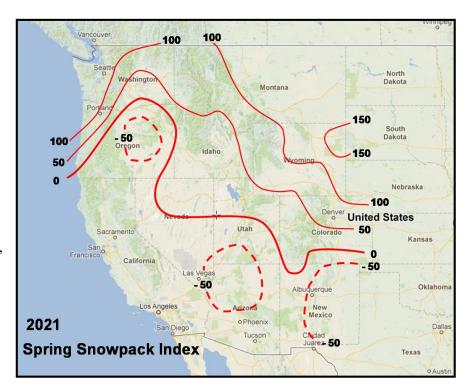# 2021 Fire Season Outlook Using the Spring Snowpack Index

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The Spring Snowpack Index (SSPI) is a unique product developed by Weather Research and Consulting Services, LLC that has proven to be an effective predictor of wildland fire season severity. The SSPI combines Snow Water Equivalent (SWE) values and snowmelt rates from National Resources Conservation Service (NRCS) SNOTEL data, resulting in a number that integrates both winter and spring weather (i.e. temperature, precipitation and evaporation). Our research indicates that it is a much better predictor of fire season severity than SWE alone because it is a measure of snowmelt date, fire season length, soil moisture and both live fuel and large dead fuel moisture. SSPI values have a wide range extending from -100 to 300 or higher. In general, the lower the SSPI value, the higher the probability of an active fire season.
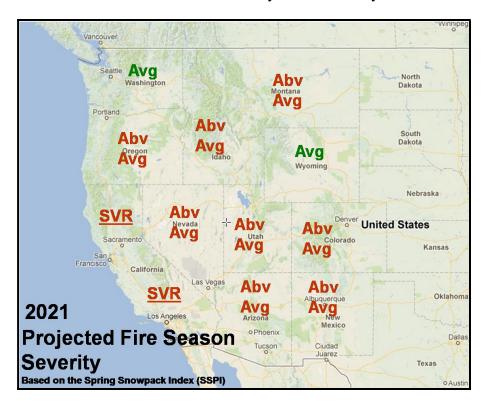
A number of refinements were made last year to improve the predictive capabilities of the SSPI.
1) additional years of NRCS snowpack and fire data were added to the database
2) new algorithms were developed that predict national acres burned and the number of National Preparedness Level 4 and 5 days
3) algorithms were developed to predict acres burned for each of the eleven western states and Alaska, and
4) an SSPI climatology was implemented to determine the mean and median values for each of the eleven western states and Alaska.

The graphic to the right displays this year's SSPI calculated for river basins in the Western United States using NRCS SNOTEL data. The lowest SSPI values, less than minus 50, are located in Arizona, New Mexico, southern Utah, southern Nevada and eastern Oregon. Unusually warm and dry April weather produced rapid snowmelt in Oregon, California, Nevada and Utah. In these states the SSPI is much below the mean compared to Arizona and New Mexico. The highest SSPI values, 100 to 150 plus, are located in western Washington and portions of Montana and Wyoming.
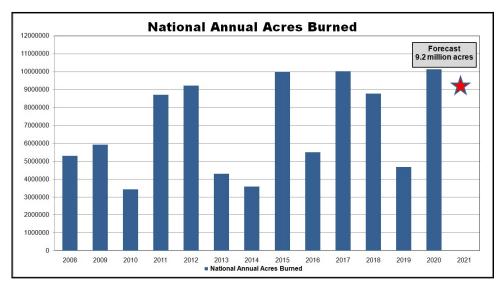

2021
Spring Snowpack Index

Using new algorithms to predict acres burned for each of the western states indicates that most states should experience a very active fire season again this summer and fall (see graphic below). An above average fire season is possible in Oregon, Idaho, Montana, Nevada, Utah, California, Arizona and New Mexico. Only Washington and Wyoming are likely to experience an average fire season. California again has the potential for a severe fire season with more than a million acres burned by the end of the year.
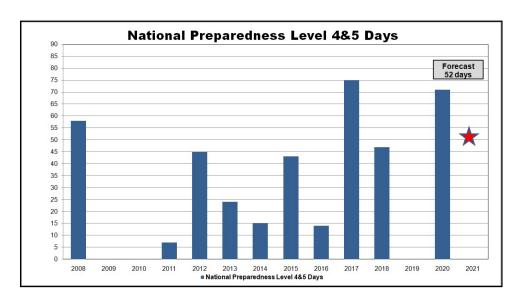

The table below lists the statewide SSPI averages for the past eight years. Figures in red indicate negative values with Arizona and New Mexico reporting the most. Nearly all states are showing lower SSPI values this year compared to last year indicating a lower winter snowpack and/or an above normal spring snowmelt rate. The only exceptions are Wyoming, Washington and Montana.

State	2021	2020	2019	2018	2017	2016	2015	2014
MONTANA	91	101	109	154	151	67	56	166
WASHINGTON	104	86	73	140	146	48	24	125
WYOMING	92	91	83	116	155	125	49	145
IDAHO	28	61	112	78	200	55	9	113
CALIFORNIA	-6	23	165	36	317	73	4	9
COLORADO	43	68	122	34	94	117	49	94
OREGON	4	7	87	34	200	8	4	62
NEVADA	8	-23	132	4	192	92	-9	57
UTAH	12	47	152	-6	115	89	1	53
ARIZONA	-77	-14	49	-7	4	-6	0	-9
NEW MEXICO	-28	-12	97	-13	40	48	15	15
AVG	25	40	106	52	147	65	18	75

Data developed by Weather Research and Consulting Services, LLC

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The SSPI is also a good predictor of annual acres burned throughout the United States. The algorithm was developed by correlating the average SSPI value for the eleven western states with national annual acres burned as reported by the National Interagency Fire Center in Boise, Idaho. The average SSPI this year is 25 compared to 40 last year and 106 in 2019 (table previous page). The algorithm output is 9.2 million acres burned this year (graphic to the right), plus or minus a million acres.

National Annual Acres Burned

Forecast 9.2 million acres

Thus, the number of national acres burned this year could vary between 8.2 million and 10.2 million acres. This suggests an active fire season and is very similar to last year's 10.1 million acres burned nation-wide.

National Preparedness Level 4&5 Days

Forecast 52 days

In addition to national acres burned, we also added an algorithm to predict the number of National Preparedness Level (NPL) 4 and 5 days during the fire season. This was done to provide insight into the severity of the fire season and also the level of fire management necessary to meet objectives. The forecast is for an above normal 52 NPL days this year compared to 71 days in 2020. The graphic to the left illustrates how this forecast compares to previous years.

In summary, an analysis of this year's Spring Snowpack Index indicates a very active 2021 fire season with 8.2 to 10.2 million acres burned nationally. A high demand for firefighting resources is likely across most Geographic Areas and the state of California.

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