

Creating an Efficient Summer Tour Schedule for Montana Shakespeare in the Parks.

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Introduction

Montana Shakespeare in the Parks has inquired about a possible change in their tour schedule. They tour all around Montana, and think there may be a better way to do so than what they are doing now. Our goal for this model is to devise a modified tour schedule that will save MSIP money for gas as well as travel time without dramatically altering the scheduled dates from the year prior. We know their tour schedule, the attendance numbers at each stop, as well as the profit. We will look at the distances traveled between shows and the dates each stop occurs on the tour and attempt to create a model of a new tour schedule.

Model

In order to minimize the distance traveled we reorganized the route to schedule the towns that are relatively close to each other next to each other on the schedule; this will minimize travel distance and save travel time. We will then find the miles between each stop, and compare the total miles traveled at the end of the summer using our new route. Using a map we were able to see what towns were close to each other and what routes would be shortest and most efficient that would allow us to schedule each stop that was reasonably close to the previous schedule. We decided “close” to be the next nearest town, with minimal backtracking. After calculating the total distance traveled on our route we were able to find the difference in miles driven between last year’s schedule and our proposed schedule, as well as calculate the difference in cost of gas between both routes. In order to calculate gas costs and savings, we assumed the average miles per gallon of each vehicle is 25 miles per gallon, and the average

cost of gas in Montana of \$2.78. Since we did not know the miles per gallon of each car driven by the cast of MSIP and aren't able to accurately predict the gas prices around the state at that time we decided to use the average of both miles per gallon of cars and the average gas price for the state of MT, both found on google. We thought using the average price of gas in MT and the average miles per gallon of cars would give us the best estimate to do our calculations and justify our model. We took the total miles traveled and divided by the miles per gallon, which gave us the gallons used to travel that far. We then multiplied this by the cost of a gallon of gas to get our values. Saving mileage will save valuable time and money, so our main focus is the mileage. The actors on tour in the summer of 2017 traveled 7,819 miles. Assuming they are driving 80 mph this whole time, this is nearing 100 hours of drive time. This is very time consuming, and costs a lot of gas money. They also traveled over 185 miles 12 different times. We believe the tour can be adjusted to reduce that 12 to less than 5. This would cut off many long trips. We also believe an adjustment to the schedule would save time elsewhere other than the long trips, as well as money in terms of gas. The cost of gas is just supporting information to validate our schedule.

Results

This is our finished tour schedule. On the left it shows the sequential order of each stop with the miles driven between each town and on the right is the final schedule with the dates of each performance.

Towns	Miles Driven		Date	Town
Bozeman			June 14th	Bozeman
Columbus	115		15th	Bozeman
Absorkee	14		16th	Bozeman
Hardin	102		17th	Bozeman
Forsyth	74		18th	Bozeman
Miles City	46		19th	Bozeman
Ekalaka	115		20th	Bozeman
Beach	84		21st	Bozeman
Glendive	39		22nd	Bozeman
Sidney	53		23rd	Bozeman
Wolf Point	91		24th	Bozeman
Malta	118		26th	Columbus
Lewistown	133		27th	Absarokee
Hobson/Utica	23		28th	Hardin
Conrad	138		29th	Forsyth
Choteau	33		30th	Miles City
Simms	28		July	
Roundup	214		1st	Ekalaka
Colstrip	136		2nd	Beach
Birney	52		3rd	Glendive
Sheridan	62		5th	Sidney
Worland	127		6th	Wolf Point
Cody	89		7th	Malta
Powell	24		8th	Lewistown
Billings	94		9th	Hobson/Utica
Laurel	18		10th	Conrad
Red Lodge	44		11th	Chouteau

Cooke City		62	12th	Simms
Big Timber		145	13th	Roundup
West Yellowstone		148	14th	Colstrip
Driggs		94	16th	Birney
Thayne		75	17th	Sheridan
Pocatello		120	18th	Worland
Salmon		210	19th	Cody
Dillon		137	20th	Powell
Sweet Pea		114	21st	Billings
Chico		48	22nd	Billings
Townsend		111	23rd	Laurel
Boulder		55	24th	Red Lodge
Helena		29	25th	Cooke City
Fort Benton		133	26th	Big Timber
Great Falls		42	27th	West Yellowstone
Seeley		144	28th	Driggs
St. Ignatius		94	29th	Thayne
Charlo		14	30th	Pocatello
Plains		46	31st	Pocatello
Kalispell		82	August	
Superior		124	1st	Salmon
Trout Creek		90	2nd	Dillon
Liberty Lake		119	3rd	Sweet Pea
Sandpoint		56	5th	Sweet Pea
Libby		83	6th	Chico
Eureka		68	7th	Townsend
Cut Bank		179	8th	Boulder

Anaconda	266	9th	Helena
Butte	23	10th	Fort Benton
Whitehall	26	11th	Great Falls
Manhattan	40	12th	Seeley
Bozeman	20	13th	St. Ignatius
Big Sky	44	14th	Charlo
Belgrade	44	15th	Plains
Livingston	35	16th	Kalispell
Hamilton	274	17th	Kalispell
Missoula	47	18th	Trout Creek
Total Miles	5507	19th	Liberty Lake
		20th	Sandpoint
		21st	Libby
		22nd	Eureka
	2312 Miles Saved	24th	Cut Bank
	~\$258 saved in gas per vehicle	25th	Anaconda
		26th	Butte
		27th	Whitehall
		28th	Manhattan
		29th	Bozeman
		30th	Big Sky
		31st	Belgrade
		September	
		1st	Livingston
		2nd	Hamilton
		3rd	Missoula
		4th	Missoula

As seen in the spreadsheet, by taking this route instead of the current route, we saved 2312 total miles while keeping 76 shows. Using the average miles per gallon of current cars, and average cost of gas throughout the state, we estimated that per vehicle this could save about \$258 dollars per vehicle for on tour. This could be more or less depending on each car's individual miles per gallon.

Discussion

In our model we tried to keep the show dates in roughly the same period, within the range of a week, although some shows were moved more than that. For example Choteau made the largest move at around a month difference. It was on August 8th in 2017, and in our proposed schedule we have it on July 11th. We moved it by so much because it seemed like a good stopping place between Conrad and Simms. This might be due to the fact that we added Simms into this schedule, as they had mentioned interest, and it is only 28 miles from Simms. This was the largest change and the only change that was more than two weeks. The most changes happened at the beginning of the tour because we decided to move the eastern part of Montana up a week or so, but we believe this is also where we were able to save the most miles compared to the rest of the tour. Obviously, more miles could have been saved if we made an entirely new schedule, but according to MSIP the towns request dates and MSIP tries to honor that. We focused on keeping the large towns the same or very close to the same because we assumed they probably have stricter schedules for when they could host performances. Sweet pea for example, is already set and the

performances have to be on those set days. We were also told that Simms had expressed interest for this upcoming summer and that MSIP was considering adding Kalispell back into the tour. According to the MSIP mission statement, they want to get to “underserved rural areas that would otherwise not have this opportunity” and with a 2010 census population of 354, Simms fits their mission perfectly, so we honored that and added Simms into this tentative schedule. We also added a show in Kalispell, because in order to accomplish this mission, money is unfortunately needed. Kalispell is one of the larger towns in the state, and is surrounded by many beautiful areas that could potentially attract many people from around the area. We were informed that instead of doing two shows in Great Falls next summer they were planning on only doing one. This allowed us to add Simms into the schedule. We also recommended removing Deer Lodge from the schedule because attendance numbers were very low 67 out of 3000, roughly 2.2%. We thought somewhere else would be more beneficial and reach more people. We believe that Kalispell can reach people from surrounding areas in a beautiful setting. One thing worth mentioning is that we decided to go from Red Lodge to Cooke City by use of the Beartooth Highway. It is only 62 miles, opposed to the other option in which you have to drive back around and through Bozeman which is 230 miles and an estimated 4 hours of drive time. The Beartooth Highway should be open during the tour time, but it is never guaranteed with Montana weather. However this is the distance we included in our model. Overall, we were able to rearrange the tour schedule, while keeping

most show dates roughly the same, and save over 2000 miles of travel which is roughly four trips across the state of Montana.

References

<http://www.shakespeareintheparks.org/about.php>

<https://www.google.com/maps>

https://en.wikipedia.org/wiki/Simms,_Montana