

APPENDIX H: USER DISCRETIONARY TIME

User Discretionary Time Model

Colorado River Management Plan

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Purpose

The User Discretionary Time ("UDT") model is designed to assist evaluation of different management alternatives for recreational use on the Colorado River in Grand Canyon National Park.

The UTD model uses the number of daylight hours available in two-week increments through the year as the basis for time calculations. Model users may select daylight or three types of twilight as the basis for discretionary time calculations on the "UDT Variables" worksheet.

From available daylight hours, various tasks associated with Colorado River trips are subtracted.

There are two types of tasks, those that occur on a "per trip" basis (for example, downriver travel), and those that occur on a "daily" basis (for example, eating a meal).

"Trip Tasks" are subtracted once per trip per user (trips and users are based on launches from Lees Ferry)

"Daily Tasks" are subtracted once per user-day from all users. There are two types of Daily Tasks: those whose time commitment remains constant throughout the year, and those whose time commitment can vary by month.

Constant Daily Tasks form the basis of the Daily Task variable.

Daily Tasks whose time commitment varies by month are then added or subtracted from the Constant Daily Tasks to derive the final Daily Task time commitment by month.

Both Trip and Daily tasks can have unique hour values for each of the four trip types analyzed in the CRMP, although the same number of hours can be used for some or all of the types:

Commercial Motor

Commercial Non-motor

Non-commercial Standard

Non-commercial Small

After these subtractions, the remaining time is assumed to be available at the River-users' discretion (hiking, photography, etc.), thus the name "user discretionary time."

Working the Spreadsheet

The workbook is designed to allow changes on one worksheet, "UDT Variables," to cascade through the entire workbook (including the graphs). There are 5 categories of variables the user can enter (each in its own colored box) on that sheet:

Trip Tasks: Hours Used (river running, put-in, etc.)

Daily Tasks: Hours Used Year-round (eating, hygiene, etc.)

Monthly Variables (month-specific tasks that add or subtract UDT)

New User Days (removing days from average trip length for take-out)

Select Light Period (sunrise/sunset, 3 types of twilight)

The "cascading" allows users to analyze the effect of different variables and the time assigned to them on the total UDT available to specific trip types under different management alternatives.

Numeric Basis

This workbook builds on a CRMP master workbook where such inputs as probable user days and probable launches are calculated.

If the CRMP master workbook changes, this workbook can be modified by pasting the appropriate new values into the following worksheets:

Basic Info


ProbLaunch

ProbUserDays

The UDT model uses a newly calculated user-day statistic that subtracts one day per trip per person to account for take-out.

This subtracted day can be adjusted on the UDT Variables worksheet.

This day is subtracted from user days, *not* from daylight hours.



Variables for Calculating User Discretionary Time:

There are 5 categories (colored boxes) in which to enter variables (shown as red numbers)!

	Commercial		Private		Assumptions
	Motor	Non-motor	Regular	Small	
Trip Tasks: Hours Used					
Put-in	4	4	6	6	
Exchanges	0	0	0	0	Although exchanges occur, resource use occurs during the interval making it essentially "UDT."
Take-out	0	0	0	0	See "New User Days" below
River "drift"	37.5	56.25	64.28571	64.28571	225 miles 4 mph for commercial non-motor 3.5 mph for private non-motor
Scout Rapids	2.25	5.25	11.25	11.25	6 mph for motor 0.75 hour/rapid scouted 3 Rapids scouted/commercial motor 7 Rapids scouted/commercial non-motor 15 Rapids scouted/private
First day Credits	-1.5	-1.5	-2	-2	Includes "eat breakfast" and "break down camp"
Last day credits	0	0	0	0	See "New User Days" below
Total	42.25	64	79.53571	79.53571	

Daily Tasks: Hours Used Year-round					
Load boats	1	1	1	1	
Unload boats	0.5	0.5	0.5	0.5	
Eat Breakfast	0.5	0.5	0.5	0.5	
Eat Lunch	1	1	1	1	
Set up camp & eat din	1.5	1.5	2	2	
Break down camp	1	1	1.5	1.5	
Hygiene	0.5	0.5	0.5	0.5	
Total	6	6	7	7	

Monthly Variables

A. Eating after Sunset

UDT is based on daylight hours. During winter months, dinner is often eaten in the dark, and should not reduce UDT. The hours spent eating after sunset can be changed by trip type (red numbers)

0.75	0.75	0.75	0.75
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The months in which dinner is eaten in the dark can be assigned in Column A below (red Yes or No)

B. Other Monthly Subtractions

Explain monthly subtraction from UDT Daily tasks here and enter time as decimal fractions of an hour by trip type below:

0	0	0	0
---	---	---	---

The months in which this subtraction applies can be assigned in Column B below (red Yes or No)

C. Monthly Additions

Explain monthly addition to UDT Daily tasks here and enter time as decimal fractions of an hour by trip type below:

0	0	0	0
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The months in which this addition applies can be assigned in Column C below (red Yes or No)

TOTAL MONTHLY ADJUSTMENTS TO DAILY TASKS

Month	A. Dark Dining?	B. Other Subtract	C. Other Add
Jan	Y	N	N
Feb	Y	N	N
Mar	N	N	N
Apr	N	N	N
May	N	N	N
Jun	N	N	N
Jul	N	N	N
Aug	N	N	N
Sep	N	N	N

Oct	N	N	N
Nov	Y	N	N
Dec	Y	N	N

Final Time Consumed by Daily Tasks by Month (summary only, no user entries needed)

Month	Commercial		Private	
	Motor	Non-motor	Regular	Small
1	5.25	5.25	6.25	6.25
2	5.25	5.25	6.25	6.25
3	6.00	6.00	7.00	7.00
4	6.00	6.00	7.00	7.00
5	6.00	6.00	7.00	7.00
6	6.00	6.00	7.00	7.00
7	6.00	6.00	7.00	7.00
8	6.00	6.00	7.00	7.00
9	6.00	6.00	7.00	7.00
10	6.00	6.00	7.00	7.00
11	5.25	5.25	6.25	6.25
12	5.25	5.25	6.25	6.25

New User Days

The last day of a River Trip is assumed to be consumed by take-out, with no UDT. This assumption does create "double dipping" into UDT for River running. Since most trips camp close to the take-out, double dipping is assumed to be minimal. New user days are calculated for each of the four trip types as follows:

existing data sets are in lower case, NEW VARIABLE ARE IN UPPER CASE

- | | | |
|---|---|-----------------|
| 1 | probable launches * avg passengers/launch | USERS |
| 2 | probable user days / USERS = | TRIP LENGTH |
| 3 | TRIP LENGTH - 1 = | NEW TRIP LENGTH |
| 4 | NEW TRIP LENGTH * USERS = | NEW USER DAYS |

Note that by changing the number subtracted from trip length (shown in red above), new user days will "ripple through" the UDT calculations

Select Light Period

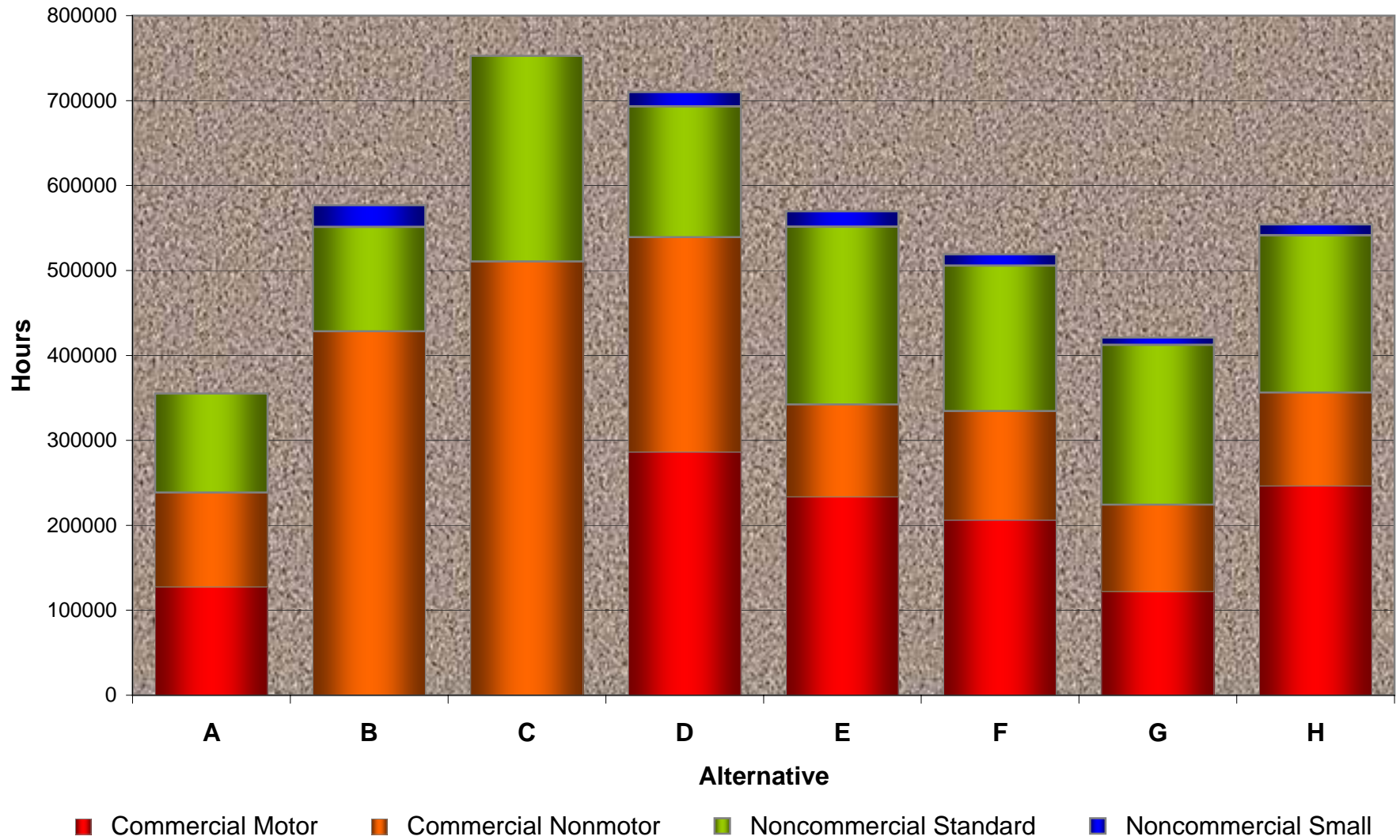
The amount of light available in a 24-hour period forms the basis of the UDT calculation. The available types are listed and defined below. Select the type you would like to use.

- 1 Sunrise and sunset** conventionally refer to the times when the upper edge of the disk of the Sun is on the horizon, considered unobstructed relative to the location of interest. Atmospheric conditions are assumed to be average, and the location is in a level region on the Earth's surface.
- 2 Civil twilight** is defined to begin in the morning, and to end in the evening when the center of the Sun is geometrically 6 degrees below the horizon. This is the limit at which twilight illumination is sufficient, under good weather conditions, for terrestrial objects to be clearly distinguished; at the beginning of morning civil twilight, or end of evening civil twilight, the horizon is clearly defined and the brightest stars are visible under good atmospheric conditions in the absence of moonlight or other illumination. In the morning before the beginning of civil twilight and in the evening after the end of civil twilight, artificial illumination is normally required to carry on ordinary outdoor activities. Complete darkness, however, ends sometime prior to the beginning of morning civil twilight and begins sometime after the
- 3 Nautical twilight** is defined to begin in the morning, and to end in the evening, when the center of the sun is geometrically 12 degrees below the horizon. At the beginning or end of nautical twilight, under good atmospheric conditions and in the absence of other illumination, general outlines of ground objects may be distinguishable, but detailed outdoor operations are not possible, and the horizon is indistinct.
- 4 Astronomical twilight** is defined to begin in the morning, and to end in the evening when the center of the Sun is geometrically 18 degrees below the horizon. Before the beginning of astronomical twilight in the morning and after the end of astronomical twilight in the evening the Sun does not contribute to sky illumination; for a considerable interval after the beginning of morning twilight and before the end of evening twilight, sky illumination is so faint that it is practically imperceptible.

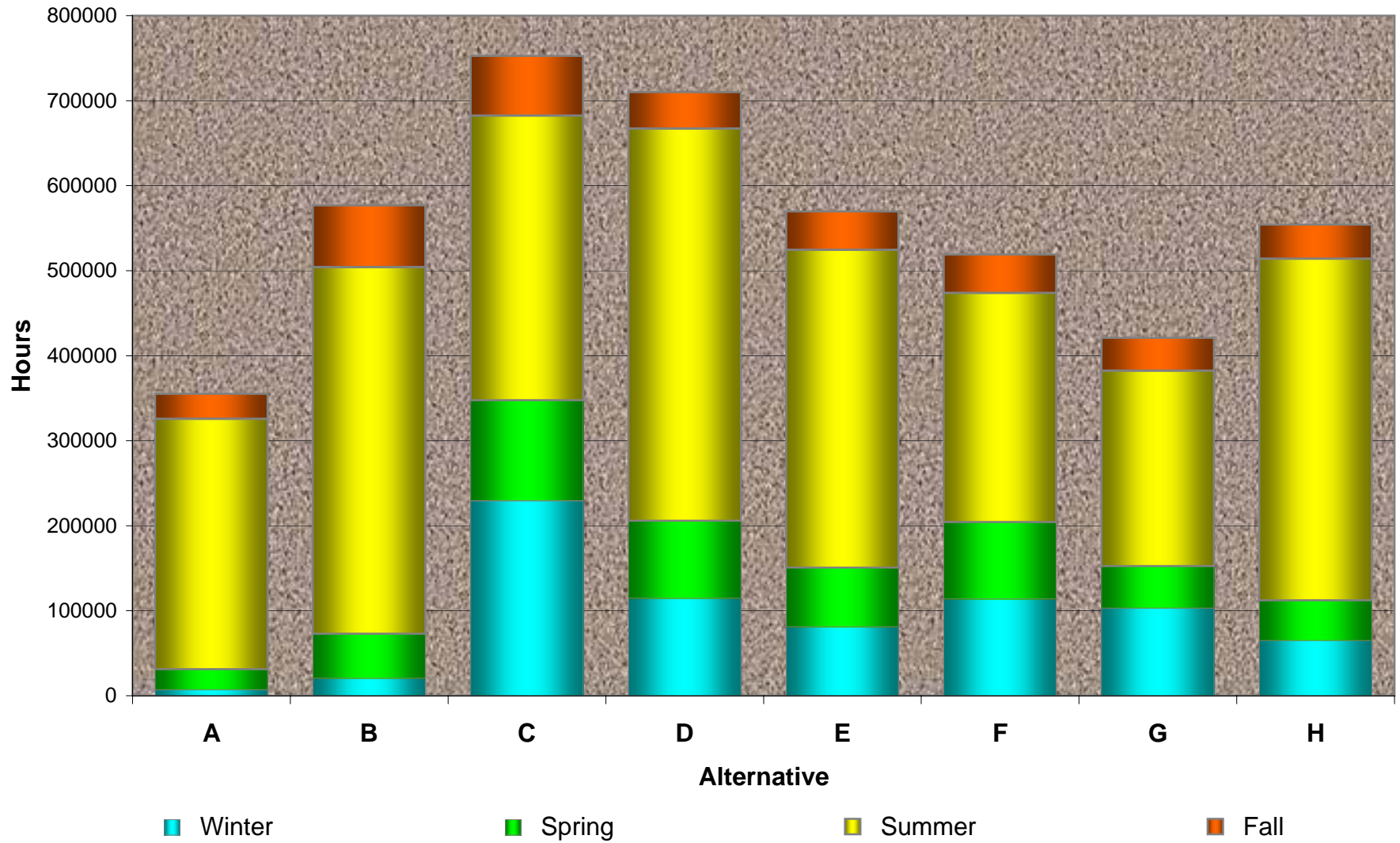
Select the type of daylight you would like to use: **2**

You have chosen: **CIVIL TWILIGHT**

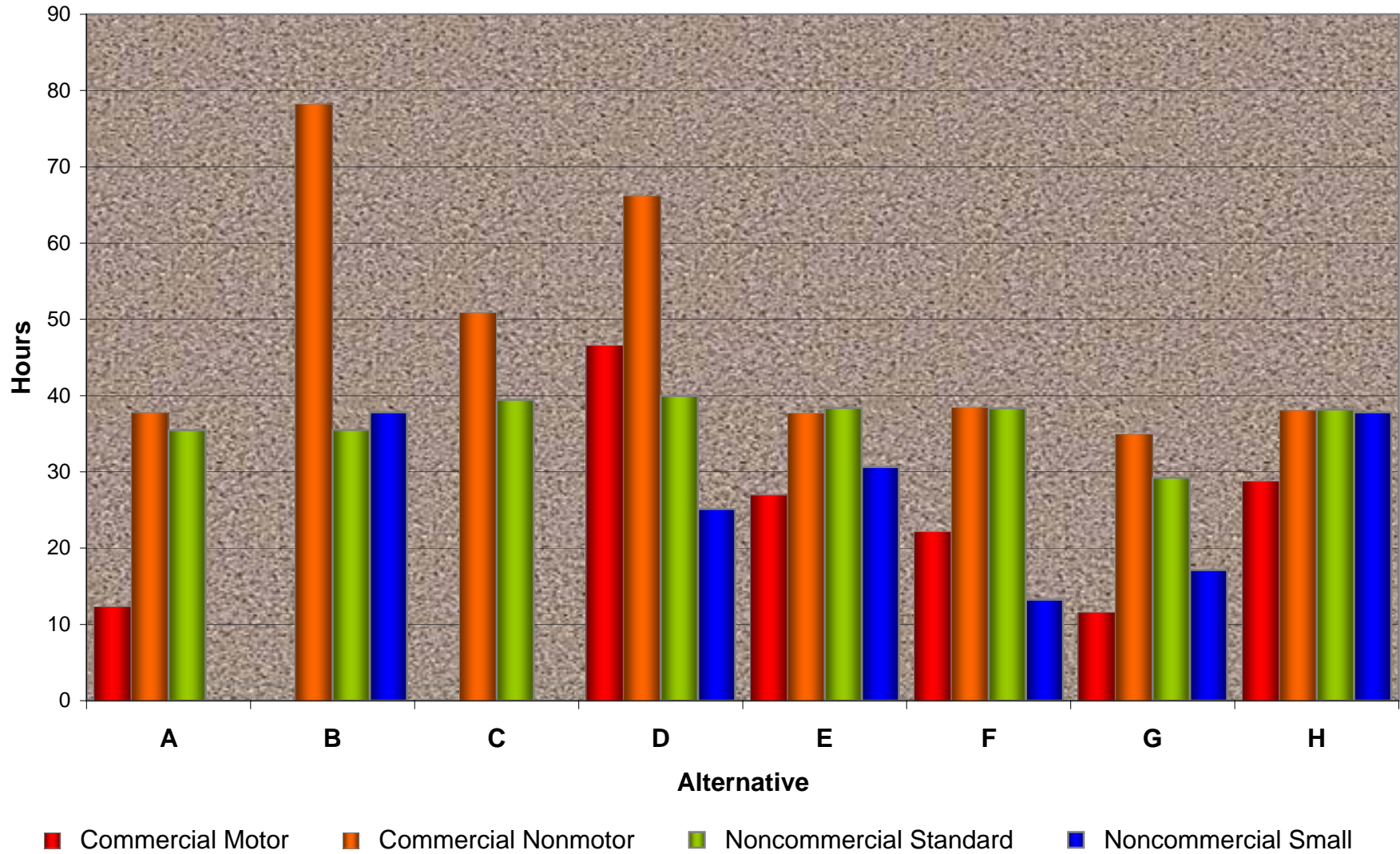
Total User Discretionary Time by Trip Type



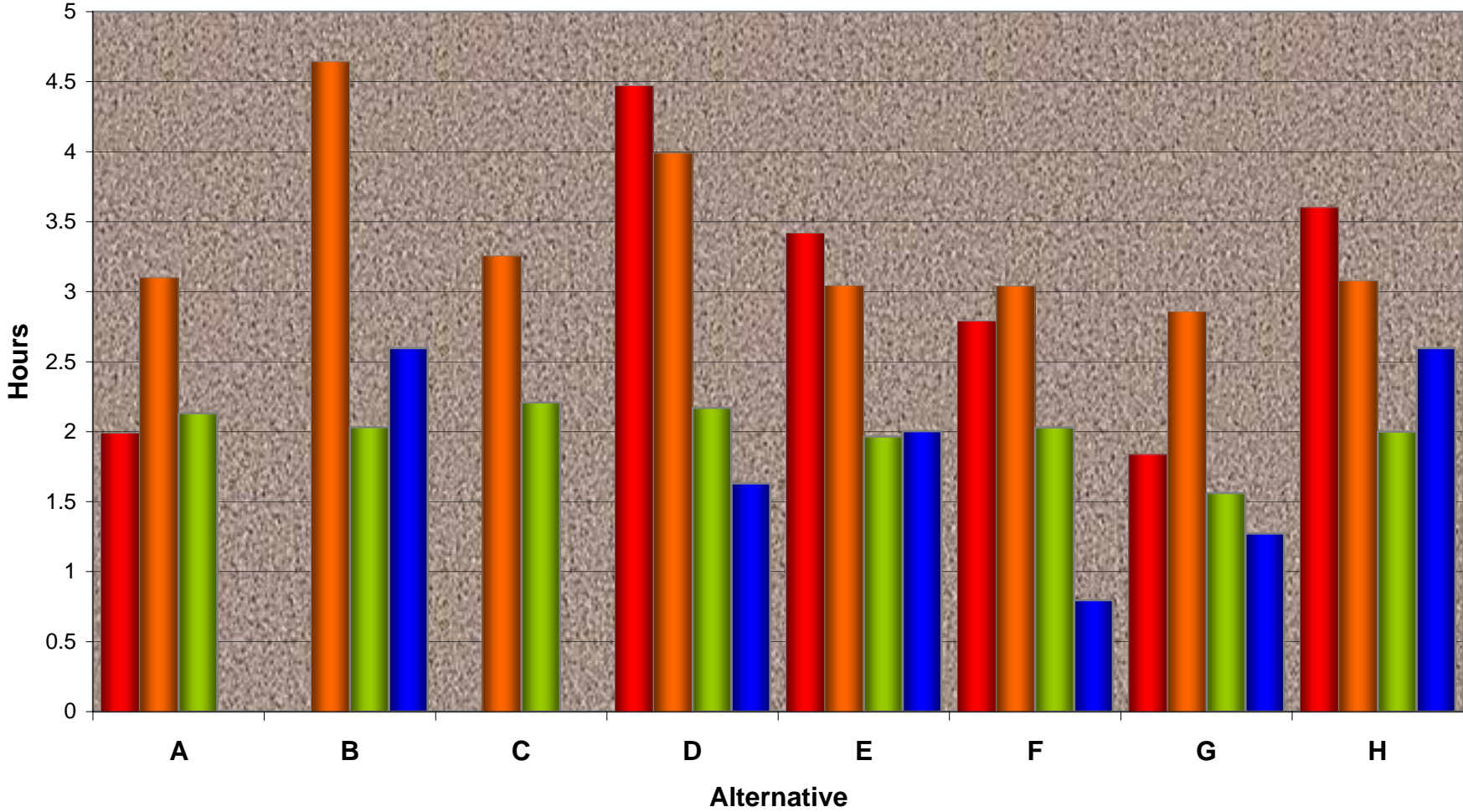
Total User Discretionary Time by Season



Average User Discretionary Time per Passenger



Average User Discretionary Time per Day



■ Commercial Motor ■ Commercial Nonmotor ■ Noncommercial Standard ■ Noncommercial Small