



Fire Management Plan  
Smoke Management

National Park Service Management  
Policies, 2006

“...the [National Park] Service will seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and ecosystems, (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas.”

“The Service will ... minimize air pollution emissions associated with park operations, including the use of prescribed fire and visitor use activities;”

“Superintendents will make reasonable efforts to notify visitors and employees when air pollution concentrations within an area exceed the national or state air quality standards to protect public health”

Smoke Management Issues

•**Evaluating the Alternatives:** Smoke impacts from the 5 alternatives are similar, but the emissions (tons of pollutants) produced under Alternative 3 are noticeably lower. Since Alternative 3 concentrates treatment in the wildland-urban interface, overall impacts to park visitors and residents would remain similar to those under the other alternatives.

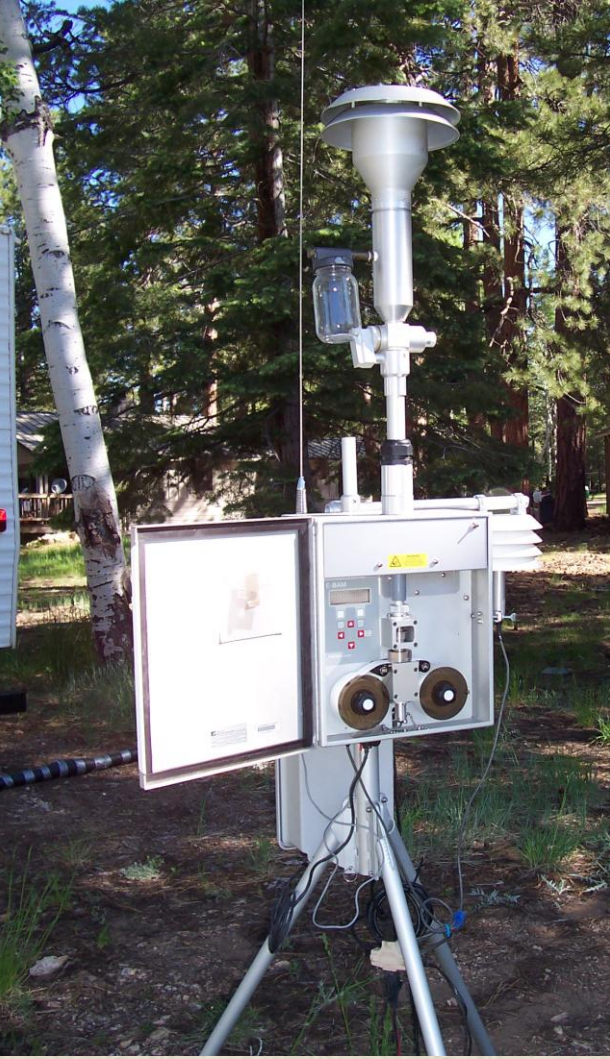
•**Human Health:** Fire planning and management will seek to minimize or avoid impacts to human health under all alternatives. Weather reports and computer models will be used to predict smoke behavior, but unforeseen conditions may still cause smoke to exceed health standards. Consequently, real-time particulate monitoring and an action plan to alert the public of unhealthy conditions are part of all the alternatives.

•**Visibility:** Smoke is a natural consequence of any wildland fire. Smoke plumes provide an opportunity for visitors to see a dramatic natural process in action. Generally, only a few fires each year produce enough smoke to seriously obscure Canyon views. The plan calls on fire managers to evaluate the severity of visibility impacts (using EPA visibility goals) against the beneficial impacts of the fire as they determine appropriate fire management actions.

Fire – related Air Quality Monitoring



Portable samplers monitor particulate concentrations to protect human health.



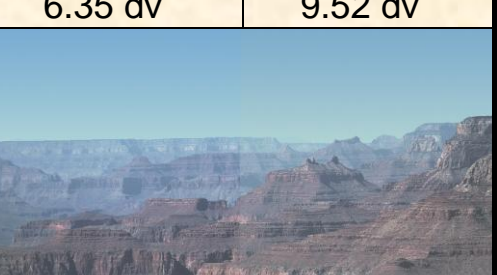
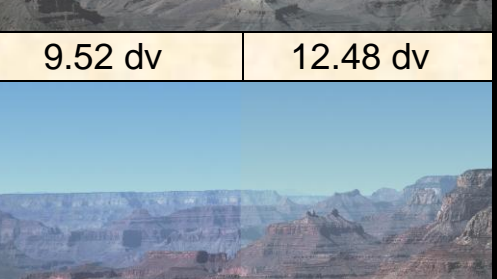
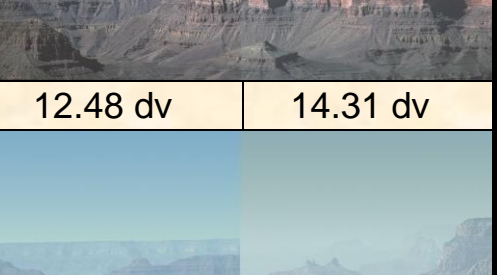


Fire-related ozone has not been a health problem at Grand Canyon in the past, but standards are tightening. The park monitors ozone levels year-round.



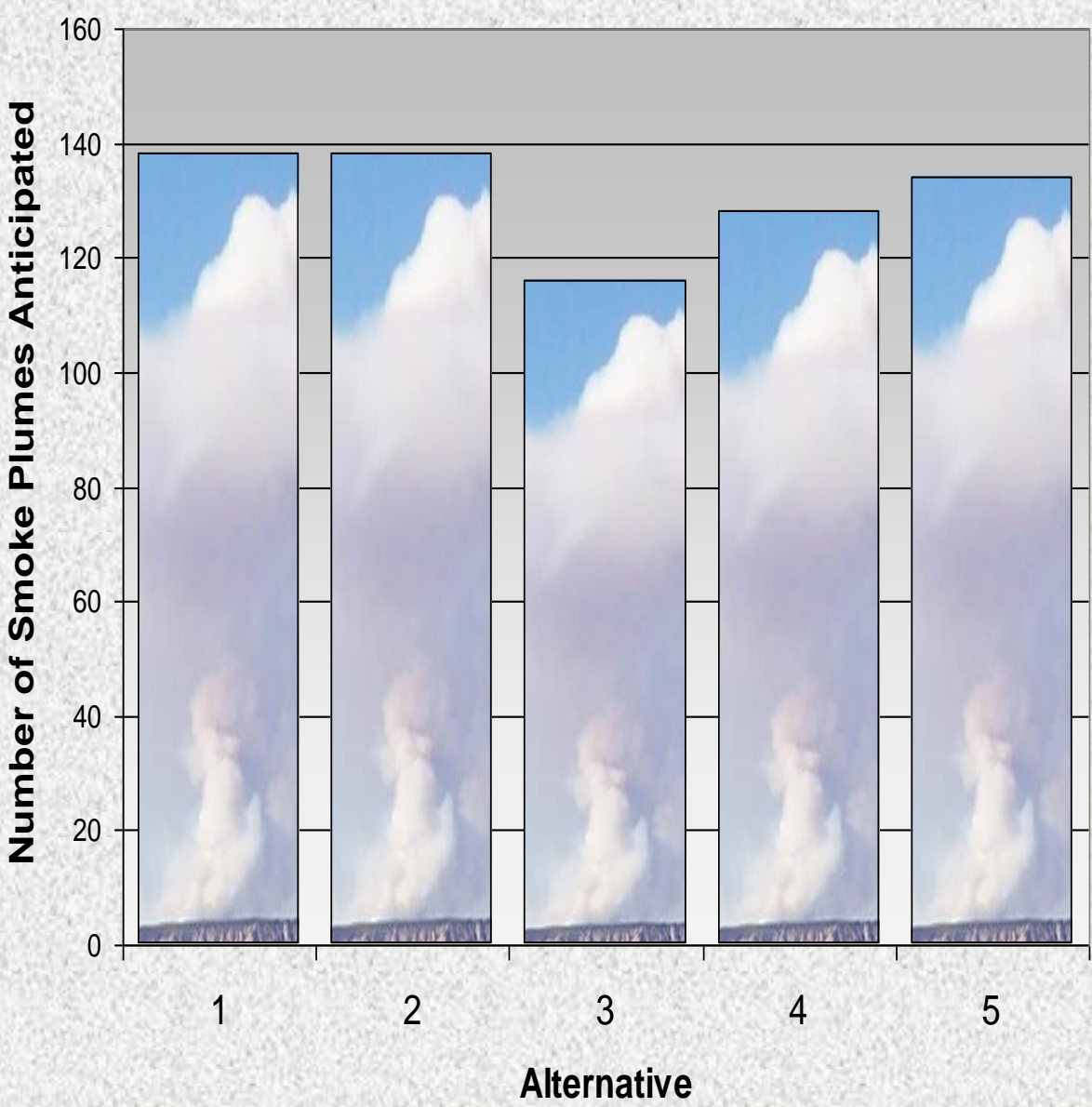
The transmissometer measures visibility conditions from River to Rim at Yavapai Point

Proposed Haze Scale for  
Grand Canyon N.P.

Haze Class	Haze Index (deciviews)	Justification	Computer-modeled Haze (daily average, individual hours could be much better or worse)	
Excellent	<6.35 dv Best 10%	The Regional Haze Rule goal is to preserve the best 20% of days. "Excellent" visibility would be better than the average of these best days. Air this clear fosters attainment of the national visibility goal.	 0 (Rayleigh)   6.35 dv	
Good	6.35 – 9.52 dv Best 10% to Average	The upper limit for this classification is based on the average visibility at Grand Canyon. Although not a specific visibility target, visibility this good will not impede attaining the national visibility goal.	 6.35 dv   9.52 dv	
Moderate	9.52 – 12.48 dv Average to worst 20%	Although worse than average, visibility on these days would still be better than the worst 20% of days targeted for clean-up by the Regional Haze Rule to meet the national visibility goal.	 9.52 dv   12.48 dv	
Poor	12.48 – 14.31 dv Worst 20% to worst 10%	EPA has targeted cleaning up the worst 20% of days to meet the national visibility goal. Visibility in the "Poor" range does not move conditions toward this goal.	 12.48 dv   14.31 dv	
Very Poor	> 14.31 Worst 10%	"Very Poor" is the worst of the worst (hazier than the average of the worst 20% of days targeted for clean-up). Visibility in this range moves away from the national visibility goal (24.93 dv is the 99 <sup>th</sup> percentile, the very worst haze obscures the Canyon completely).	 14.31 dv   24.93 dv	

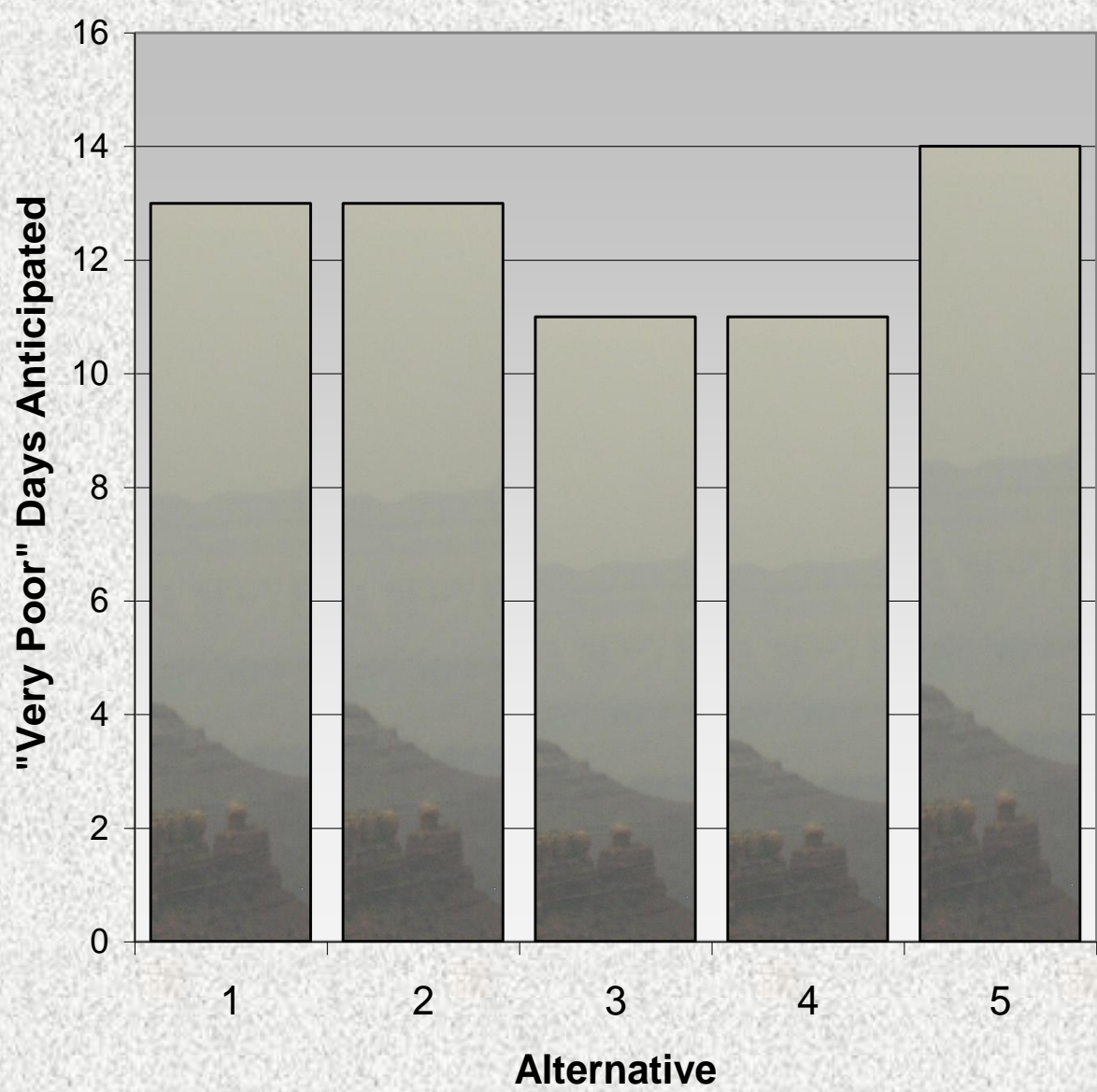
Visibility Issues

Visible Smoke Plumes Anticipated  
Annually by Alternative



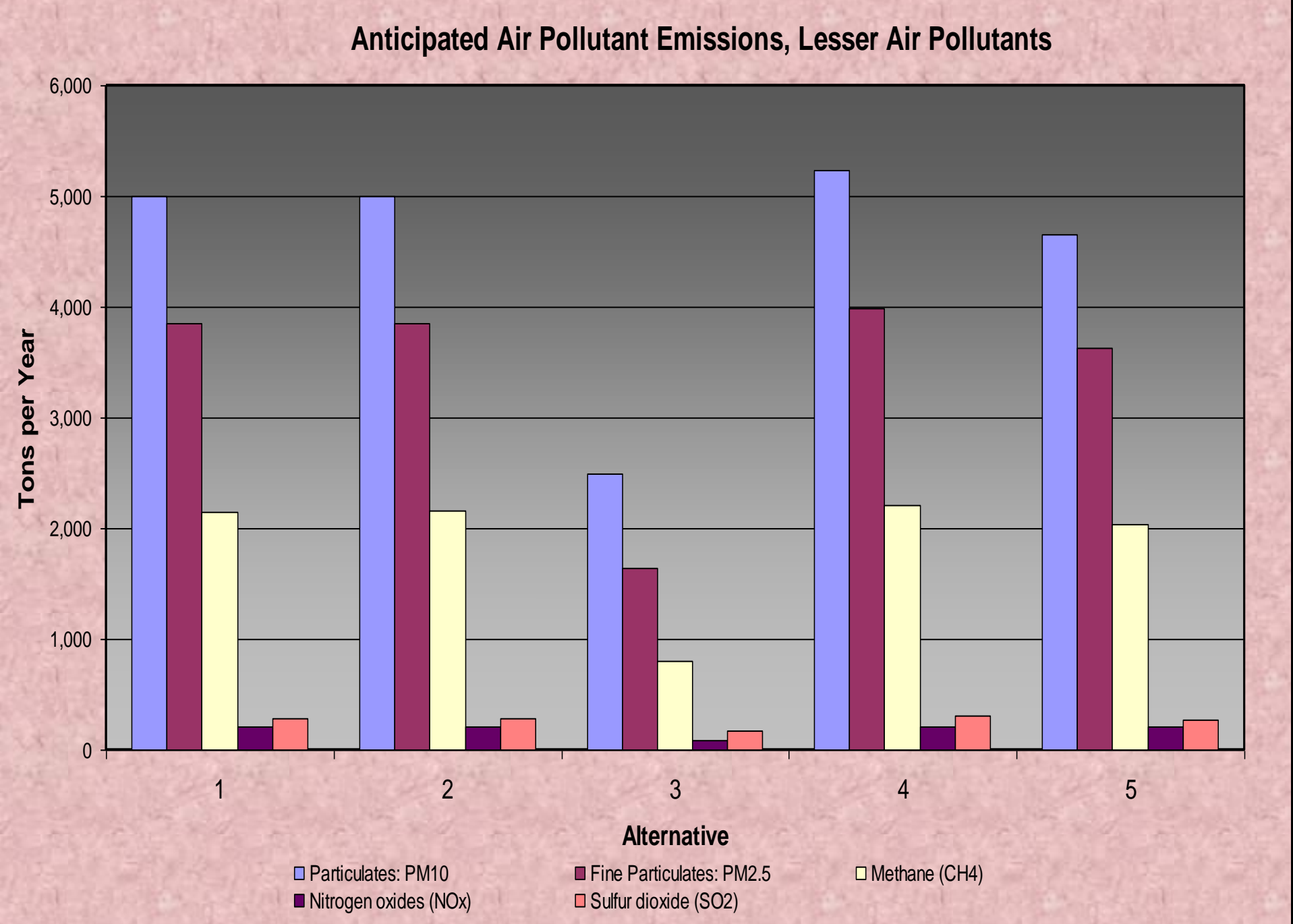
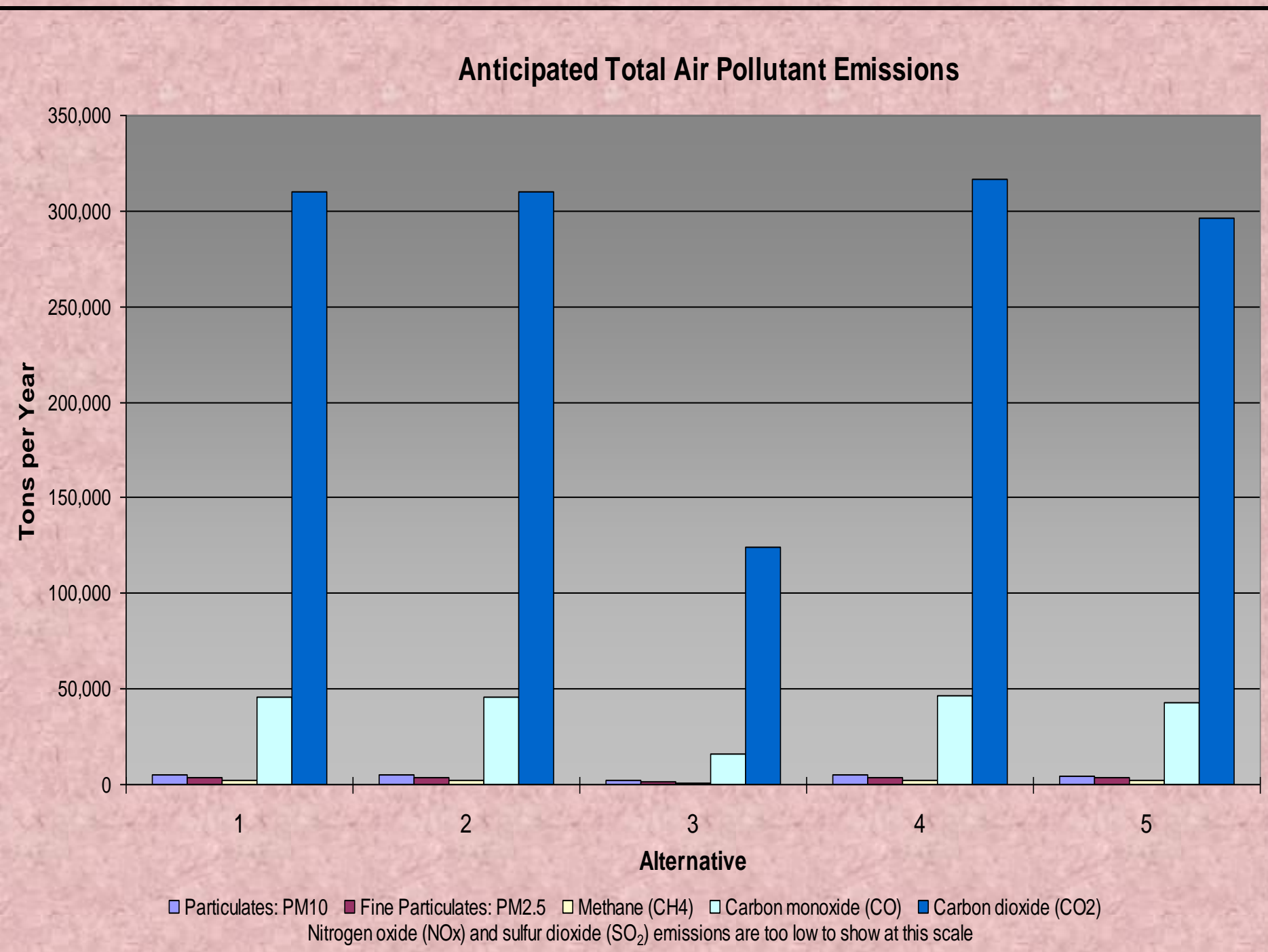
Smoke plumes are a natural part of park fires. Small plumes may be confined to the immediate vicinity of the fire, while larger ones may reach many miles. Under favorable conditions, plumes rise and disperse without any adverse impacts. Any smoke plume offers opportunities to educate visitors about fire's essential role in park ecosystems.

"Very Poor" Visibility Rating Anticipated  
Annually by Alternative



Occasionally, smoke plumes (alone or in combination with other air pollutants) may become thick enough to cause "Very Poor" visibility (see the Proposed Haze Scale, above right). Smoke can be carried into and be trapped in the Canyon by cool night air drainage. The poorest visibility may also be a warning sign of unhealthy fine particle concentrations.

Air Pollutant Emissions from Wildland Fire



Fire is a natural process, the air "pollutants" in smoke can be considered natural (although fuel loads and ignition timing may not be). The air into which this smoke is released is no longer "natural," since it already contains air pollutants of completely human origin.

**Carbon dioxide** is the dominant gas produced by wildland fire. It is a greenhouse gas, but not toxic. It is rapidly dispersed in the atmosphere.

**Carbon monoxide** is also produced in wildland fires. This gas is toxic, but studies have found health concerns only for repeated exposures near the fireline.

**Particulates** (especially fine particles, or PM<sub>2.5</sub>) may cause both visibility and health problems. These impacts can occur both near and downwind from the fire. All alternatives include particulate monitoring.

**Nitrogen oxides** and **hydrocarbons** (represented by methane) combine in sunlight to produce toxic ozone. Ozone levels generally peak well downwind of the fire, making it a regional issue. When issuing permits, State air quality regulators will consider a fire's ozone potential as new standards take effect.

**Nitrogen oxides** and **sulfur dioxide** can be transformed in the atmosphere to form haze-causing particles or acids. Wildland fire produces relatively low levels of these pollutants.

EPA's Fine Particulate  
Air Quality Index

Air Quality Index	PM <sub>2.5</sub> 24-hour average (µg/m <sup>3</sup> )	Descriptor	Group Notified
0 to 50	0 – 15.4	Good	none
51 to 100	15.5 – 40.4	Moderate	none
101 to 150	40.5 – 65.4	Unhealthy for Sensitive Groups	Sensitive Groups (defined by EPA: "People with respiratory or heart disease, the elderly and children are the most at risk")
151 to 200	65.5 – 150.4	Unhealthy	General Public
201 to 300	150.5 – 350.4	Very Unhealthy	General Public
301 to 500	> 350.5	Hazardous	General Public