



# A Reservoir Model for the Flooding of the Snowy River Passage of Fort Stanton Cave

Fort Stanton Science  
Conference

Steve Peerman

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All models are wrong,  
but some are useful.

George E. P. Box



# What we know about the Flooding of Snowy River at Turtle Junction.

**1<sup>st</sup> Event Start – before July 1, 2007**

**1<sup>st</sup> Event End – between October 16 and October 30, 2007 – arbitrarily set to October 23, 2007**

**2<sup>nd</sup> Event Start – between July 13 and August 2, 2008 – arbitrarily set to July 29, 2008**

**2<sup>nd</sup> Event End – between January 10 and January 14, 2009 – arbitrarily set to January 12, 2009**

**3<sup>rd</sup> Event – April 22, 2010 – Dec. 21, 2010**

**4<sup>th</sup> Event – Sept. 19, 2014 – Aug. 16, 2016**

**5<sup>th</sup> Event – Sept. 10, 2016 – Dec. 31, 2016\***

**6<sup>th</sup> Event – Jan. 3, 2017\* – Aug. 9, 2017**

**7<sup>th</sup> Event – Feb. 22, 2018 – May 7, 2018**

**8<sup>th</sup> Event – Oct. 29, 2018 – July 27, 2019**

**9<sup>th</sup> Event – Dec. 7, 2019 – Feb. 21, 2020\***

**10<sup>th</sup> Event – Feb. 26, 2020\* – July 18, 2020**

**11<sup>th</sup> Event – July 8, 2020 – Nov. 1, 2021**

**\* These stop and start dates happened in quick succession at Turtle Junction. It is unlikely that Snowy River dried up throughout its extent in the cave.**



# Fort Stanton Cave Area Map



# Insurgences on Eagle Creek



Eagle's Mouth  
Insurgence



Curious Sinkhole Insurgence



# Underground Reservoir Concept

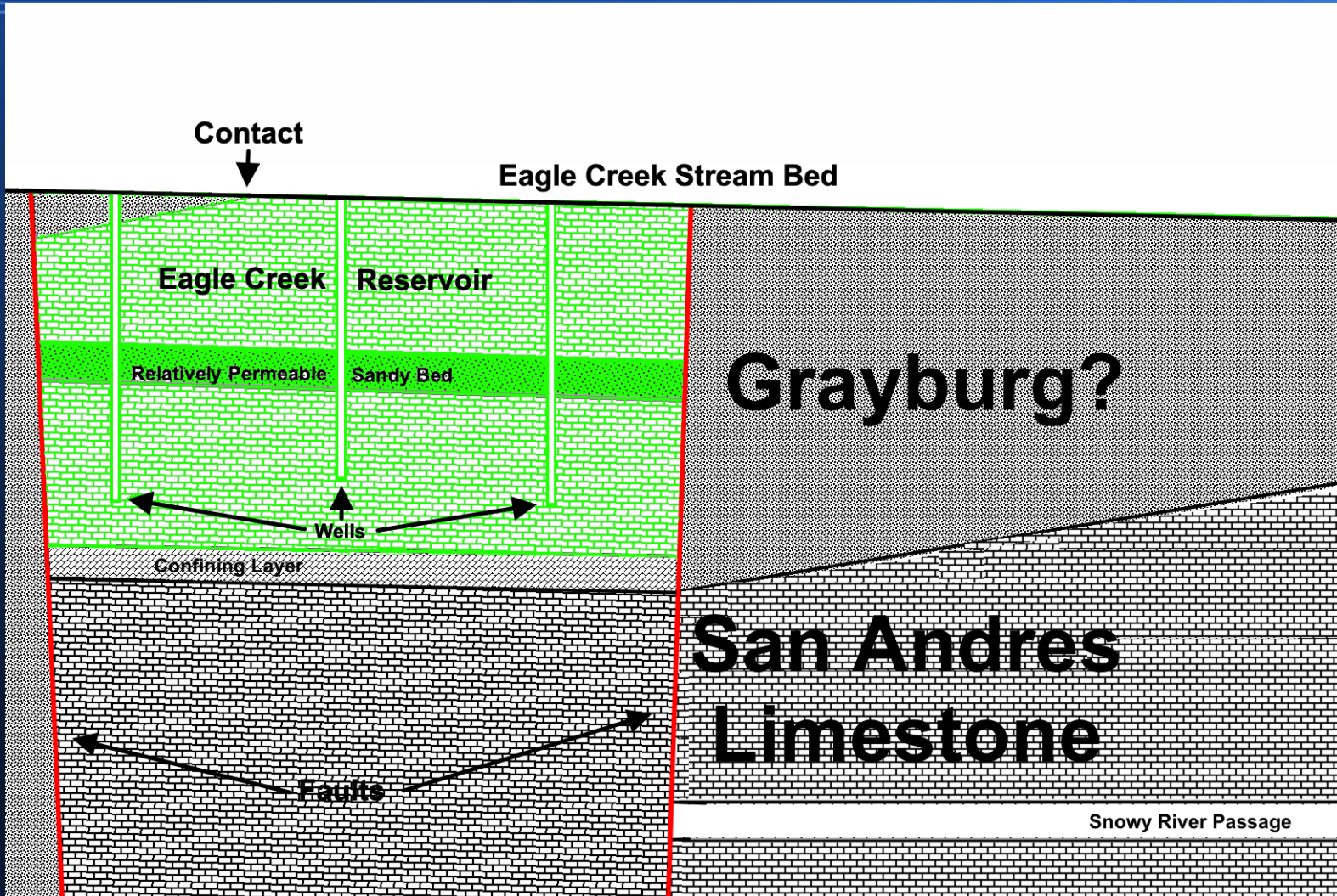


Diagram by Steve Peerman

# Reservoir during low water conditions

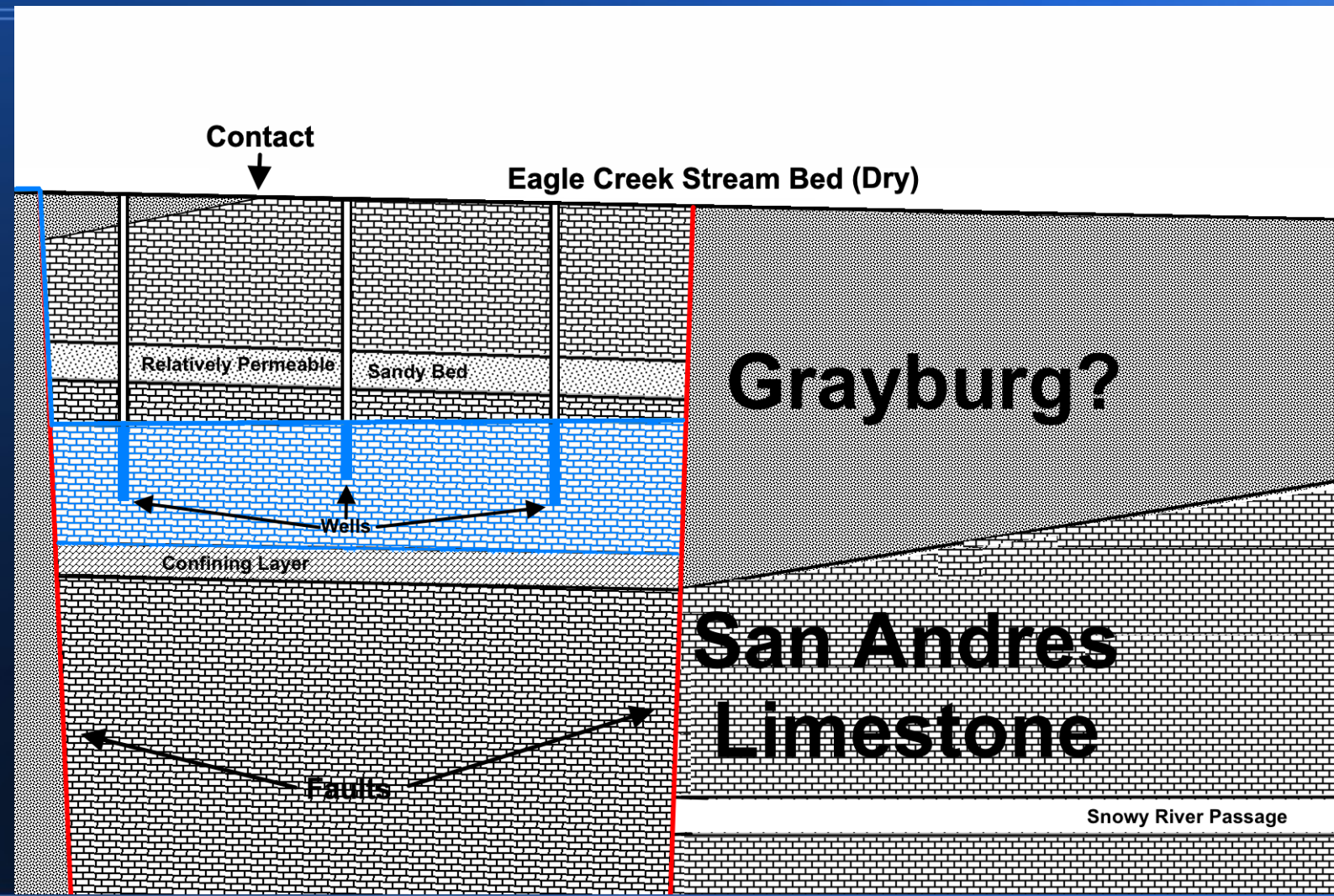


Diagram by Steve Peerman



# Reservoir during high water conditions

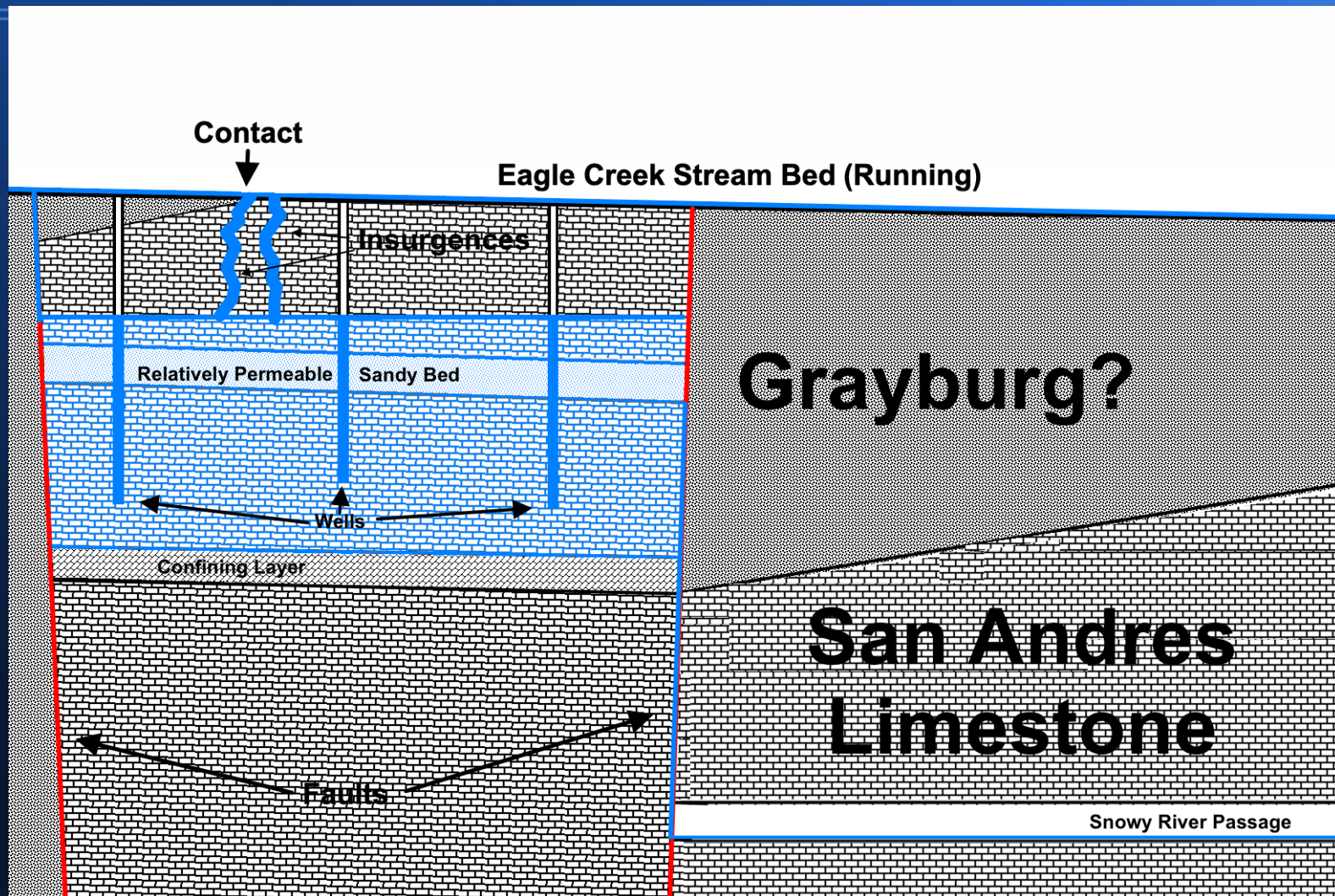


Diagram by Steve Peerman



# What are the assumptions of this model?

Relatively Confined Underground Reservoir

Limited Input to reservoir through insurgences

Limited Output from reservoir to Snowy River

Reservoir “spills” into Snowy River at certain level

Reservoir has some permeability into surrounding aquifer

# What are the parameters for the model?



Reservoir Volume

Snowy River Flow Limit

Insurgence Flow Limit

Declining Spill Point

Flood Start Point

Flood End Point

Leakage Rate



# What are the parameters for the model?

Reservoir Volume 400 Acre Feet

Snowy River Flow Limit

Insurgence Flow Limit

Declining Spill Point

Flood Start Point

Flood End Point

Leakage Rate



# What are the parameters for the model?

Reservoir Volume	400 Acre Feet
Snowy River Flow Limit	8.91 Acre Feet/Day
Insurgence Flow Limit	
Declining Spill Point	
Flood Start Point	
Flood End Point	
Leakage Rate	

# What are the parameters for the model?



Reservoir Volume 400 Acre Feet

Snowy River Flow Limit 8.91 Acre Feet/Day

Insurgence Flow Limit 10.0 Acre Feet/Day

Declining Spill Point

Flood Start Point

Flood End Point

Leakage Rate



# What are the parameters for the model?

Reservoir Volume	400 Acre Feet
Snowy River Flow Limit	8.91 Acre Feet/Day
Insurgence Flow Limit	10.0 Acre Feet/Day
Declining Spill Point	3.00 Acre Feet above spill
Flood Start Point	
Flood End Point	
Leakage Rate	



# What are the parameters for the model?

Reservoir Volume	400 Acre Feet
Snowy River Flow Limit	8.91 Acre Feet/Day
Insurgence Flow Limit	10.0 Acre Feet/Day
Declining Spill Point	3.00 Acre Feet above spill
Flood Start Point	14.0 Acre Feet above spill
Flood End Point	
Leakage Rate	





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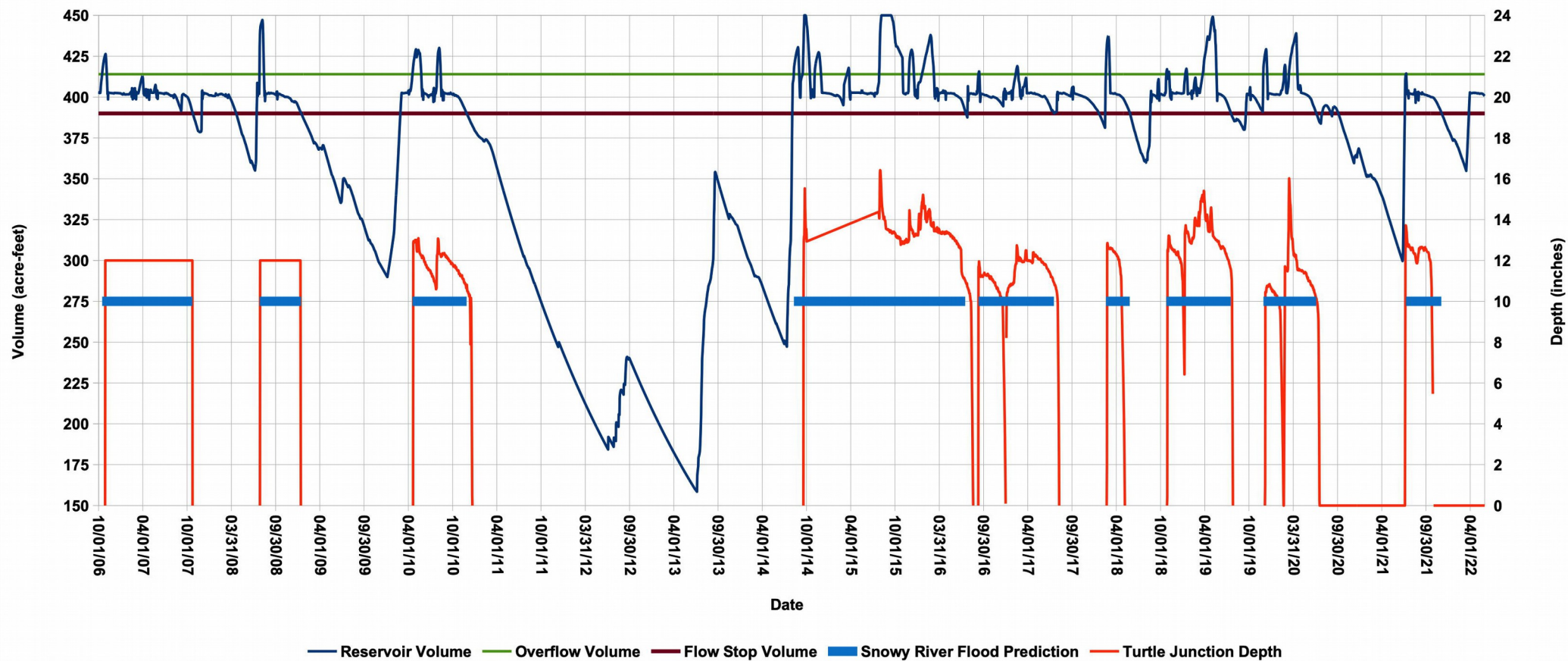
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Leakage Rate	0.15%

# Eagle Creek/Snowy River Reservoir Model



Eagle Creek and Snowy River Reservoir Model  
from 2006 through May, 2022

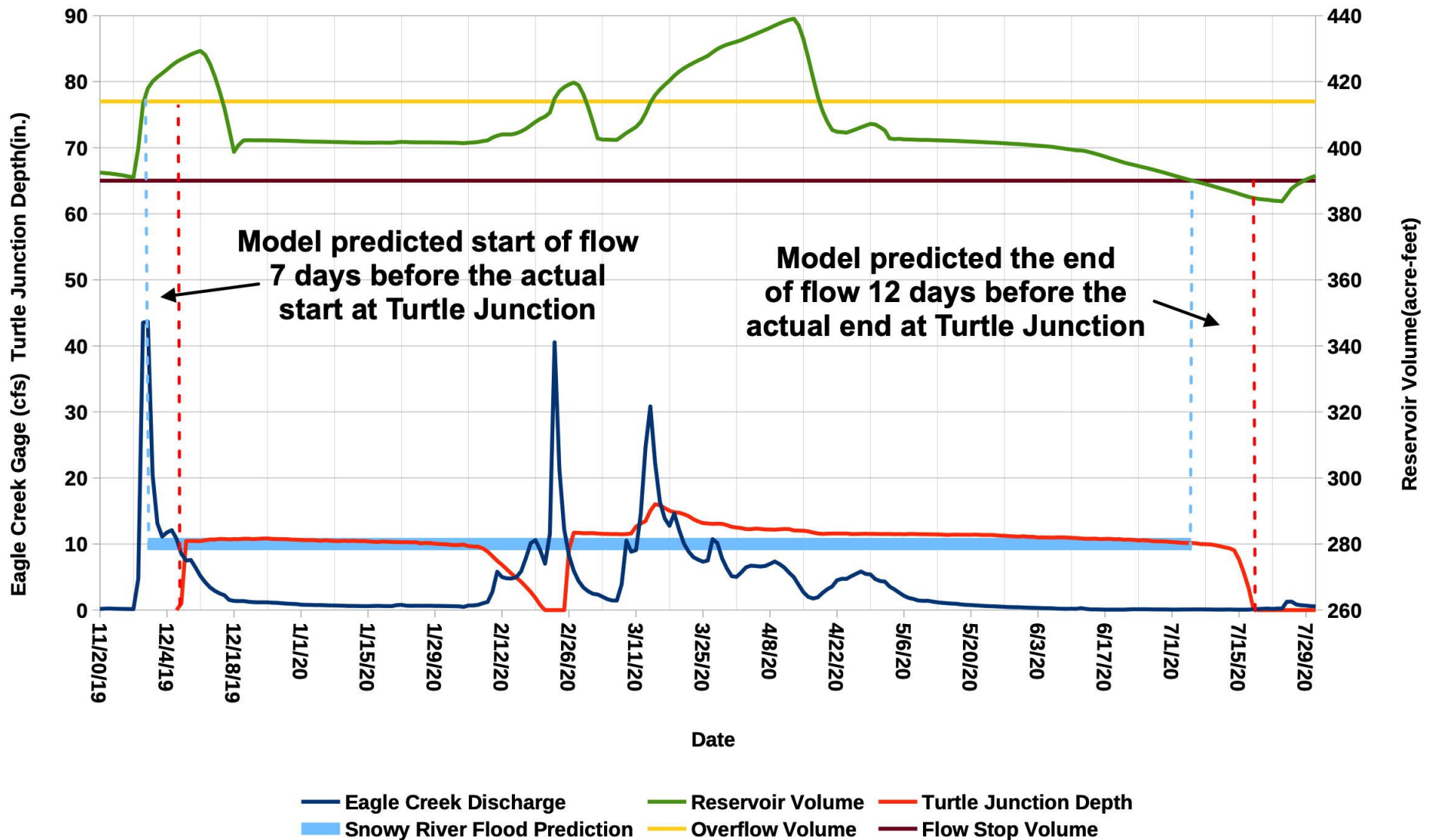


On this chart, the model indicates Snowy River was flooded 44.5% of the time. Beginning date error 2.9 days, End Date error 15.0 days, Overall error 9.3 days.

# Detail of Events 9 and 10 in 2019 and 2020.



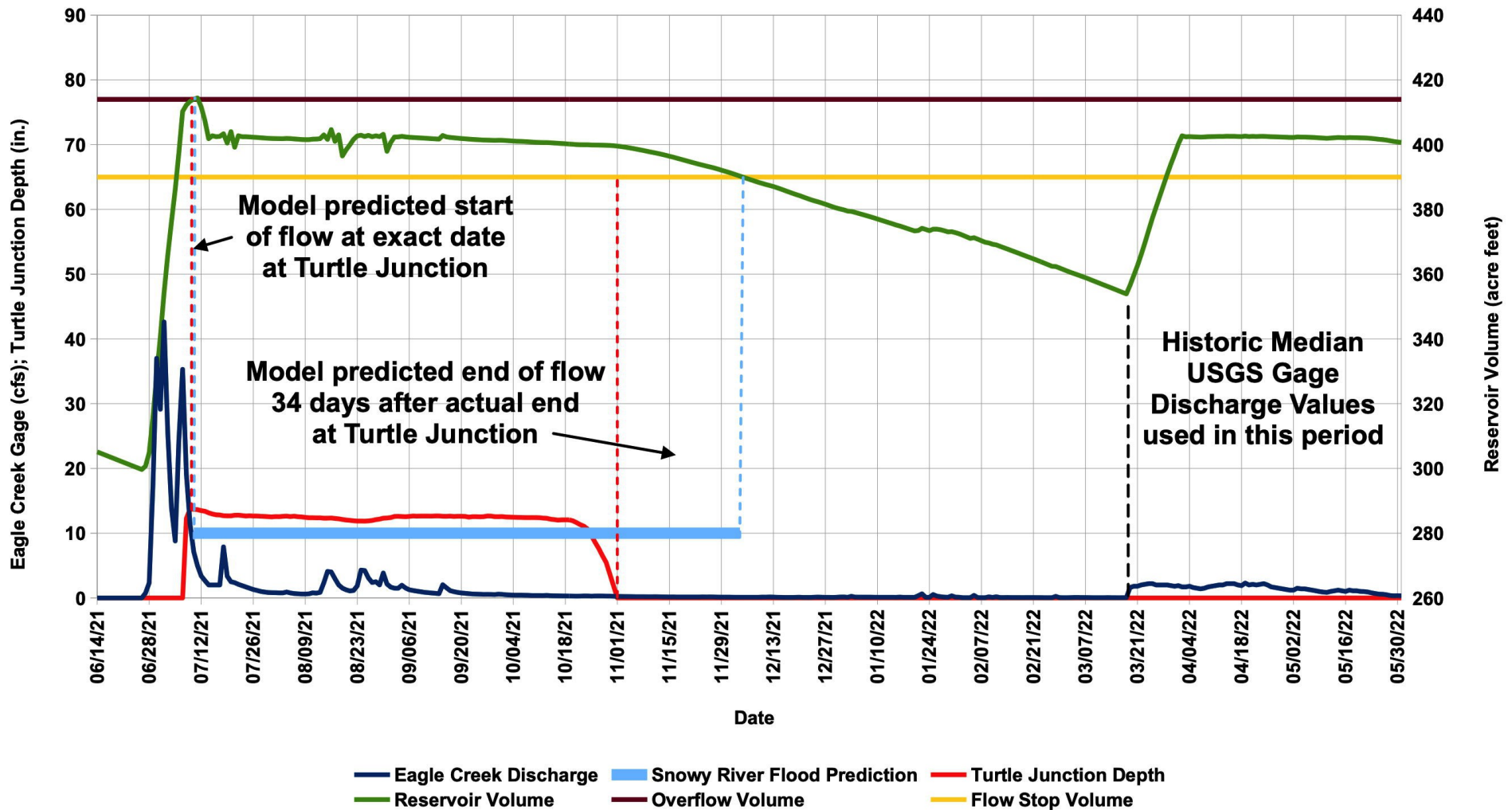
Selected Reservoir Model Values 11/20/19 to 7/31/20



# Detail of the 11<sup>th</sup> Flood Event during 2021.



Selected Reservoir Model Values 6/14/21 to 5/31/22





# And what about the historical model?

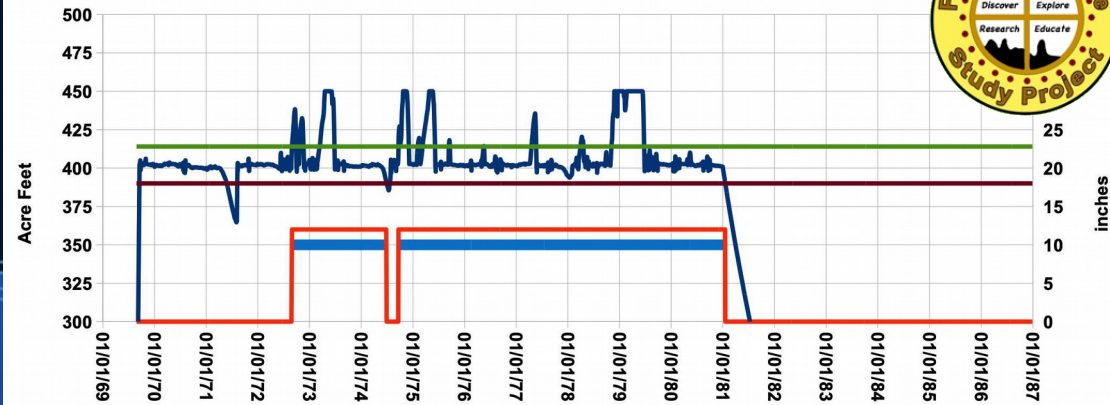
6 Snowy River Flood Events implied from 1969 through 2006.

Eagle Creek USGS Gage off-line during much of the 1980's and 2004-2005.

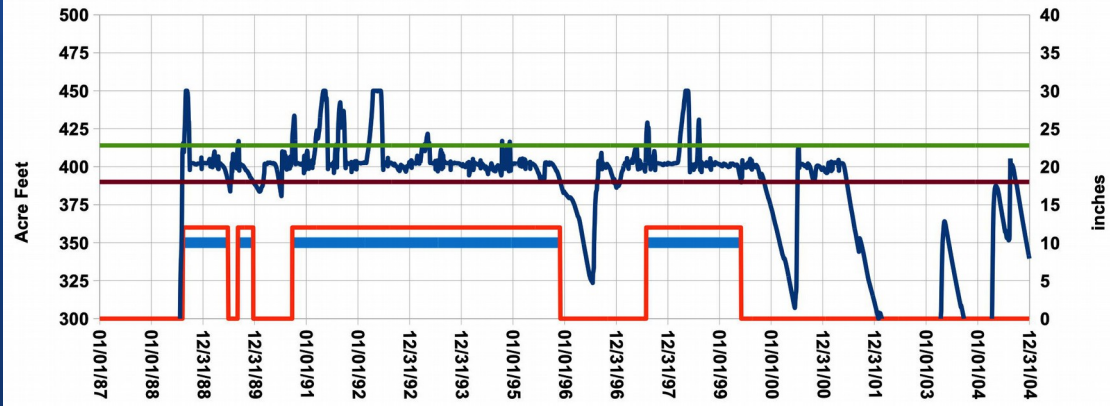
Data implies that Snowy River is flooded approximately 56.3% of the time.

Period of Flood Events = 2.4 yr.

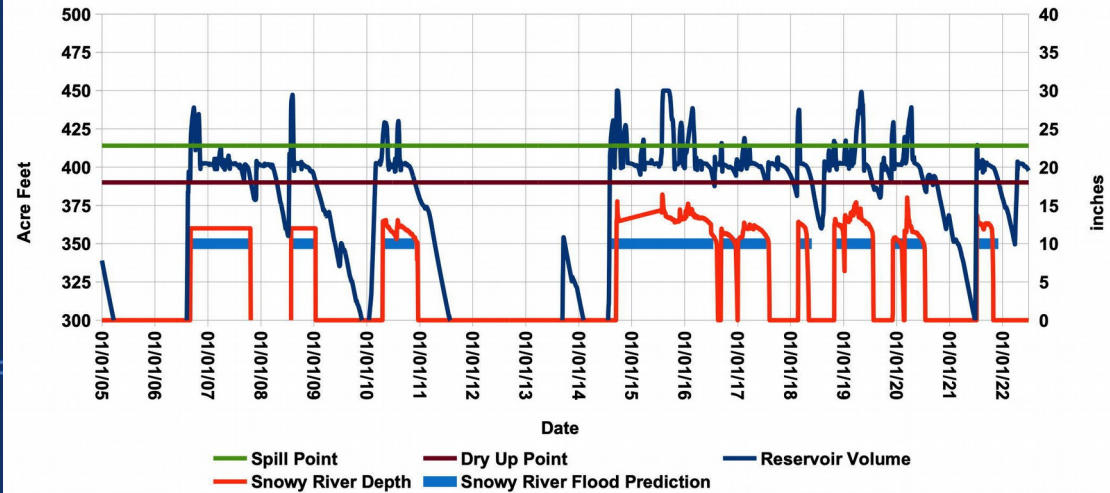
Eagle Creek and Snowy River Correspondence 1969 -- 1986 Reservoir Model



Eagle Creek and Snowy River Correspondence 1987 -- 2004 Reservoir Model



Eagle Creek and Snowy River Correspondence 2005 -- 2022 Reservoir Model





# Government Spring





# Government Spring



This video was taken on November 11, 2018.



# Thank you to all organizations and individuals involved with Fort Stanton Cave!

