunset Tunnel (Figure 3.2) was 3,456 vehicles. If this is used as the unity figure of 100%, then the third Sunday's expected traffic volume of 189% of this figure is 6,532 vehicles at 1972 levels. Table 3.1 summarizes the 1972 mean summer weekday volumes for all permanent traffic recorders used in this study. Obviously, the average weekday volumes for any past or future year can be substituted for the unity figure.

Table 3.1. Mean 1972 summer weekday traffic volumes at eight permanent traffic recorders (vehicles per day).

Permanent traffic recorder	1972 Mean summer weekday volume
Gearhart (#04-001)	6,701
Rockaway (#29-001)	4,358
Sunset Tunnel (#34-001)	3,456
Otter Rock (#21-002)	5,580
Valley Junction (#27-001)	7,733
Winchester Bay (#10-001)	6,986
Noti (#20-005)	3,215
Winchuck (#08-005)	4,504

All motel data are expressed in terms of percent total occupancy and should offer no problems of graphic interpretation. The other types of data utilized in this study are presented either in direct units, as a certain number of people per day, or as a percentage of the average summer daily value.

Significant Concepts. Several important concepts are raised within the forthcoming discussions and their occurrence in the text should be noted by the reader. Most significant is the identification of a four- or five-phase aspect to the tourist-recreation season along Oregon's coast. This concept of phases is developed in greatest detail in the section on the North Coast sector and reference to the various phases is made throughout the remaining body of the text. Additionally, note should be made of the following characteristic aspects of visitation in all sectors of the coast: (1) Low weekday visitation in May; (2) relatively low weekend visitation in June, September, and October; (3) extreme maximum visitation in the 15th and 16th weeks of the summer; (4) the marked decrease of visitation in the week prior to Labor Day; (5) the existence of a brief sub-phase with increased visitation during part of September.

North Coast Sector

The North Coast sector is the area dominated by Seaside and Cannon Beach (Figure 3.1). Seaside has long been a center of coastal recreation development, but in recent years has lost much of its pre-eminence due to the growth of other coastal centers, especially Lincoln City. This sector is interconnected to Portland and the Lower Willamette Valley by U.S. Highway 26, the Sunset Highway.

Traffic Data

Traffic data for the North Coast sector is provided by permanent

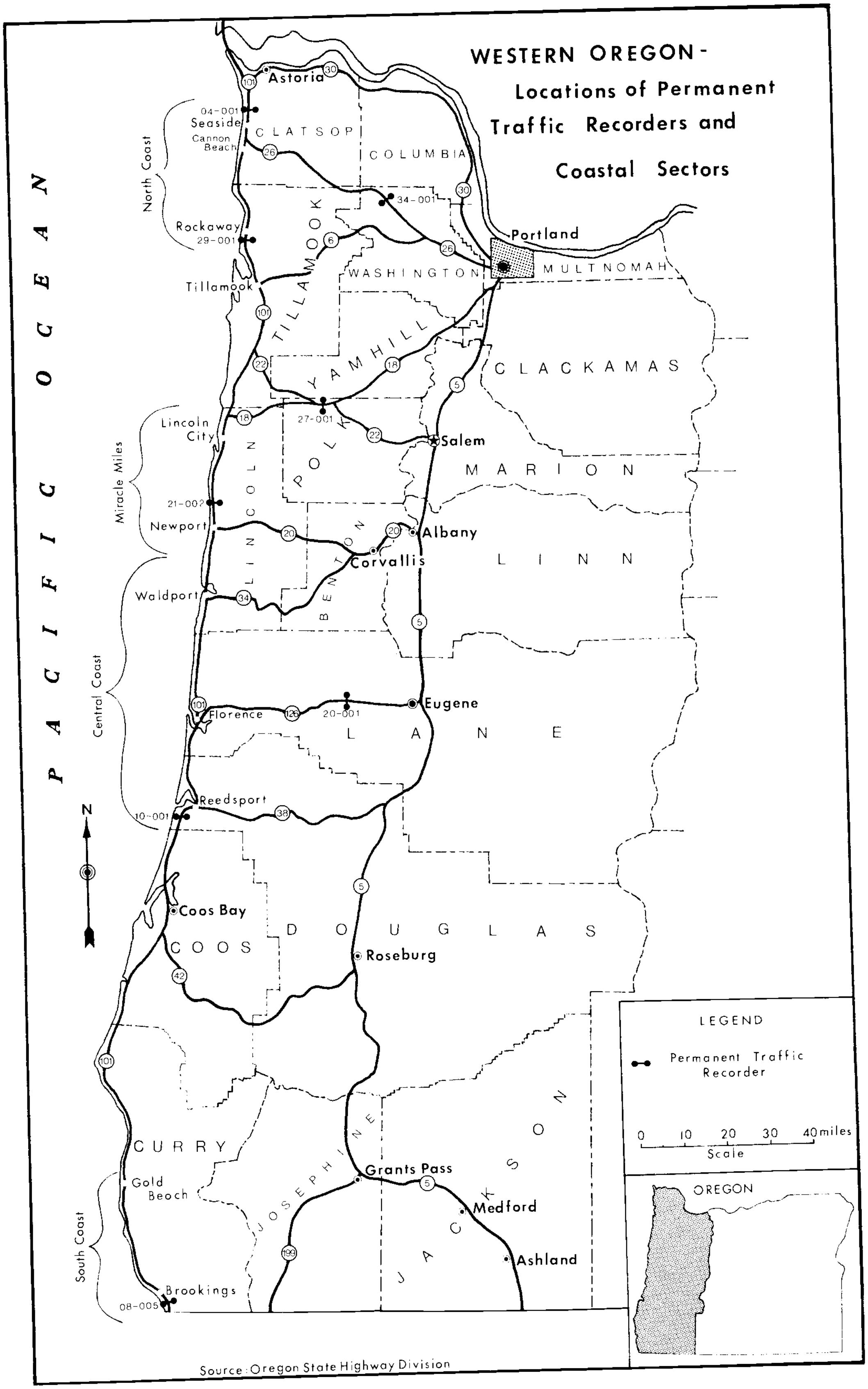
WESTERN OREGON -
Locations of Permanent
Traffic Recorders and
Coastal Sectors
PACIFIC OCEAN
North Coast
Miracle Miles
Central Coast
South Coast
Astoria
04-001
Seaside
Cannon Beach
CLATSOP
COLUMBIA
34-001
Rockaway
29-001
Tillamook
TILLAMOOK
WASHINGTON
Portland
MULTNOMAH
YAMHILL
CLACKAMAS
Lincoln City
27-001
POLK
Salem
MARION
21-002
Newport
LINCOLN
BENTON
Albany
Corvallis
LINN
Waldport
Florence
20-001
Eugene
LANE
Reedsport
10-001
Coos Bay
COOS
DOUGLAS
Roseburg
CURRY
Gold Beach
JOSEPHINE
Grants Pass
Medford
JACKSON
Ashland
Brookings
08-005
LEGEND
Permanent Traffic Recorder
0 10 20 30 40 miles
Scale
OREGON
Source: Oregon State Highway Division

Figure 3. 1

traffic counters at Gearhart (counter #04-001) and Rockaway (#29-001) on U. S. Highway 101, and at Sunset Tunnel (#34-001) on U. S. Highway 26, the Sunset Highway. Location of these counters is shown in Figure 3. 1. Information from the counters demonstrates that the highways involved are significant for local recreation traffic because the weekend traffic volumes are much higher than those of weekdays (Wolfe, 1969). This is especially evident at Sunset Tunnel where maximum weekend-day values average over 300% that of the average summer weekday value. Along U. S. Highway 101, where the Portland traffic is both less concentrated and absorbed into the general coastal traffic flow, these maximum values are less extreme, but nonetheless are 170-190% of average weekday levels. Furthermore, traffic volumes are high. Average weekday traffic for the summer (expressed in terms of 1972 traffic volume) is 3,456 at Sunset Tunnel, 4,358 at Rockaway, and 6,701 at Gearhart (Table 3. 1). Thus, average weekend volumes in summer range as high as 9,227 cars per day at the height of the season along Sunset Highway and 11,500 at Gearhart; Rockaway has lesser values. Average weekday values range from 60-70% of normal in May and October to 130-140% at peak season along U. S. Highway 101, and 50-130% on Sunset Highway. This information is summarized graphically in Figures 3. 2, 3. 3, and 3. 4.

<u>Daily Variations.</u> Due to the fact that only four years of data are available for analysis, caution must be used in drawing conclusions

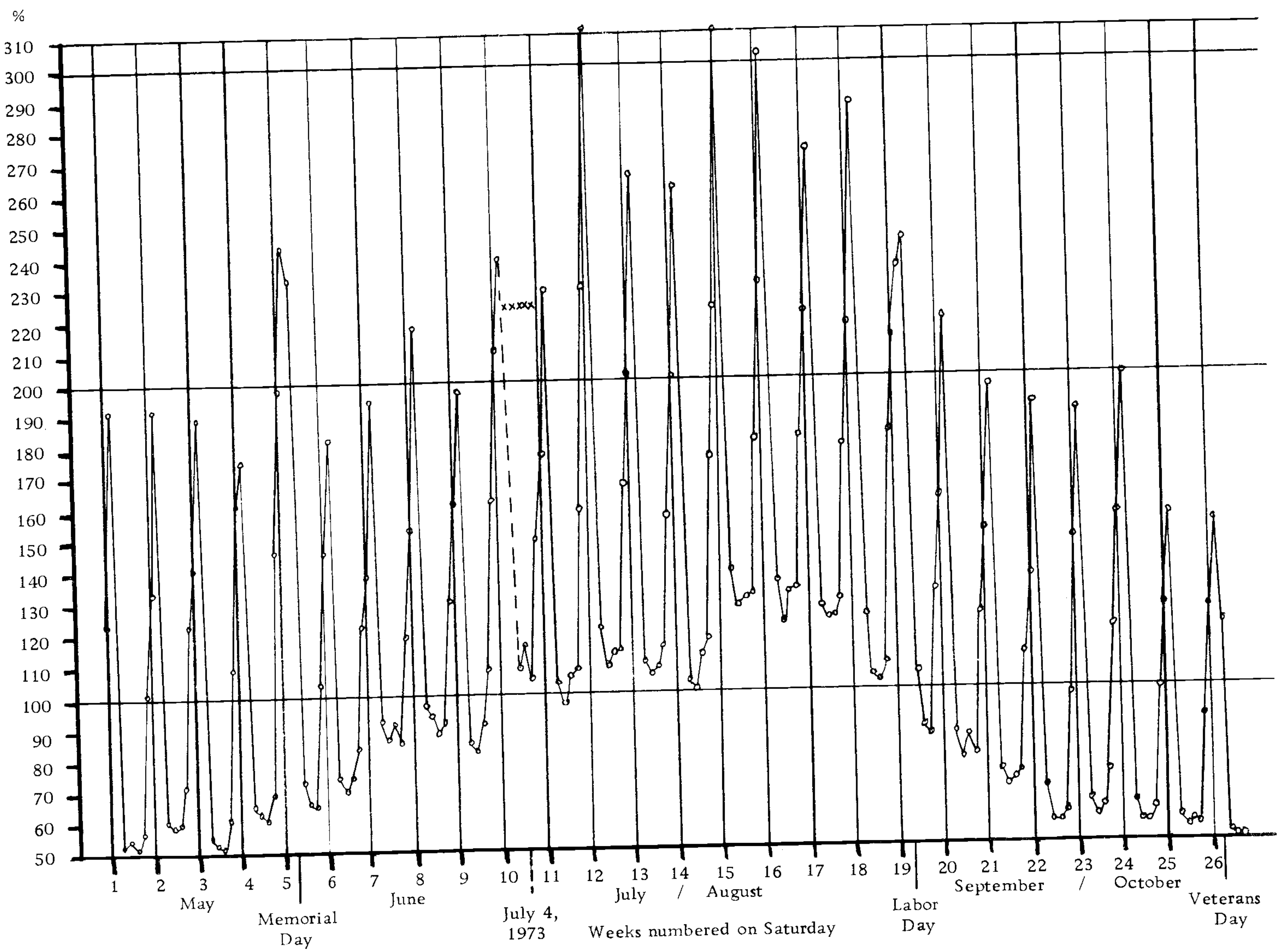

Figure 3.2. Sunset Tunnel (#34-001) Permanent Traffic Recorder. Average daily traffic volume expressed as a percent of the mean summer weekday volume (four-year average).

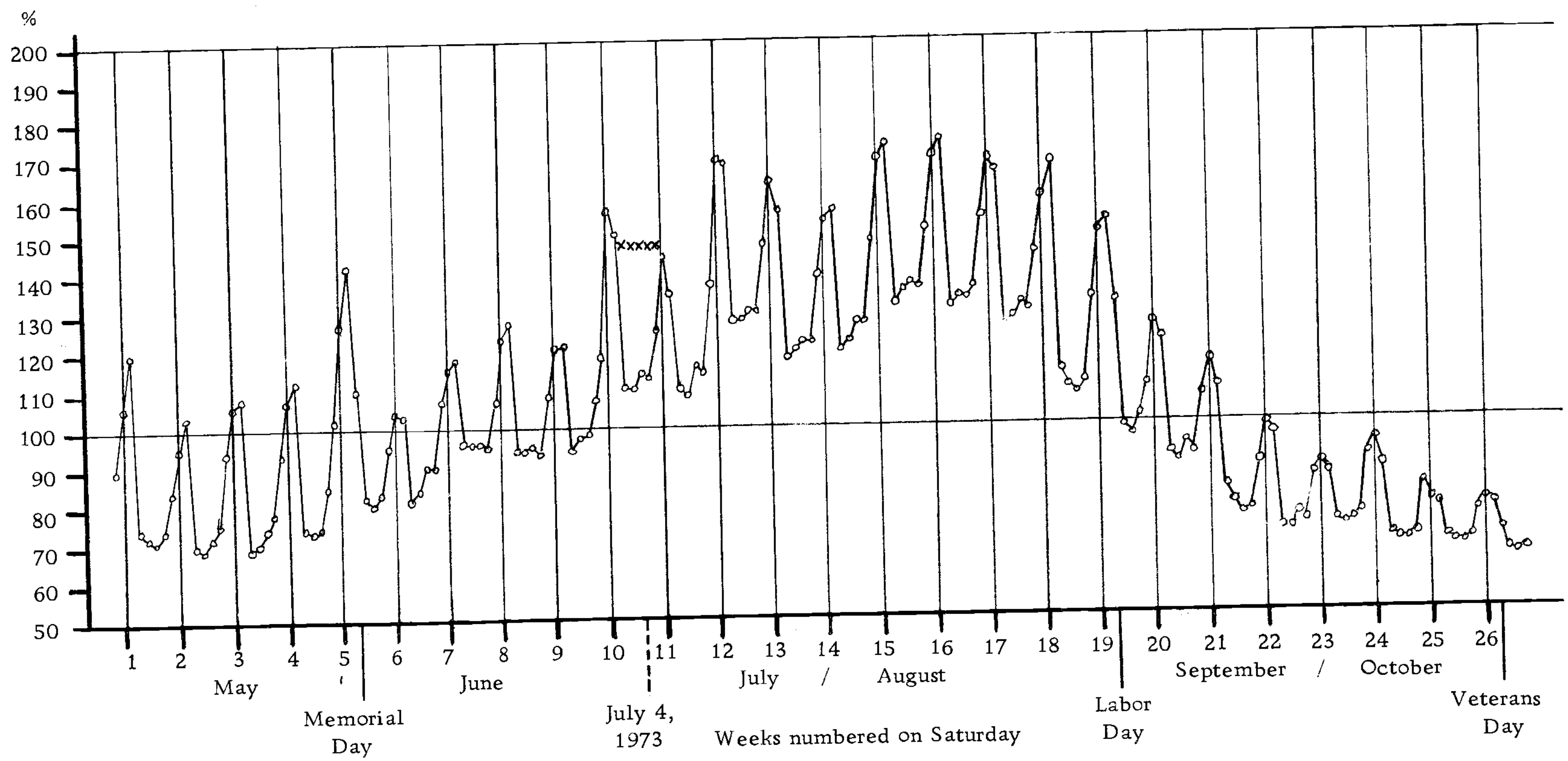

Figure 3. 3. Gearhart (#04-001) Permanent Traffic Recorder. Average daily traffic volume expressed as a percent of the mean summer weekday volume (four-year average).

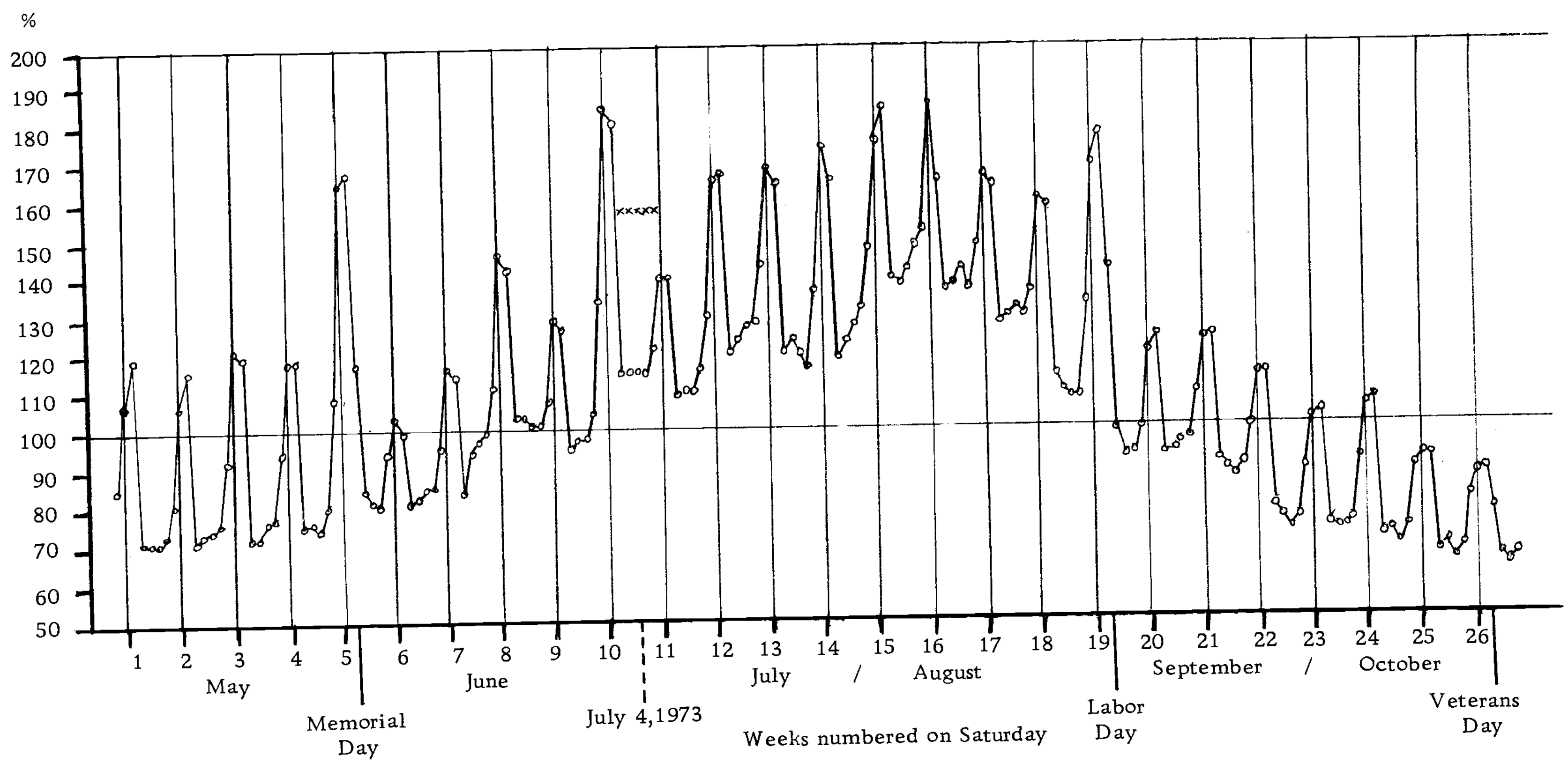

Figure 3.4. Rockaway (#29-001) Permanent Traffic Recorder. Average daily traffic volumes expressed as a percent of the mean summer weekday volume (four-year average).

from the traffic counter records. But, definite patterns are revealed. During the four weeks preceding Memorial Day, traffic volume is very stable from week to week, with daily variation conforming to the normal seven-day cycle. The four principal weekdays, Monday through Thursday, have between 50 and 60% of their mean summer value at Sunset Tunnel, and between 70 and 80% at both Rockaway and Gearhart. Fridays, although weekdays with normal business traffic, reflect the approaching weekend with a sharp increase in volume. Saturday and Sunday constitute the days with most traffic, as they do throughout the entire summer season. Sunday is the day with greatest volume. Weekend daily traffic averages about 160-170% of the weekday summer mean on Sunset Highway, 100-110% on Highway 101 at Gearhart, and 110-120% at Rockaway.

Memorial Day. Memorial Day weekend, the fifth weekend of the summer, brings a marked traffic increase in all three North Coast counters with indicated volumes matched only by the peak weeks of mid-season. The increase is greatest along U. S. Highway 101. Memorial Day itself, now the last Monday in May, has heavy traffic. Along U. S. Highway 101, at Gearhart and Rockaway, the volume is the least of the three-day holiday, but on Sunset Highway, which feeds traffic back to Portland, Memorial Day's volume is within a few percentage points of being the greatest of the long weekend (Figure 3. 2).

Following Memorial Day the weekday traffic beings an irregular but steady increase. However, relative to the weekdays, there is a decided drop in weekend traffic. For that matter, volumes are generally little greater than in May and, in some cases, are even lower. This diminution is particularly marked in the sixth week. Such decreases seem to be characteristic of the weekend immediately after a holiday.

Post Memorial Day Period. Of the four weeks following Memorial Day, the eighth is characterized by a marked increase in traffic, especially on the weekend. The ninth week is then somewhat reduced in volume. The variations during June (generally weeks six through nine) are probably explained by cultural factors. June is a busy month for most people--schools are often still in session for the first two weeks, lawns and gardens demand attention, and in Portland, the Rose Festival early in the month is a very popular event serving to keep many people in the metropolitan area. Why the eighth week should stand so relatively high, however, is unknown, but is possibly related to its being the first weekend following the close of school.

Weekday traffic rises steadily during this four-week post Memorial Day period, with a slight decline during the ninth week. It is this weekday increase which indicates the beginning of the principal tourist-recreation season, there being no reason to believe that the majority of the increase is due to anything but recreationists and tourists moving along the coast. Average values, however, are still below the summer norm.

The Fourth of July Period. The tenth week is associated with the Fourth of July and, although this day has been eliminated from the graphed data (as it falls on a different day of the week each year), its influence can still be seen in the sharply higher weekend value. At Rockaway, on U. S. Highway 101, this weekend has the greatest traffic volume of the entire summer (Figure 3.4). The weekend, however, is not nearly so outstanding at Sunset Tunnel or Gearhart. When the Fourth of July holiday falls on a weekday, traffic volumes are almost as great as on the tenth weekend. The inferred level of the Fourth of July volume is indicated on the graphs by a series of small x's in the 10th week.

During the 10th week, weekday traffic volumes rise to a level above their summer mean, then tend to hold steady with only slight increase throughout the next four weeks, that is, essentially during the month of July. This mid-summer "plateau" is a distinctive and important aspect of the tourist-recreation season of the Oregon coast.

Seasonal Peak. Weekend values display a post holiday slump in the 11th week, then jump upward in the 12th to some of the highest levels of the summer. At Sunset Tunnel, this weekend has more traffic than any other, a fact possibly due to the occurrence of the annual Miss Oregon Pageant at Seaside during this time in July. Thus, the 12th week can be considered as initiating the height of the tourist-recreation season along the north Oregon coast.

The tourist-recreation "solstice," so to speak, along the North Coast takes place in the 15th, 16th, and 17th weeks. Following the "plateau" of previous weeks, weekday values increase abruptly in the 15th week at all three counters to what are the highest traffic volumes of the year. The 16th week almost matches the 15th, and the 17th is but little reduced.

With the exception of the 12th weekend at Sunset Tunnel, and the 10th at Rockaway, the 15th and 16th weekends have the summer's highest traffic volumes. On Sunset Highway these weekends record average daily traffic volumes 267% of the mean summer weekday volume and Sundays of both weeks exceed 300%. Thus, at 1972 traffic rates, as many as 10,400 vehicles pass the traffic counter on maximum days. Relative volumes are lower at Gearhart and Rockaway, but the weekends still average between 170 and 180% of the weekday summer mean, peak days seeing more than 11,500 vehicles pass the counter at Gearhart (1972 rate).

The occurrence of the maximum weekday traffic during the 15th and 16th weeks possibly is due to the tendency of North Americans to take vacations during this period. It is possible to visually fit on the graphs a line through the values of weekday traffic after Memorial Day and see that such a line would intersect the indicated values at the 15th and 16th weeks. This is an interesting relationship that currently defies absolute explanation, but does exist at every traffic counter considered in the course of this investigation.

Labor Day Period. The 18th week brings a dramatic drop in weekday values, although the weekend is still high. Probably, the approach of Labor Day weekend (week #19) with the consequent start of school accounts for the lack of weekday traffic. Volumes decline to early July levels, but are still higher than the summer weekday mean. Thus, the main season comes to an end.

Labor Day weekend is, as expected, the last major weekend of the summer in terms of traffic volume but, contrary to public opinion, is by no means the greatest of the entire season. At both Sunset Tunnel and Gearhart, eight other weekends have greater average daily volume. Rockaway displays its unique pattern of unusually high holiday traffic relative to other weekends (Figure 3.4), but only Sunset Tunnel records high volume on Monday, the day people return home. (A similar situation was observed on the Memorial Day weekend.)

With the advent of autumn in the weeks following Labor Day, traffic volumes continue to decline. Weekday volume falls below summer averages. Weekend values are at levels similar to those in May on Sunset Highway, but somewhat lower along U.S. Highway 101. At Gearhart, weekend traffic diminishes to such an extent that, after the 22nd weekend, averages are even less than the summer weekday mean. Weekend traffic on Sunset Highway holds at a relatively steady rate until after the 24th week, then drops to lower values in the final two weeks of the period. A similar if less pronounced pattern is discernible at Gearhart and Rockaway as well. Weekday volume diminishes into October, leveling off during the last weeks at 50-60% of the summer mean on U. S. Highway 26, and 60-70% on U. S. Highway 101.

An interesting feature of weekend traffic during the last seven weeks of the season is the decidedly smaller weekend traffic values in proportion to weekday volumes at Rockaway and Gearhart. Throughout most of the season, as can be seen from Figures 3. 3 and 3. 4, weekend volumes exceed those of weekdays (Fridays excepted) by amounts equal to 40 or 50% of the mean summer weekday volume. Immediately after Labor Day, however, this figure falls to only 10-30%. There is no obvious explanation for this, but it is apparent that more people visit the coast on weekends in early season than in late season.

Seasonal Phases. Thus, records of daily traffic volumes on the North Coast suggest a five-phase subdivision of the tourist-recreation season. Phase I consists of the four weeks prior to Memorial Day and is characterized by a relatively stable traffic volume from one week to the next. Phase II begins in the fifth week, immediately after

Memorial Day, and continues until the 12th week. It encompasses a period of rising activity, commencing with low volumes in June and terminating with the high volumes of mid-July. Phase III constitutes the height of the season, extending from the 12th through the 18th weekend. The 12th, 13th, and 14th weeks form a mid-summer "plateau," the 15th, 16th, and 17th marking the absolute high point. With the 18th week and Labor Day forming a transition, the fourth phase begins during week 19 and continues well into October, through the 24th week. Traffic volumes diminish steadily during this time. Phase V appears at the end of the summer season, in October, with a small but abrupt diminution in weekend traffic, weekday volumes having stabilized at a level as low or lower than any during the six-month season. This phase probably extends into November and includes only the 25th and 26th weeks. Such a pattern leads to the conclusion that the summer tourist-recreation season realistically ends with the 24th week, that is, sometime near the middle of October.

Motels

Data concerning daily occupancy were collected from three motels in the North Coast sector, two in Seaside and one in Cannon Beach. Of these, one in Seaside (Seaside "A") provided four years of data and another (Seaside "B"), one year--1972. The Cannon Beach motel supplied three years' data, 1970-1972.

These motels are not strictly comparable to one another. Seaside "A" is located adjacent to the beach and is an older, well maintained establishment of modest size, 10-15 units. During the winter season some of these units are rented as apartments on a monthly basis, thus fewer units are available to the general public during May, September, and October than in June, July, and August. Seaside "B," from which there is only one year's occupancy data, is larger and newer than "A," containing approximately 20 units, but is located at some distance from the beach. This motel is of a type defined in Chapter II as "standard." A significant share of its business is due to "commercials."[6] The Cannon Beach motel is adjacent to the beach, but is quite small with fewer than 10 units.

The average percent occupancy at Seaside "A" and Cannon Beach is depicted in Figure 3.5. Seaside "B" is shown in Figure 3.6, but it must be remembered that this graph represents only one year's data (1972).

These motels appear to adequately reflect general occupancy conditions on the North Coast. Cannon Beach probably has higher than average occupancy due to its small size, whereas Seaside "A" is

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[6] The term "commercials" in the motel industry refers to salesmen, deliverymen, and others traveling for business purposes. Frequently these men stop in a particular town at regular intervals and usually stay at the same motel on each occasion, thus forming a type of regular clientele.

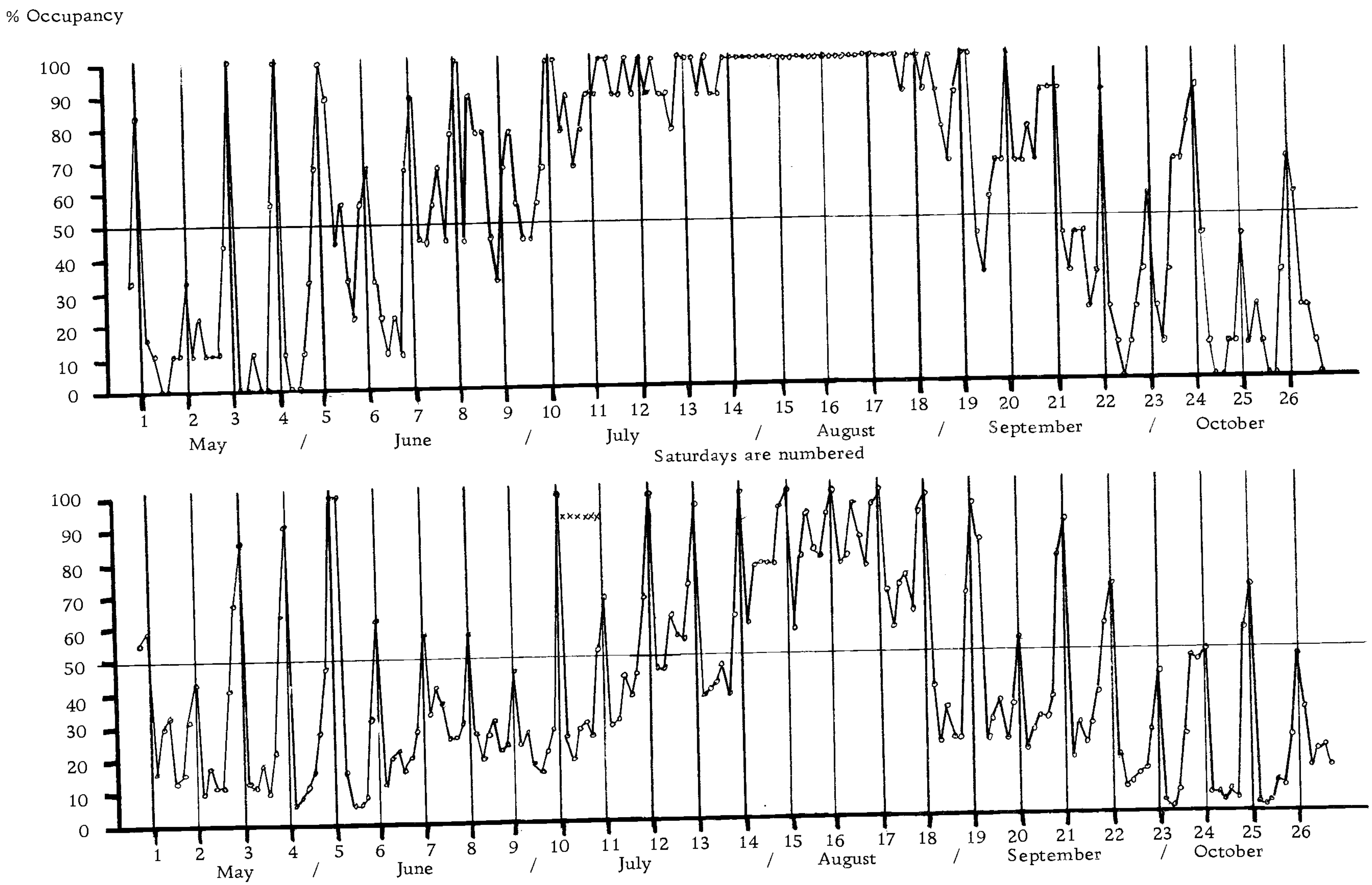

Figure 3.5. Cannon Beach Motel (upper) and Seaside "A" Motel (lower). Average daily occupancy, percent (three-year and four-year average).

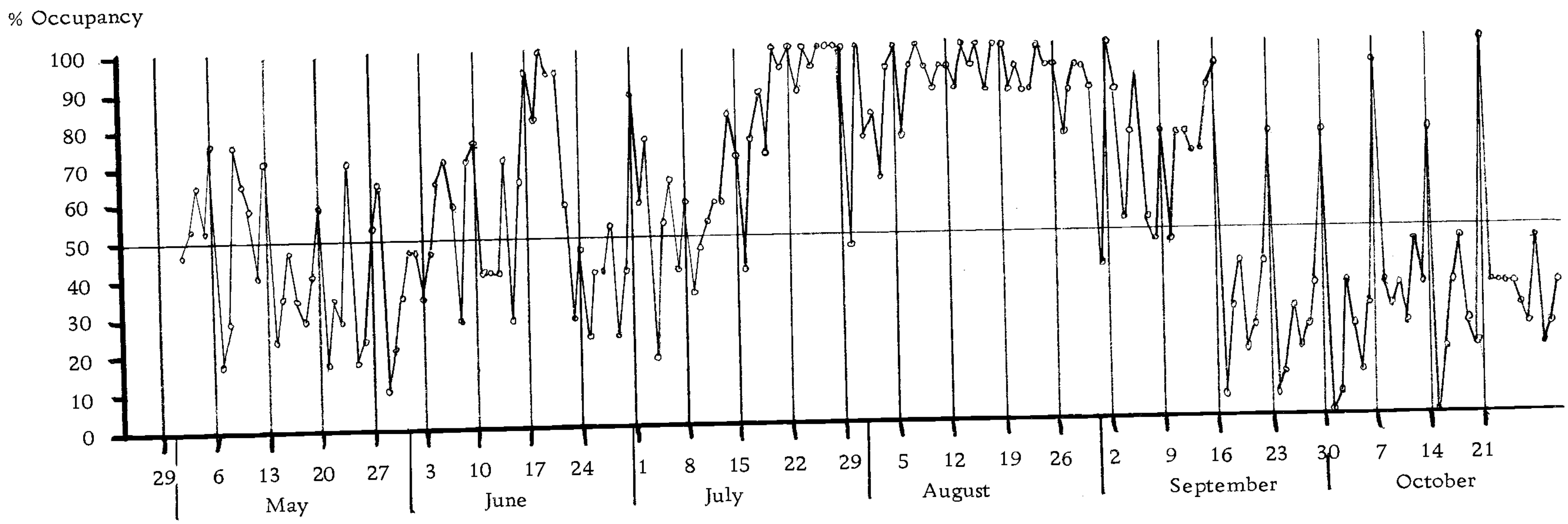

Figure 3. 6. Seaside "B" (motel). Daily occupancy, 1972 (percent).

somewhat lower than average, an unusual condition in light of its situation near the beach in the town of Seaside. Occupancy rates will vary from the figures given here depending upon location, cost, established clientele, and other factors. Motels associated with certain national chains seem to have higher than average occupancy due to the convenience of reservation services.[7]

Phase I. The motel data, as that of the traffic counters, reflect a five-phase tourist-recreation season. Although the three motels analyzed on the North Coast all exhibit somewhat different characteristics, the basic pattern still shows through. Phase I, the first four weeks, is signified by weekend occupancy of nearly 100% and weekday occupancy of less than 20%. The failure of Seaside "B" (Figure 3.6) to show this higher weekend pattern may result from its location some distance from the beach, thus making it less desirable to the weekend recreationist. Both Seaside "A" and Cannon Beach did have high occupancy in 1972 (the year analyzed from Seaside "B"), thus it must be considered possible that only those motels with choice beachfront locations have substantial weekend trade in Phase I. Conversely, the higher weekday occupancy at Seaside "B" undoubtedly is reflective of greater commercial trade. The low average occupancy during the second week cannot be explained.

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[7] This statement is based upon the writer's experiences in coastal locations other than the Seaside-Cannon Beach area.

Memorial Day weekend brings essentially full occupancy on Saturday and Sunday nights to Seaside "A" and Cannon Beach but, occupancy at Seaside "B" is no greater than on previous weekends. This is the only motel analyzed from any sector of the Oregon coast that displays this unusual characteristic, even if only 1972 occupancy is considered; full occupancy is normal on the coast over Memorial Day. The reason for this situation at Seaside "B" remains inexpli - cable, but must be considered as highly atypical.

Phase II. Phase II commences immediately following Memorial Day and continues until the 12th week. It is characterized by increasing weekday occupancy, but weekend occupancy is often less than in Phase I, particularly on the weeks between Memorial Day and the July Fourth holidays. This "June slump" was also present in the traffic data. There is, However, a slight upswing in occupancy rates after the close of school in the 7th or 8th week. Fourth of July week-end (#10) again brings nearly 100% occupancy (except to Seaside "B"!) and weekday occupancy rises sharply after this holiday.

Phase III. By the 12th week, the beginning of Phase III, all motels display essentially 100% occupancy every weekend while week-day rates approach or exceed the 80% level. There is some variation, of course, in the dates the various motels attain these levels. The Cannon Beach motel does it in the 11th week while Seaside "A," with its apparently lower than average occupancy rate, doesn't achieve these levels until week 14. In 1972, Seaside "B" reached these levels at the end of the 12th week.

Seasonal Peak. Peak season, that is, maximum average occupancy rates, is realized at all motels during weeks 14, 15, 16, and 17. At Cannon Beach, with its limited number of units, occupancy has been 100% for the last three years during this period. Seaside "B" averaged above 90% during 1972 and Seaside "A" runs at an 80%+ average. Thus, as with the traffic volumes, Phase III motel patterns reflect the July "plateau" and early August upsurge.

Although there is some slight drop in occupancy toward the end of week 17, a more significant diminution occurs during week 18. This is especially detectable at Seaside "A," where average occupancy on weekdays drops from the 60-80% level of previous weeks to only some 25%! Undoubtedly, this drop in occupancy prior to the Labor Day weekend (week #19) is due to the onset of school after the holiday and the consequent need for many tourists-recreationists to return home. There is an apparent desire for many to reach home before the holiday weekend and thus avoid heavy highway congestion. However, occupancy in general remains well in excess of 50%.

Phase IV. Labor Day weekend, as expected, has essentially maximum occupancy, but there is a rather dramatic decrease after the holiday, as Phase IV begins. This decrease is followed by a stabilization or even slight increase from the 20th through the 21st weekend, a feature apparently resulting from the vacation habits of older people traveling after Labor Day to avoid mid-summer congestion and expense. Such mid-September activity is recognized and appreciated by many motel operators along the Oregon coast.

Phase IV is characterized by an abrupt decline in business during the 21st and 22nd weeks, weekday occupancy falling to rates similar to those of Phase I. Weekend activity remains high, but less than in Phase I with occupancy averaging 50-90% at the Cannon Beach motel, about 50% at Seaside "A," and 80-100% during the single year analyzed from Seaside "B."

Phase V is not detectable from the motel data. Occupancy stabilizes at a relatively low rate after the 21st or 22nd week, there being no further change, as is the case with traffic volumes, in weeks 25 and 26.

Other Data

A final form of data analyzed from the North Coast sector was the official police record of arrests at Cannon Beach. Four years' data (1969-1972) were averaged together (Figure 3.7). Each day's average arrests are graphed as a percentage of total summer arrests. There is an average of 203 arrests per season (May-October), a figure which has remained very stable during the years under consideration.

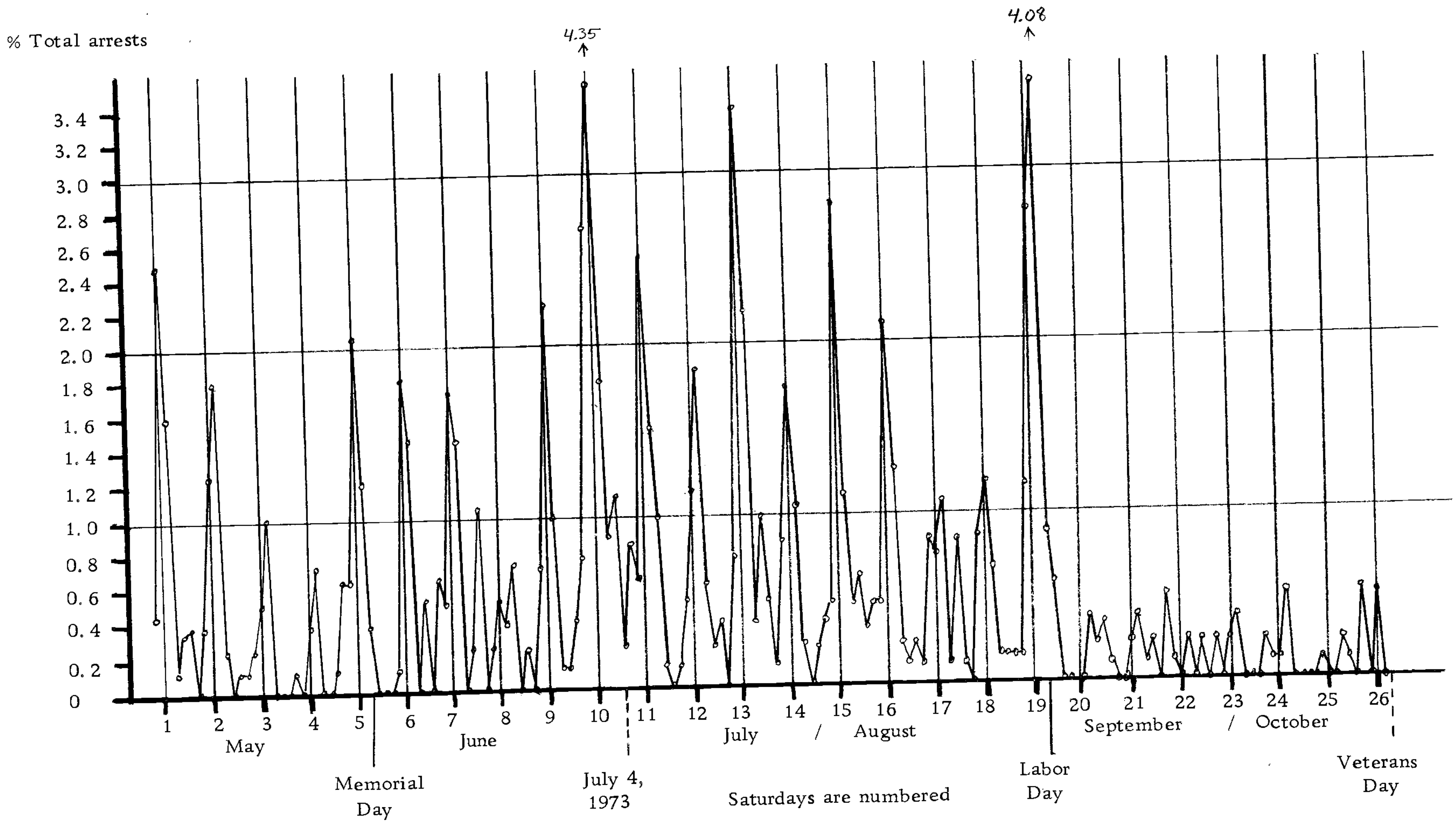

Figure 3.7. Cannon Beach, Police Records. Average number of daily arrests as a percent of total summer arrests.

The pattern of arrests differs rather markedly from that of motel occupancy or traffic volume. Indeed, rather than a five-phase subdivision, the police data group themselves into only three, each of which is distinct. The first of these three subdivisions extends until the Fourth of July weekend and exhibits a consistent pattern of low weekday arrest volumes and moderately high weekend volumes. Arrests around Memorial Day are not appreciably higher than on other weekends. Notable features are the unexplainable low arrest figures on the 3rd, 4th, and 8th weekends.

The second subdivision, one of high arrest rates, runs from the Fourth of July weekend (week #10) through Labor Day. Fourth of July weekend itself is particularly oustanding with Saturday of that weekend averaging well over 4% of all summer arrests. If the preceding day is included as part of the weekend, then the holiday weekend accounts for 8.81% of all summer arrests. Weekday arrests during the second subdivision are also high.

Unlike traffic and motel data, the rate of arrests reaches its height during the entire period of the 10th to 16th week, the greatest volume actually lying early rather than late in the period; there is no upsurge in the graphed data during the 15th and 16th weeks.

The second subdivision ends during the 17th and 18th weeks with a sharp decline in the number of arrests, certainly a response to the decreasing numbers of tourists-recreationists. Labor Day weekend, though, has a very high arrest rate, matched only by the Fourth of July holiday in total volume.

The third subdivision begins immediately after Labor Day with an abrupt drop in arrests. Weekday arrests approach an average of 0.1 of one percent of total summer arrests and weekends, which averaged 2-3% in the first subdivision, and 3-5% in the second, drop away to less than 1%.

There is no immediate explanation for why the police data should differ so markedly from other indicators of tourist-recreation population in the North Coast sector. The high holiday values, Fourth of July and Labor Day, are not surprising as holiday crowds have reputations for being rambunctious and police agencies are usually more stringent during these periods. However, it is not known if the other differences are due to changing efficiency and purpose of enforcement or due to some sociological variable operating on the recreationists themselves.

Miracle Miles Sector

The "Miracle Miles" sector lies from Lincoln City to Newport in Lincoln County (Figure 3.1). It is the most significant portion of the coast for tourism-recreation in terms of economic impact, Lincoln County having almost twice as much revenue from this source as any other county in Oregon--$95 million in 1972 (Travel Advisory

Committee). This well developed economic stature is certainly due in part to the sector's accessibility to Portland, Salem, and the densely populated northern Willamette Valley, as well as its attraction to the general tourist.

Traffic Data

Two traffic counters measure vehicular movement into and through the Miracle Miles (Figure 3.1). Valley Junction (counter #27-001) is on Oregon State Highway 22 (Salmon River Highway), the principal coastal access highway for the Portland and Salem metropolitan areas. Otter Rock (#21-002) is on U.S. Highway 101 between Lincoln City and Newport. Both counters record much higher traffic volumes on weekends than weekdays, thus meeting the criterion set forth by Wolfe (1969) as the definition of a recreation highway oriented toward an urban population.

The weekend maxima, of course, is superimposed on the normal seasonal variation that mirrors the ordinary summertime increase of tourist-recreation traffic. Both traffic counters exhibit the five-phase pattern described for the North Coast sector, but differ from each other in that the weekend maxima are more distinct at Valley Junction. This condition also exists on Fridays, with Valley Junction traffic showing a marked increase relative to the other weekdays, whereas no such change occurs at Otter Rock.

Additionally, due to homeward bound traffic at the end of the weekend, Valley Junction has much higher traffic volume on Sunday, relative to Saturday, than does Otter Rock. Thus, Salmon River Highway (Valley Junction) is principally a local recreation highway closely tied to nearby urban centers whereas Otter Rock, lying farther from Portland or Salem and on U. S. Highway 101, is probably more indicative of large scale tourist-recreation movements rather than local weekend activity. These broad relationships are readily apparent from Figures 3. 8 and 3. 9.

Seasonal Phases. Phase I, weeks one through four, is characterized by little variation in traffic volume from week to week. Monday through Thursday traffic averages near 70% of the summer weekday mean at Valley Junction, 65% at Otter Rock. Weekends average about 140% of the weekday mean at Valley Junction and 117% at Otter Rock, but the daily distribution is not equal, especially at Valley Junction, where Sunday values may exceed 160%. There is a slight decrease on the second weekend for reasons not understood, but it whould be recalled that a similar decrease existed on the North Coast and was particularly evident in the motel data.

Memorial Day weekend generates its expected high traffic volumes, with Sunday and Monday exceeding 170% of the weekday mean at Valley Junction. Otter Rock has a lesser percentage, the maximum days being Saturday and Sunday with just over 150%. Nonetheless,

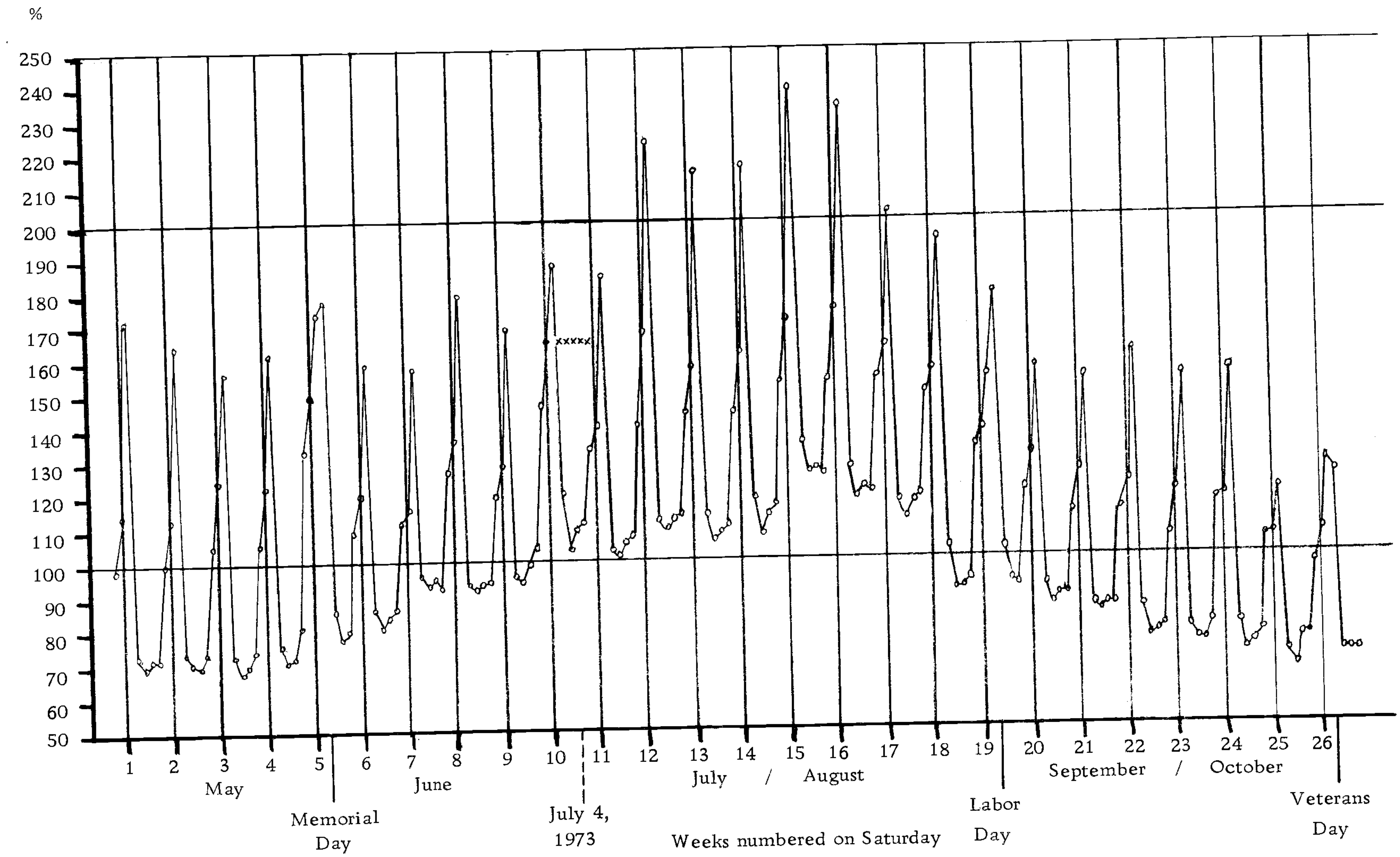

Figure 3.8. Valley Junction (#27-001) Permanent Traffic Recorder. Average daily traffic volumes expressed as a percent of the mean summer weekday volume (four-year average).

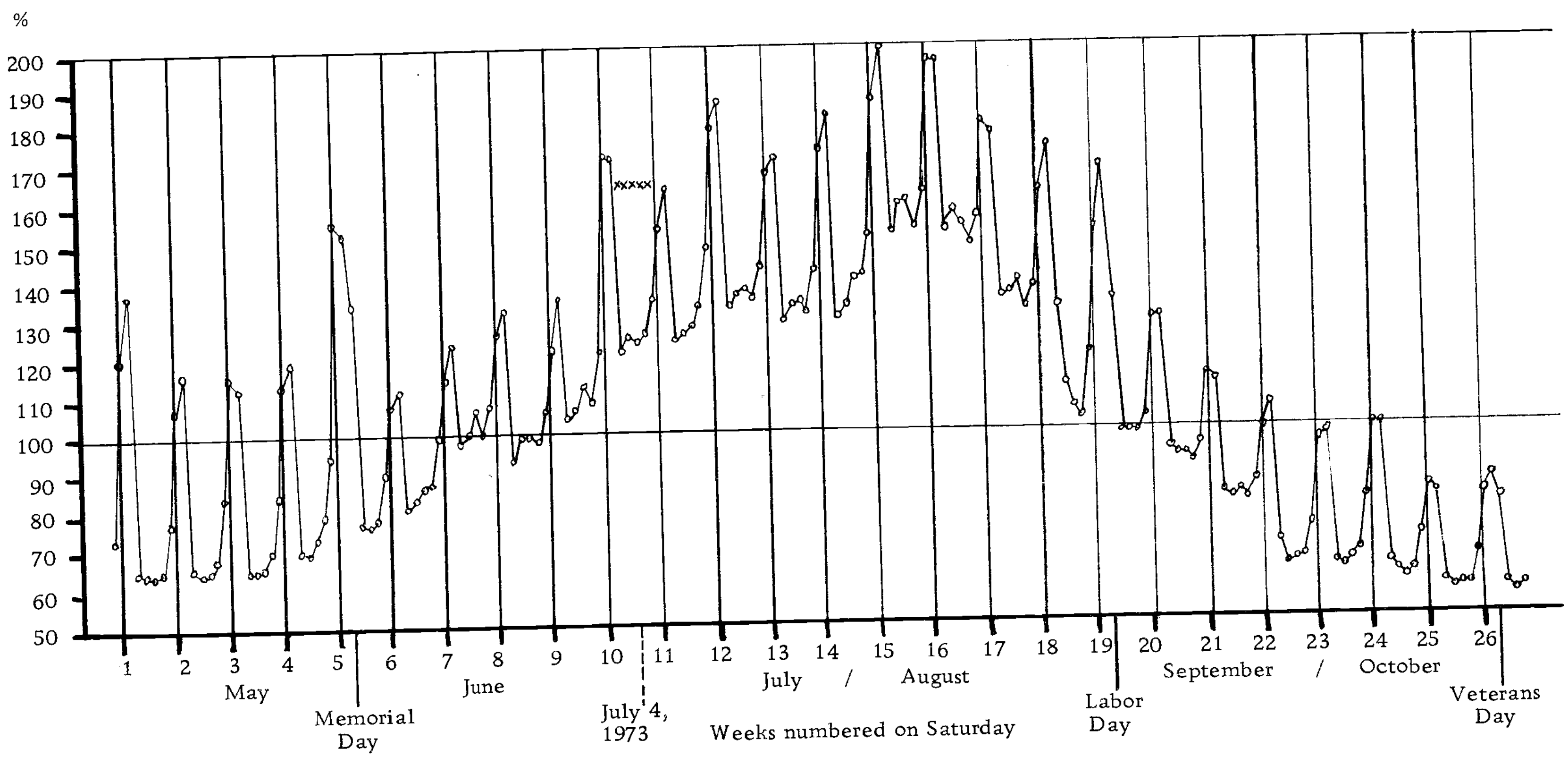

Figure 3.9. Otter Rock (#21-002) Permanent Traffic Recorder. Average daily traffic volumes expressed as a percent of the mean summer weekday volume (four-year average).

daily traffic volume is high--over 8,500 vehicles per day at Otter Rock (1972 traffic rates) while Valley Junction records more than 13,000. Furthermore, as was the case on the North Coast, the access highway (Salmon River) carries its greatest traffic at the end of the holiday when people go home, whereas U. S. Highway 101 is busiest earlier in the weekend.

Phase II commences with the fifth week, just after Memorial Day, and continues until the 12th week, thus maintaining the pattern established for the North Coast sector. Along both Salmon River Highway and U. S. Highway 101, weekday traffic increases steadily during this period and does so at a rate generally more rapid than for the weekends. The rate of increase is faster on U. S. Highway 101, however, weekday traffic reaching 100% of its mean summer level by the 7th week whereas it is the 10th week before such a level is attained on Salmon River. The Fourth of July weekend hardly breaks the general trend, but there is still a noticeable increase in traffic, particularly at Otter Rock. By the end of Phase II, weekday traffic is approaching 130% of its summer mean at Otter Rock and 110% at Valley Junction; weekends run about 160-170% at both locations.

Phase III begins on the 12th weekend with an abrupt increase in traffic volume. At both traffic counters this is the third greatest weekend of the summer, being exceeded only by the summer peak in the 15th and 16th weeks. The 12th, 13th, and 14th weeks then produce a stabilization in traffic volume, thus constituting the mid-summer "plateau" in visitations so well defined along the North Coast. Then, at the end of the 14th week, traffic volumes record the previously noted upsurge in the 15th and 16th weeks. At Otter Rock, the upsurge is especially well developed. Maximum weekday and weekend traffic volumes for the entire summer occur during these weeks. At Valley Junction, weekend averages are something above 200% per day of the weekday summer mean and weekdays other than Friday average 120-130%. At a rate equivalent to 1972 traffic volumes, such averages indicate that some 9,670 cars pass the Valley Junction traffic counter during the week and as many as 17,800 on Sunday.

At Otter Rock, a typical day on the weekend averages about 200% of the weekday summer mean, but weekdays are proportionately much greater than at Valley Junction, between 150 and 160% of their summer mean. Thus, at 1972 values, traffic approaches 8,650 cars per day during the week and 10,900 on Saturday or Sunday. There is a slight decline in traffic during the 17th week, but volume on both weekdays and weekends is still as high as the volumes of the 12th to the 14th weeks.

Phase III ends with the 18th weekend, the succeeding weekdays forming a transition to Phase IV and displaying a dramatic decrease in traffic volume. This decline is very evident in Figures 3.8 and 3.9. At Valley Junction, traffic volumes on Tuesday, Wednesday, and

Thursday of this 18th week drop below the 100% level and, at both locations (Valley Junction and Otter Rock), mid-week traffic is at the lowest level since the weeks prior to the Fourth of July holiday. Thus, the pre-Labor Day "slump" is well developed and forms a readily definable end to the principal tourist-recreation season.

The traditional end of summer in the United States, Labor Day weekend, develops daily traffic volumes in the Miracle Miles sector that are less than any of the preceding seven weeks. At Otter Rock, this weekend has substantially heavier traffic than any succeeding it, but at Valley Junction the traffic volume is little greater than several upcoming autumn weekends. Thus, the importance of the Portland-Salem weekend travel on the Salmon River corridor is emphasized.

Phase IV initiates a rapid decline in both weekday and weekend traffic volumes on U. S. Highway 101, but Salmon River undergoes a slower weekday decline and weekend traffic hardly decreases at all. Weekday traffic at both recorders is below 100% of the average summer weekday value. The marked decline in weekday traffic during the 22nd week at Otter Rock is interesting, a feature comparable to the decline in motel occupancy along the North Coast at the same time. Thus, it is hypothesized that the September influx of older and retired people in the post-Labor Day period is essentially over by this time, the 22nd weekend marking the end of that subphase.

At this time (23rd weekend), weekend traffic at Otter Rock has declined so much that it is less than the average weekday summer traffic.

Finally, both Valley Junction and Otter Rock display characteristics of Phase V during the 25th and 26th weeks. This is indicated especially through the decline of weekend traffic relative to preceding weeks.

Motel Data

Several motels provided data concerning daily occupancy. One of these, Lincoln City "A," supplied what seems to be the most reliable, thorough, and indicative motel data collected from any sector. A full five years of occupancy data was provided by this motel, thus allowing the compilation of the most reliable average occupancy graph (Figure 3.10). A second Lincoln City motel, Lincoln City "B," supplied three years data, but information for May was not available in two of these years (Figure 3.11). Two other Lincoln City motels provided data, but only for 1972, and their data have consequently not been used except for comparison purposes in this analysis.

Two motels in Newport provided occupancy information, one of them (Newport "A") for three years, the other (Newport "B") for only one year, 1972. However, the three-year data are not complete,

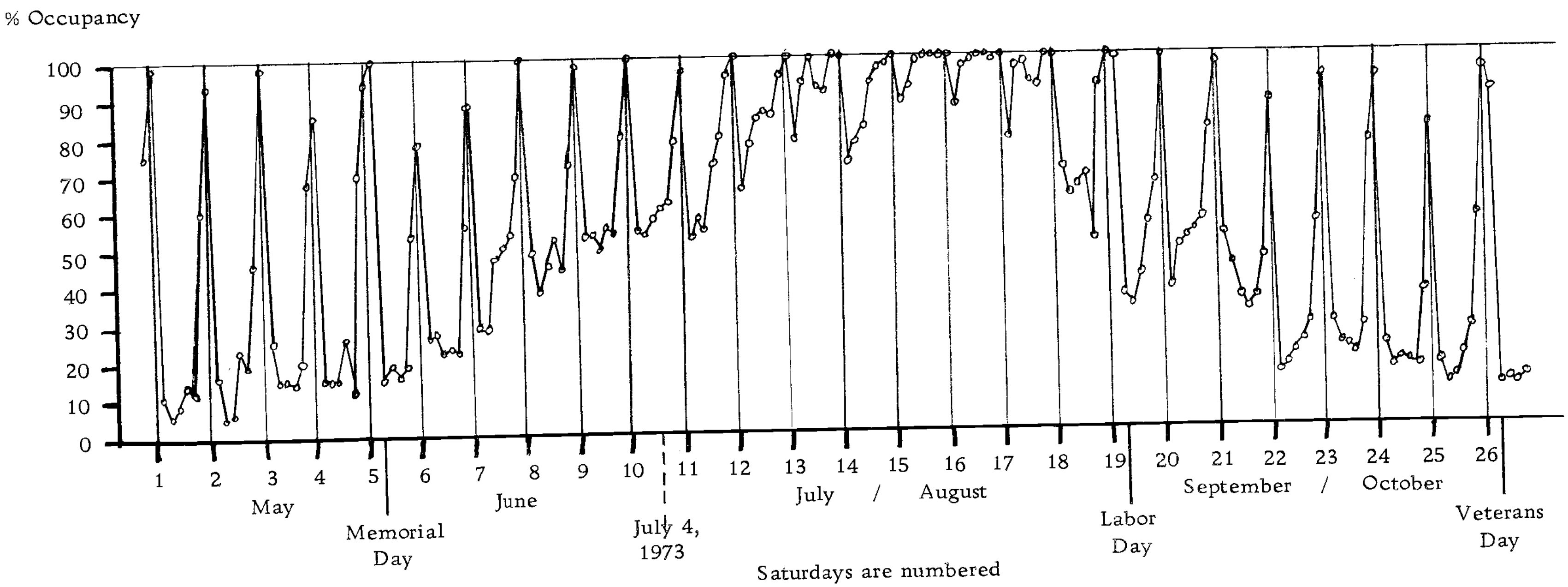

Figure 3. 10. Lincoln City "A" (motel). Average daily occupancy, percent (five-year average).

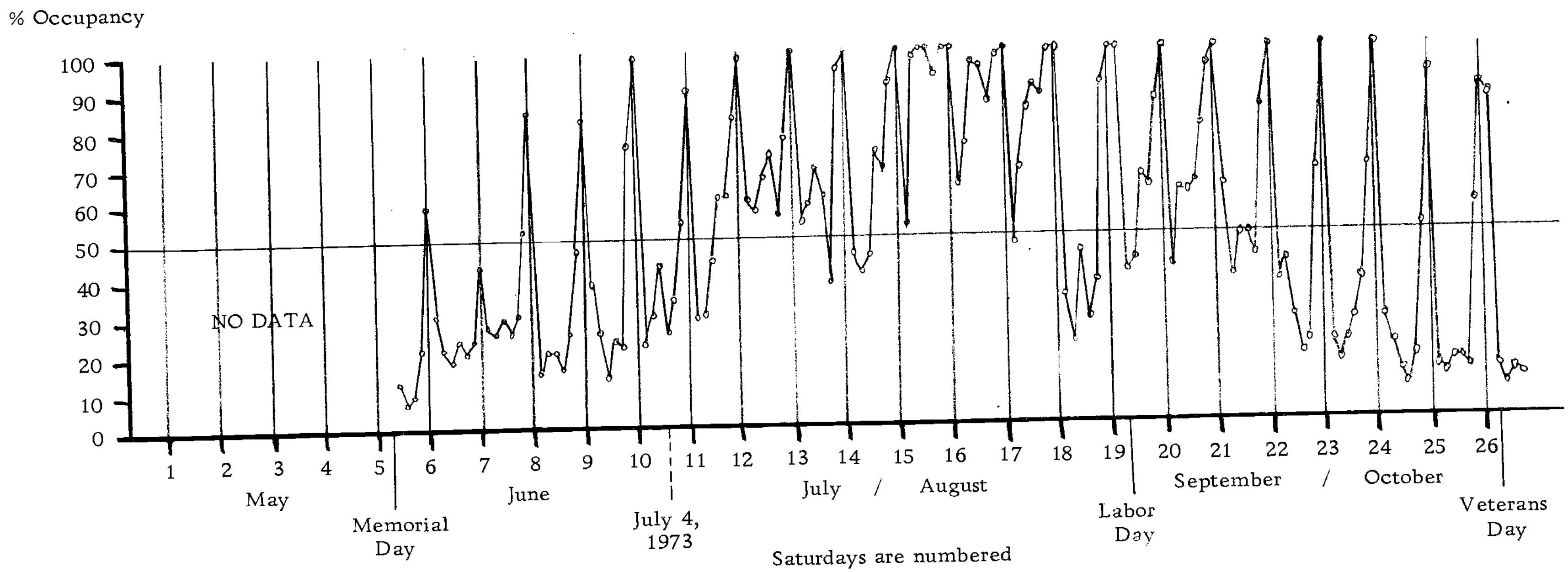

Figure 3.11. Lincoln City "B" (motel). Average daily occupancy, percent (three-year average).

each year having significant gaps in the record. Thus, to demonstrate occupancy patterns at Newport, one year was selected from Newport "A" (1970) and presented along with the 1972 figures from Newport "B" (Figure 3.12).

Lincoln City "A" appears to be highly sensitive to general occupancy patterns in the Miracle Miles sector and thus is used as the basis for the following discussion. Of course, actual occupancy will vary from one motel to another, and from year to year, but Lincoln City "A" seems to represent a good "normal" condition. A four-phase season is detectable. Similar patterns, but with lower occupancy, also occur in the data from Lincoln City "B" (Figures 3.10 and 3.11).

Seasonal Changes. Phase I conforms to the four-week period preceding the Memorial Day weekend clearly identified by the visitations data. Weekends are busy, nearly 100% occupancy on Saturday night, but weekdays run generally less than 20%. Memorial Day weekend itself has essentially full occupancy on both Saturday and Sunday nights.

Phase II begins after Memorial Day and continues until the 12th week. After a post holiday "slump" in the sixth week, weekends maintain close to 100% occupancy on Saturday night and weekday occupancy increases steadily from less than 20% to over 50%. Fourth of July produces only a minor increase in occupancy, the principal effect being to produce 100% occupancy the night before the holiday.

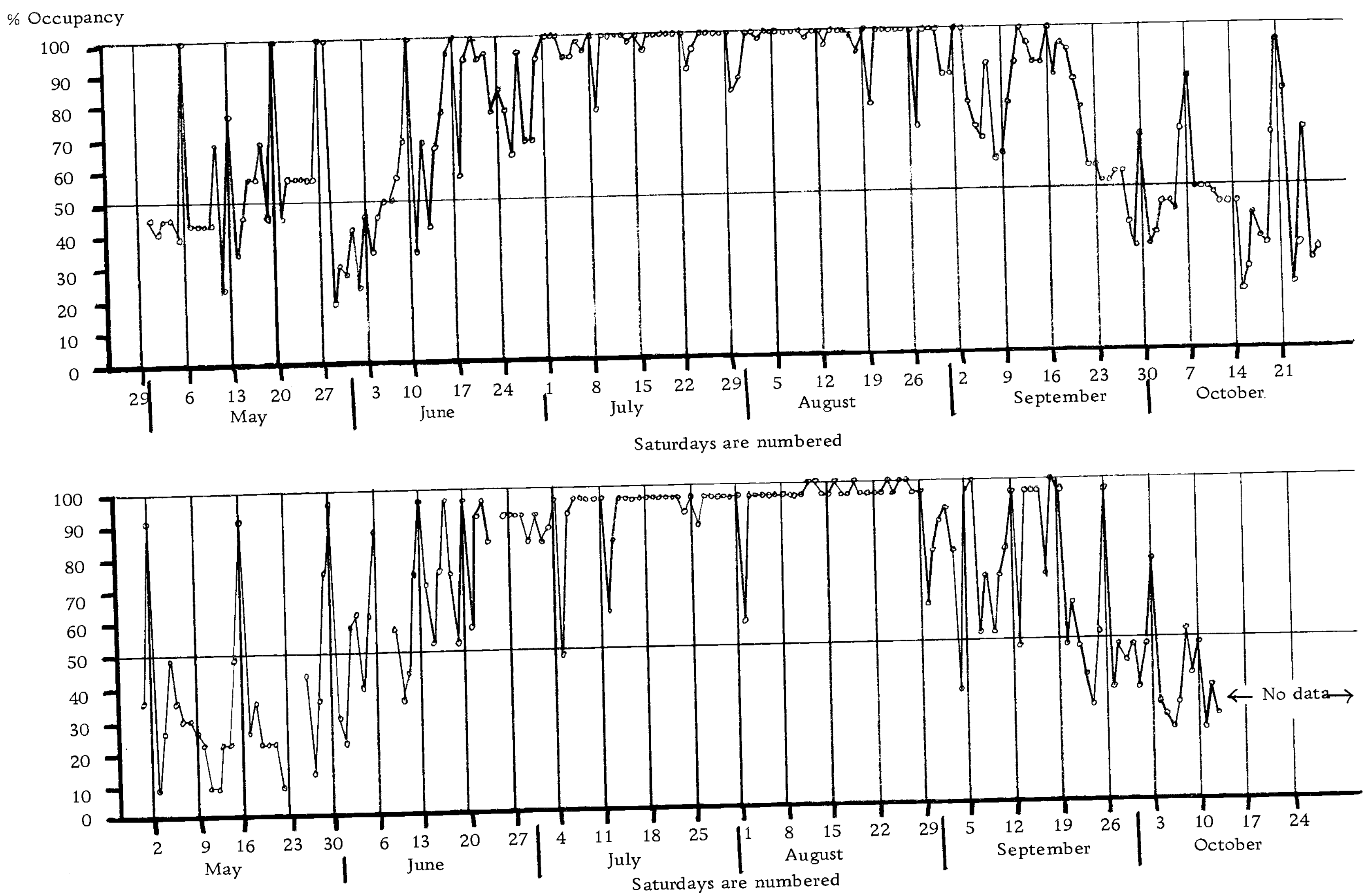

Figure 3. 12. Newport "A" (upper) and Newport "B" (lower) Motels. Daily occupancy, percent, for 1972 at Newport "A" and 1970 at Newport "B."

The 12th week is associated with notable increase in occupancy and ushers in Phase III. On the 12th weekend, Friday occupancy rises sharply over its value in previous weeks (from about 70% to over 90%) and the succeeding weekday occupancy increases from 50-60% to over 80%. This pattern of high occupancy continues through the 18th weekend, but reaches a maximum in weeks 15, 16, and 17 when only three days average less than 90% occupancy at Lincoln City "A." These three weeks also compose the main season at Lincoln City "B" as well as at those motels from which only a single year's data were analyzed.

Week 18 is transitional, weekday occupancy dropping abruptly to values typical of late June or early July, that is, between 50 and 70% occupancy at Lincoln City "A" and less than 50% at Lincoln City "B." Labor Day weekend again experiences full occupancy, but is followed by a further decline in the 19th week, the beginning of Phase IV.

Phase IV continues for the remainder of the 26-week summer season. Probably due to the effect of the Portland-Salem metropolitan areas, weekends continue to have high occupancy rates (80-100% on Saturday), but weekday occupancy undergoes a decline. There is, however, an upsurge of weekday occupancy during the 20th and 21st weeks, the post Labor Day subphase described for the North Coast. This subphase ends with a sudden decrease in weekday occupancy during the 22nd week. Except for a slight interruption in the decline of weekday occupancy during weeks 25 and 26, there is no evidence of a separate Phase V. This conforms to the North Coast pattern.

Newport Motels. Motel data from Newport, at the south end of the Miracle Miles sector, are not nearly so complete as from Lincoln City. However, two motels did supply information and individual years from each of these is reproduced in Figure 3.12. For reasons outlined previously in this discussion, a graph of average occupancy based on several years could not be constructed for Newport. However, Lincoln City "A" is probably indicative of conditions in Newport and further inferences can be drawn from Figure 3.12.

Despite the fact that these graphs (Figure 3.12) represent different motels of different sizes and different years, the similarity of occupancy pattern is quite strong. Both display the four-phase season exhibited at Lincoln City. High weekend values characterize Phases I, II, and IV. Phase II has steadily increasing weekday occupancy, and the post Labor Day subphase is evident. The principal difference between Newport and Lincoln City appears to be in Phase III. At Lincoln City, Phase III with its near maximum occupancy, commences in the 12th week. However, at Newport such high occupancy appears to establish itself fully two weeks earlier. Additionally, weekday occupancy rates at Newport appear to be higher in Phases I and IV than they do in Lincoln City. Why these differences should exist between the northern and southern portions of the Miracle Miles sector has not been fully explained. These differences may be a result of the individual traits of the motels sampled, or may reflect differences in the amount of competition existing at Lincoln City and Newport. Moreover, the fact that Newport lies at what might be considered the limit of the Portland-Salem recreation hinterland may evidence itself in a different motel occupancy pattern. It is certainly true that Newport's occupancy more closely resembles that of the Central Coast than of the remainder of the Miracle Miles or North Coast.

Other Data

Additional data were collected from the Miracle Miles sector. The Tourist Information Office at Lincoln City (Twenty Miracle Miles Chamber of Commerce) provided records of the number of people entering the office daily in 1972. Also, a popular gift shop made its guest register available from which was extracted the total number of signatures by day for the most recent four years (1969-1972).

Data from the Tourist Information Center records when graphed display a more bell-shaped curve than is the case with motel or highway traffic data, a feature possibly traceable to fewer people signing the register (from which the attendance count is made) on busy days due to congestion in the office (Figure 3. 13). In any case, a four-phase period is discernible, conforming to that as defined by motel or traffic data (excluding Phase V from the traffic curve).

The gift shop information is difficult to analyze. A complicating factor is that not everyone bothers to sign the guest register. Statistically, it could be assumed that this factor would average itself out. Unfortunately, this seems not to be the case. On quiet days, the managers are able to speak with each customer and encourage them all to sign the register. But, on busy days, this does not occur and the congestion in the shop further reduces the proportion of people signing. For example, August, 1972, saw the shop take in more revenue than in any other month, with large crowds being experienced daily. But, signatures in the guest register showed a marked decline from the previous month, a feature directly attributable to the congestion.

Due to this inadequacy of data recording during crowded periods, it is undesirable to analyze the gift shop data in the same manner as other types of information. Thus, rather than attempt to average the data into a composite, only a single year is reproduced here (Figure 3. 14). The year 1971 was chosen, but it must be kept in mind that certain peak periods, especially holidays and August, may reveal unreliable figures. Nonetheless, the four-phase pattern, though subtle, is detectable. There is even a suggestion of the September

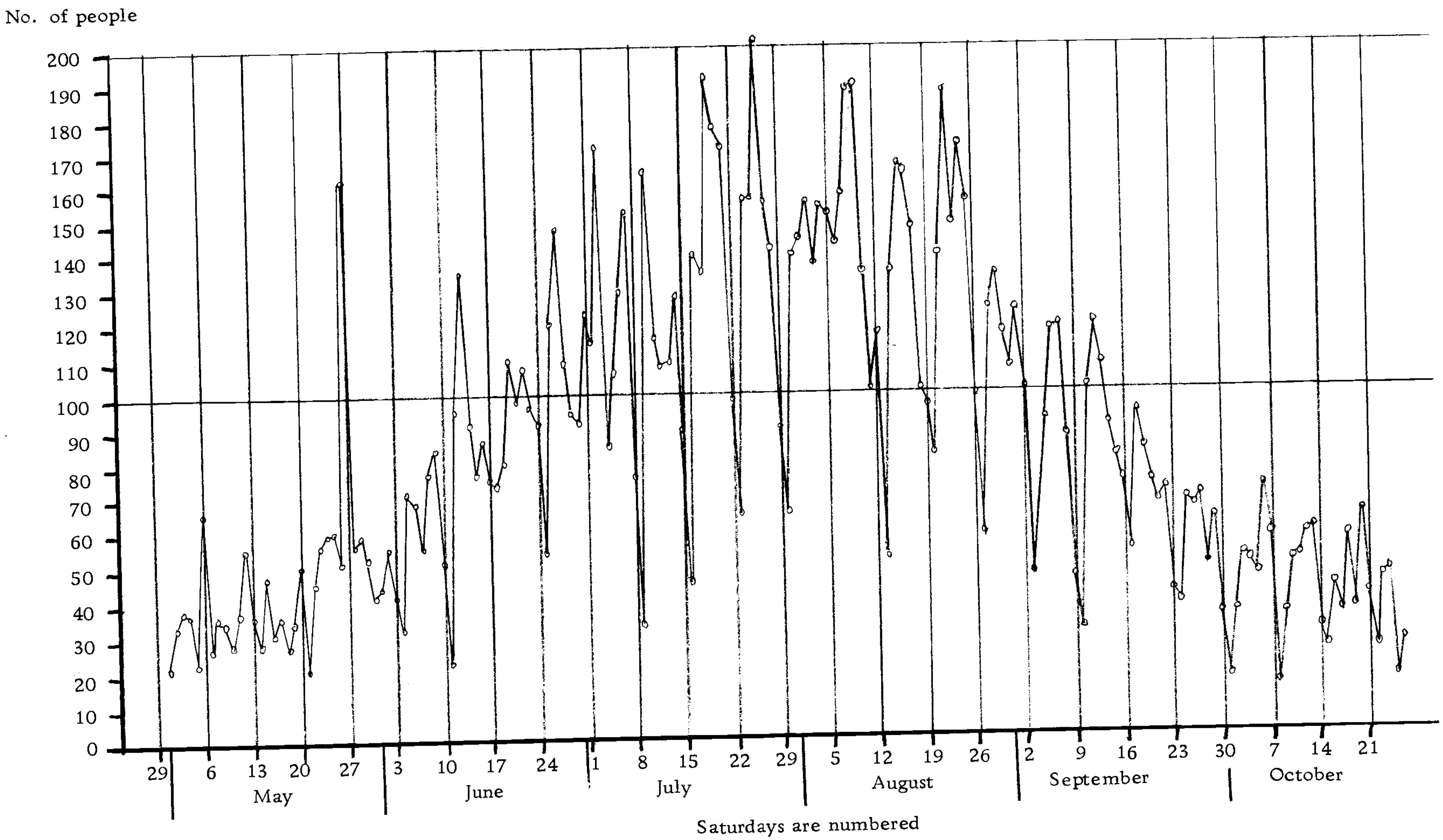

Figure 3.13. Lincoln City Tourist Information Office. Daily number of visitors, 1972.

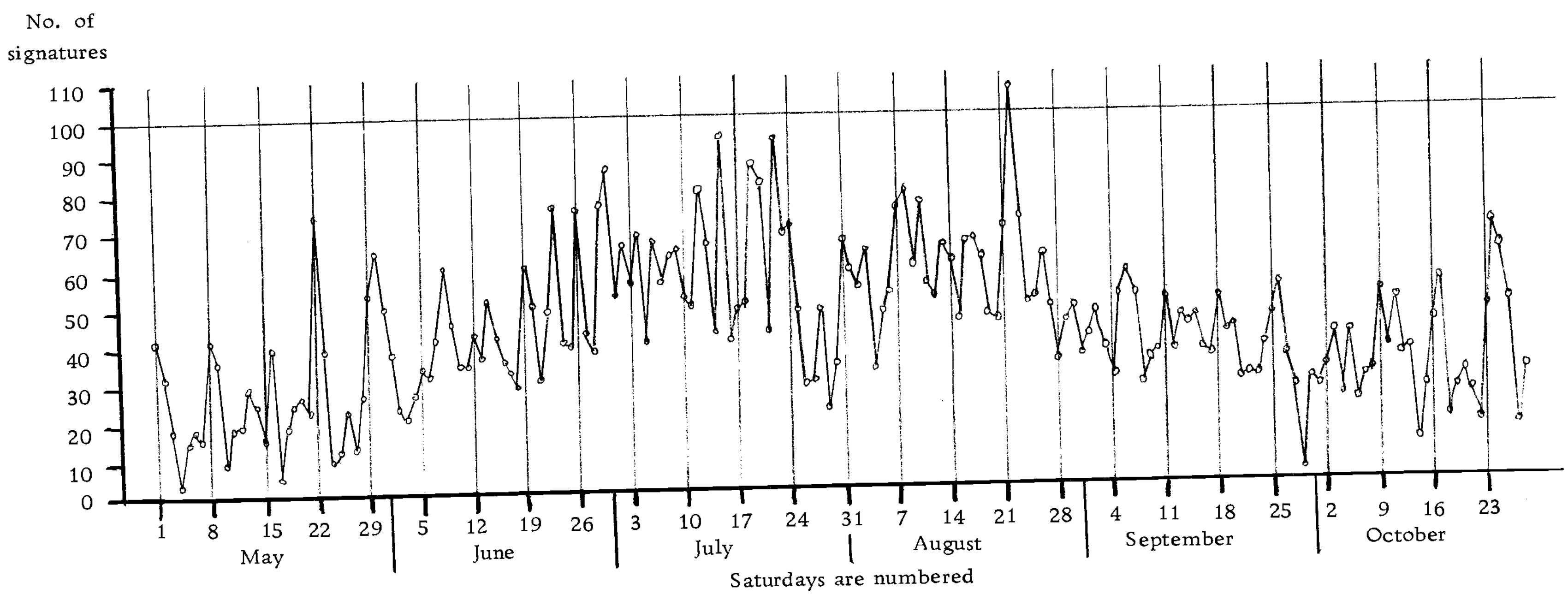

Figure 3. 14. Gift shop, Miracle Miles Sector. Daily total number of signatures in guest register, 1971.

subphase as evidenced by the flattening of the curve between approximately the 10th and 20th of the month. This subphase is more distinct in 1972.

Central Coast Sector

It has been found that most day and weekend recreation trips terminate within a two-hours' one-way driving time from the participant's residence, a distance of about 100 miles (Mercer, 1970; Paul, 1972, p. 18-20). South of Newport, the coast lies beyond that theoretical 100-mile limit of an urban recreation hinterland centered on Portland and the densely populated northern Willamette Valley. Thus, the volume of weekend activity relative to weekday is greatly reduced, a feature more than evident in the traffic pattern at Winchester Bay (Figure 3.15). Nonetheless, this is a well developed and popular portion of the Oregon coast, the Oregon Dunes between Florence and Coos Bay being a particularly well known recreation area. However, the region seems to attract a rather local clientele, Anderson (1973, p. 48) finding that 55% of the people he surveyed near the Oregon Dunes during the summer of 1972 lived in a relatively nearby section of the state. Still, this sector does not lie in the day-use recreation hinterland of any major urban center, Eugene (about 100,000) being the only city of notable population within 100 miles,

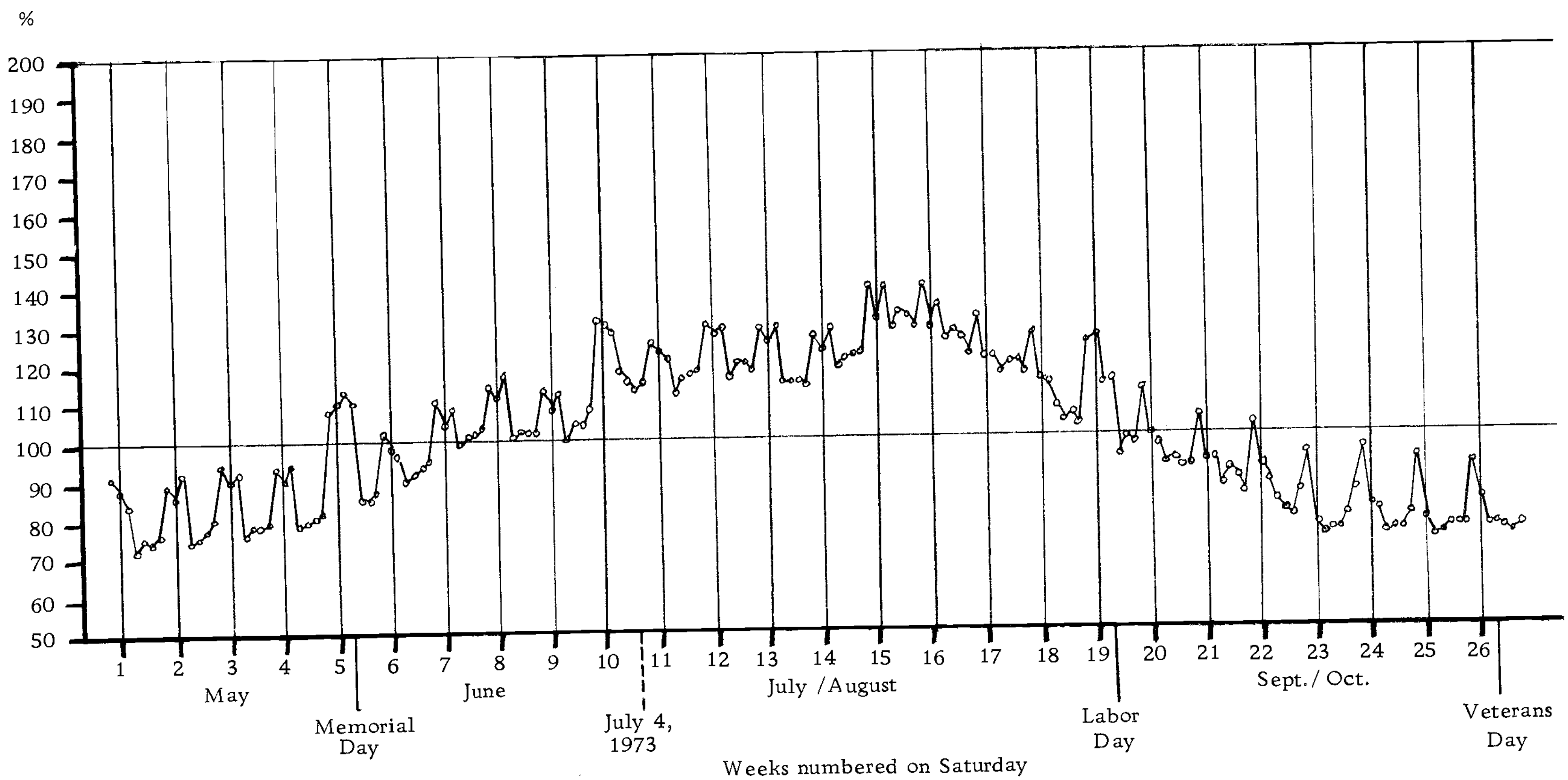

Figure 3. 15. Winchester Bay (#10-001) Permanent Traffic Recorder. Average daily traffic expressed as a percent of the mean summer weekday volume (four-year average).

and the area thus differs in seasonal pattern from the North Coast and Miracle Miles sectors.

Traffic Data

Two traffic counters measure the principal movement of vehicles into and through the Central Coast sector, Winchester Bay (#10-001) on U. S. Highway 101, and Noti (#20-005) on State Highway 126, the principal access highway to the coast from the Eugene metropolitan area.

The data recorded at Noti resemble in pattern of fluctuation those of Valley Junction on the Salmon River Highway of the Miracle Miles sector. It has a smooth, well defined weekly rhythm with week-end maxima superimposed on a slight seasonal cycle (Figure 3. 16). That much of the traffic on this highway is of local origin is indicated by the small variation in mid-week traffic volumes, from a minimum of 75-80% of the average summer weekday volume to only about 115% in the maximum week. By contrast, this variation at Winchester Bay, on U. S. Highway 101, is from 75 to 130%. However, traffic at Noti differs from that at Valley Junction in that volumes are much less, weekdays averaging only about 42% of the volume on Salmon River Highway, or some 3,200 vehicles per day at a rate equivalent to 1972.

At Winchester Bay, increased weekend recreation traffic barely offsets decreased business traffic with the result that the distinct

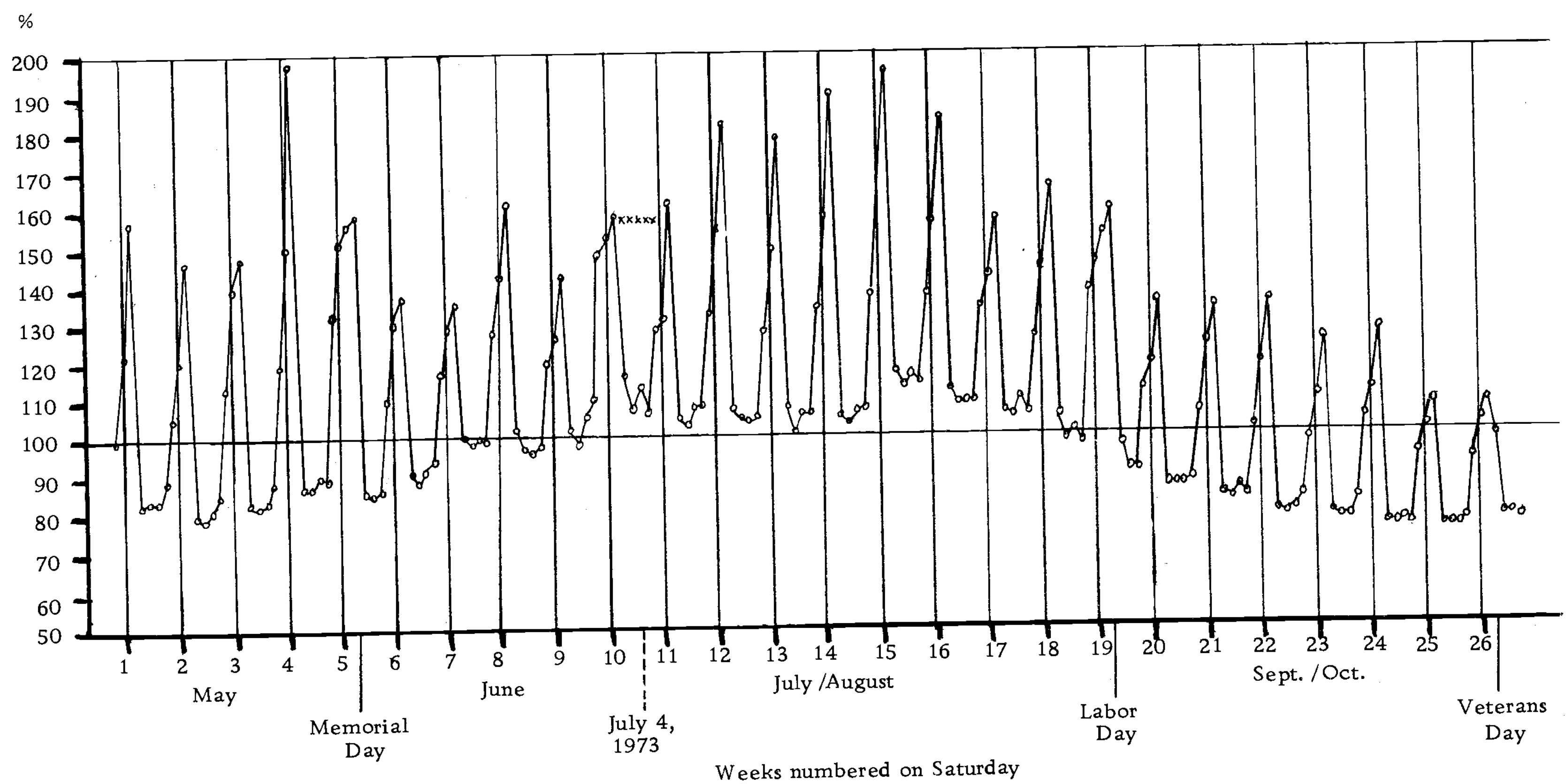

Figure 3.16. Noti (#20-005) Permanent Traffic Recorder. Average daily traffic volumes expressed as a percent of the mean summer weekday volume (four-year average).

weekend maxima so typical at Noti and the highways of the North Coast and Miracle Miles are almost absent. Friday, carrying both business and early weekend traffic, is often the busiest day of the week. Traffic in the Central Coast sector, therefore, appears to flow mainly north-south rather than east-west, as is the case for North Coast and Miracle Miles. Thus, volume at Winchester Bay is much higher than at Noti, weekdays averaging almost 7,000 vehicles per day (1972 rates). This figure is actually higher than the maximum daily values observed at Noti on peak weekends (approximately 6,100 vehicles per day). At the season's height, an average of 9,100 vehicles per day pass the Winchester Bay recorder (1972 rate).

Seasonal Phases. Seasonal phases are not so distinct on the Central Coast as they are farther north. However, the five-phase subdivision still exists and can be readily seen by reference to Figures 3.15 and 3.16. Phase I again encompasses the first four weeks. Weekday volumes are relatively low, between 80 and 90% of their summer average at Noti and 70 to 80% at Winchester Bay. Weekend volumes are modestly higher than those of weekdays at Winchester Bay, but Noti nearly doubles its traffic volume from the weekdays to the weekend. Noti displays a sharp traffic maxima on Sunday, but weekend traffic at Winchester Bay varies little from Friday to Sunday, a characteristic displayed by that recorder throughout the entire 26-week summer season. The unusually high value at

Noti on the fourth weekend probably is an effect of the Rhododendron Festival held annually at this time in Florence. That Winchester Bay fails to show this increase would indicate that more people come to the festival from the east (Eugene) or north than from the south.

Memorial Day weekend causes a slight traffic increase, most noticeable at Winchester Bay. This is followed by Phase II and, at Noti, there is a post holiday slump during the sixth and seventh weeks. However, weekday traffic begins to respond to increased tourist-recreation activity with rising values. Winchester Bay has no slump, both weekday and weekend values rising immediately after Memorial Day.

Phase II has some unusual characteristics. The eighth weekend has a marked increase in traffic at Noti, probably a feature related to the close of school. Such increases in the eighth weekend were noted in other coastal sectors.

The eighth and ninth weeks bring a leveling-off in the rate of traffic increase and mid-week volumes are near the weekday summer mean. The 10th week, containing the Fourth of July holiday, records another increase and is followed by the mid-summer "plateau" which begins some two weeks earlier than in the North Coast or Miracle Miles sector. Noti does show an increase in weekend traffic on the 12th weekend, but there is no strong evidence of this on U. S. Highway 101 at Winchester Bay. Thus, Phase III appears to begin on the

Central Coast with the Fourth of July holiday, although the pattern at Noti still hints of a 12th week demarcation point. Whatever the case, the change from Phase II to Phase III is more subtle than farther north, a factor indicating that the existence of the 13th week traffic increase is somehow related to the influence of large urban populations.

Phase III exhibits the same upsurge described for the North Coast and Miracle Miles during the 15th and 16th weeks. As is the case at other traffic recorders, the 15th weekend at Noti and at Winchester Bay has the summer's greatest volume, averaging 177.5% of the summer weekday mean at Noti and 135.5% at Winchester Bay. A steady decline then commences through the Labor Day holiday with little interruption. There is only a slight tendency for a greater rate of decline during the 18th week, unlike the situation on the North Coast or Miracle Miles.

At Winchester Bay, holiday traffic over Labor Day weekend (week 19) is decidedly heavier than on the preceding weekend, but such a daily increase is not noticed on Highway 126 at Noti. The noticeable traffic increase at Winchester Bay over holiday periods may be due to the travel of people from Portland and the northern Willamette Valley to the Oregon Dunes recreation area.

Phase IV begins with a continuation of the steadily declining traffic volumes that commenced after the 16th week. Weekday volumes fall below their summer average and, at Noti, weekend values become appreciably less in proportion to mid-week values. An interesting feature at Winchester Bay is the relatively high traffic volume on Friday, this day consistently running greater than any day of the week, including the weekends. This unusual pattern begins abruptly on the 17th weekend and does not exist prior to that week. Yet, the Friday maximum is recorded in every remaining week of the period, except Labor Day weekend, where its volume is only slightly less than Saturday's. At Winchester Bay, weekend values become only little greater than those of mid-week during Phase IV and, after Labor Day, actually are less than the summer weekday mean.

At both traffic recorders, volume declines steadily until the 23rd week, at which time the rate of decline lessens at Noti and stops completely at Winchester Bay, volumes at this recorder remaining stable for the remaining four weeks of the period. At Noti, however, weekday values do not become stable until the 24th week and there is a detectable change to lower volumes in weekend traffic during the 25th and 26th weeks, thus indicating the onset of Phase V. No such decline is evident at Winchester Bay, a feature suggesting that Phase V is a response to lessening local Oregon recreation traffic rather than out-of-state influences.

Motel Data

Three motels in the Central Coast sector provided occupancy information, but only one of these could supply more than one year. This motel, located in Florence, had data from 1971 and 1972. The occupancy rates for these two years at this motel are shown in Figure 3.17.[8] Data from 1972 at the other motels analyzed in this sector are not presented graphically, but they support the general trend established in Figure 3.17.

Occupancy rates on the Central Coast appear to be somewhat higher than on the North Coast or Miracle Miles sectors. This may be only a chance factor of the motels sampled or, more likely, it may be a result of different conditions--possibly less competition in the motel industry.

Seasonal Phases. Reference to Figure 3.17 showing motel occupancy in the Central Coast sector reveals again a four-phase motel season, although Phases I and II are less distinct from each other than is the case farther north on the coast. Phase I begins with generally low weekday occupancy with weekend occupancy less than 100%, a feature not found on the North Coast or Miracle Miles sectors, where all weekends run near capacity throughout this phase.

[8] It was felt that the motel data were too erratic to provide a meaningful display if only two years were averaged together. Thus, each year has been graphed separately, but the basic patterns are still clearly discernible.

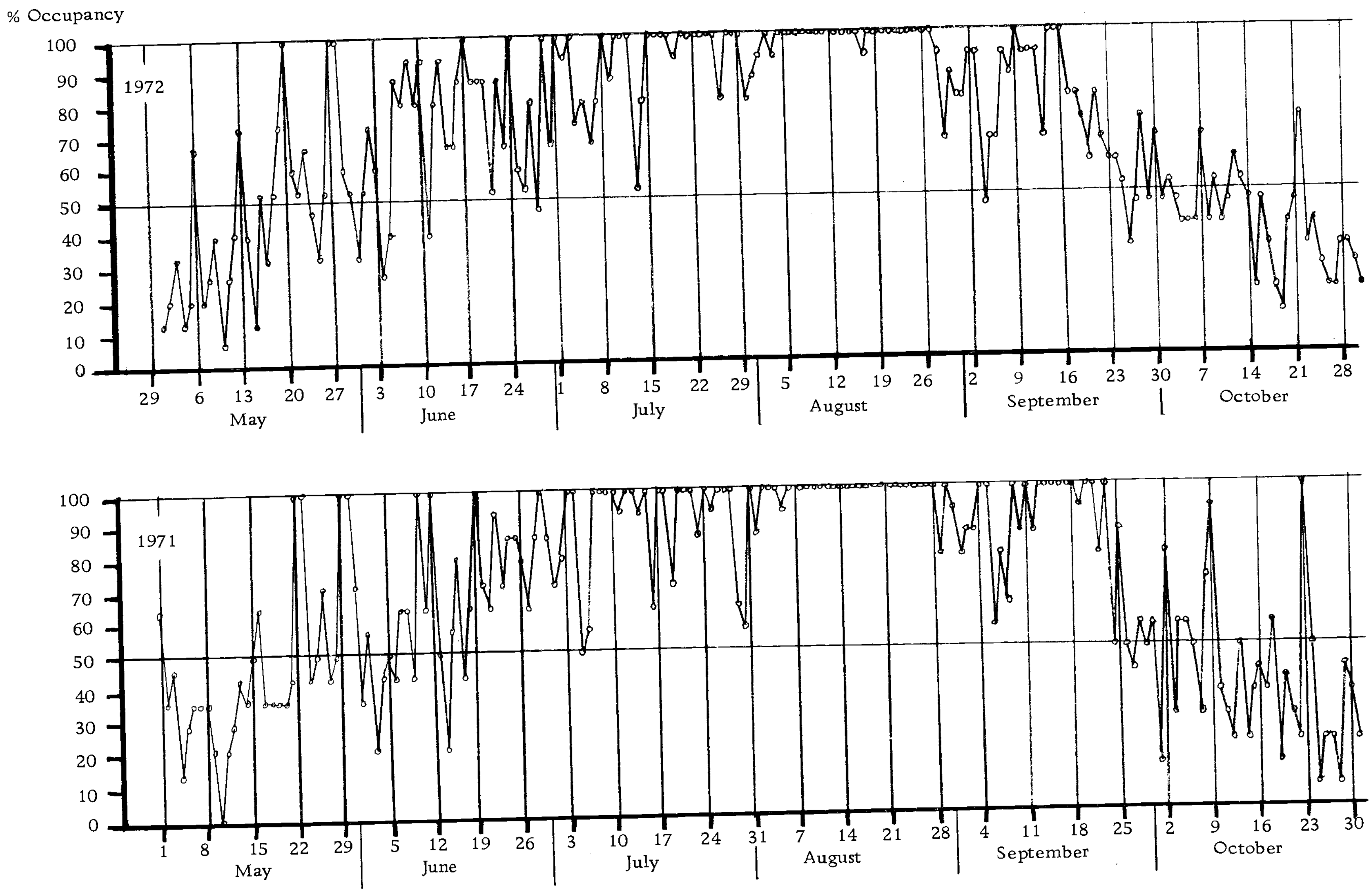

Figure 3. 17. Florence Motel. Daily occupancy, percent, in 1971 and 1972.

Full occupancy is achieved, at least in Florence, during the Rhododendron Festival on the fourth weekend. Memorial Day weekend, as expected, also produces full occupancy.

Phase II continues a steady rise in occupancy, a trend particularly evident on weekdays. There is the usual post holiday slump on the sixth weekend, none of the motels examined being near full capacity.

By the 10th week occupancy rates are approaching 100% on many days, thus suggesting that the principal part of the season, Phase III, has begun. However, occasional days of low occupancy at the Florence motel in conjunction with a single year's data from near Waldport, indicates that Phase III isn't well established until the 12th week. However, the distinction is not clear, and perhaps it is more accurate to speak of a transition period between Phases II and III as occurring during weeks 10 and 11. Such a contention is supported by the traffic record at Winchester Bay.

The 15th, 16th, and 17th weeks bring the season's most consistently high occupancy rates, thus maintaining the established pattern of an August peak that has been observed in the other coastal sectors. There is a decline in occupancy during the 18th week followed by full occupancy again over Labor Day weekend.

Phase IV is initiated by a few days of low occupancy in week 19, followed by increased occupancy during the 20th and 21st weeks--the

September subphase. A steady decline in occupancy then begins and continues through week 26. During this period occasional weekends approach or reach full occupancy on Saturday night, and Veteran's Day holiday appears to positively affect occupancy on the 26th weekend.

Other Data

Two other sources of information were utilized in the Central Coast, the Visitors Center at Cape Perpetua, operated by Siuslaw National Forest, and the Tourist Information Office at Florence. At Cape Perpetua, daily information on the number of visitors was available for three years, 1970-1972; the Florence office could supply two years' data, 1971 and 1972. The average daily attendance at these centers, expressed as a percentage of the average daily summer attendance, is displayed in Figures 3.18 and 3.19. Both curves show a strong similarity of form, thus indicating that they are reliable measures of at least a portion of the Central Coast's tourist-recreation system. They clearly support the concept of phases in degree of activity, each revealing a four-phase season with maximum activity in the 15th and 16th weeks following a mid-summer "plateau" during weeks 12, 13, and 14. There is the usual sudden decline in week 18 followed by further rapid decline after Labor Day. A striking weekly cyclicity is evident, Saturday being busiest at the Florence Information center (as people arrive for the weekend) while Sundays

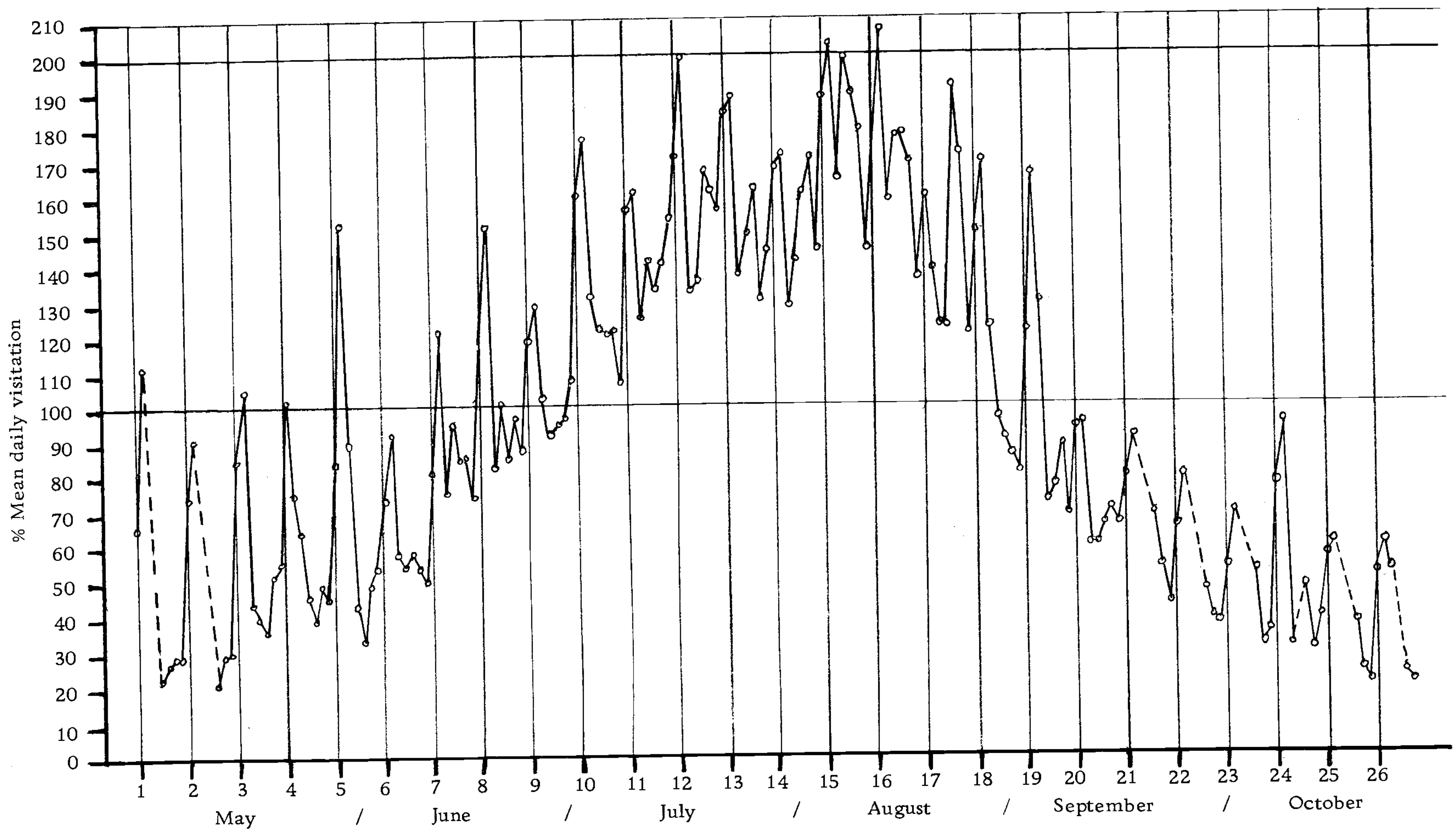

Figure 3. 18. Cape Perpetua Visitor Center. Daily number of visitors expressed as a percent of the mean daily summer visitation (three-year average).

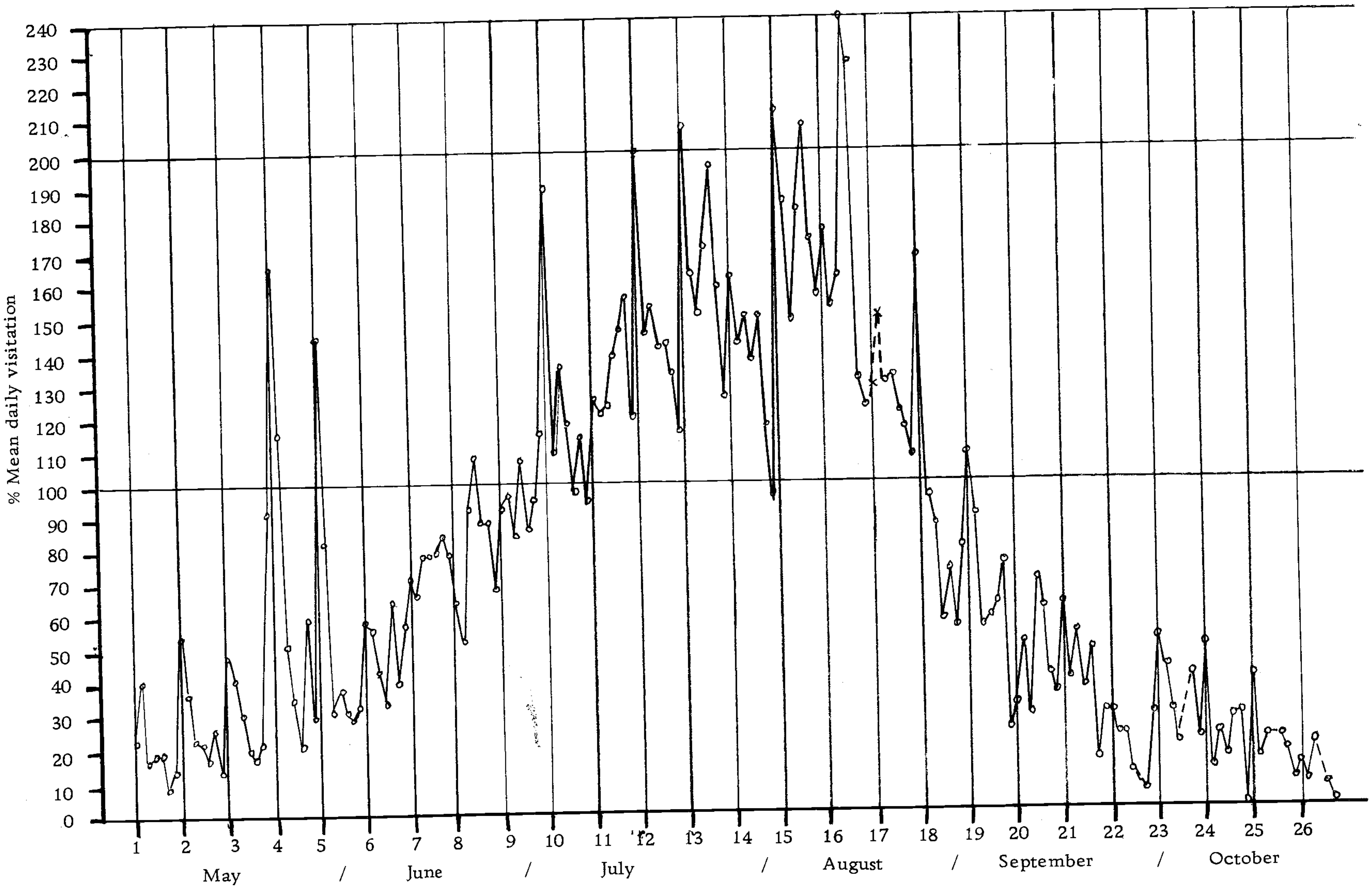

Figure 3. 19. Florence Tourist Information Office. Daily number of visitors expressed as a percent of the mean daily summer visitation (two-year average).

have maximum crowds on Cape Perpetua. The anomalously high value at Florence in the fourth week probably is a result of the Rhododendron Festival.

It is, of course, very evident that the seasonal variation at these visitor centers is much greater than is the case with traffic volumes or motel occupancy. Volumes vary from 10 or 20% of the summer daily mean to over 200%. Thus, the extreme concentrated nature of the tourist-recreation season is highly visible. Visitor centers such as these are true mirrors of the season as their attendance is drawn from the tourist-recreation population. By contrast, motels draw from only a portion of this population and have, in addition, their regular commercial clients. Traffic recorders, however, are the ultimate in "democratic" devices, imperturbably giving equal social value to any vehicle passing by them.

South Coast Sector

In general, recreation activity along the southern Oregon coast is less intense than farther north, a situation probably deriving from the lack of nearby urban centers. At the Winchuck traffic recorder, two miles north of the California state line on U. S. Highway 101, weekend traffic volume is little or no greater than the weekday volume, a marked contrast to the highways between Portland and the coast, or U.S. Highway 101 itself in the Miracle Miles or North Coast sectors. Nonetheless, there is considerable tourist-recreation activity in this sector and the general pattern of the season conforms to the four- or five-phase division.

Due to the smaller size of the tourist-recreation industry in the South Coast sector, less data were available for analysis than elsewhere. Only one traffic recorder (Winchuck, #08-005) exists in the sector and no daily motel occupancy figures were obtainable. The Tourist Information Offices were of some help, Gold Beach providing data for the summer of 1972, but the records of the Brookings office had been misplaced and only one-half of the summer of 1972 could be found--an amount deemed insufficient for analysis. However, the Brookings record should not differ appreciably from that of Gold Beach.

In order to help overcome this insufficiency of data, information was collected from the Chetco Ranger District, Siskiyou National Forest, with regard to the total daily number of people coming into the reception office at the Brookings station during the summers of 1970 and 1972. As many of these people are seeking information concerning recreation in the National Forest, it is felt that these reception office figures are indicative of the tourist-recreation season along the South Coast. Additionally, the Chetco Ranger District provided records of the number of individuals on permit in the Kalmiopsis Wilderness area during the summer of 1972. Since this wilderness area lies in the mountainous district immediately east of the South Coast sector, it has been considered here as part of that sector's recreation resource base.

Traffic Data

The Winchuck traffic recorder (Figure 3.20) on U.S. Highway 101, lying almost on the border with California, is reported by the Oregon State Highway Department to have the highest percentage of out-of-state vehicles (21.3% in 1971) of any coastal recorder in Oregon. It lacks the weekend influx of recreationists typical of the coastal sectors nearer urban centers, but still carries a high proportion of recreation traffic as 36% of all weekday trip purposes sampled in an Oregon Department of Highways origin and destination study in the summer of 1972 (Schwab) were for recreation.

Phase I at Winchuck, as at all other traffic recorders, consists of the first four weeks of the season. Weekend traffic slightly exceeds weekdays with the greatest volume on Saturday. Volumes run between 70 and 80% of the summer weekday mean, or about 3,150 to 3,600 vehicles per day at 1972 equivalent values. Memorial Day weekend has a very large relative traffic increase, larger than at any other coastal traffic recorder in Oregon. Traffic volume on Saturday of the holiday weekend reaches 127% of the weekday mean. This unusually high proportion is probably due to the South Coast's remoteness from

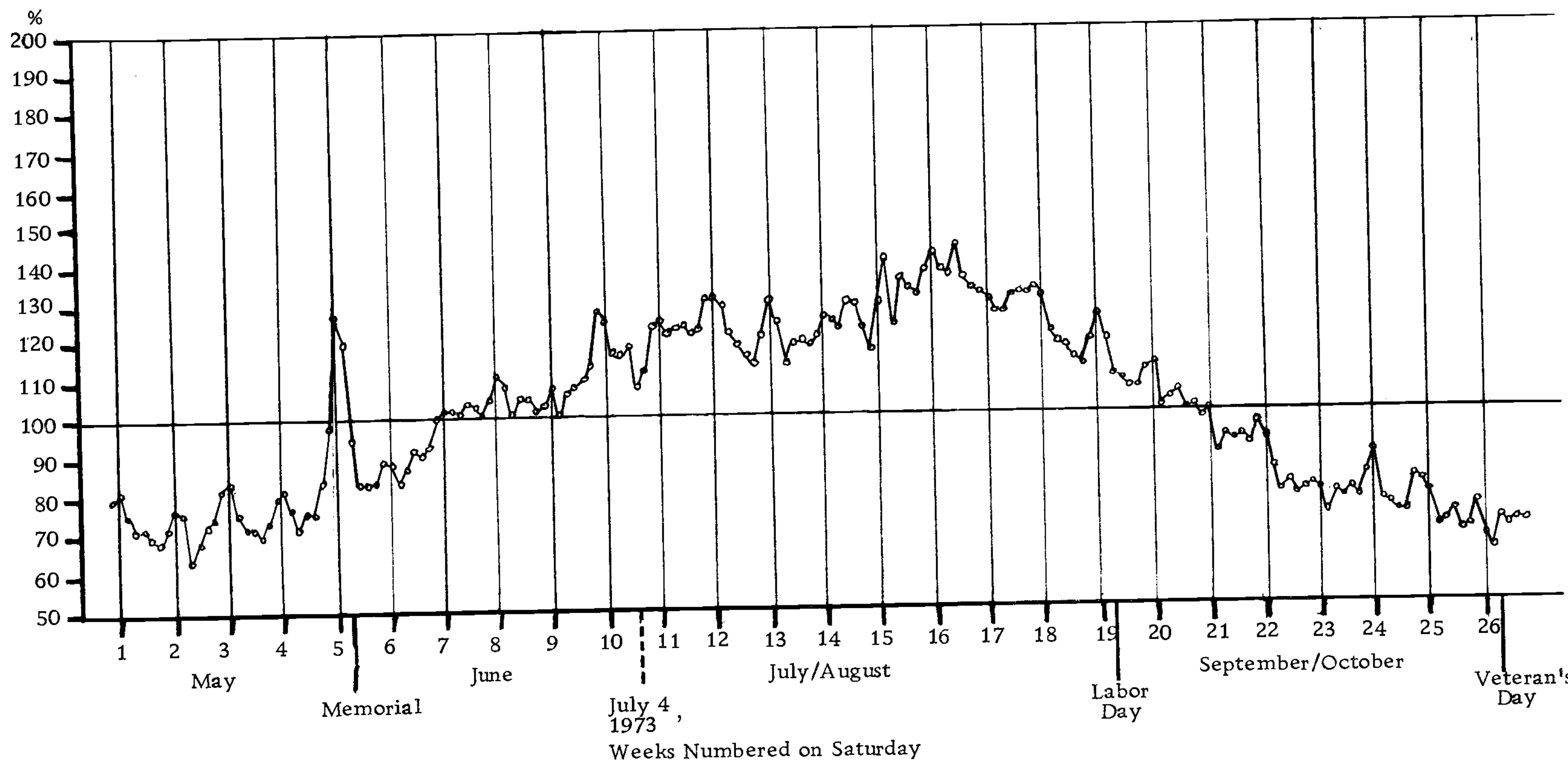

Figure 3.20. Winchuck (#08-005) Permanent Traffic Recorder. Average daily traffic volumes, expressed as a percent of the mean summer weekday volume (4-year average).

population concentrations, thus having limited weekend usage except on long holiday periods. Furthermore, the Azalea Festival in Brookings over the holiday period contributes to the traffic volume at Winchuck.

Phase II extends from the 5th to the 12th week with a steady increase in traffic volume, from about 85% of the weekday summer mean to over 120% (3,800 cars per day to 5,600, 1972 equivalent). There is only a slight traffic increase around the Fourth of July, the holiday itself having traffic volumes ranging from less than the summer weekday mean to over 130% of this value.

Phase III, beginning in the 12th week, displays a three-week mid-summer "plateau," traffic volumes no longer increasing, but fluctuating between 110 and 130% of the summer weekday mean. This is followed by an upsurge in traffic during the 15th and 16th weeks as the tourist-recreation season reaches its maximum intensity. Thus, the basic pattern of the South Coast's traffic volume during this phase conforms to that of the other coastal sectors.

A steady decline in traffic volume commences in the 17th week and continues with essentially no interruption until the 22nd week, when the rate of diminution slows down slightly. Unlike volume recorded at most other traffic counters along the coast, there is no abrupt decline during the 18th week and only a slight increase in traffic over Labor Day. The only unusual feature in the weeks following the beginning of Phase IV (in week 19) is the unexplained low volumes on the 23rd weekend. There is a hint of Phase V in the leveling-off of the declining traffic rate at a volume around 70% of the summer weekday mean during the 25th and 26th weeks.

Motel Data

No motel data were obtainable from the South Coast sector, although interviews with motel owners-managers in Brookings and Gold Beach produced many opinions and observations. A general concensus seems to be that the motels run full in the main season, a period consisting of July and August according to a Brookings owner. A Gold Beach manager indicated that his principal season begins about May 15th and that his motel is filled most nights thereafter. Two other managers in Gold Beach stated that their motels are nearly full throughout the period of May into October. These statements appear to be optimistic and over-generalized. Daily occupancy figures for other coastal sectors indicate that occupancy rates are well below maximum levels prior to mid-June and often full occupancy is not achieved with consistency until August. However, the Central Coast motels did seem to experience high occupancy in July and, being removed from major urban centers, probably resembles the South Coast in the pattern of the tourist-recreation season. Occupancy patterns along the South Coast, therefore, probably resemble those of the Florence motel depicted in Figure 3. 17. Thus, the contention of the Brookings owner that he runs essentially full in July and August would appear to be a correct interpretation of the South Coast's seasonal pattern whereas the Gold Beach assertions of May through October seem exaggerated.

Other Data

The daily visitor figures from the reception desk of the Chetco Ranger District, Brookings, are graphed in Figure 3. 21. Two years' data, 1970 and 1972, were obtained and are presented. It can be seen that these data portray a different pattern from that of the traffic volume. Principally, there is a broad main season extending from late June to the end of August with no distinct high point. This is in contrast to the more clearly defined maximum in traffic volume. Additionally, there is an abrupt decline in Ranger District visitor numbers after Labor Day. This pattern, then, would suggest that the season along the South Coast is broader than indicated by traffic, the traffic volumes perhaps reflecting a movement through this sector toward other portions of the Oregon coast. For contrast, the Chetco Ranger District pattern should be compared with that of the Forest Service's Cape Perpetua Visitor Center (Figure 3. 18) where an extremely sharp seasonal peak is experienced. This would also indicate a broader, less clearly defined seasonal maximum along the South Coast as opposed to those sectors farther north.

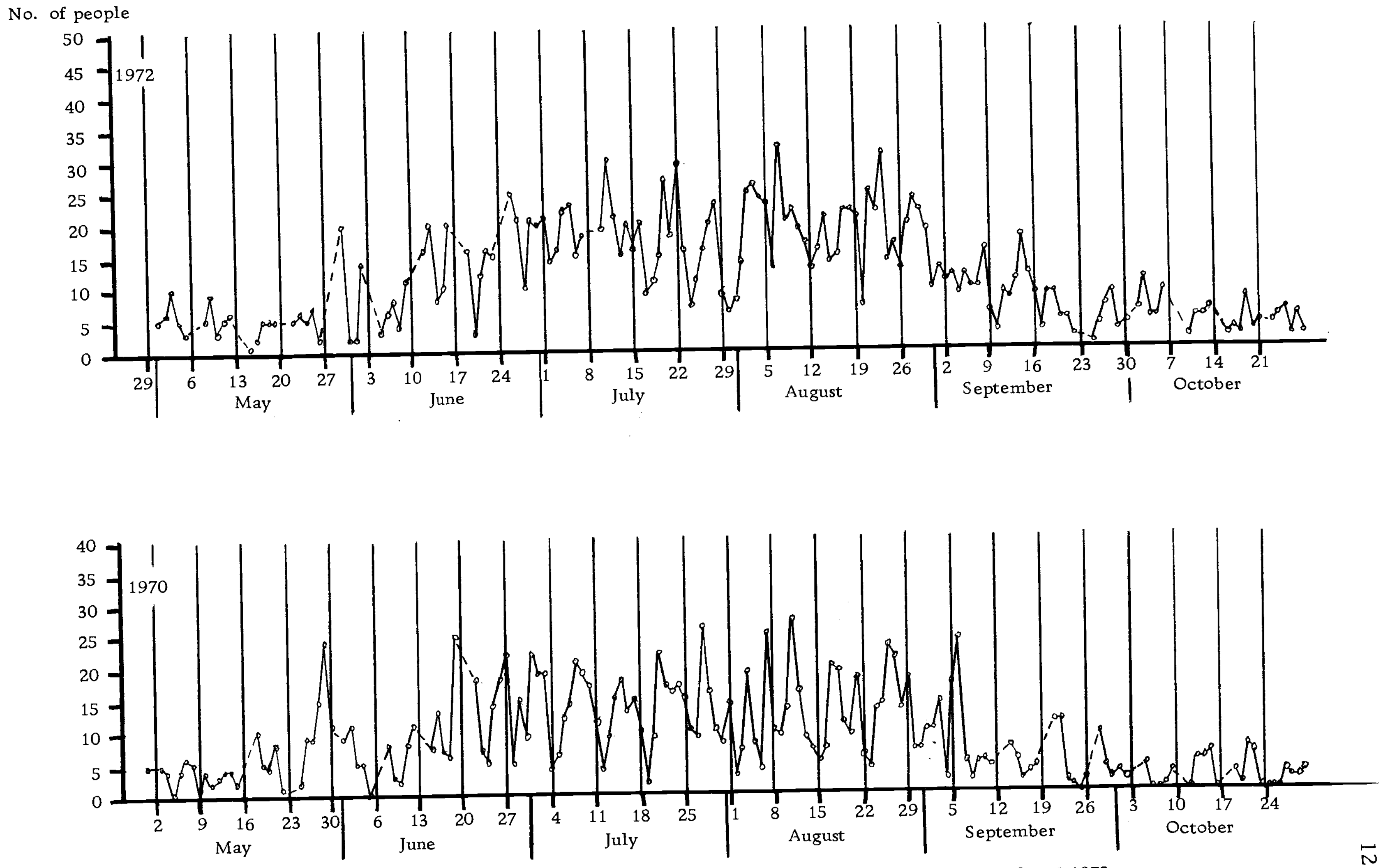

Figure 3.21. Chetco Ranger District, Siskiyou National Forest. Daily number of people at reception desk, 1970 and 1972.

However, the Tourist Information Office at Gold Beach (Figure 3. 22) displays a more traditional pattern. The information from the office consists of the total number of people coming in each day for help and advice during the summer of 1972. The July "plateau" is quite evident as is the August upsurge and abrupt decline with the approach of Labor Day. Still, the pattern here is far less peaked than in other sectors, as at Florence on the Central Coast (Figure 3. 19) and seems to reach its maximum during the 17th week, about one or two weeks later than elsewhere along the Oregon coast. This situation may be a local quirk--there is only a single year's data from Gold Beach--or it may be typical of the South Coast. If such a week's delay in the seasonal maximum is typical--and it does appear on the Winchuck traffic record (Figure 3. 20)-- then it may be possibly explained by homeward bound Californians leaving northern Oregon coastal sectors and moving south along U. S. Highway 101.

Finally, an examination of the daily visitation in the Kalmiopsis Wilderness does not reveal significant information concerning the general pattern of the tourist-recreation season (Figure 3. 22). This is probably due to the unique attractions and restrictions of this wilderness area. In 1972, the Kalmiopsis had no visitation until the end of June, then an abrupt rise to maximum visitation during July. The Fourth of July holiday stands out with the greatest single day visitation of the entire summer. The July maximum is followed by a

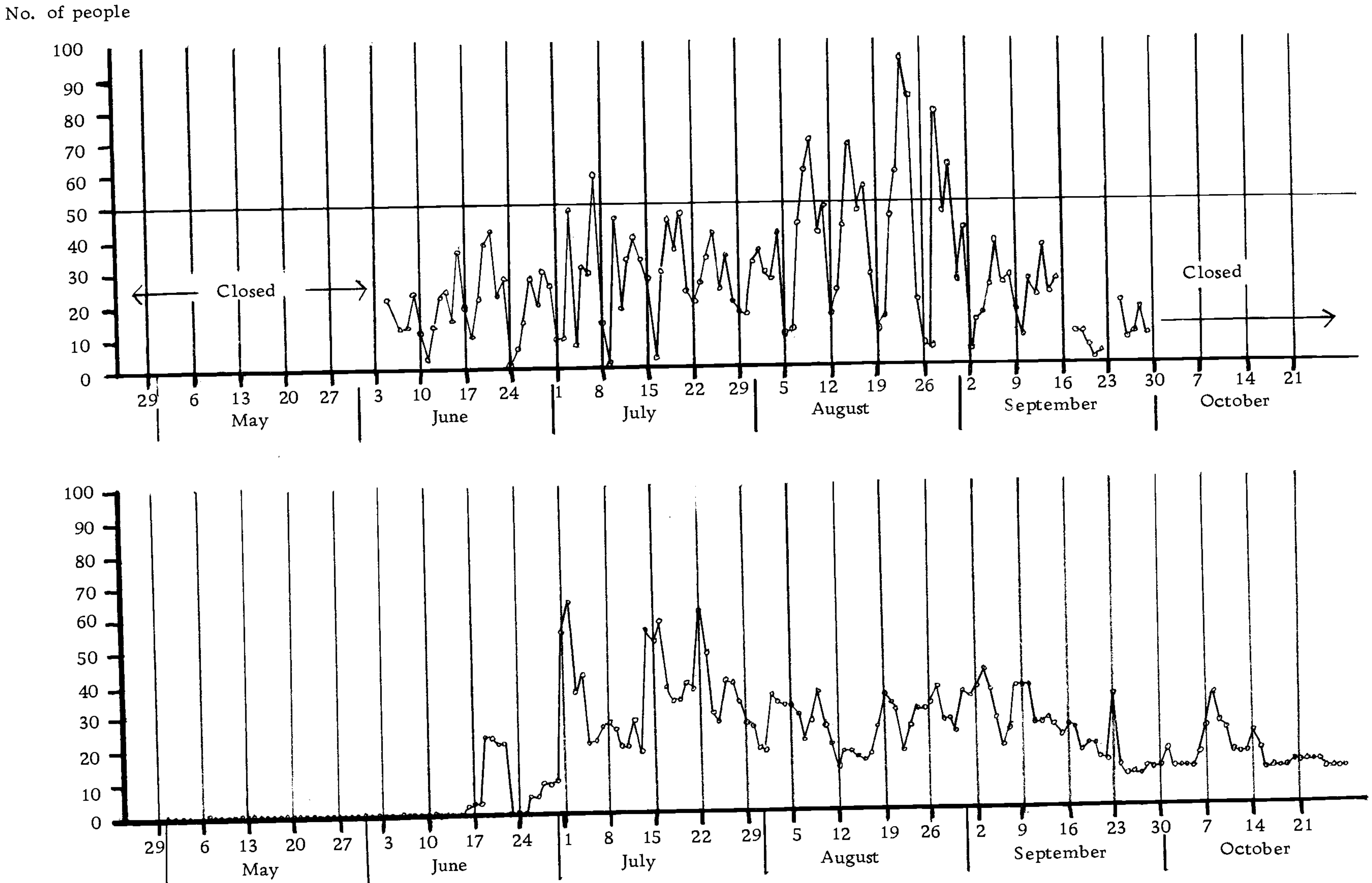

Figure 3.22. Gold Beach Tourist Information Office (upper). Number of visitations daily, 1972.
Kalmiopsis Winderness Area (lower). Number of people on permit in wilderness by day, 1972.

steady but lesser rate of usage during August and early September, then a decline to an even lower rate in the late season. Principal visitation occurs over weekends, a condition due probably to the fact that over 60% of the people holding permits for this wilderness indicated that they lived in the three local counties of Curry, Josephine, and Jackson.

The concentration of use in July may be due to the unique botanical attraction of the Kalmiopsis Wilderness, the rare Kalmiopsis leachiana. Apparently, the July maximum visitation in this wilderness area corresponds to the blooming period of this and other rare plants. Thus, the attraction of the Kalmiopsis Wilderness is unique and not indicative of the general tourist-recreation season.

Summary

Several features stand out as being especially characteristic of the tourist-recreation season in all sectors of the Oregon coast. First, there is a strong weekly and seasonal cyclicity. In traffic, weekly cycles are very strong in the North Coast and Miracle Miles sectors, less so in the Central and South coastal areas. In the northern sectors, greatest traffic volumes occur on Sundays and least volumes on Tuesdays. Friday has heavy traffic, only little less in many cases than Saturday. The Central Coast sector experiences only slight increase in weekend traffic volumes on U. S. Highway 101, Friday, Saturday, and Sunday each having about the same volume. Coastal access highways, however, do have a marked Sunday traffic maximum. On the South Coast, weekends are barely discernible from the traffic graphs, Sunday traffic being especially reduced relative to Friday or Saturday, the two days normally with greatest volumes. This aspect of the South Coast is indicative of the sector's remoteness from major urban centers and consequent heavy weekend recreation pressure.

An interesting feature of the traffic volumes is the tendency for weekend traffic to decline relative to weekday volumes after Labor Day and in the two weeks following Memorial Day. This situation, indicating a reduction of tourist-recreation activity, is most noticeable in the North Coast, Miracle Miles, and Central Coast sectors.

Motels in all sectors of the coast experience greatest occupancy on Friday and Saturday nights, the least occupancy on Sunday. Other facilities, at least along the North Coast, Miracle Miles, and Central Coast also display a weekend maximum of usage, but this does not appear to be the case in the South Coast sector.

Seasonal variation in visitations is marked in all sectors. User numbers are low prior to Memorial Day weekend, then increase steadily until after the Fourth of July. The five or six week period beginning in about mid-July constitutes the tourist-recreation industry's peak season along the Oregon coast. This period is distinguished by a relatively high but stable volume of tourists-recreationists for the first three weeks, then an upsurge to maximum summer values in the 15th and 16th weeks of the season. The occurrence of the extreme maximum during these two weeks would appear to have a cultural explanation, the early August vacation period having become ingrained in North American society for a variety of reasons, not the least of which may be a tendency to postpone vacations until after mid-summer in order to avoid any psychological "let-downs" that could follow an early holiday.

Following the season's peak, a steady decline in the number of tourists-recreationists sets in and this diminution occurs at a more rapid rate than the increase during the first part of the summer. There is usually an abrupt decrease in the week prior to Labor Day as people go home before the holiday weekend. Labor Day's significance to the tourist-recreation season derives from the traditional start of school immediately after that holiday in many sections of the United States, a factor forcing families home from vacation in time to prepare their children for the new fall term. In some areas, school now begins in the week before Labor Day, a factor serving to further augment the 18th week decline.

Following Labor Day there is a slight resurgence in tourist-recreation activity through mid-September as many older and retired people (without children) apparently take advantage of the reduced congestion for their vacations. However, the decline in numbers continues, particularly after late September and throughout October. Weekend activity remains high near the urban centers of northern Oregon.

Holiday periods do not seem to have as great an actual impact on tourist-recreation volume as is generally believed. Memorial Day alone stands out as significant relative to surrounding weeks, but the Fourth of July is little if any greater than those weekends following it. Supposed Labor Day congestion appears to be particularly over-stressed. Facilities are indeed crowded and motels run at full occupancy, but this is no different from the situation in several peak season weeks. Traffic rates over Labor Day are generally less than on any Phase III weekend and, on the North Coast and Miracle Miles sectors, little if any greater than on weekends in Phase I. Friday traffic over the Labor Day holiday is greater than average as is, of course, Monday. Veteran's Day, in October, has only a slight impact on traffic but does seem to increase motel occupancy.

Analysis of the data on visitations reveals that the seasonal variation in the tourist-recreation system along the Oregon coast can be considered in five phases. Phase I, prior to Memorial Day, is characterized by a low rate of activity, except on weekends in some sectors. Phase II, from Memorial Day to the 12th week, has steadily increasing numbers of tourist-recreationists. Phase III is the height of the season and extends from the 12th through the 17th weeks. There is an upsurge in activity to maximum seasonal values during the 15th and 16th weeks. Following a transitional week (the 18th) and Labor Day, Phase IV extends into the autumn with declining rates of activity. Finally, there seems to be a fifth phase beginning in the 25th and 26th weeks as the various measures of recreational visitation stabilize at low levels.

Relationship of Visitation Patterns to Weather

The various graphs presented in this chapter reveal a seasonal pulse suggesting an association with average weather conditions. For example, the maximum visitation (Phase III) corresponds to the normal period of highest temperature in the Pacific Northwest and, for that matter, across most of North America. Additionally, relatively low visitation in June could be explained by the normal continuation of cloudy, occasionally rainy weather into that month. After Labor Day, the sub-phase of increased visitation in September might exist in part because of the fine, sunny weather often experienced on the coast at that time of the year. Conversely, the decline in visitation toward the end of October might correspond to the increasing frequency of autumn rains and damp, chilly air masses. It can even be suggested that the upsurge of visitation in early August is a response to slightly better coastal conditions (less fog and wind) than is the case in July.

Unfortunately, it is doubtful if most of these possible relationships exist, the seasonal pattern of visitation being probably governed by socio-economic factors, not climatic ones. Of course, the basic North American tradition of summer vacations is indeed a social response to climatic conditions of mid-latitude environments, but this pattern prevails all across North America and is not unique to the Oregon coast. The summer vacation season, then, exists due to tradition and not in response to local climatic factors.

However, theremay be some aspects of the normal visitation pattern that can be related to climatic (thus, weather) parameters. Most fundamentally, the very existence of a relatively storm-free, rainless summer has probably encouraged more tourist-recreation development on the Oregon coast than would have been the case if summers were rainy. Additionally, the September subphase may not have developed if that month were one of cloud, rain, and storm as it is farther north along the Pacific Coast. The fact that conditions are often settled in September is an inducement to visitation at that time by those who are able to do so. Furthermore, the marked decrease in visitation after the September subphase and again in late October probably does reflect the influence of deteriorating weather with the advance of autumn. But, all of these possible relationships are speculative and, without comparison to the visitation patterns of other tourist-recreation regions, no firm conclusions can be drawn.

However, a lack of long-term seasonal correlation with weather conditions (other than what is traditional in a mid-latitude environment) does not mean that such correlations fail to exist in the short-run. Far from it. Day-to-day changes in weather appear to have a marked and direct impact on tourist-recreation visitation to Oregon's coast. It is, then, these day-to-day weather changes which become significant to coastal Oregon's tourist-recreation system. The significance of these fluctuations is analyzed in the next two chapters. Chapter IV looks at the influence of weather conditions by means of graphic analysis, and thus illustrates the effect of specific weather patterns at various times during the summer season. Chapter V utilizes a statistical approach on the entire body of collected data to determine the percentage of variability in visitation that can be explained by factors of weather once the weekly cyclicity of visitation is removed.

CHAPTER IV

GRAPHIC ANALYSIS OF THE RELATIONSHIP BETWEEN WEATHER AND TOURIST-RECREATION VISITATION ON THE OREGON COAST

The display of information on graphs proved to be one of the most effective means of analyzing the relationship between weather and coastal recreational visitation. For example, by placing the graph of temperature and rainfall from Portland over a graph of highway traffic across the Coast Range, the variations in the traffic can readily be correlated to Portland weather conditions. In this manner, the effect of specific weather phenomena, such as a prolonged spell of hot weather in summer or chilly, rainy weather in October can be determined. Thus, as data were collected throughout the winter and early spring of 1973, they were all transferred to graphs for comparison with graphed weather data from appropriate locations. Each year's traffic data, each year's motel data, and all other data were graphed separately so that a day-by-day comparison with the weather could be made.

In this chapter, significant relationships have been selected and presented graphically in order to illustrate basic weather-visitation correspondence. Data for presentation have been selected only from the traffic and motel information because these data seem to give the clearest relationships with weather. Also, the emphasis has been placed on the North Coast, Miracle Miles, and Central Coast sectors, where the relationships appear stronger. The attempt was made to choose specific yet typical weather patterns that can occur at certain times of the year. Thus, the selections run to the extremes--heat waves in August, a week of cold and rain in October, and so forth. In some cases, the same time of the season has been used from different years to illustrate the effect of varying weather at the same place.

This section on graphic analysis, then, should be considered as a foundation chapter setting the understanding for the more sophisticated statistical analysis that follows in the next chapter. Correlations are not quantified in this chapter, but certain strong relationships are demonstrated and their significance is too obvious to overlook or dismiss lightly.

Graphic Method

The data graphed in this chapter appear in the same units that were used in preceding chapters. Thus, all traffic volumes are expressed as a percent of the average summer weekday mean and motel occupancy is merely a percent of maximum. A few graphs demonstrate the relationship between weather and visitation for an entire season (Figures 4.1, 4.2, 4.3, 4.4, and 4.11). Most of them, however, extend over a period of only a few days and reveal the effect of some particular weather pattern at a particular time of the year.

In several of the traffic graphs (Figures 4.2, 4.3, and 4.4) a different approach was utilized. Rather than show traffic in direct percent units, as in Figure 4.1, each day's volume for a particular year was shown relative to its normal value. For example, the "0" line in Figures 4.2, 4.3, and 4.4 represents the normal traffic volume for each day of the summer season as expressed in the percent of mean summer weekday values. The graph then shows the actual departure from normal in units of percent mean weekday value for the year indicated, 1971 in all cases. Values below the "0" line indicate less than normal traffic, values above indicate greater than normal. Thus, in reference to Figure 4.2, it can be seen that traffic on Salmon River Highway on Sunday, May 16, 1971, was considerably less than normal--less than normal by a value equivalent to 36% of the mean summer weekday volume. In contrast, traffic on September 19th was much greater than normal, 44% of the mean summer weekday value. This technique is more effective than the use of a graph of actual values because it is the departures from normal which reflect the effect of weather and techniques such as used in Figure 4.2 indicate that parameter precisely.

The weather values, daily maximum temperature in degrees Fahrenheit and daily rainfall in inches, are placed at the top of each graph. Temperature is indicated by small circles connected with a line. Rainfall is delimited by a bar. Portland records were used in graphic correlation with visitation data from the North Coast and Miracle Miles sectors, and Eugene was used for the Central Coast correlations.

Seasonal Traffic Analysis

To illustrate the seasonal relationships between weather and traffic volumes, graphs of traffic for 1971 at Valley Junction, Sunset Tunnel, and Winchester Bay are reproduced (Figures 4. 1, 4. 2, 4. 3, and 4. 4).[9] Portland weather, daily maximum temperature and daily rainfall, appear directly above each traffic graph. Figure 4. 1 is a graph of the traffic volume throughout the summer of 1971 at Valley Junction on the Salmon River Highway. This is the most significant access highway between the coast and the northern Willamette Valley. Portland weather for the period appears at the top of the graph. The five-phased season, as described in Chapter III, is readily apparent as is the strong weekly cyclicity. The early August upsurge during weeks 15 and 16 is also well developed. Note should also be made of the marked decrease in traffic during the week of August 28th-September 4th, the week before Labor Day. This, too is a normal

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[9] Location of traffic counters is shown in Figure 2. 1 or 3. 1.

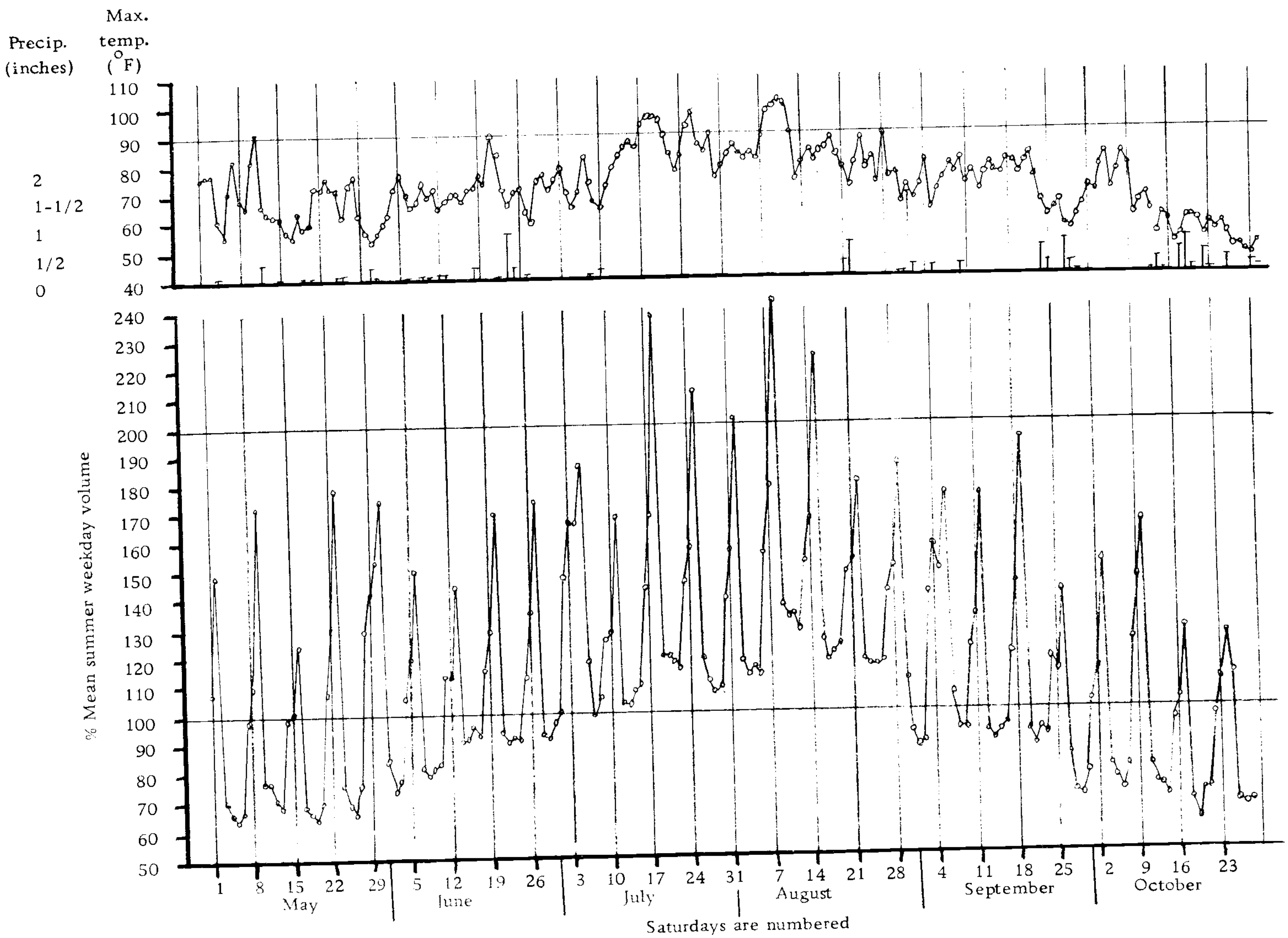

Figure 4. 1. Valley Junction. Daily traffic volumes in 1971 and Portland weather conditions. Traffic expressed as a percent of mean summer weekday volume.

response. However, unusual fluctuations appear. For example, the low value on Sunday, May 16th, is outstanding as are the relatively high values on July 18th, September 19th, and October 10th. Inspection of the corresponding Portland weather on these Sundays provides insight into the unusual values in traffic. The low value on May 16th can be seen to correspond with a period of chilly weather in Portland and the high temperature on that day was only 57 degrees. Light rain fell. Conversely, the high value on July 17th corresponds to Portland temperatures in the 90's--significantly, the first prolonged hot weather of the summer after an unusually cool period in late June and early July. Thus, the high values on the indicated dates in September and October can also be seen to correspond with periods of warm, dry weather. Further inspection of Figure 4. 1 reveals other similar relationships, such as the correspondence between the low weekday values of September 27-30 and cool, rainy weather in Portland.

Useful as Figure 4. 1 might be, however, Figure 4. 2 would appear to be even more demonstrative of the relationship between weather and traffic volumes. Figure 4. 2 depicts traffic volume at Valley Junction in 1971, as was the case in Figure 4. 1. However, the data have been plotted to show departures from normal values. Portland weather is at the top of the graph and the relationship with traffic volume is now very clear. In addition to the relationships described for Figure 4. 1, other features now become evident. For

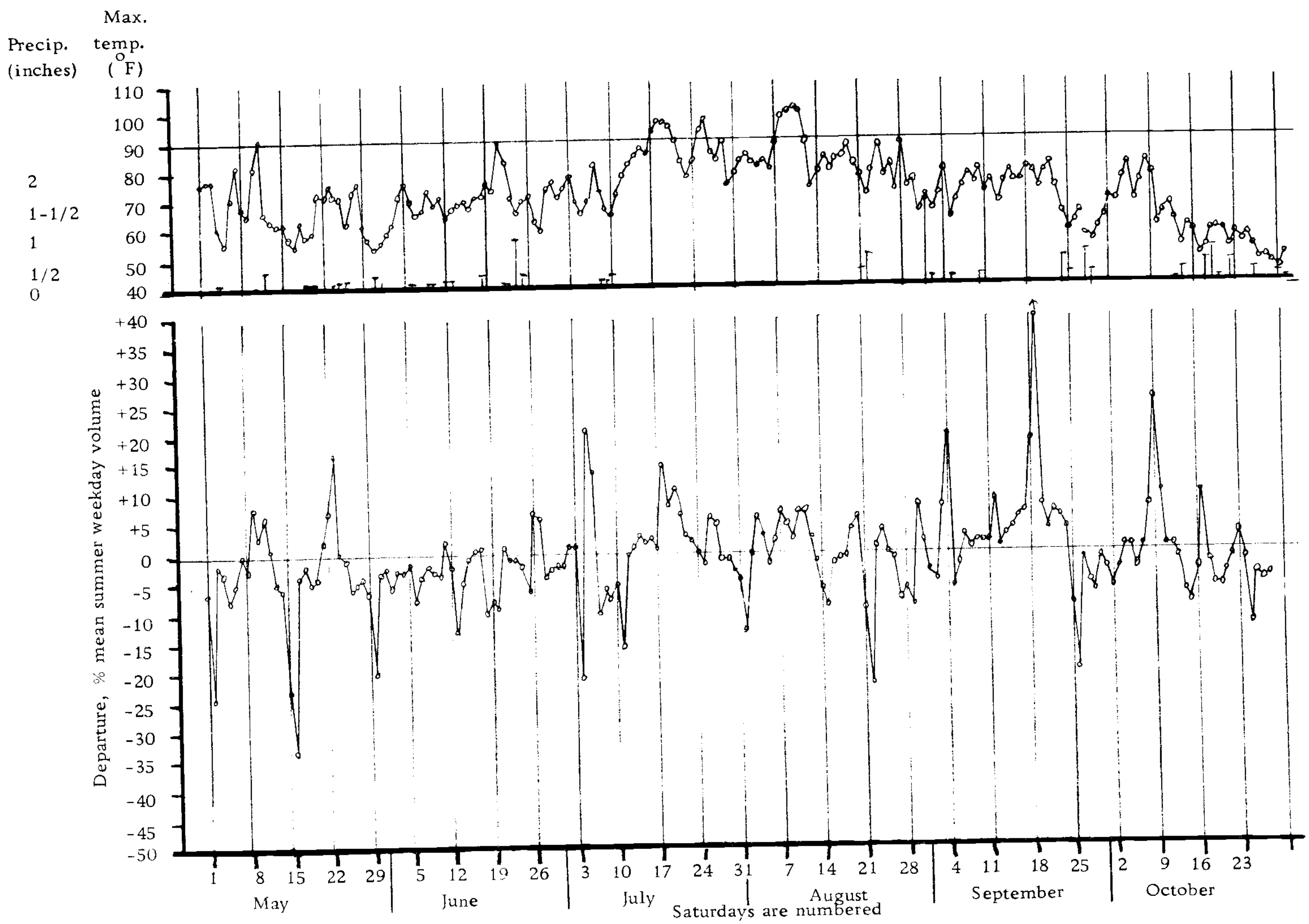

Figure 4.2. Valley Junction. Daily traffic volumes in 1971 and Portland weather conditions. Traffic expressed as departure from normal with units in percent of mean summer weekday volume.

example, the lower than normal values around July 10th, July 31st, and August 21st can all be seen to correspond to periods of cool, rainy weather. Conversely, the high values between July 17th and 24th, and again between August 7th and 14th, can be related to the occurrence of high temperatures in Portland.

The volume of traffic associated with these fluctuations is considerable. The mean weekday traffic at Valley Junction in the summer of 1971 was 7,468. Thus, as can be seen from the graph in Figure 4.2, May 16th had a traffic reduction equivalent to 33% of this figure, or 2.464 vehicles (33% of 7.468) fewer than would normally be expected on that Sunday. Conversely, on September 19th, there were 3,137 vehicles more than normal. Even the relatively smaller departures from normal of mid-summer amount to 500 to 1,000 or more cars per day. Thus, at least in 1971, there appeared to be a strong relationship between traffic volumes on the Salmon River Highway and Portland weather.

Figure 4.3 illustrates the daily departure from normal traffic volume in 1971 at Sunset Tunnel on the Sunset Highway between Portland and the North Coast sector. Again, Portland weather conditions appear above the traffic graph and the relationship between the weather and traffic is strong. For some reason, Sunset Highway seems to be even more sensitive to weather influences than Salmon River, and the variations in relative traffic volumes are

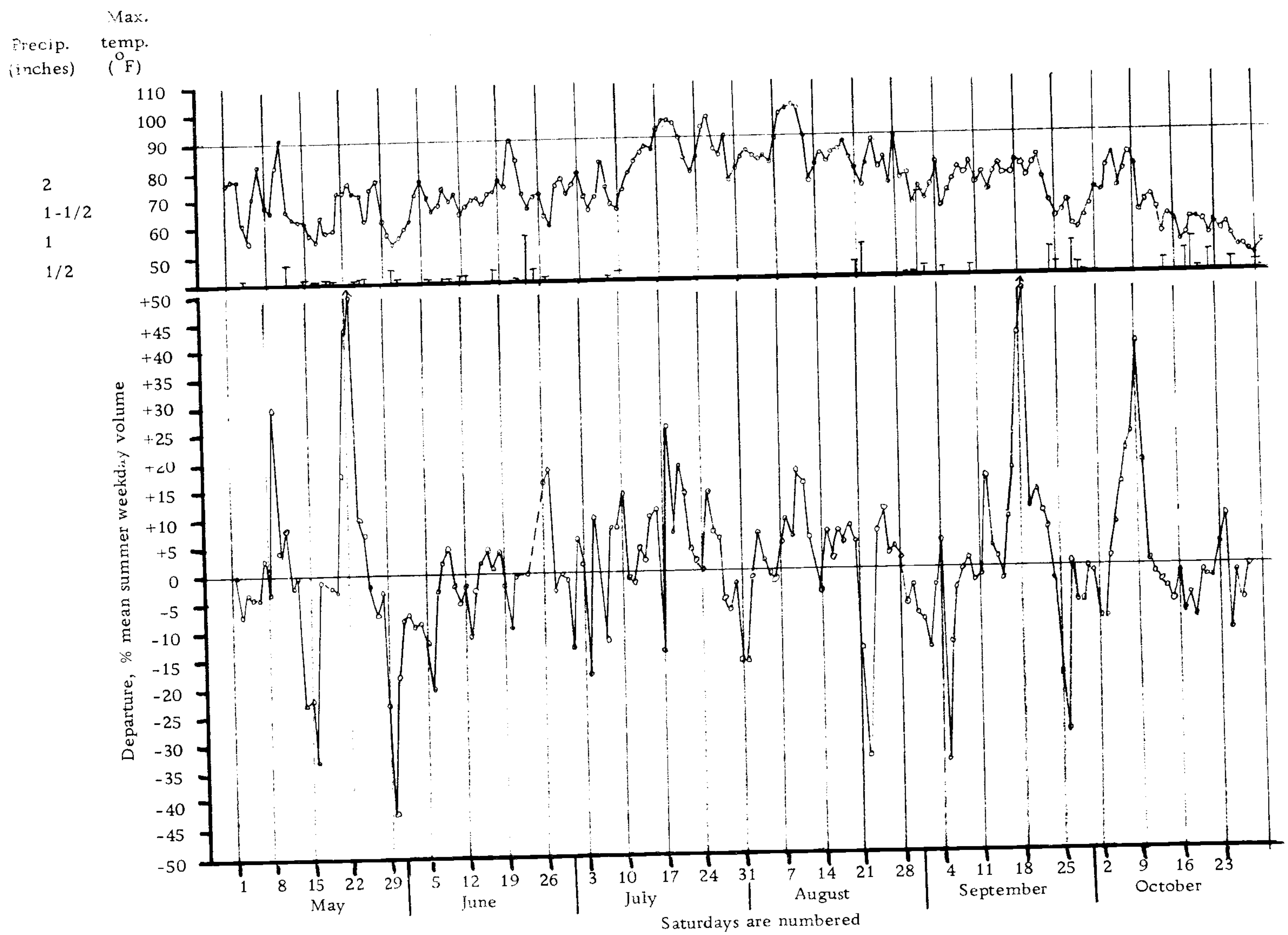

Figure 4.3. Sunset Tunnel. Daily traffic volumes in 1971 and Portland weather conditions. Traffic expressed as departure from normal with units in percent of mean summer weekday volume.

correspondingly greater. Note should be made in particular, of the effect of "good" and "bad" weather in May. Also, the effect of cool, rainy weather on Memorial Day weekend (May 29-31) should be noted, traffic on Sunday being less than the expected volume by an amount equivalent to more than 40% of the mean summer weekday value.

During the mid-summer period, the correspondence between greater than normal traffic and unusually high temperatures in Portland can be seen after July 17th and again after August 7th. Autumn, like May, creates great variation of weekend volumes in seeming response to weather. On Sunday, September 19th, for example, the departure from normal exceeded 50% of the mean summer weekday volume.

The volume of traffic involved in such variations as are discussed above amounts to a significant figure. In 1971, the mean summer weekday traffic volume at Sunset Tunnel was 3,255 vehicles. Thus, a departure of over 40% of this amount, as did occur on several occasions, means that the variation from expected volumes amounted to more than 1,300 vehicles.

Thus, the apparent relationship between Portland weather and traffic on access highways to the North Coast and Miracle Miles sectors is well established. On U.S. Highway 101 itself, this response to weather is not so large and, farther south, the response becomes even less. Indeed, beyond the Miracle Miles sector, total variation from any cause becomes quite small. Figure 4.4 shows the departure from normal volumes (in percent mean summer weekday value) for the summer of 1971 at Winchester Bay. Here, variation exceeded 10% of the mean summer weekday volume only on three days of the entire six-month summer season. Thus, traffic patterns at this recorder station are quite different from those on Salmon River or Sunset Highway. Such a discrepancy can be explained by the probable diminishing impact of day visitors and the corresponding relative increase of long-term visitation in areas well removed from urban centers. Thus, at Winchester Bay, many of the visitors have traveled for several days, or plan to stay in the area for an extended period of time, and are not so sensitive to daily changes in weather. But, all this aside, an inspection of Figure 4.4 does reveal apparent reactions in traffic volume to weather conditions.

Figure 4.4 compares daily traffic at Winchester Bay in 1971 with weather conditions at Eugene, the nearest large urban center (see Figure 2.1). Actually, the correspondence between the trend of daily maximum temperature at Eugene and the daily departure from normal traffic volumes appears to be positive. Greater than normal traffic volumes around May 22, June 19, and September 18 are associated with warm, dry weather in Eugene. The hot weather after July 17th and again after August 7th is also characterized by greater than normal traffic volumes. In contrast, the low volumes around the first

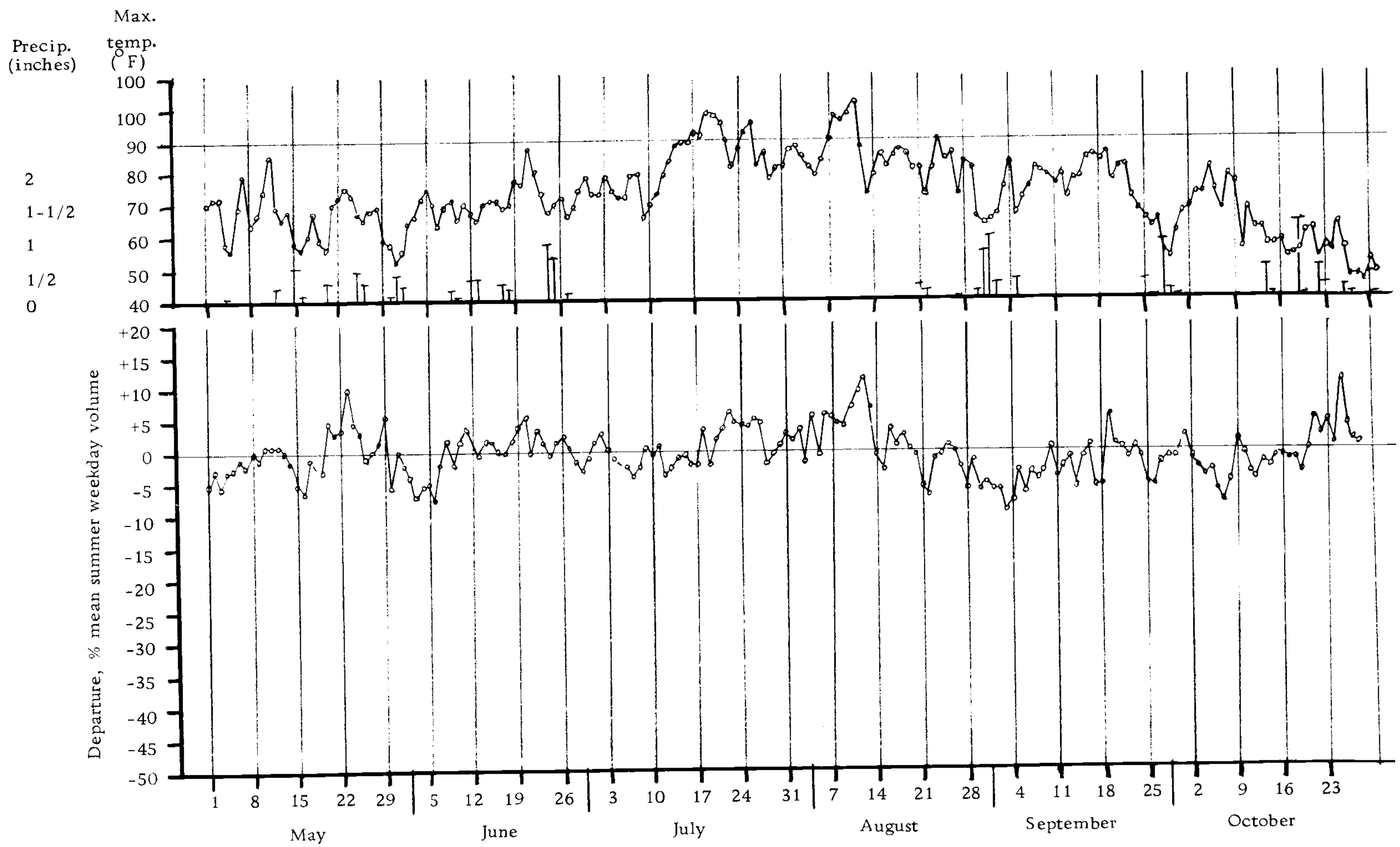

Figure 4. 4. Winchester Bay. Daily traffic volumes in 1971 and Eugene weather conditions. Traffic expressed as departure from normal with units in percent of mean summer weekly volume.

of June and again near the first of September seem to result from cool rainy weather.

Of course, as was the case at Valley Junction and Sunset Tunnel, the correspondence between weather and traffic volumes is far from perfect. One notes, for example, the lower than normal volumes between October 2nd and 9th when the weather appeared to be unusually fine. Nonetheless, the basic pattern of relationship is apparent, but the variation in traffic due to weather is generally small and does not exceed 10% of the mean summer weekday volume. However, since variation at Winchester Bay throughout the entire summer of 1971 did not much exceed 10%, it can be concluded that weather does play a relatively significant role in the explanation of daily traffic variability on U. S. 101 at Winchester Bay.

The total traffic volume that appears to be affected by weather at Winchester Bay is not so great as on Salmon River Highway or Sunset Highway. In 1971, the mean summer weekday traffic volume was 6.226 vehicles. Thus, maximum variations from normal of only about 10% mean that fewer than 700 vehicles per day are affected by weather. In mid-summer, as in late July and the first half of August, such a volume is relatively insignificant because daily traffic at that time of year would be considerably greater than the mean summer weekday volume. However, this value of 700 vehicles becomes far more significant in May, early June, and after Labor Day, when it exceeds 10% of the normal daily volume for these periods of the summer.

Conclusions from Seasonal Traffic Analysis. It can be concluded from the graphic analysis of seasonal patterns in highway traffic that weather does indeed play a role in creating variability in volume from day-to-day. The effect of weather would appear strongest in those coastal areas nearest to the major urban centers of the lower Willamette Valley, and that deviations from normal traffic volumes are greatest on weekends. The access highways from Portland and Salem to the North Coast and Miracle Miles sectors occasionally display a deviation from normal equal to 40% or more of the mean summer weekday volume. On U. S. 101 the deviation is less and, at Winchester Bay, beyond the principal urban influence of Portland, deviation in 1971 hardly exceeded 10% of the weekday mean.

There is, in addition, a tendency for the temporal variation in the influence of weather. The greatest deviations from normal, judging from 1971 as well as other years not discussed here in detail, occur in the early and late portions of the season. Prior to Memorial Day and after Labor Day, unusually fine weather seems to increase traffic volumes by a greater amount than is the case with hot weather in mid-summer. Conversely, cool and rainy weather in mid-summer does not diminish traffic to the extent that it does in May, September, or October. This may be because rainy weather is uncommon in summer and people therefore assume that the unsettled conditions will be short-lived.

The Effect of Specific Weather Patterns on Traffic Volumes

A detailed analysis of the effect of short-term weather conditions is very revealing. Several typical weather patterns were detected from the climatological records of the four summers, 1969-1972, and their specific impact on traffic volumes was investigated through graphic analysis. The patterns investigated occur with sufficient regularity as to be expected every year. The following weather patterns were selected: (1) Cool, rainy weather in May; (2) warm weather in May; (3) cool, rainy weather in June; (4) hot weather in June; (5) hot weather in July; (6) hot weather in August; (7) cool, rainy weather in August; (8) cool, rainy weather in September; (9) warm weather in October; (10) cool, rainy weather in October.

The patterns selected seem to match all of the regularly occurring weather variations that are found throughout the six-month tourist-recreation season. Thus, they probably cause a similar reaction in traffic volumes in any year of their occurrence.

Salmon River and Sunset Highways. Salmon River Highway is the single busiest coastal access highway in Oregon, traffic volumes on peak Sundays in 1972 exceeding 18,000 vehicles. Due to this great volume of recreational traffic, Salmon River's response to weather factors is of particular significance. Figures 4.5, 4.6, and 4.7 demonstrate the response of traffic on this highway to selected weather conditions at different times of the tourist-recreation season. Figure 4.5A covers the period of May 10 through May 24, 1972. Two different weather patterns occurred during these two weeks and each pattern included a weekend as well as weekdays. From the 10th through the 14th, weather in Portland was warm and dry, temperatures exceeding 80 degrees on several days. Traffic volumes were above normal, especially on Sunday, the 14th, when the volume exceeded the normal by a value equivalent to 18.5% of the summer weekday mean. On the 15th, a cool series of days with rain commenced. Traffic volumes immediately fell below normal and remained there throughout the next nine days. The effect of this unsettled weather was particularly great on the 20th and 21st, a weekend. Traffic on Saturday was 15% below par and, on Sunday, dropped even further, with the sub-normal volume equal to over 33% of the summer weekday mean. As weekday traffic in the summer of 1972 averaged 7,733 vehicles, it can be seen that there were some 2,600 cars fewer on May 21st than would be expected given normal volumes.

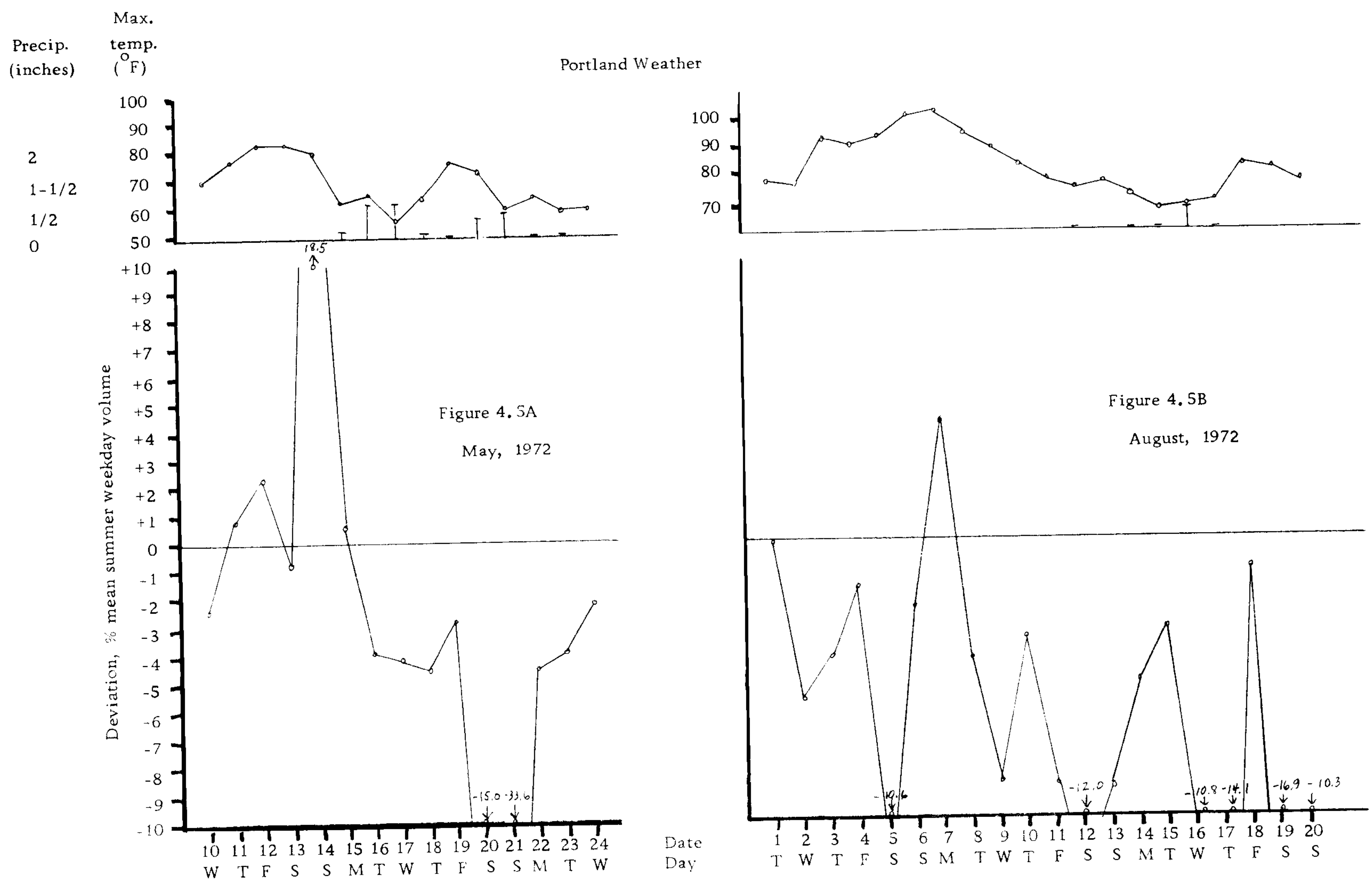

Figure 4.5. Valley Junction. Deviation of traffic volumes from normal in response to warm-dry and cool-wet weather patterns, 1972.

Figure 4. 5B also illustrates the changes in volume which occur on Salmon River Highway as hot, dry weather gives way to cool, rainy conditions. In this case, the time illustrated was during the maximum visitation period in August, 1972--weeks 15, 16, and 17. Due to unexplained factors in the summer of 1972, traffic volumes in mid-summer were less than expected and this situation is obvious in Figure 4. 5B. With the exception of Monday, August 7, all of these days were below normal. Considering the very hot weather that influenced Portland during these days, over 100 degrees on the 6th and 7th, one would have expected above normal values. However, a cooler period with some rain began on the 12th and traffic volumes fell to levels far below what they had been. During the heat wave, traffic was running below normal by an equivalent volume of less than 10% of the summer weekday mean. However, during the succeeding cool, damp stretch, this figure increased to well in excess of 10% on several days. Thus, the pattern of reduced traffic was maintained, but the effect of the poor weather was not nearly so great as it was in May (Figure 4. 5A), when negative values were two to three times greater.

Figure 4. 6A and 4. 6C demonstrate the effect of different weather patterns at the same time of the season on Salmon River Highway. Figure 4. 6A represents the departure from normal traffic during the period of June 21 through June 30, 1969. As can be seen, the Portland weather was unusually cool with substantial rain daily from the 22nd

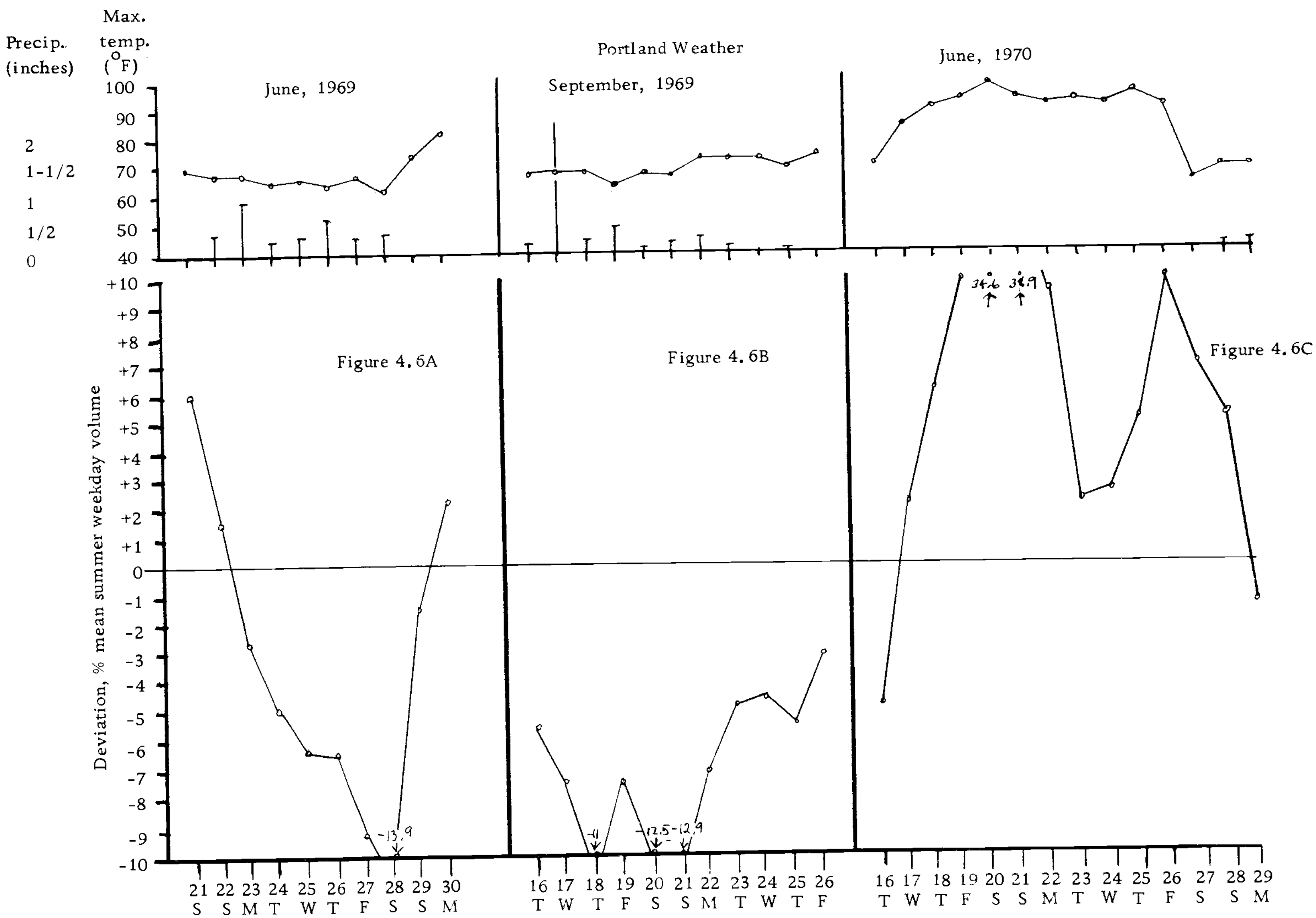

Figure 4.6. Valley Junction. Deviation of traffic volume from normal in response to cool-wet and warm-dry weather patterns in June, and a cool-wet pattern in September.

to the 29th. In contrast, Figure 4.6C encompasses a series of hot days in June of 1970. These days, June 16 through the 29th, included no fewer than seven in succession that were above 90 degrees. The contrast in traffic volumes between the two years is striking. In 1969, traffic volumes fell steadily as the rains continued, falling below normal on Saturday the 28th to a level equivalent to 13.9% of the summer weekday mean. In 1970, however, traffic on these same days of the month was well above average, the weekend of the 20th and 21st seeing values exceed the normal by 30 to 40% of the weekday mean. Thus, it can be seen that weather in late June seems to have a strong impact on traffic volumes between Portland or Salem and the Miracle Miles sector. In 1970, the percentages of June 20th and 21st amounted to almost 2,700 vehicles per day more than normal whereas, during the rains of 1969, traffic on Saturday the 28th was almost 900 vehicles less than what would have been expected on that weekend.

Figure 4.7A and 4.7B primarily illustrates the effect of hot weather in mid-summer on Salmon River's traffic volumes, but Figure 4.7B additionally demonstrates the post heat wave response as well as the effect of a cool, rainy weekend. Figure 4.7A covers the days of July 15-25, 1971. Temperatures in Portland during this period equaled or exceeded 90 degrees from the 17th through the 21st. As can be seen, traffic volumes on these days was considerably above normal, especially on Sunday the 18th and Tuesday the 20th, but fell below normal with the onset of cooler conditions after the 23rd.

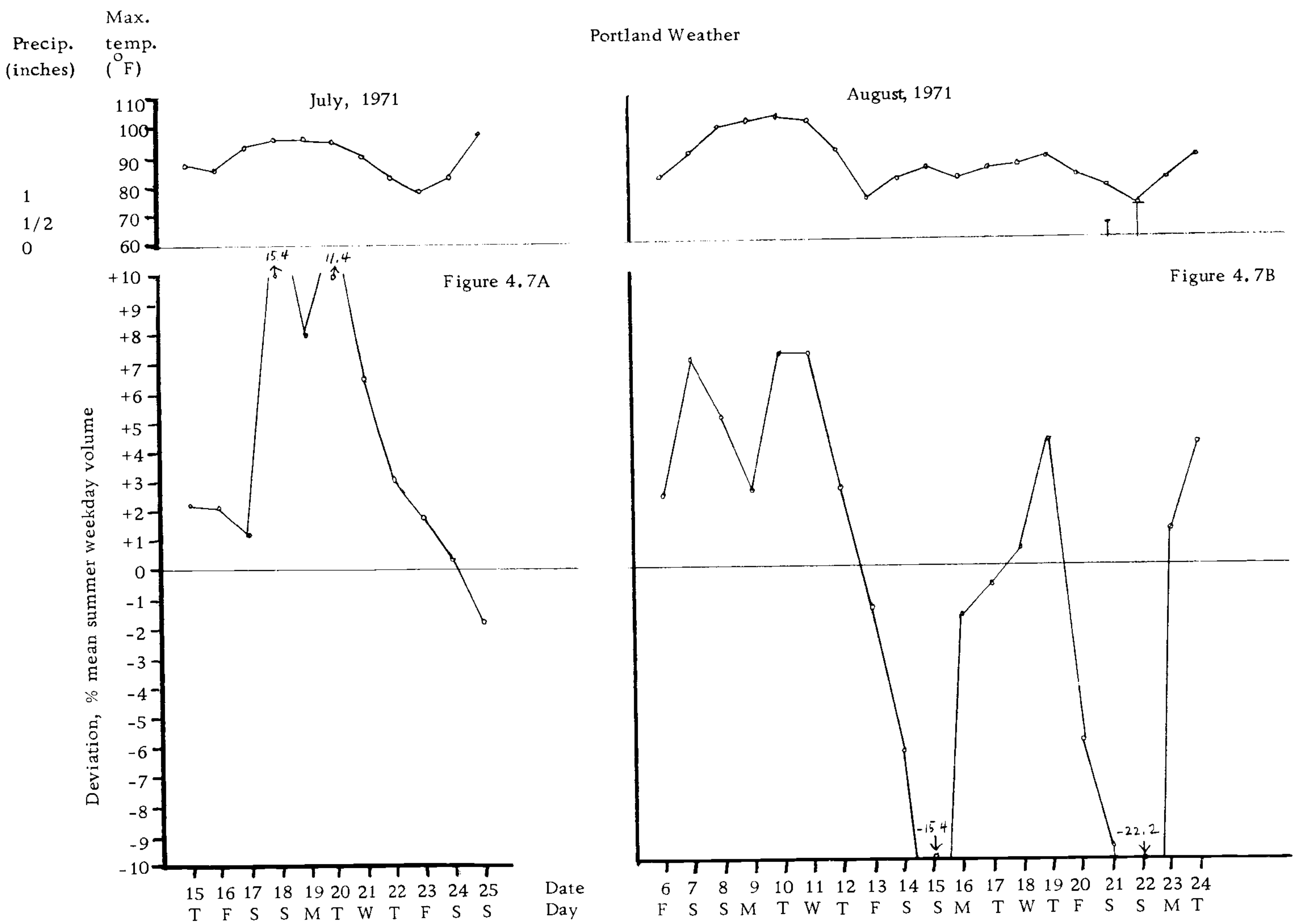

Figure 4.7. Valley Junction. Deviation of traffic volumes from normal in response to a hot weather pattern in July, and to both hot and cool patterns in August.

Figure 4.7B extends over the days of August 6th through the 24th, 1971. A heat wave with temperatures in excess of 100 degrees characterized the first part of the period and, in apparent response, traffic volumes across the Coast Range on Salmon River Highway were above normal. Excess values were not great, only about 2-7% of the summer weekday mean, but were nonetheless above normal. The heat wave broke on the 13th with a maximum temperature in Portland of only 75 degrees. Correspondingly, traffic volumes fell below normal and, on Sunday the 15th, were more than 15% of the unity value (the mean summer weekday volume) below the expected level. The warm weather of the following week brought traffic volumes again to levels above normal, but the recovery ended abruptly on the 20th, 21st, and 22nd with the onset of a late summer rain. The traffic decline from normal on Sunday the 22nd equaled 22% of the summer weekday mean, or some 1,600 vehicles.

Thus, on Salmon River Highway, mid-summer heat waves seem to produce moderately above normal volumes with a drop to well below normal volumes during succeeding cooler days. As has already been demonstrated, rainy weather in August brings substantially lower traffic volumes than would otherwise be expected.

The effect of stormy autumn weather on the coastal access highways leading from Portland is shown in Figures 4.6C and 4.8. Figure 4.6C presents the reaction in traffic volumes on Salmon River

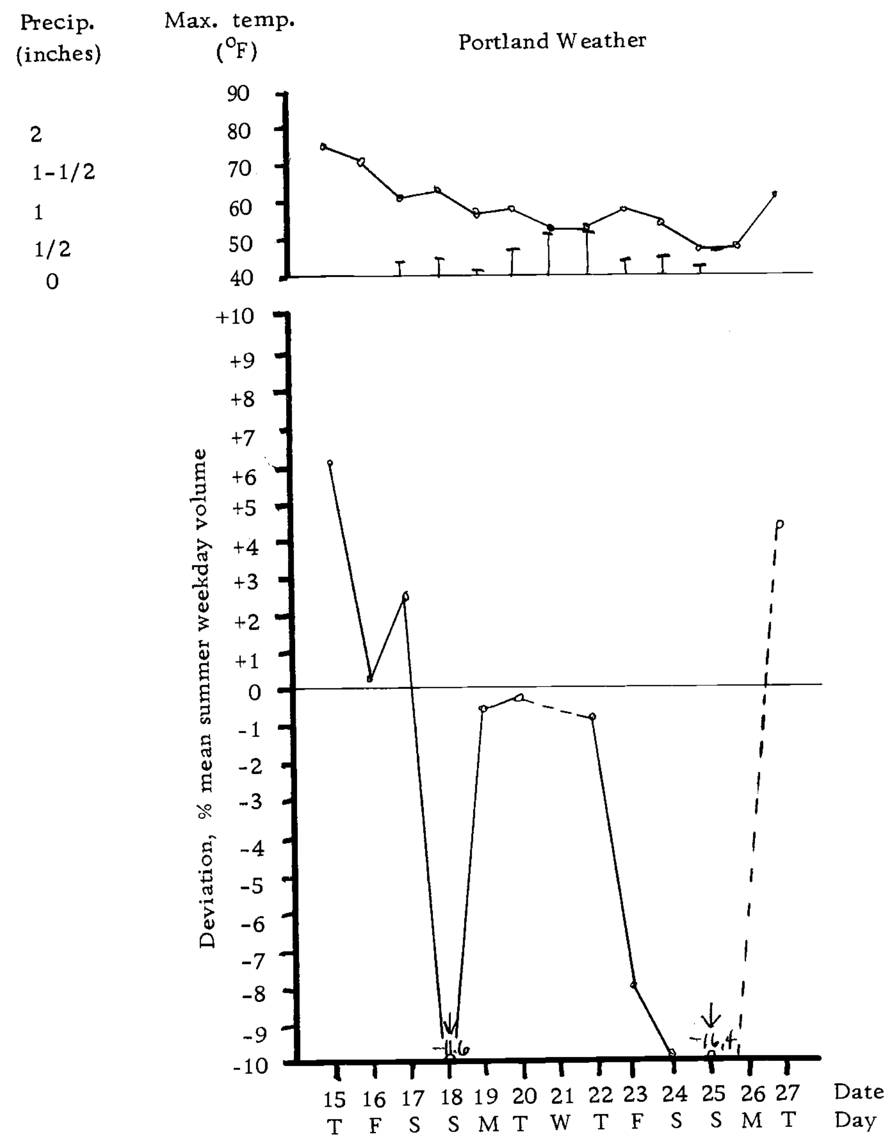

Figure 4. 8. Sunset Tunnel. Deviation from normal traffic volumes during a cool-wet weather pattern in October, 1970.

Highway to cool, rainy weather in mid-September. Daily values were substantially below normal, especially on the weekend, when the decreased traffic equaled between 13 and 18% of the mean summer weekday volume. Traffic volumes began to return toward normal with the cessation of the rainy period on the 23rd, but an apparent continuation of cloudy weather prevented a full recovery. As can be seen from the graph of Portland weather, this was a major unsettled period with measurable rain falling on eight consecutive days and totaling more than three inches.

Figure 4.8 uses traffic volumes from Sunset Highway. The period diagramed is October 15th through the 27th, 1970. These days included more than a week of stormy weather with low temperatures and substantial daily rainfall. The onset of the unsettled weather on Saturday the 17th resulted in Sunday traffic volumes that were well below normal. The succeeding weekdays continued both the stormy weather and below normal traffic volumes. Finally, after a week of rain, the next weekend brought traffic volumes down to the lowest levels of the period, volume on Sunday the 25th dropping by the equivalent of 16.4% of the weekday mean.

<u>Otter Rock.</u> Traffic at Otter Rock on U.S. Highway 101 generally reflects the same patterns as exist on Salmon River or Sunset Highways, although the variation is sometimes more subdued. Merely to illustrate the effect of weather at Otter Rock, a series of days from

about the same time in October of two separate years has been selected. In 1972, from October 11th through the 20th, the weather in Portland was dry and mild with temperatures in the 70's. However, from October 15th to the 27th, 1970, there was a week-long period of chilly, rainy weather. (This is the same October period described for Sunset Highway, Figure 4. 8.) The graphs of Otter Rock traffic are shown on Figure 4. 9A and 4. 9B. The contrast between the two years' traffic volume is very clear. In Figure 4. 9A with pleasant weather, traffic was well above normal. However, in 1970 the onset of the unsettled weather after the 16th led to substantially below normal volumes. On Sunday the 25th, the decrease from expected volumes was greater than 16% of the mean summer weekday value. Volumes returned to near normal on the 27th, with the cessation of the stormy weather.

Winchuck. It has already been discussed that the apparent response of traffic volume to weather is of lesser magnitude in the Central Coast sector than it is in Miracle Miles or North Coast. In the South Coast sector, the influence of weather appears to be even more subtle and, at least from graphic analysis, less evident. However, the influence of weather is most decidedly present as is demonstrated in Figure 4. 10. This figure covers a 13-day period from May 11th through the 23rd in 1972 at Winchuck. The period begins with temperatures at Medford (upper portion of the diagram)

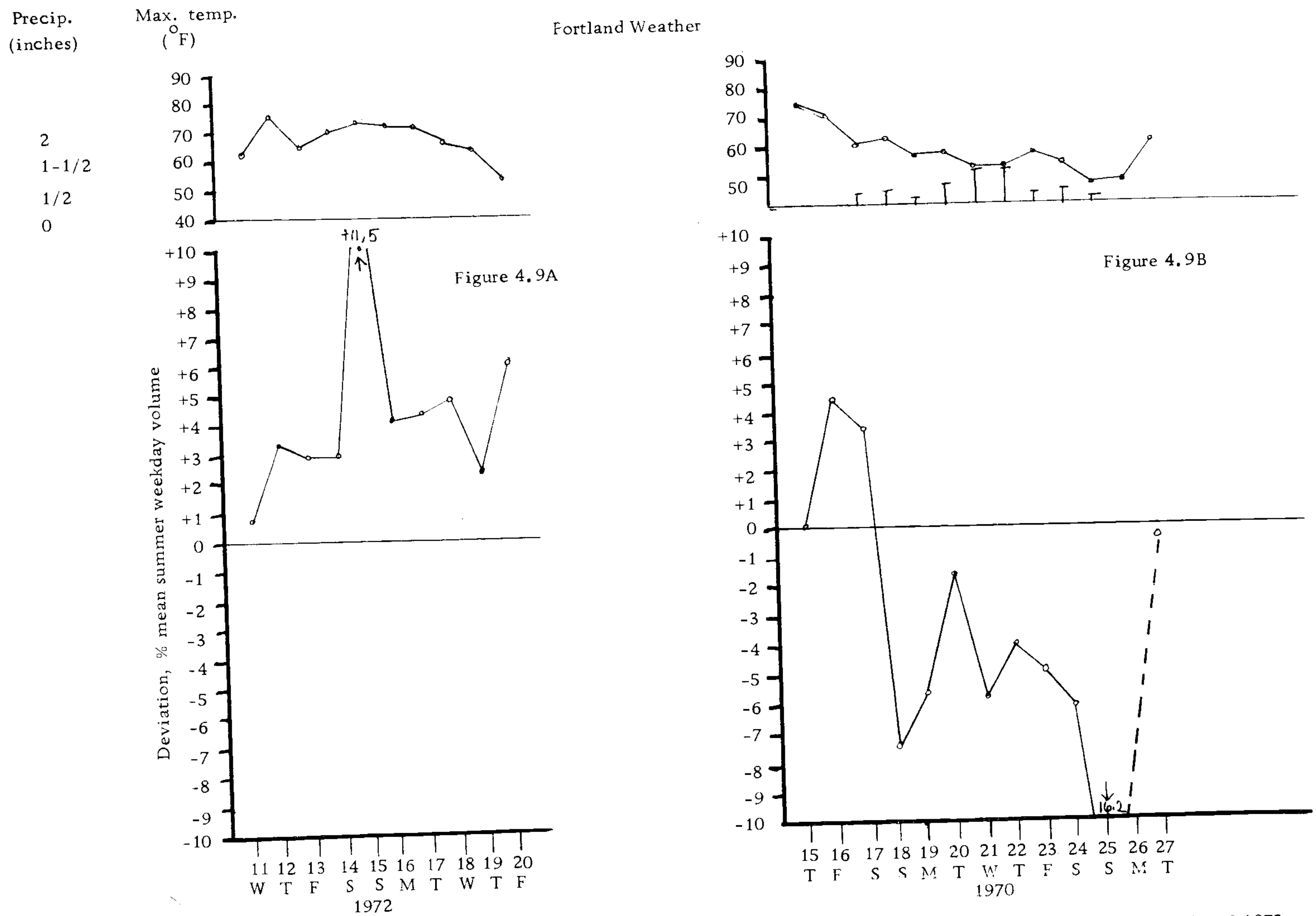

Figure 4. 9. Otter Rock. Deviation from normal traffic volumes during a warm-dry and cool-wet weather pattern in October, 1970 and 1972.

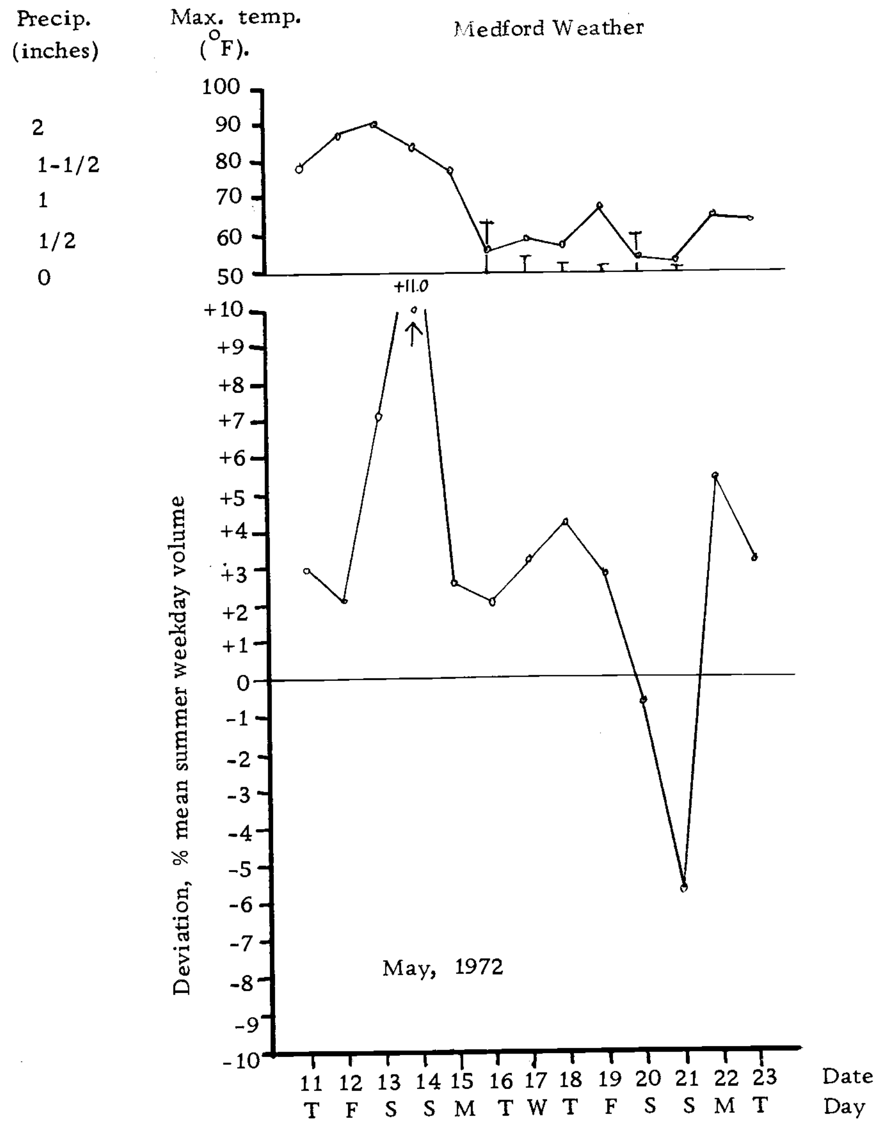

Figure 4. 10. Winchuck. Deviation from normal traffic volumes in response to warm-dry and cool-wet weather patterns in May.

reaching 90 degrees. On the corresponding days, traffic at Winchuck was above normal, decidedly so on the weekend. However, a cool, rainy stretch began on the 16th and lasted through the next Sunday. Weekday volumes during the rainy days remained above normal, but the weekend value was decidedly below normal. Thus, even on the South Coast, graphic analysis reveals relationships between traffic volumes and weather conditions.

The Effect of Weather on Motel Occupancy

The response of motel occupancy to weather conditions is not so marked as is the response of traffic volumes. However, a few diagnostic relationships are analyzed in the following section.

Seasonal Relationships. Figure 4.11 presents the daily percent occupancy at Lincoln City "A" motel for 1971. Portland weather conditions are also shown. It is immediately evident that the relationship between occupancy at this motel and weather conditions is subtle. However, certain features are noticeable. For example, the high occupancy at the end of July corresponds to a period of hot weather in Portland. It should also be observed that the warm, dry weather in early October was associated with a marked increase in weekday occupancy. Conversely, the effect of unsettled weather can be observed after the 25th of September when several days of rain and low temperatures produced an abrupt decrease in weekday occupancy.

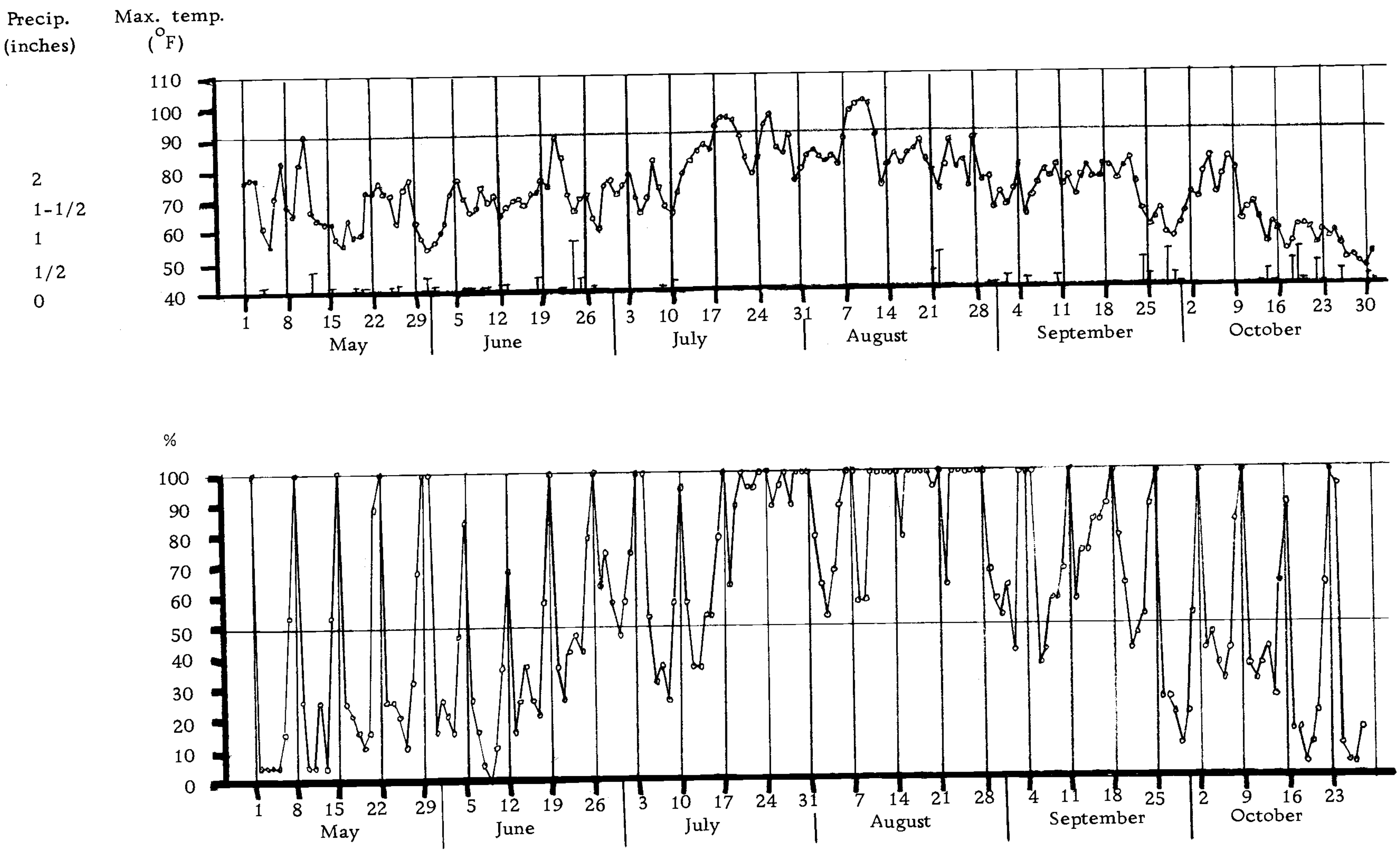

Figure 4.11. Lincoln City "A" (motel). Daily percent occupancy, 1971, and Portland weather conditions.

Weekends do not appear so sensitive to weather as do weekdays. Additionally, it seems that the post Labor Day is more sensitive, in terms of occupancy, than are other times of the season.

The effect of substantial rainfall during the height of the summer season cannot readily be seen from Figure 4.11. There was rain on the weekend of August 21 and 22, and occupancy on the night of the 22nd can be seen to have dropped relative to other days. Whether or not this was in response to the bad weather is uncertain. Sunday night frequently has the poorest occupancy along the coast during the summer season and, this being the beginning of the 17th week in 1971, the decline on Sunday night may be a response to declining tourist-recreation activity. However, in the summer of 1968, heavy rainfall occurred over a two-week period at the height of the season in August. At the motel shown in Figure 4.11, Lincoln City "A," occupancy did not decline at all during these weeks. Thus, it appears that poor weather at the height of the season does not influence motel occupancy to an appreciable degree.

Effect of Specific Weather Conditions. The effect of weather on motel occupancy under specific circumstances can be seen in Figures 4.12 and 4.13. Figure 4.12 demonstrates the response of motel occupancy at Lincoln City "A" to different weather patterns at the same time of the season. On the left, Figure 4.12A, the occupancy during the 18th week in 1971 and 1972 are contrasted. Portland

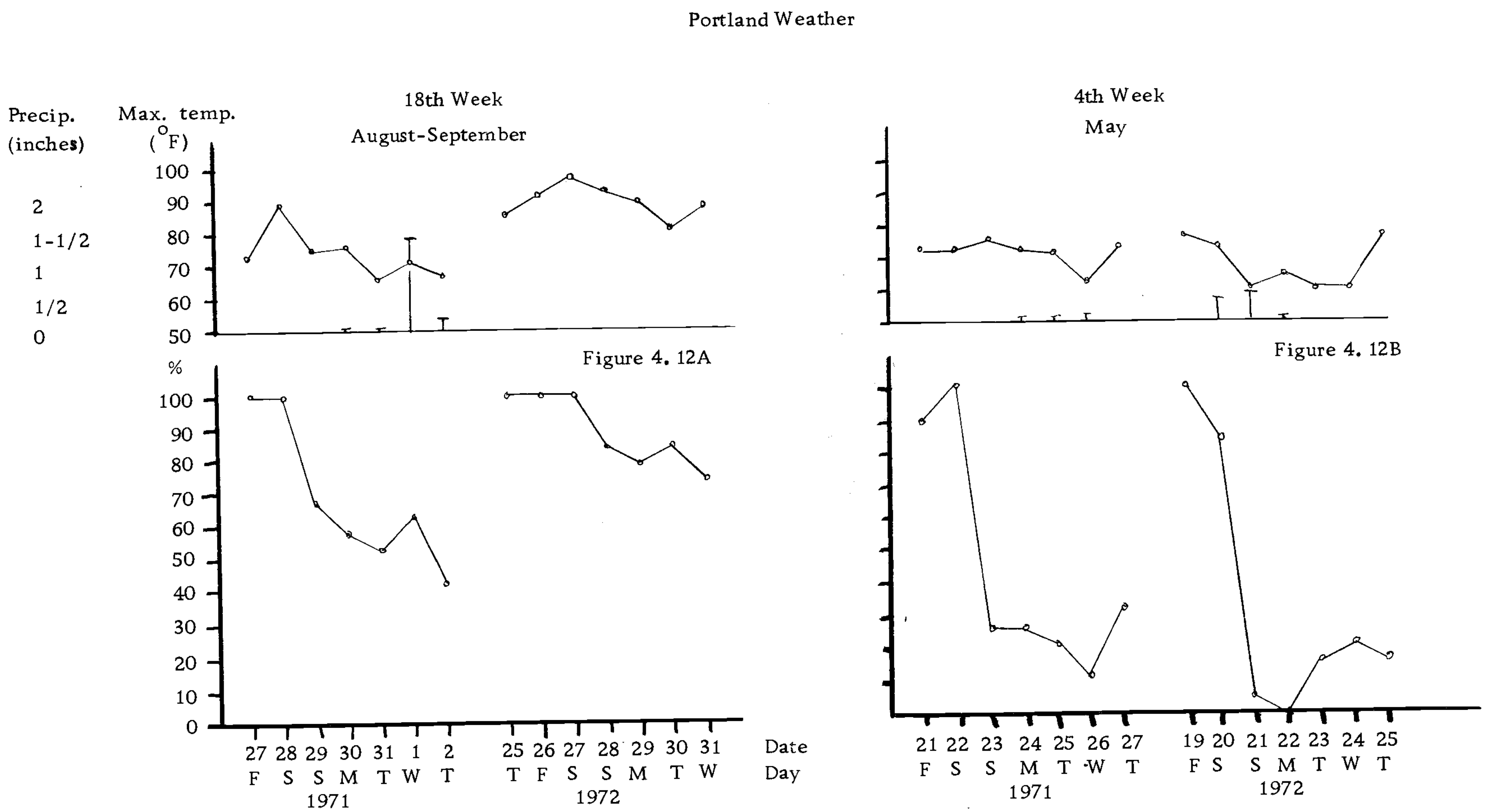

Figure 4. 12. Lincoln City "A" (motel). Daily occupancy during contrasting warm-dry and cool-wet weather patterns in the 18th and 4th weeks of the season.

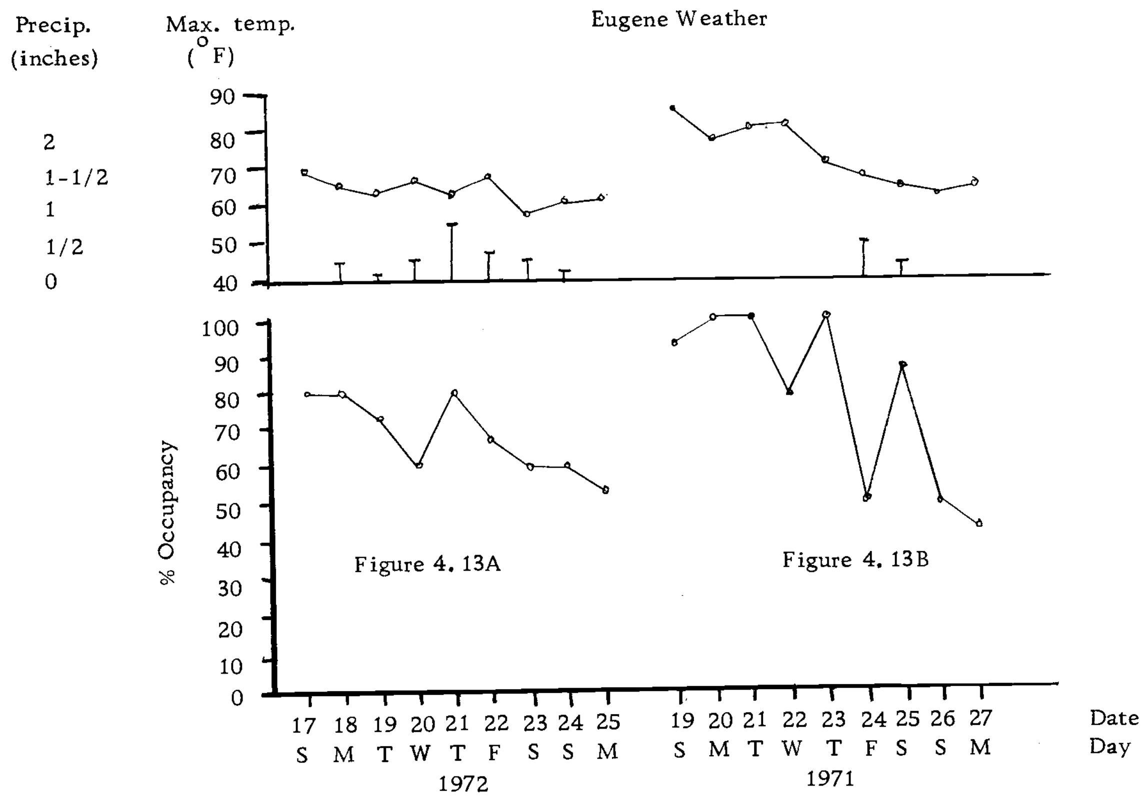

Figure 4. 13. Florence Motel Occupancy. Influence of contrasting cool, wet and warm, dry weather patterns during the 21st and 22nd weeks, 1971 and 1972.

weather appears at the top of the diagram. In 1971, the weather during this week turned rainy and cool, and it can be seen that occupancy dropped to around 50%. In 1972, however, the Portland weather was warm to hot with temperatures in the 80's and 90's. Occupancy throughout this warm week did not fall below 70%, a substantial increase from 1971.

Figure 4. 12B illustrates the effect of warm versus cool, rainy weather on occupancy at Lincoln City "A" in the spring. The period depicted is the fourth week of the 1971 and 1972 seasons, respectively. In 1971, temperatures on Friday and Saturday (the 21st and 22nd) in Portland were in the 70's, and motel occupancy increased from 90 to 100% on these two days. The following weekdays were cooler with a slight amount of rain, but occupancy rates at Lincoln City "A" were still generally above 20%. A notable exception was the 26th, when occupancy fell to about 10%, the coolest and rainiest day of the week in Portland. But, in 1972, rainy, cool weather began on the weekend and apparently caused Saturday occupancy to drop relative to Friday, an unusual condition. Saturday's occupancy was only 85% as opposed to Friday's 100%. With the continuation of cool, rainy conditions into Monday the 22nd, occupancy dropped markedly relative to 1971 and, on the 22nd, the motel (Lincoln City "A") had no rooms occupied at all. Later in the week, the rain ended and occupancy climbed back to levels comparable to those of 1971. As a

sidelight, the normal condition of very low weekday occupancy in May can be noted from Figure 4. 12A.

The main portion of the September sub-phase of increased tourist-recreation visitation is presented for 1971 and 1972 in Figure 4. 13. This figure diagrams occupancy at a Florence motel, Central Coast sector, during the 21st and 22nd weeks of the season. Weather data are for Eugene.

In 1972, Figure 4. 13A, the weather was chilly and wet with significant rain occurring on seven consecutive days. Occupancy declined from 80% on the night of Sunday, the 17th, to 60% by the following weekend, the 23rd and 24th. In 1971, however, the weather was better (Figure 4. 13B). From Sunday the 19th until Wednesday the 22nd, sunny weather brought temperatures in the 80's to Eugene and motel occupancy seemed to respond by running as high as 100% at the Florence motel. After the 22nd, however, the weather grew cooler and rain fell on Friday and Saturday, the 24th and 25th. Occupancy dropped to only 50% on Friday night, jumped to over 80% on Saturday, then fell again as the next week began. Thus, occupancy on the rainy weekend of the 24th-25th was 20 to 50% less than on the previous weekend. The conclusion can be that, in the Central Coast sector, good weather during the September sub-phase results in occupancy rates between 80 and 100%, whereas poor weather lowers this rate to around 50%--a difference that is of undoubted economic significance.

Conclusions from Analysis of Motel Data. Motel occupancy does not seem to be as strikingly responsive to changes in weather as are traffic volumes. Nonetheless, the effect of weather is detectable, as has been demonstrated in this chapter. In the Miracle Miles sector, and presumably on the North Coast as well, weekdays would seem more responsive to weather than weekends. In the Central Coast sector, however, this differential response is not so marked. Furthermore, the greatest impact of weather on occupancy appears to be in the autumn, that is, beginning in the week before Labor Day. Warm, dry weather during this period seems to result in substantially higher occupancy, especially on weekdays, whereas poor weather (cool, rainy) produces a correspondingly great reduction on occupancy. Thus, it can be speculated that the occurrence of bad weather during the September sub-phase, or the occurrence of an especially stormy autumn would have marked adverse economic impact on the motel industry. Conversely, good weather would have a positive effect, especially at times other than the already well developed September sub-phase.

Mid-summer appears to be unresponsive to weather conditions, occupancy remaining high regardless of either prolonged rain or heat waves.

Statistical Basis of Weather-Visitation Relationships

Demonstrative as graphic analysis may be in revealing broad relationships between weather and tourist-recreation visitation to the Oregon coast, this technique is not conducive to measuring the total magnitude of variation for all data points--there is too much material for complete visual assimilation. Nor can it provide a means for testing statistical significance of apparent observed correlations. Therefore, the entire body of data collected and utilized in this research was subjected to a more sophisticated analysis than could be achieved through graphic investigation alone. Use was made of the computer facilities at Oregon State University. The statistical technique and its results are discussed in Chapter V.

CHAPTER V

QUANTIFICATION OF RELATIONSHIPS BETWEEN WEATHER AND TOURIST-RECREATION VISITATION TO THE OREGON COAST

It has been demonstrated in Chapter III that the tourist-recreation season on the Oregon coast is characterized by considerable daily fluctuation in addition to well defined weekly and seasonal patterns. Chapter IV, through graphic analysis, emphasized the relationship between some of these daily variations and the existing weather conditions. In this chapter, the amount of variation in visitation that correlates with variability in weather is quantified.

Statistical Method

The Oregon State University computer facilities were utilized in the analysis of variation.[10] The technique employed was designed to remove the weekly cyclicity in the visitation data and correlate the residuals with selected weather parameters and seasonal trend. It was assumed that the density, i. e., daily visitation for each data source, had a seasonal trend, that it was dependent on both coastal

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[10] Use of the computer was supported by a grant from the Oregon State University Computer Center. The specific method of analysis and appropriate computer program was developed by Mr. Richard Erickson of the Department of Statistics, Oregon State University.

and interior weather conditions, and that this density had a weekly cycle. Based on these assumptions, the weekly cycle was removed by use of auto-regression with a seven day lag. With the weekly cycle thus removed, the residuals could be used as the adjusted density. Multiple regression was then run on the seasonal trend and on weather, both coastal and interior. The adjusted density was considered as the dependent variable with seasonal trend, temperature, and precipitation being independent. The most significant independent variable was selected by the computer and subjected to a standard F-test. Then, given the existence of the first variable, the one of next greatest significance was chosen, and so forth until all independent variables had been selected. As each new variable was selected, it was subjected to a partial F-test, that is, the significance of the contribution of the new variable in explaining variation in the adjusted density was tested.

What the Analysis Shows

This method of analysis determines how much of the total variability can be correlated to changes in the weather parameters once the weekly cyclicity is removed. It does not determine if this variability is greater on one day of the week than another, that is, if variation on Sunday, for example, explains most of the observed variability, or if the relative response to weather is essentially equal on all days of the week.

The method assumes that the response in coastal visitation to weather factors is essentially the same throughout the six-month summer season. However, graphic analysis indicates that such is not the case. Rather, it would appear that visitation response to weather is greater in May and after Labor Day than it is during the mid-summer period of July and August. Further analysis in which each phase of the tourist-recreation season would be analyzed separately might provide deeper insight into the problem of distribution of visitation variability at different times of the season.

Since it measures response to change in weather, not to absolute value, the statistical technique employed for this analysis is independent of seasonal climatic factors. However, it is quite possible that response to change in weather may increase or decrease beyond some as yet unidentified threshold. Thus, a temperature decrease of 10 degrees in mid-summer, when temperatures are in the range of 80 to 90°F, may produce little or no response from coastal visitation. But, a change of 10 degrees in October, when temperatures are lower, can mean the difference between physical comfort and discomfort to people, thus markedly affecting visitation.

Therefore, the quantification technique applied here measures only the total amount of adjusted variation for the entire summer and does not consider the additional complex variables of lag time in visitor response, unequal contribution to variation from different days of the week, or unequal contribution to variation in different phases of the tourist-recreation season. Each of these is a major problem in itself, but they are given some consideration at the end of this chapter.

Analysis of Quantification

The following section addresses itself to the actual quantification of the visitor data. For convenience, the results are summarized onto tables.

Variables

The dependent variables, after adjusting for weekly cyclicity, were traffic volumes, motel occupancy, and the various other forms of data utilized by this investigation. The independent variables were (1) maximum daily temperature at an interior location; (2) daily precipitation at an interior location; (3) maximum daily temperature at a coastal location; (4) daily precipitation at a coastal location; (5) the linear seasonal trend; and (6) the seasonal trend, days squared. These last two variables measure the importance of the seasonal trend, which is assumed to be explained by a quadratic equation. Variables (5) and (6) constitute the two parts of the quadratic equation. They will not be considered further in this analysis.

In the South Coast sector, three additional variables were added. These were the daily maximum temperature from three

California cities--Sacramento, San Jose, and Los Angeles--which were included in an attempt to measure the possible effect of California weather on visitation to the southern Oregon coast. The names of all other weather station locations used in this study are listed by sector in Table 5. 1.

Table 5. 1. Weather stations by sector.

Sector	Interior weather station	Coastal weather station
North Coast	Portland	Seaside
Miracle Miles	Portland	Newport
Central Coast	Eugene	Reedsport
South Coast	Medford	Brookings

Presentation of Data

Each sector of the coast is analyzed separately in the forthcoming discussion. Tables are included to summarize pertinent statistical information as well as the quantified weather-visitation.

North Coast. The weekly cycle explains more than 50% of the variability in traffic volumes on the North Coast and between 30 and 40% of the motel occupancy. No other forms of data were analyzed from the North Coast. Of the remaining variability, some 6 to 13% is correlated with changes in weather factors.

Two of the three traffic counters in the North Coast sector were subjected to analysis, Gearhart and Sunset Tunnel. The weekly cycle explained over 50% of the variability at Sunset Tunnel, but only a little over 3% at Gearhart. Such a low percentage is so far from other measured values on the coast that error must be considered as a possibility in this case. Of the remaining variability, Portland maximum temperature explained the greatest amount at both counters. The percentages, presented in Table 5.2, ranged from 6.62% at Gearhart to 12.82% at Sunset Tunnel. It would be consistent with logic to expect the higher percentage on the coastal access highway, as is the observed situation. In both locations, the percentages were highly significant at the 1% level. Other weather factors were of relatively minor importance, as can be seen from Table 5.2, generally accounting for less than 1% of the adjusted variability. Some weather variables were not statistically significant.

The measured percentages are very low. They indicate that, taking the entire six-month summer season as a whole, only some 7 to 14% of the adjusted variability correlates to changes in weather parameters. These figures apply to the variability remaining after the weekly cycle has been removed, so the amount of total variation explained by weather is even smaller than the indicated value. Comments on the sighificance of this relationship are made at the end of this chapter.

Motel data were analyzed from three motels, Seaside "A," Seaside "B," and Cannon Beach. Between 32 and 38% of the total

Table 5.2. Traffic volumes: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the North Coast sector.

Location	Independent variables	Percent variability	Significance test F-test	Significance test Partial F-test
Sunset Tunnel	Weekly cycle	57.45	755.92**	-
	Portland temp.	12.82	82.31**	-
	Portland ppt.	N. S.	-	-
	Seaside temp.	0.31	20.64**	4.64*
	Seaside ppt.	0.77	44.15**	39.14**
Gearhart	Weekly cycle	3.21	20.31**	-
	Portland temp.	6.62	43.37**	-
	Portland ppt.	N. S.	-	-
	Seaside temp.	0.08	13.83**	4.43*
	Seaside ppt.	N. S.	-	-

*Significant at the 5% level

**Significant at the 1% level

N. S. - Not significant

variability is due to the weekly cycle. Of the remaining variability, only about 10 to 15% is explained by weather changes. In all cases, Portland maximum temperature was the most important weather variable and its correlation with motel occupancy was highly significant at the 1% level. The percent variability in motel occupancy due to weather variables is summarized in Table 5.3.

Miracle Miles. Quantification of visitation data from the Miracle Miles sector with weather variables does not produce significantly different results from those found in the North Coast sector. At the traffic counters, again small but statistically significant amounts of variation correlated with weather, and the same was true of motel and other data.

Two traffic counters were used in this analysis, Otter Rock on U. S. Highway 101, and Valley Junction, on the coastal access road, Salmon River Highway. At both counters, the weekly cycle accounted for more than 50% of the observed variation and, of the remaining adjusted density, less than 15% correlated with weather changes (Table 5.4). Portland maximum temperature was the single most important weather variable, accounting for most of the total weather-correlated variation. The relationship with other variables was inconsistent, but the Portland temperature correlation was highly significant at the 1% level.

Table 5.3. Motel occupancy: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the North Coast sector.

Location	Independent variables	Percent variability	Significance test F-test	Significance test Partial F-test
Seaside "A"	Weekly cycle	31.88	322.74**	-
	Portland temp.	8.80	66.52**	-
	Portland ppt.	0.54	35.52**	31.39**
	Seaside temp.	0.05	23.76**	11.71**
	Seaside ppt.	N. S.	-	-
Seaside "B"	Weekly cycle	38.37	106.43**	-
	Portland temp.	12.95	25.43**	-
	Portland ppt.	N. S.	-	-
	Seaside temp.	0.25	10.63**	5.06*
	Seaside ppt.	2.69	15.77**	10.36**
Cannon Beach	Weekly cycle	33.33	258.65**	-
	Portland temp.	10.30	59.34**	-
	Portland ppt.	0.14	18.24**	4.34*
	Seaside temp.	N. S.	-	-
	Seaside ppt.	0.45	22.61**	6.63**

*Significant at the 5% level

**Significant at the 1% level

N. S. - Not significant

Table 5.4. Traffic volumes: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the Miracle Miles sector.

Location	Independent variables	Percent variability	Significance test F-test	Significance test Partial F-test
Valley Junction	Weekly cycle	50.05	652.95**	-
	Portland temp.	9.36	67.56**	-
	Portland ppt.	N. S.	-	-
	Newport temp.	0.60	27.59**	11.59**
	Newport ppt.	1.31	38.96**	29.37**
Otter Rock	Weekly cycle	57.82	789.43**	-
	Portland temp.	12.41	81.77**	-
	Portland ppt.	0.80	34.31**	14.43**
	Newport temp.	0.33	26.29**	8.02**
	Newport ppt.	N. S.	-	-

**Significant at 1% level

N. S. - Not significant

In general, a smaller percentage of total variation was a result of weekly cyclicity in motel occupancy than in traffic volumes. Values of this relationship ranged from 32 to 56% at the four motels analyzed. Of the remaining variability, generally less than 10% was correlated with weather. Portland maximum temperature was once again the factor accounting for most of the correlation, and this parameter proved highly significant at 1%. The amount of adjusted variability correlating with weather is summarized for the Miracle Miles sector motels in Table 5.5.

Of the other two data sources analyzed from the Miracle Miles sector, the Lincoln City Tourist Information Office showed correlations with weather that were consistent with traffic and motel quantities, that is, about 10% of the variation in adjusted density. Portland maximum temperature accounted for all of this correlation, the other weather variables not being statistically significant.

The gift shop, whose guest register was investigated for the daily number of signatures, proved to be useless to this portion of the investigation. No weather factor proved statistically significant in explaining the adjusted variability from the number of daily signatures. This is probably because the days of maximum visitation at the shop result in so much congestion that fewer people are able to sign the register. Additionally, there may be a tendency for people to take advantage of bad weather days to visit gift shops, thus actually

Table 5.5. Motel occupancy: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the Miracle Miles sector.

Location	Independent variables	Percent variability	Significance test: F-test	Significance test: Partial F-test
Lincoln City "A"	Weekly cycle	46.72	608.84**	-
	Portland temp.	8.75	66.53**	-
	Portland ppt.	N.S.	-	-
	Newport temp.	N.S.	-	-
	Newport ppt.	0.44	35.05**	31.72**
Lincoln City "C"	Weekly cycle	32.12	5.67*	-
	Portland temp.	7.24	13.35**	-
	Portland ppt.	0.35	7.00**	6.35*
	Newport temp.	N.S.	-	-
	Newport ppt.	N.S.	-	-
Lincoln City "D"	Weekly cycle	56.39	221.04**	-
	Portland temp.	7.56	14.00**	-
	Portland ppt.	N.S.	-	-
	Newport temp.	0.73	7.69**	6.32*
	Newport ppt.	N.S.	-	-
Newport	Weekly cycle	41.34	120.52**	-
	Portland temp.	10.70	20.54**	-
	Portland ppt.	N.S.	-	-
	Newport temp.	N.S.	-	-
	Newport ppt.	N.S.	-	-

*Significant at 5% level
**Significant at 1% level
N.S. - Not significant

increasing the tendency toward visitation on days when total coastal visitation may be reduced. The quantification of the Information office and gift shop is summarized in Table 5. 6.

Central Coast. Along the Central Coast sector, the weekly cycle seems to account for as much or even more of the total variability in tourist-recreation visitation than was the case in the more northerly sectors. However, it would also appear that the magnitude of variability on the Central Coast is less than in the Miracle Miles or North Coast sectors. Therefore, the actual proportion of visitations involved may be less.

At the Winchester Bay traffic counter, on U. S. Highway 101, more than 64% of the total variability is due to the weekly cyclicity. Of the remaining variability, about 8% correlates with weather changes. At Noti, on the access highway from Eugene, about 50% of the total variation in traffic volumes is due to the weekly cycle and 9% of the adjusted density is due to weather variations. In the case of both traffic counters, Eugene maximum temperature is the most significant variable in explaining unadjusted variation, and this variable accounts for most of the correlation (Table 5. 7). This continues the pattern observed from the Miracle Miles and North Coast sectors in which the maximum temperature at the interior weather station was the most important in correlating with visitation variability.

Table 5.6. Other visitation data: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the Miracle Miles sector.

Location	Independent variables	Percent variability	Significance test: F-test	Significance test: Partial F-test
Lincoln City, Tourist Information Office	Weekly cycle	55.06	209.61**	-
	Portland temp.	10.54	20.15**	-
	Portland ppt.	N. S.	-	-
	Newport temp.	N. S.	-	-
	Newport ppt.	N. S.	-	-
Gift Shop	Weekly cycle	37.41	414.47**	-
	Portland temp.	N. S.	-	-
	Portland ppt.	N. S.	-	-
	Newport temp.	N. S.	-	-
	Newport ppt.	N. S.	-	-

**Significant at 1% level

N. S. - Not significant

Table 5.7. Traffic volumes: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the Central Coast sector.

Location	Independent variables	Percent variability	Significance test F-test	Significance test Partial F-test
Winchester Bay	Weekly cycle	64.11	871.15**	-
	Eugene temp.	7.81	41.36**	-
	Eugene ppt.	N. S.	-	-
	Reedsport temp.	0.79	21.72**	8.71**
	Reedsport ppt.	0.40	16.89**	4.89*
Noti	Weekly cycle	49.26	458.29**	-
	Eugene temp.	8.31	42.74**	-
	Eugene ppt.	N. S.	-	-
	Reedsport temp.	0.45	15.25**	4.30*
	Reedsport ppt.	0.77	19.51**	7.71**

*Significant at 5% level

**Significant at 1% level

N. S. - Not significant

Motel occupancy in the Central Coast also seems to be somewhat more responsive to changes in weather than was the case in other sectors. At a Florence motel, where about 39% of the total variation was due to the weekly cycle, almost 19% of the remaining variability correlated with weather. Of this, most of it (16.98%) could be explained by changes in maximum temperature at Eugene. A second Miracle Miles motel supported the figures from the Florence motel, but a third motel did not. This latter, located between Florence and Waldport, exhibited unusually high occupancy rates and could only be investigated for one year. Thus, its correlations are probably not typical of the Central Coast sector. Motel correlations are summarized in Table 5.8.

Correlations were also determined between weather and daily variability in visitation at the Florence Tourist Information Office. More than 50% of total variability is due to the weekly cycle and only about 7% of the remaining variability correlates with weather--Eugene maximum temperature. No other weather parameters were significant, even at the 5% level. The weather correlations with this information office are summarized in Table 5.9.

South Coast. Less data were available for analysis from the South Coast than from any other sector. There was only one traffic counter in the area, but two additional sources of data were utilized.

Table 5.8. Motel occupancy: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the Central Coast sector.

Location	Independent variables	Percent variability	Significance test	
			F-test	Partial F-test
Florence	Weekly cycle	38.88	218.83**	-
	Eugene temp.	16.98	70.28**	-
	Eugene ppt.	0.47	22.09**	4.99*
	Reedsport temp.	1.93	32.01**	11.80**
	Reedsport ppt.	N. S.	-	-
Second Motel	Weekly cycle	41.18	119.67**	-
	Eugene temp.	16.24	33.14**	-
	Eugene ppt.	1.64	18.53**	15.12**
	Reedsport temp.	0.03	12.30**	6.12*
	Reedsport ppt.	N. S.	-	-
Third Motel	Weekly cycle	55.81	215.95**	-
	Eugene temp.	N. S.	-	-
	Eugene ppt.	N. S.	-	-
	Reedsport temp.	N. S.	-	-
	Reedsport ppt.	N. S.	-	-

*Significant at 5% level

**Significant at 1% level

N. S. - Not significant

Table 5.9. Other visitation data: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the Central Coast sector.

Location	Independent variables	Percent variability	Significance test: F-test	Significance test: Partial F-test
Florence, Tourist Information Office	Weekly cycle	53.85	236.98**	-
	Eugene temp.	6.76	14.72**	-
	Eugene ppt.	N.S.	-	-
	Reedsport temp.	N.S.	-	-
	Reedsport ppt.	N.S.	-	-

**Significant at 1% level

N.S. - Not significant

The Winchuck traffic counter on U. S. Highway 101 is located only two miles north of the California border and in a position to record not only the passage of people into the South Coast sector from California, but also the arrival of Oregonians who live in the interior region around Medford and Grants Pass. As can be seen, the weekly cycle accounts for about 57% of the total variability, a figure consistent with other sectors. Weather, however, is a very insignificant factor, and even the most important weather variable correlates with only a little more than 1% of the residual variation in traffic volumes. Correlations with California weather conditions are not statistically significant. Table 5. 10 summarizes the Winchuck statistical analysis.

The two other sources of data analyzed from the South Coast sector were the Tourist Information Office at Gold Beach and the visitor total from the reception desk at the Chetco Ranger District in Brookings. The results of the analysis from these other sources were dichotomous, when compared to other data, and suggest the possibility of error.

At the Gold Beach visitors Tourist Information Office, the weekly cycle only explains a little over 4% of the total variability (Table 5. 11), and Brookings' daily maximum temperature explains almost half of the remaining variability. The analysis also reveals that an additional 28% of the residual variability correlates with

Table 5.10. Traffic volumes: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the South Coast sector.

Location	Independent variables	Percent variability	Significance test: F-test	Significance test: Partial F-test
Winchuck	Weekly cycle	57.15	686.48**	-
	Medford temp.	0.52	26.92**	7.91**
	Medford ppt.	N.S.	-	-
	Brookings temp.	N.S.	-	-
	Brookings ppt.	1.20	34.60**	13.46**
	Sacramento temp.	0.82	22.70**	4.40*
	San Jose temp.	N.S.	-	-
	Los Angeles temp.	N.S.	-	-

*Significant at 5% level

**Significant at 1% level

N.S. - Not significant

Table 5.11. Other visitation data: Percent variability due to weekly cycle (total variability) and weather variables (adjusted variability) in the South Coast sector.[a]

Location	Independent variables	Percent variability	Significance test[b] F-test	Significance test[b] Partial F-test
Gold Beach, Tourist Information Office	Weekly cycle	4.02		
	Brookings temp.	48.96		
	Brookings ppt.	0.05		
	Medford temp.	27.76		
	Medford ppt.	0.04		
	Sacramento temp.	0.01		
	San Jose temp.	0.01		
	Los Angeles temp.	1.39		
Chetco Ranger District	Weekly cycle	0.10		
	Brookings temp.	59.06		
	Brookings ppt.	0.02		
	Medford temp.	0.04		
	Medford ppt.	0.63		
	Sacramento temp.	29.89		
	San Jose temp.	0.01		
	Los Angeles temp.	0.09		

[a] Data on this table are suspect. See text for explanation.

[b] All factors measured significant. Due to the strange results of these tabulations, the values of the significance tests have not been included as they are most probably meaningless.

changes in daily maximum temperature at Medford. Los Angeles' maximum temperature accounts for almost 2% of this remaining variability. Thus, assuming that an error has not occurred, visitation at the Gold Beach Tourist Information Office would seem to be highly correlated with weather factors with local coastal temperature the most important.[11]

Significantly, the Chetco Ranger District visitation has a similar pattern to the Gold Beach information office. A very small amount of the total variability is due to weekly cyclicity, less than 1%, and Brookings' maximum daily temperature is the most important weather variable, explaining 59% of the residual variation. California temperatures are not significant. The results of the statistical analysis are summarized in Table 5.11.

Comment on Results of Quantification

Several conclusions can be drawn from the statistical analysis presented in this chapter. An original hypothesis of this investigation was that weather conditions at locations other than the coastal sectors themselves were probably the most important in explaining weather related variability in tourist-recreation visitation. Quantification of

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[11] These results and the raw data from which they came were checked by the statistical consultant for a source of error. None could be found, but the dichotomous results should probably be discounted.

the relationship between weather and visitation proved this hypothesis to be correct. However, the small amount of variability that was found to correlate with changes in weather was an unexpected result of the investigation.

Summary of Correlations

With few exceptions the daily maximum temperature at the interior weather station proved to be the most important in correlating with visitation variability on the coast. Such a result corresponds to the conclusions of Paul (1972), who found that daily maximum temperature was consistently one of the most important factors in explaining variation in visitation to outdoor recreation facilities in Canada. The lack of variation due to coastal weather was not unexpected because the prevailing marine influence on weather conditions results in very little variability from day to day.

The measured correlations between precipitation and visitation was unexpectedly small--often, the correlation was not statistically significant. From graphic analysis, as discussed in Chapter IV, a greater correspondence with precipitation was anticipated. However, precipitation correlations are inherently difficult to detect and complicated by other factors. For example, the occurrence of precipitation during the summer season at interior locations in Oregon is almost always associated with a drop in temperature, thus providing two simultaneous factors for analysis. Also, in this research, actual precipitation amounts were utilized. A stronger correlation might have been found if the mere presence of precipitation alone had been utilized.

Amount of Variability Due to Weather. The amount of variability correlating to changes in weather during the overall tourist-recreation season is surprisingly small. In most cases, whether the measure of visitation be traffic volumes, motel occupancy, or some other source, not more than 15% of the residual variability after the removal of the weekly cycle can be correlated with weather. Since the weekly cycle generally explains from 30 to over 50% of the total variability, it can be seen that the impact of weather across the tourist-recreation season as a whole is very small. However, it would be a mistake to dismiss weather as a significant factor affecting coastal visitation merely on the basis of these figures. As demonstrated in the previous chapter on graphic analysis, the response in visitation to weather factors under specific circumstances can be quite considerable. Thus, although weather would appear to be a minor factor in explaining visitation throughout the entire summer season, it is probably very important on individual days.

Unequal Contribution by Day. The graphic analysis in Chapter IV indicates that variability is not equal on each day of the week, it being greatest on weekends. Furthermore, the graphs reveal that the effect of weather also is unequal, being again strongest on weekends. Thus, it would appear that much of the variability detected by this investigation and correlated with weather changes occurs on weekends. Such a concentration to specific days of the week means that the impact of weather can be quite noticeable on individual days. Additional research focusing separately on weekends and weekdays might be very revealing.

Effect of Phase of Season. To judge from the various graphs in Chapter IV, both total variability in visitation and the response to weather is greatest in the pre-Memorial Day and post-Labor Day phases of the tourist-recreation season, that is, in Phases I and IV. Thus, it would appear that the percent of variability explained by changes in weather would be larger than the values reported in this chapter during the early and late season, but the percent would be much smaller during the mid-summer period. Thus, although minor across the entire season, the effect of weather on coastal visitation appears stronger in certain phases. Further research should perhaps concentrate on specific portions of the tourist-recreation season rather than on the season as a whole.

Lag-time in Visitor Response to Weather. It can be assumed that there is a degree of sluggishness in the response of coastal visitation to weather factors. Very probably, the weather on a specific day may not have a measurable influence on visitation until some future day. For example, a sudden increase in temperature in Portland during July to above 90°F may not increase the number of visitors to the coast on that day. However, the next day may see an increase in visitation and not in temperature, a relationship not detected by this investigation. Furthermore, the response of visitation may be to prolonged weather conditions, that is, those which prevail for several days rather than for a single day. In this manner, a week of cool weather may result in decreased weekend coastal visitation, even if the temperature on the weekend rises to higher values.

The problem of detecting lag-time in visitation response to weather is also related to possible problems of unequal daily response. Thus, weather during the week may not have an impact on visitation until the weekend. Or, to further complicate the situation, weather on certain weekdays only may have an effect on weekend visitation.

Summary

The quantification of the variability of visitation on the Oregon coast with weather conditions substantiated an initial hypothesis that coastal weather itself plays a minor role and that the most significant relationships are with interior weather. However, the total variability explained by weather proved to be quite small. These figures, however, are not considered as diagnostic of the situation because of various factors. The inter-relationships between coastal visitation and weather conditions are obviously extremely complex. This investigation has served the purpose of quantifying the minimum variation that correlates with selected weather parameters for the principal tourist-recreation season in its entirety. This quantification indicates that, overall, weather is not a dominant factor. However, the research has also shown, through graphic analysis, that weather factors are indeed significant in individual circumstances and, very probably more important than the figures of quantification would suggest.

In light of the apparent discrepancy between the results of graphic analysis and the quantification techniques used in this chapter, further research would seem warranted. Such research should concentrate on differentiating the variability in coastal visitation between weekdays and weekends. It should investigate the effect of weather in each separate phase of the tourist-recreation season rather than consider the season as a whole. In addition, such research must be cognizant of the existence of possible "thresholds" in visitor response to weather. By this, it is meant that changes in weather conditions within certain limits would have little effect on recreation visitation to the Oregon coast whereas an equal change in weather conditions beyond those limits might have a great response in visitation. Thus, a change in temperature in Portland from 45 to 55 $^{\circ}$F in October may not have such an effect on visitation as would a 10 degree change of from 55 to 65°F. This type of threshold relationship should be investigated, as was done with significant results by Paul (1972) for certain outdoor recreation activities in Canada.

Finally, future research into the relationship between weather and tourist-recreation visitation to the Oregon coast must consider the possible lag-time in visitor response. It is believed that lag-time would increase the relationships as measured in this chapter.

Weather conditions do indeed influence recreation visitation to the Oregon coast. This has been demonstrated through graphic analysis and has been quantified with a high degree of statistical significance. The next problem, one which awaits future research, is to refine and re-examine these relationships with different statistical techniques or conceptual approaches.

CHAPTER VI

CONCLUDING OBSERVATIONS AND RECOMMENDATIONS

In our time of concern with "environmental quality," tourist-recreation industries are no longer so clearly considered to be desirable forms of economic activity by certain groups and individuals. They argue that tourist-recreation development draws large numbers of visitors and thus leads to overcrowding, air and water pollution, visual pollution through the construction of buildings and other facilities, and even the destruction of natural landscapes. In Oregon, it has even been suggested that the provision of public facilities for tourism costs more than the value of the revenue generated. In reply, defenders of the tourist-recreation industry point to the estimated more than $400 million spent in the state by tourists in 1972, a figure that multiplies to nearly 1.5 billion dollars in direct and indirect value (Travel Advisory Committee, 1972). Also, spokesmen for the tourist-recreation industry remind its critics that the basic pollution and environmental problems created are easily overcome and that recreation activity is a fundamentally clean source of revenue, especially when contrasted with heavy industrial activity. It is, then, not surprising to find that controversy now surrounds Oregon's tourist-recreation industry and will probably continue to do so for some time into the future.

It would appear, however, that all the pro and con arguments about tourist-recreation development in Oregon are academic. Since the state has no legal authority to prevent the visitation by non-residents, it can be assumed that Oregon's recreation resources will continue to attract large numbers of visitors. Furthermore, it is somewhat difficult to support the negative arguments of the critics of tourist-recreation development, even though they are correct when they point to the deterioration of aesthetic quality that can occur with some kinds of development, or when congestion lessens enjoyment of the recreation resource for everyone. The problem, however, would not seem to lie so much with the existence of tourism-recreation *per se* as with the lack of proper controls that apply to the activity. Properly controlled, a healthy tourist-recreation industry would be a boon to Oregon, or any other place, just as it has been to Switzerland and certain other areas of long-developed tourist trade. But, proper control requires understanding and, as Gunn (1972) indicated, the entire tourist-recreation system functions upon popularly held opinions and assumptions rather than upon the outcome of cool, objective investigation. No facet of the tourist-recreation system demonstrates this reliance upon assumption and opinion more than does the presumed role of weather. The purpose of this research was to investigate and quantify weather's role in affecting tourist-recreation visitation along Oregon's coast.

Research Results

Two fundamental facets of the tourist-recreation system on the Oregon coast were revealed by this research: (1) A delimitation of the normal day-to-day visitation throughout the summer season, and (2) the identification and quantification of relationships between visitation and weather conditions.

Normal Visitation

The assimilation of a large amount of visitation data revealed a consistent pattern, both weekly and throughout the season. Based primarily upon daily traffic volumes and motel occupancy information, supplemented by certain other sources, the normal day-to-day visitation to various sectors of the Oregon coast was determined. This normal visitation was discussed in detail in Chapter III.

Weekly Cycle. All of the visitation data show a strong weekly cyclicity, a not unexpected phenomenon in a society where most people are off from work on the same days. Thus, visitation on the Oregon coast is greatest on Saturday and Sunday, least on the weekdays, especially Tuesday, Wednesday, and Thursday. In the North Coast and Miracle Miles sectors, where the influence of the major urban centers of the lower Willamette Valley is strong, the weekly cyclicity is especially well developed. Traffic volumes on weekends are sometimes twice what they are on weekdays. The highways interconnecting the coast with Portland and adjacent urban centers also show increased traffic on Fridays as numerous recreationists leave the city after work for a weekend holiday.

In the Central Coast and South Coast sectors, however, the weekly cyclicity is much less evident. Traffic volumes on Saturday and Sunday are but little greater than on weekdays and, in some instances, even lower. This is undoubtedly due to the lack of major urban centers in proximity to the area. For that matter, the recreation hinterland of Portland and the lower Willamette Valley can be delimited with a good deal of precision merely by observing the relative proportion of weekend to weekday traffic along the various access highways and U. S. Highway 101. Otter Rock (permanent traffic recorder), between Lincoln City and Newport, exhibits the high relative weekend volumes that are associated with the influx of urban visitors. But, the traffic counter at Winchester Bay, in the Central Coast sector, does not have such a pattern, thus indicating that the Miracle Miles sector is within Portland's weekend recreation hinterland whereas the Central Coast sector is not.

Motel occupancy also has strong weekly cyclicity. Occupancy is greatest on weekends, Friday night being second only to Saturday. Sunday night, in contrast, seems to have the lowest occupancy of the week. This situation is probably due to the fact that neither recreationists nor "commercials" are away from home in large number on

Sunday evening. All sectors of the coast have weekly cyclicity in motel occupancy.

The other forms of data also illustrate cyclicity. In general, weekends again indicate maximum visitation. Some visitor information centers show decreased activity on weekends, especially Sunday, perhaps because weekend visitors already know where they are going and what they are going to do and don't seek information.

Seasonal Distribution of Visitation. The data generated by the research for this thesis suggest that day-to-day visitation to the Oregon coast during the six-month summer season of May through October has five phases. Phase I, the pre-Memorial Day period, lasts through the month of May, ending with the Memorial Day weekend. In general, weekday visitation is low but, with the exception of the South Coast sector, weekend visitation is high, probably because many people are anxious to engage in outdoor activity after Oregon's typically cloudy, rainy winter season. Weekday traffic volumes are well below summer means, but weekend volumes are high. Motels often have less than 20% occupancy during the week, but are full over weekends.

Memorial Day causes increased visitation, particularly in those sectors which are a considerable driving time from major urban centers. Thus, the Memorial Day weekend stands out strongly, especially in the South Coast sector.

Phase II, the period of increasing weekday visitation, begins after Memorial Day and lasts until the 12th week of the season, that is, about one week after the Fourth of July. Activity is low at the beginning of the phase, but increases steadily to high levels. Particularly low visitation characterizes the weekends following Memorial Day, but weekday visitation begins a steady increase immediately after that holiday.

Phase III, the height of the tourist-recreation season, commences with the 12th weekend and high visitation continues through the 17th week. This phase forms the height of the season. Visitation levels remain relatively constant throughout July, then increase abruptly in early August, the 15th and 16th weeks, to the highest values of the summer. Every sector of the coast, and virtually every measure of visitation, displays this apparently fundamental feature. An abrupt decline in weekday visitation during the 18th week, the days prior to Labor Day weekend, marks the end of Phase III and the transition into Phase IV.

Phase IV, the autumn decline, follows Labor Day, a holiday in which daily coastal visitation volume is popularly overestimated. The generally declining rates of visitation in Phase IV are interrupted by a brief subphase of increased activity in mid-September. This increase is probably the result of retired people vacationing after the main season. Visitation continues to decline throughout September and October, although the pattern of high weekend values continues in the North Coast, Miracle Miles, and Central Coast sectors. However, weekend visitation in this phase, particularly after the September subphase. is less than in Phase I.

Phase V, in which tourist-recreation visitation seems to reach the low winter level, begins after the middle of October. Actually, the beginning of this phase in about the 24th week could be used to define the end of the summer visitation season.

Relationship between Visitation and Weather

The visitation data generated by the research show that overall the weather appears to have only a small impact on summer season visitations to the Oregon coast, but that there is a marked influence on the daily basis. Graphic analysis reveals this correlation and it is substantiated by more sophisticated statistical techniques utilizing auto-regression and multiple regression analysis.

Graphic Analysis. Graphic analyais shows that visitation fluctuates considerably from day to day. Much of this fluctuation is due to weekly cyclicity, as has already been explained, but other variations can readily be seen to correspond to certain kinds of weather conditions. Thus, graphic analysis reveals positive fluctutations in traffic volumes on warm, dry days and negative fluctuations on cool, damp days. The response to weather appears to be strongest in Phases I and IV. Phase III seems particularly unresponsive. This lack of response in Phase III is probably because, in mid-summer, residents of Oregon do not expect poor weather to be especially severe or prolonged. Thus, they generally do not let weather deter them from planned activities. In spring and fall, however, weather conditions can be worse and, since people have other activity orientations at those times of year, the occurrence of bad weather has a greater impact on decision making vis-a-vis coastal visitation.

Conversely, so many people in summer plan on outdoor activities, that the occurrence of unusually hot weather does not markedly increase the amount of visitation. There is some increase, of course, but not as much as might be expected. This condition is quickly detectable from graphs showing visitation departures from normal during summer heat waves.

Graphic analysis of spring and autumn patterns indicates much greater response to weather, for reasons as speculated above. In these portions of the season, Phase I and Phase IV, bad weather seems to produce a marked decline in visitation. But, in contrast with mid-summer (Phase III), unusually warm weather creates an equally large positive response. In all sectors of the coast the response to weather would appear to be greatest on weekends.

It is, thus, from graphic analysis that the effect of particular weather patterns at particular times of the season can be easily revealed. Such analysis was described thoroughly in Chapter IV.

Quantification. When subjected to statistical analysis, the relationship between recreation visitation to the Oregon coast and weather conditions can be quantified. In this investigation, the amount of variability in visitation that correlates with selected weather parameters was measured. Through the use of auto-regression, the weekly cycle in the visitation data was removed and the residual density subjected to multiple regression analysis. The results from all coastal sectors indicated that from 7 to 17% of the adjusted variability was correlated with the weather. These correlations were, in general, highly significant at the 1% level.

In each sector, four weather variables were used for correlation with visitation data; daily maximum temperature and daily precipitation from an interior location, and daily maximum temperature and daily precipitation from the coastal sector itself. In most cases, where a weather factor was found to be highly significant in explaining variability, the daily maximum temperature from the interior location was the most important. Precipitation at either location and coastal temperature explained relatively little of the variability, if these factors were even significant at all.

The actual volume of visitations effected by weather is a function of magnitude of the variability in the data. Thus, for example, in places such as the Central Coast, where traffic volumes vary less than in more northerly sectors, the actual impact of weather would be less than in locations of greater variability.

In explaining traffic variability, weather appears more significant in the North Coast and Miracle Miles sectors than on the Central of South Coasts. In these sectors, about 10 to 12% of the variability correlates to weather, but only about 8% correlates on the Central Coast and even less on the South Coast.

Motel occupancy produces a different result, however. Motels in the North and Miracle Miles sectors have only about 8% of their adjusted variation correlated with weather, but a Florence motel has no less than 17%.

Types of visitation data other than traffic volumes and motel occupancy were not so useful in measuring the influence of weather. This is probably a result of various extenuating factors which can affect visitation at any of these other facilities. These factors have been discussed elsewhere in this investigation.

One feature that was not quantified was the possible unequal contribution to variation by different days of the week. In other words, not only does visitation vary on a weekly cycle, but the variability itself may fluctuate. This condition could mean, for example, that almost all of the measured variability correlating with weather is a result of large discrepancies on weekends and little variation on weekdays. Conversely, it may be that certain weather conditions lead to large discrepancies and that variability due to weather in these situations may be far larger than the percentages determined in Chapter V. The investigation of these possible biases in variation would prove to be very useful and would serve to refine and upgrade the findings presented here.

Additionally, it appears logical that the response in tourist-recreation visitation to weather conditions would not be instantaneous, but would, rather, lag over a period of one to several days. In other words, the weather during the preceding week may be very significant in effecting the decision on the part of recreationists to go to the coast or, from the other viewpoint, to leave the coast and go home. An inspection of the graphs presented in Chapter IV would seem to indicate the presence of such a lag, but the quantification technique used in Chapter V did not test for this relationship.

It is also possible that the variation due to weather is concentrated in one part or another of the six-month season. Thus, although from 7 to about 15% of the adjusted variability correlates with weather for the summer as a whole, it may be that most of this correlation is a result of larger relationships in May, September, and October, with correspondingly smaller relationships in July and August.

Under any circumstances, this investigation has demonstrated a small but significant relationship between weather and overall tourist-recreation visitation to the Oregon coast. Graphic analysis reveals the nature of this relationship and, with multiple regression analysis, its total impact on variation has been quantified.

Suggested Further Research and Applications

Several lines of potential inquiry present themselves as a result of this research. The use of weather parameters other than maximum daily temperature and rainfall might reveal additional, more significant relationships between weather and the coastal recreation visitation. In particular, the use of hourly precipitation data could increase the significance of the precipitation variable in explaining variation due to weather. Furthermore, an analysis of the daily and seasonal organization of this variability, as described elsewhere in this chapter, might be revealing.

One further source of information that was unavailable for utilization in this study was economic data. Such information might prove difficult to obtain, but it would provide significant results if revenue were indeed found to correlate with weather conditions. For example, the register at the Miracle Miles gift shop was not found to be a reliable indicator of visitation, but the revenue from that shop probably would have been.

It would be useful to investigate the relationship between tourist-recreation visitation and weather conditions during the winter season; that is, to extend the current research into the other half of the year. Visitation to the coast is much less during the winter months, but not necessarily less significant economically to the tourist-recreation industry. It may be that the winter trade, reduced though it is, provides the extra revenue needed to carry a seasonally-oriented industry through the entire year. Fluctuations in winter trade, then, could be an important area of research.

The traffic information summarized in Chapter III may well be useful. The development of normal daily traffic volumes as a percent of the mean summer weekday volumes is a technique giving flexibility to traffic data. Through the use of regression analysis, or other statistical techniques, weekday volumes can be predicted for future years with reasonable accuracy. Utilizing the normal percentage values presented on the graphs in Chapter III, actual traffic volumes can be anticipated for any day during the summer of future years. Such information should prove highly useful to agencies concerned with traffic flow because it would allow days of potentially great volume and congestion to be predicted. Furthermore, the traffic volumes under various weather conditions can also be anticipated by using the graphic relationships developed in Chapter IV or the quantified correlations from Chapter V.

EPILOGUE

Man is a biological phenomenon, though there are times when he appears all to ready to ignore this. Given a highly technological culture, it becomes easy to disassociate man from the physical influences of the environment. Yet, as has been shown in this investigation, even something which is considered so prosaic as daily weather has a quantifiable influence on human activity.

It must be assumed that man will continue to face his physical environment and, in the future, obstacles to the march of civilization will develop. Whether these obstacles come directly from "nature" itself, or whether they arise from man's biological weaknesses and apparent inability to overcome himself, is a question of only academic interest. From a practical viewpoint, man can move only in two directions, forward or backward. Those people who are most successful at overcoming themselves and their environment will advance, and thus advance all of mankind with them. Those who are least successful will fall into the backwaters of history. Perhaps, at some distant time, Nietzsche's dream of the <u>Übermensch</u> will become a reality. Until then, Man and environment will continue to interact with each other, and it is from this interaction that the course of civilization will be determined.

> . . . no nation can ever go any great distance independently of the geographic environment, but everywhere each of them

can move faster and more safely in proportion to the degree to which man's cultural achievements overcome the difficulties imposed by nature. And, finally, the ultimate fate of. . . each nation depends on the quality of people concerned.

Ellsworth Huntington
(Mainsprings of Civilization)

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