

This appendix provides information about historic visitor counts in Glacier National Park, compares these historic figures with other national parks, and provides forecasts of future visitors to Glacier over the next twenty years. The information was also used as a foundation for the *Going-to-the-Sun Road Socioeconomic Study*.

Historic Visitor Estimates: Glacier National Park

Glacier has been open to the public and keeping visitor counts since 1911. Over its 89-year history, visits to Glacier have increased at an average annual compound rate¹ of 7.1 percent. The average of annual increases² is 11.4 percent. A comparison of these calculations indicates that the years where there was a positive change in visitor numbers were more or greater than the years in which there was a negative change in visitor numbers. Fluctuations in annual visitors have been significant in some years, as illustrated in Figure G-1. Some major events, which explain some of the more significant fluctuations in visitors, are noted on the graph. These include local

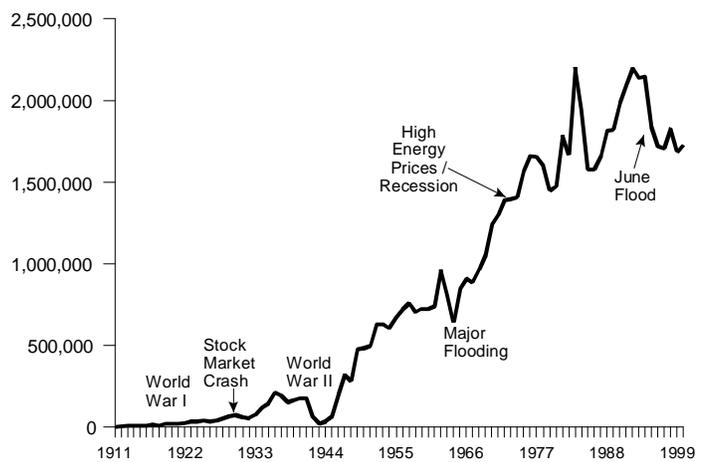


Figure G-1: Visitors Entering Glacier National Park

1. This calculation estimates the rate of change using the first year as the present value and the last year as the future value. It does not use any intermediate year data in the calculation.
2. This figure calculates each annual change in visitors and then averages the annual changes.

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conditions, such as a flood; national circumstances, such as the stock market crash of 1929 and years of high energy prices and recession in the late 1970s; and international circumstances, such as World War I and World War II.

The quantitative relationship between the national or international event and changes in visitation may not be as straightforward as it appears because multiple positive and negative influences may be in effect during the same time period. History has generally shown that the troughs in visitation have been followed by new highs.

Visitors To Glacier National Park Average Annual Compound Rate of Change	
Time Period	Avg. Annual Compound % Change
89 Years (1911-2000).....	7.1%
Last 50 Years (1950-2000).....	2.6%
Last 25 Years (1975-2000).....	0.4%
Last 10 Years (1990-2000).....	-1.4%

It is reasonable to expect that the average annual compound rate of change would decrease over time as the number of visitors increase. Over 89 years, visitation increased at an average annual compound rate of 7.1 percent; this is from a base year of 4,000 visitors. Over the last fifty years (1950 through 2000) the average annual compound rate of

changes was 2.6 percent; over the last 25 years (1975 to 2000), the rate of change was 0.4 percent; over the last decade (1990 to 2000), the average rate of change was minus 1.4 percent.

Reporting Methodology

The NPS has been preparing visitor estimates on a monthly basis for a number of decades. Their more recent estimates include calculations for recreation and non-recreation visitors, recreation and non-recreation visitor hours, and overnight stays. This appendix focuses on visitor estimates. A brief definition of terms used in the NPS visitor estimates is presented below.

Table G-1: Definition of Terms, National Park Service Visitor Estimates

Name	Definition
Recreation Visitor	A visitor is one person entering the park for one day or a portion of one day. Recreation visitors include all visitors except for those traveling in non-recreation vehicles. The National Park Service uses the terms “visits” and “visitors” interchangeably.
Non-Recreation Visitor	These are people traveling in a non-recreation vehicle.
Non-Recreation Vehicle	These are vehicles that are owned by in-park (inholder) land-owners, tradesmen and delivery services, and employees of federal agencies except the NPS.
Non-Reportable Vehicles	These are vehicles owned or operated by NPS families, on-duty NPS staff, employees working for NPS contractors, and all concession employees.

Most visitor estimates are calculated as a multiple of vehicles entering one of ten entrances. Recreation vehicles are converted to recreation visitors by applying a persons-per-vehicle (PPV) multiplier of 2.9. To these calculations, the following additions are made:

- **Bus passengers.** At attended entrances, these are determined by asking the bus driver how many people are on his/her bus. At non-attended entrances, buses are counted as recreation vehicles; bus passengers are not (cannot be) counted. There are likely to be very few buses at non-attended entrances.
- **Bicyclists.** At attended entrances, these are determined by park ranger observation at the gate. At non-attended entrances, bicyclists are not counted.

More specific methods used to calculate visitors at each park entrance are described below:

Ranger-Attended Entrances such as West (Apgar), Many Glacier, Two Medicine, and St. Mary Entrances. Visitors through these entrances comprise about three-fourths of all visitors. An inductive¹ loop for counting traffic is located in the entrance lane or lanes. During the hours that the gate is attended, which vary according to location and time of year, vehicular traffic counts are recorded automatically and then reduced manually by the number of bicycles, non-reportable vehicles, non-recreation vehicles and duplicate re-entries. These reductions are determined by responses to questions that the park ranger asks at the gate. Reduced traffic counts are converted to visitors by applying a PPV multiplier of 2.9.

When the gate is unattended, the traffic count is not reduced; all vehicles are assumed to be recreation visitors. The number of non-reportable vehicles and non-recreation vehicles are likely to be low after 4:30 p.m. and before 8:00 a.m.

Camas and Polebridge Entrance. An inductive loop traffic count is located on the park side of the entrance lane. Traffic counts are converted to visitors by applying a PPV multiplier of 2.9. The Polebridge entrance is ranger-attended during portions of the year.

Walton Goat Lick. A pneumatic tube traffic counter is located at the viewing area on the entrance and exit lanes. The traffic count is reduced to adjust for vehicles entering and exiting and for duplicated axle counts. Traffic counts are converted to visitors by applying a PPV multiplier of 2.9.

Chief Mountain Customs Border Crossing. The number of visitors entering the park at the customs station is counted directly by the U.S. customs official. Each new entry is considered a new park visitor. There are no downward adjustments for duplicate entries within a single day.

Waterton (Goat Haunt). The number of visitors from private boats and shoreline cruises are counted directly by the concession operator.

¹ This is a traffic counter that is buried in the roadbed. It counts traffic on an hourly basis.

Historic Visits: Glacier National Park in Comparison with Others

To provide some additional perspective, this section compares historic visitor numbers to Glacier with historic visitor numbers at all national parks and with historic visitor numbers at Yellowstone National Park because it is the closest and most comparable facility in the NPS system. The purpose of these comparisons is descriptive only. There is no intended implication that figures for Glacier should have been different from what they are.

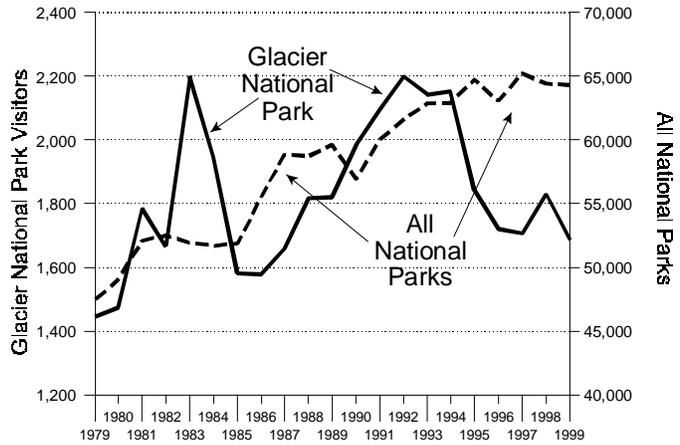


Figure G-2: Visitors to Glacier and All Other National Parks
(Measured in Thousands)

As illustrated in Figure G-2, over the last 20 years visitors to Glacier National Park ranged from about 1.4 million in 1979 to about 2.2 million in 1983 and 1992, and increased at an average annual compound growth rate of 0.8 percent.

During this same time period, visitors to all national parks ranged from about 47.5 million visits in 1979 to about 65.3 million visits in 1997. Annual fluctuations have been less severe since the total figures are not subject to changes from single environmental events and are in a wide range of urban, rural and remote locations throughout the country. Visits to all national parks increased at an average annual compound rate of 1.5 percent between 1979 and 1999.

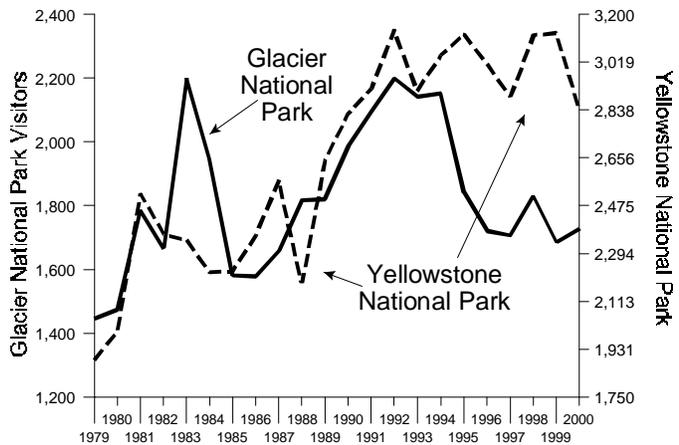


Figure G-3: Visitors to Glacier and Yellowstone National Parks
(Measured in Thousands)

Figure G-3 compares visitor estimates from 1979 through 2000 (21 years) for Glacier National Park

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and Yellowstone National Park. During this 21-year time frame, visitors at Glacier increased at an average annual compound rate of 0.9 percent per year; visitors at Yellowstone increased at an average annual compound rate of 1.9 percent per year. Visitation tracked somewhat similarly until the 1990s when Glacier experienced some significant flooding problems (1995).

In 2000, Yellowstone experienced a ten percent reduction in visitors from the prior year due, in part, to visitor concerns about forest fires. In 2000, Glacier experienced a 2.6 percent increase in visitors over the prior year.

Figure G-4 compares visitor estimates of Glacier and Yellowstone National Parks from a different perspective. The graph extends from 1911, the year Glacier National Park opened, through 2000. Both sets of visitor data are displayed on the same scale on the vertical axis; this presentation highlights the volume of visitors at each park more easily. For many years, both parks seem to have experienced similar increases and decreases in response to the same national or international events, such as the two world wars and the energy crisis of the 1980s. During the 1990s, however, Glacier experienced a decrease in visitation relative to Yellowstone National Park.

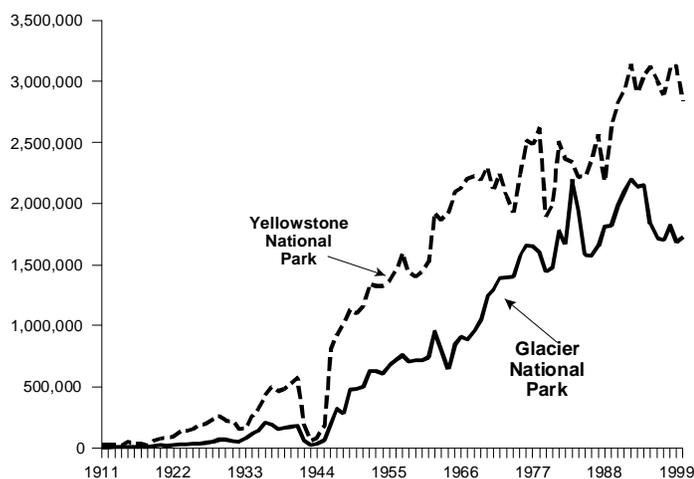


Figure G-4: Visitors, Glacier and Yellowstone National Parks

Visitors to Glacier & Yellowstone National Parks Average Annual Compound Rate of Change		
Time Period	Glacier	Yellowstone
89 Years (1911-2000)	7.1%	5.6%
Last 50 Years (1950-2000)	2.6%	1.9%
Last 25 Years (1975-2000)	0.4%	1.0%
Last 20 Years (1980-2000)	0.8%	1.8%
Last 10 Years (1990-2000)	-1.4%	0.1%

A comparison of Glacier and Yellowstone average annual rates of change during the last ten, 20, 25, 50, and 89 years are summarized above. Over the last 50 years, Glacier National Park visitation increased at an average annual compound rate of growth of 2.6 percent while Yellowstone increased at a rate of 1.9 percent per year. In more recent decades, Glacier’s rate of change has been below Yellowstone’s rate of change.

Socioeconomic Indicators Affecting Visitor Forecasts

The National Park Service Social Science Program has identified and developed information about socioeconomic factors that impact visitor counts, visitor demographics, and park resource management. This section excerpts from the report *Discovery 2000*, which was prepared for the National Park Service General Conference, September 2000 by the Social Science Program.

While these factors have not been used directly in the forecasts presented below, they provide a good perspective on the relationship between changes in the socio-economic climate and their potential impacts on park visitation and underlie the qualitative portions of the visitor development strategy and the analysis of direct visitor impacts. The indicators are grouped into five general categories: Demography, Technology, Economics, Environment, and Culture. This section introduces the indicators that are expected to have an impact on visitor counts and visitor demographics, describes anticipated trends, and outlines their relevance to park visitation.

Table G-2: Summary of Key Social & Environmental Indicators
Excerpted from *Discovery 2000*, NPS Social Science Program

Indicator	Trend	Significance to Park Visitation
Demography		
General Population & Households	Population in the US will increase 8.9% and households will increase 12.3% during the next ten years.	As the US population increases, so will visitation to national parks, generally. The impact on individual parks is a more complex function of multiple factors.

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Indicator	Trend	Significance to Park Visitation
Younger Population	During the next ten years, youth (5-17) will increase by only 1% while young adults (18-29) will increase by 12.4%. The proportion of youth will decline; the proportion of young adults will remain relatively constant.	The presence of children in visitor groups can influence activities of the entire group. Youth and young adults are often the focus of many visitor services such as park interpretive programs, recreation activities, facilities, and concessioner marketing.
Older Population	Americans aged 55 or older are expected to be the fastest growing demographic group during the next decade, as they will increase by 27.7%.	Those 55 and older have more leisure time and financial stability than other age groups. Many are park enthusiasts. They have unique recreational behavior and consumer spending patterns that often require special attention.
Ethnic Diversity	The five major race or ethnic groups in the US will experience varying degrees of population growth. Rapidly growing groups during the next ten years include Hispanics, 39.3% increase; Asians, 40.7% increase; and Native Americans, 21.7% increase.	Individual racial and ethnic groups have unique park visitation rates and may engage in different recreational activities.
Life Expectancy	Average life expectancy for males and females continues to increase.	Longer life expectancy will increase the size and relative proportion of America's older population. This may increase overall visitation and may influence demand for specialized activities, facilities, and visitor services.
Disabled Population	The number of disabled Americans is expected to increase by 1.5 million over the next ten years. Their proportion of the total population will increase slightly from 1.4% to 1.7%.	The number of disabled visitors to park service facilities is likely to increase. They require special access to facilities and may participate in unique recreational activities.
Technology		
Motor Vehicle Gasoline Consumption	The consumption of motor vehicle gasoline is expected to increase by 5% during the next ten years unless gasoline prices deter driving patterns.	Increasing oil prices may decrease automobile fuel consumption and particularly affect short-term visitation to national parks. Long distance travel may not be economically practical for certain user groups.

Socioeconomic Indicators Affecting Visitor Forecasts

Indicator	Trend	Significance to Park Visitation
Personal Vehicle Ownership	The number of automobiles and light trucks/SUVs are expected to increase by 14.4% and 12.6%, respectively, over the next ten years. These rates are 40% to 60% higher than the general population growth.	New technologies, changes in disposable income, and consumer interest rates are improving affordability of personal vehicles. Increased personal vehicle ownership adds to the existing challenge of accommodating vehicles in national parks.
Recreational Vehicle Use	RVs include motor homes, travel trailers, fifth-wheels, campers, and van conversions. The percent of households owning RVs is expected to increase from 2.3% to 3.1% over the next ten years. Newer technology is lowering the cost of RVs and increasing fuel efficiency. The aging population may increase RV purchases.	Accommodation of larger, slower vehicles adds to traffic congestion. Development of RV services, such as campsites, parking, dump stations, and hookups as well as accessible roads impact park resources and budget.
Internet Access & Email Use	Use of internet and email to exchange information is expected to increase 48.9% during the next ten years. Households with internet access is forecasted to increase from 45 to 67 million.	Use of the internet and email services is changing the way Americans access information regarding trip plans, park recreation opportunities and facilities, and visitor service information. It can be used to improve public awareness and participation about park uses.
Air Travel	Air transportation is becoming a more affordable means of vacation travel. Air travel in the U.S. in the next ten years is expected to increase 37.4% from 487 to 669 billion passenger miles.	Air travel allows for vacations to be taken far from home. The relative price of air travel to different park gateways may impact visitation more heavily than in the past. As more visitors arrive by air, alternative road transportation needs will increase.
Economics		
US Workforce	By 2008, the composition of the American workforce will be different from today. Workers between 16 and 24 will increase by 15.1%, workers between 25 and 54 will increase by 5.1% and workers 55 to 64 will increase by 47.4%.	These workforce changes may reflect changes in relative spending power, including spending for leisure, recreation, and park visitation.

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Indicator	Trend	Significance to Park Visitation
Telecommuting	The percent of the U.S. workforce telecommuting from home is expected to increase from 5% to 20% during the next ten years.	The ability to work at home may allow more people to move closer to parks. Freedom in work schedules may also allow more leisure time for recreational activities.
Federal Budget	The prosperity of the 1990s and fiscal policy has produced a federal budget surplus which is projected to grow over the next ten years.	An increased budget surplus may provide more funding opportunities for the NPS that improve access to or visitation information about park services.
International Visitors to the US	International visitation to the US is increasing significantly from an estimated 51.5 million in 2000 to 102.0 million in 2020, an increase of 98.1%.	Foreign visitation accounts for an increasing portion of people visiting the National Park System. Accommodating international visitors requires changes in interpretive media and information services.
Environment		
Wilderness, Undeveloped Land, and Intensively Developed Areas	Over the next decade, there will be changes in the American landscape. The amount of acreage in wilderness and extensive roadless areas and undeveloped areas near roads is forecasted to decrease by 6% to 8% while the amount of acreage in intensively developed areas is forecasted to increase by 7%.	A decrease in wilderness and undeveloped land is likely to increase pressures on existing parks with similar values. The wilderness environment within parks will become a more rare and desirable vacation experience.
Global Temperature Change	The buildup of greenhouse gases has and will continue to cause a gradual increase in global temperature. Between 1990 and 2010, the global mean temperature change is expected to increase 0.8 degrees Celsius.	Further increases in global temperature can alter rainfall patterns, vegetation types, habitat suitability, and species' home ranges. These conditions can directly impact the quality of the natural environment within national parks.
Culture		
Education Level	The number of Americans attaining education degrees is increasing more rapidly than the general population. High school degrees will increase by 20.2%; bachelor's degrees by 8.9%; master's degrees by 10.9%.	Education level is an important consideration in park management activities such as marketing, the design of interpretive information, and outreach programs.

Indicator	Trend	Significance to Park Visitation
Annual Leave Days	Many employers are increasing the number of annual leave days they provide workers. Some research suggests that the average annual leave days will change from 10.2 days in 2000 to 30 days in 2030.	As workers are granted more personal leave time, visitation to national park sites may increase. Visitation to park sites in more remote locations might increase more rapidly, as workers can put together longer vacation schedules.
Outdoor Recreation	There is a continuing upward trend in outdoor recreation trips away from home. Between 1995 and 2009, cross-country skiing, day hiking and backpacking trips are expected to increase by 30%; bicycling trips by 27%, visiting historic sites by 21%; photography trips by 20%; and visiting museums and sight-seeing by 19%.	Many of these activities are available in national parks. Recreational activities have varying impacts on natural resources and require unique park facilities, services, interpretive media, and regulations.
Global Amusement and Theme Park Visitation	Amusement and theme parks are projected to grow by 38.2% during the next ten years.	Competition for disposable income and how money is spent may impact national park visitation. Experiences at amusement and theme parks may also alter visitor expectations when visiting national parks.

State of the Art in Forecasting Visitors to National Parks

As described above, many reasons why visitation to national parks fluctuates are due to unpredictable circumstances, such as the stock market crash, world wars, the energy crisis, and park-specific natural events such as flooding and fires. Because of this condition, forecasting future visitors is very difficult.

The Public Use Statistics Office of the NPS does forecast visitation for two years in the future using a regression model that employs prior visitation statistics for the last five years, the annual amount of visitor fluctuation and derivative mathematical calculations using this information. The National Parks Conservation Association recently retained the services of a statistician to develop ten-year forecasts for all NPS civil war sites. This analysis is currently in internal review and will be released soon.

Appendix G: Visitor Use Trends and Forecasts

The NPS Social Science Program is unaware of any other significant work on visitor projections other than the analyses referenced above. The focus of the Social Science Program is to help park managers understand the relationship of socioeconomic factors and their potential influence on visitation rather than on quantitative forecasts. An example of its work, *Discovery 2000*, is summarized above.

Forecasts for Glacier National Park: 2001 – 2020

This project requires the development of visitor forecasts that extend through the anticipated Going-to-the-Sun Road rehabilitation plus several years. Since it is uncertain how many years the Road may be under construction, we have elected to develop forecasts for 20 years.

Dr. Thomas Obremski, Associate Professor of Statistics, University of Denver, has developed the forecasts presented below. Dr. Obremski is also retained by the National Park Service to develop short-term forecasts for all national park sites throughout the country. His analysis follows.

Dr. Obremski examined historic monthly data for 22 years: 1979 through 2000. There are no statistically significant trends, upward or downward. While there is a recent upswing in visits in the winter months over the last six years, this is heavily counterbalanced by a downward trend in visits in July and August.

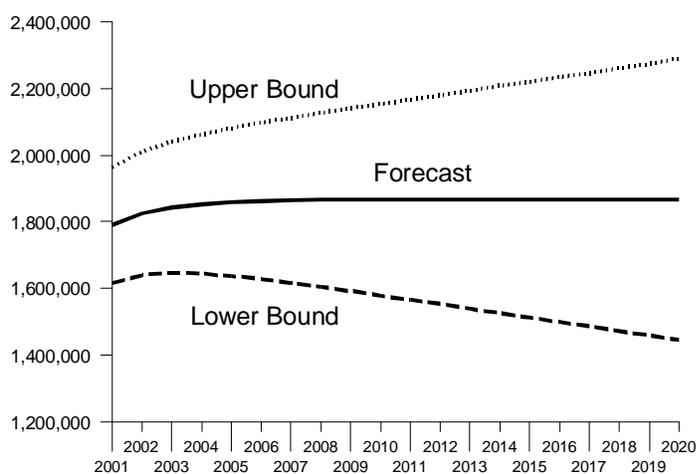


Figure G-5: Forecasted Visitors, Glacier National Park

Several forecasting models were applied to the data and evaluated. These included exponential smoothing, Holt's Method, Winter's Method, Autoregressive One, and Autoregressive Two. Autoregressive One, in which a forecast is obtained for a given year by looking back one year, turned out to be the best model.

Specifically, the model for Glacier National Park forecasts is:

$$Y_{t+1} = 835.7 + 0.552682Y_t + \text{Error}_t$$

Visitations in Year (t+1) are 835.7 + 0.552682 times the visitations in Year (t). Visitations are in thousands, so “835.7” means 835,700 visitors.

The forecasts, the margin of error, and the upper and lower bounds of the forecasts are illustrated in Figure G-5 and presented below.

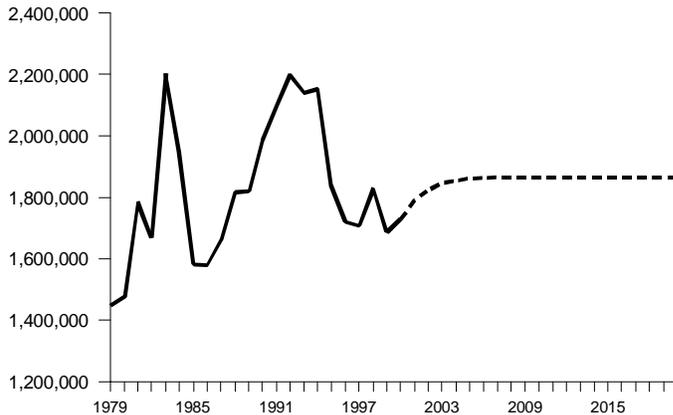
Table G-3: Forecasted Annual Visitors to Glacier National Park

Year	Margin of Error	Lower Bound	Forecast	Upper Bound
2001	173,000	1,618,000	1,791,000	1,964,000
2002	185,000	1,641,000	1,826,000	2,011,000
2003	198,000	1,647,000	1,845,000	2,042,000
2004	210,000	1,645,000	1,855,000	2,065,000
2005	223,000	1,638,000	1,861,000	2,084,000
2006	236,000	1,629,000	1,864,000	2,100,000
2007	249,000	1,617,000	1,866,000	2,115,000
2008	262,000	1,605,000	1,867,000	2,129,000
2009	275,000	1,593,000	1,868,000	2,142,000
2010	288,000	1,580,000	1,868,000	2,156,000
2011	301,000	1,567,000	1,868,000	2,169,000
2012	314,000	1,554,000	1,868,000	2,182,000
2013	328,000	1,541,000	1,868,000	2,196,000
2014	341,000	1,527,000	1,868,000	2,209,000
2015	354,000	1,514,000	1,868,000	2,223,000
2016	368,000	1,500,000	1,868,000	2,236,000
2017	381,000	1,487,000	1,868,000	2,249,000
2018	395,000	1,474,000	1,868,000	2,263,000
2019	408,000	1,460,000	1,868,000	2,276,000
2020	422,000	1,447,000	1,868,000	2,290,000

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For the year 2001, the forecast is 1,791,000 visitors. With the margin of error of 173,000 visitors, there is a 95 percent level of confidence that the true value will range between 1,618,000 and 1,964,000 visitors. The forecasts increase slightly in the first eight years and then converge to 1,868,000 from 2009 on. However, as the forecast extends in time, the margin of error increases. In the year 2020, it is interesting to note that the lower and upper bounds, 1,447,000 and 2,290,000, are near the

high and low figures over the last 22 years.



**Figure G-6: Visitor History and Forecasts
Glacier National Park**

The forecasts provided appear to be neither optimistic nor pessimistic. If considering the visits in the early 1990s, one might consider the forecasts as too low. Looking at the slight loss in visitors over the last six years, one might view the forecasts as too high. Given the amount of variability present in the historical data, the forecast figures appear to take a reasonable, middle course.