

New Jersey Wildfire Risk Assessment
(Excerpt from New Jersey State Hazard Mitigation Plan, pp. 330-341)

Appendix B, Section 4. Fires

a. Forest Fires

Although usually associated with the urbanized east, forest fires are not an uncommon occurrence in New Jersey, especially in the Pine Barrens (Figure 3-1 Physiographic Provinces and Location of the Ramapo Fault). Fires which burn more than 1,000 acres of forest occur on average approximately once every 10 years in the Pine Barrens. Although many plants in the Pine Barrens ecosystem rely on fire for a part of their reproductive cycle, the homes and property of the people who live there do not. Although Pinelands fires generally do not cause casualties, property loss can amount to thousands of dollars for each fire. Often, State roads are closed because of dangerous smoke conditions. Emergency responders are often needed to reroute traffic and control the fires.

Fire has been a major factor in New Jersey's environment since prehistoric times. Natural fires and Native American burning played a major role in shaping the land and providing the vast expanses of forestland that greeted early settlers. These settlers soon realized that the Pinelands of New Jersey is one of the most hazardous fuel types in the nation, as best characterized in a report from 1755 describing a wildfire 30 miles long from Barnegat to Little Egg Harbor.

The reasons for New Jersey's continuing wildfire problem are many and varied. However, the major contributing factors, or what could be termed the "Wildfire Equation," can be grouped into the two broad areas of *hazard* and *risk*. **Hazard + Risk = Wildfire Probability.**

A *hazard* is what burns! The New Jersey Pinelands is a fire adapted forest community that takes advantage of wildfire to reproduce. **This Forest community is one of the most hazardous wildland fuel types in the nation.** The Pinelands are classified as Fuel Model B of the National Fire Danger Rating System with California chaparral and a number of other high hazard types. Fuel loadings exceed twenty tons per acre in some locales. This has been **equated to having an inch of gasoline covering all of south and central New Jersey.** Pinelands fires burn extremely hot and spread rapidly. Crown fires are fairly common, spreading from treetop to treetop, as is long range spotting where flying embers start new fires in advance of the main fire.

Risk is what causes fires. In New Jersey, 99% of all forest fires are caused by people, either through carelessness or intentional acts. New Jersey's high population density has created land use pressures in which more people are moving from urban areas to build homes in rural wildland areas. With more people living in, and enjoying the state's wildlands for various forms of recreation, the number of fire starts and the seriousness of their consequences increases.

A potentially explosive combination is created when the factors of hazardous wildland fuels, interface home development, and an increased risk of human caused ignition come together under extreme fire weather conditions. The following is a list of some significant wildfires that have occurred during the last 50 years.

1954- A 20,000- acre wildfire threatened the town of Chatsworth.

1963- A series of 37 major wildfires burned 193,000- acres during the period of April 20 through 22. 186 homes and 197 buildings were destroyed and 7 people were killed. \$8.5

million in property damage was reported. These 1963 conflagrations are often cited as a benchmark for wildfire and wildland/urban interface comparisons in the United States.

1971- The Manahawkin fire burned 21,00- acres in 7 hours, 13 minutes.

1977- A 15,000 acre wildfire burned six homes and caused extensive damage. Four volunteer firefighters were killed during a 2,300-acre fire in Bass River.

1992- A series of four major wildfires burned 14,000- acres on May 3rd closing the Garden State Parkway and forced a shutdown of the Oyster Creek Nuclear Facility.

1995- On April 4th, a 19,225-acre fire burned through Manchester, Lacey, and Ocean Townships in Ocean County.

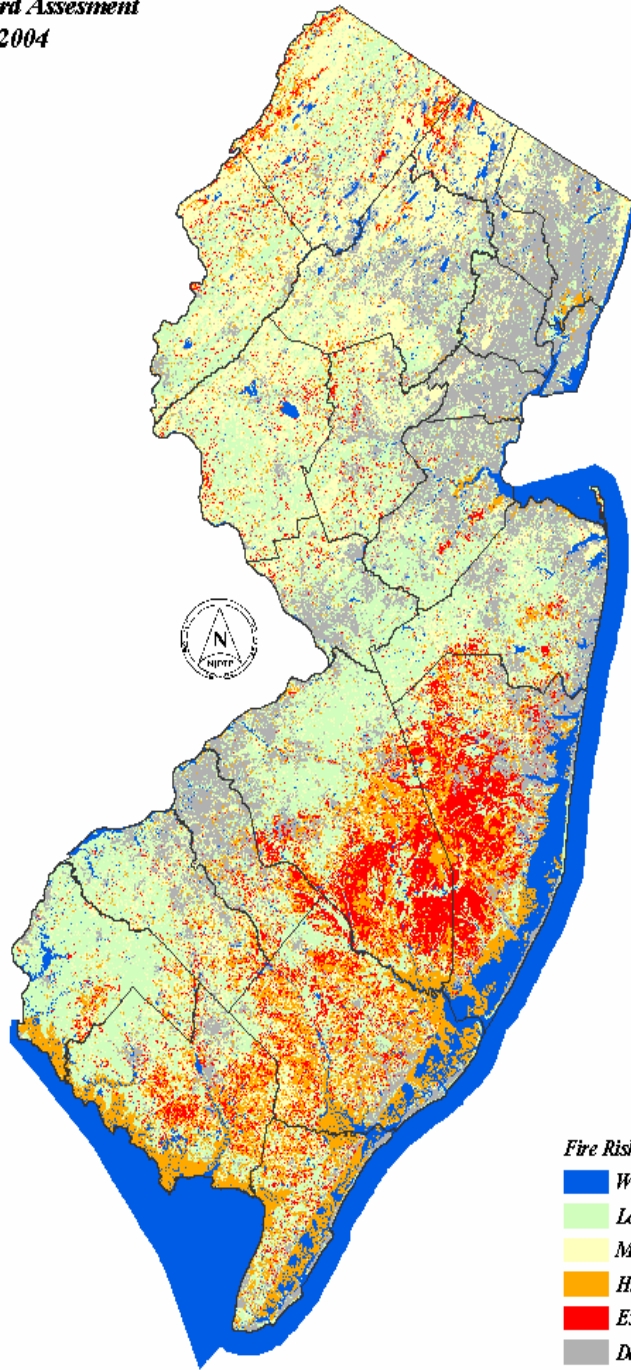
1997-The Wrangle Brook Fire on July 19 burned 702-acres and threatened over 300 homes in the retirement community of Holiday City, Berkeley Township, damaging 20. On July 29, an additional 1918-acres were burned in Hammonton and Mullica Townships on the Rockwood fire which threatened the community of Totem Village.

1999- The Bass River fire burned 11,975- acres in Burlington County.



Crown fire

*New Jersey Forest Fire Service
Wildfire Hazard Assessment
Draft 2004*



- Fire Risk*
- *Water*
 - *Low Hazard*
 - *Moderate Hazard*
 - *High Hazard*
 - *Extreme Hazard*
 - *Developed*



New Jersey
Forest Fire Service
GIS 2004



2001- Several major fires occurred this year including the 765-acre Airport Fire evacuating 60 homes and the 151-acre Cheesequake Creek Fire evacuating 25 homes in April, and the Warren Grove Fire destroying 1,600- acres in June.

2002- The Jake’s Branch Fire was started in a remote portion of Berkeley Township and before it was controlled at 1,277- acres it destroyed 3 homes and 15 outbuildings, seriously damaged an additional 18 homes and outbuildings, and forced the evacuation of 500 residences in the community of Beachwood. This fire also closed the Garden State Parkway between 3pm June 2, and 2am June 3, 2002.



Wrangle Brook Fire, Berkeley Township – July 1997

Number of Incidents per Year by County*

County	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Totals	10 Year Average	Rank
Atlantic	219	171	226	126	214	224	206	155	232	250	163	2186	219	2
Bergen	15	9	5	1	7	8	8	6	13	4	5	81	8	17
Burlington	141	141	154	99	121	133	140	88	128	109	64	1318	132	4
Camden	57	86	110	55	138	126	145	124	143	103	45	1132	113	6
Cape May	48	72	129	59	86	71	84	50	92	80	40	811	81	9
Cumberland	151	152	191	93	151	206	173	100	140	102	58	1517	151	3
Gloucester	18	50	77	34	67	53	72	36	73	78	23	581	58	11
Hunterdon	55	32	72	21	37	28	69	44	66	41	26	491	49	15
Mercer		3	2				5		4	26	8	48	5	18
Middlesex	65	51	70	18	54	50	87	62	106	106	41	710	71	10
Monmouth	63	51	48	30	30	34	50	35	75	54	42	512	51	13
Morris	146	84	137	62	113	99	139	58	65	87	63	1053	105	7
Ocean	355	313	452	196	347	304	412	265	374	287	227	3532	353	1
Passaic	51	51	66	17	37	50	71	29	61	39	21	493	49	14
Salem	24	32	76	22	36	47	24	10	38	37	15	361	36	16
Somerset	79	97	55	6	50	17	65	15	50	86	41	561	56	12
Sussex	52	67	87	38	137	109	176	85	162	129	102	1144	114	5
Warren	54	60	64	33	56	94	129	75	90	144	55	854	85	8
Total	1593	1522	2021	910	1681	1653	2055	1237	1912	1762	1039	17385	1738	

*The number of incidents includes only those wildfires to which the NJ Forest Fire Service responded to in its designated response area. Numbers are rounded for clarity.



Wildland/Urban Interface in the NJ Pinelands

Number of Acres Burned per Year by County*

County	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Total	10 Year Average	Rank
Atlantic	56	277	317	130	2150	136	188	189	166	206	88	3904	390	3
Bergen	5	12	17	0.25	49	42	103	8	98	10	2	348	35	17
Burlington	133	372	142	130	282	121	12857	340	215	57	26	14677	1468	2
Camden	42	12	113	61	265	220	171	283	279	806	382	2744	274	6
Cape May	38	39	126	33	69	30	54	178	60	32	26	684	68	13
Cumberland	94	187	265	149	138	222	290	514	994	78	50	2982	298	4
Gloucester	8	59	99	44	134	117	173	36	110	111	12	905	90	10
Hunterdon	12	45	408	7	38	44	108	12	30	21	7	733	73	12
Mercer		17	2				4		60	19	1	104	10	18
Middlesex	17	288	122	26	99	145	196	78	279	118	124	1492	149	7
Monmouth	11	58	26	81	22	30	33	20	30	24	18	353	35	16
Morris	57	77	122	58	422	37	102	25	52	63	42	1057	106	9
Ocean	179	567	19777	136	1023	138	712	123	1806	4089	109	28661	2866	1
Passaic	59	56	90	32	18	35	77	16	24	16	32	452	45	14
Salem	11	88	416	58	74	62	37	40	19	30	6	840	84	11
Somerset	8	78	22	2	30	6	164	5	43	32	9	399	40	15
Sussex	14	589	94	17	69	62	84	99	165	112	28	1334	133	8
Warren	7	36	1565	51	23	20	1058	98	32	43	6	2940	294	5
Total	754	2968	23721	1016	4905	1469	16410	2064	4462	5866	966	64609	6461	

*The number of incidents includes only those wildfires to which the NJ Forest Fire Service responded to in its designated response area. Numbers are rounded for clarity.

“Major” Fires per County, 1993 - 2003

YEAR	NUMBER OF ACRES BURNED	COUNTY
1993	120	OCEAN
1994	500	SUSSEX
1994	223	BURLINGTON
1994	201	MIDDLESEX
1994	145	OCEAN
1994	140	OCEAN
1994	110	ATLANTIC
1995	19225	OCEAN
1995	100	SALEM
1995	115	ATLANTIC
1995	325	HUNTERDON
1995	200	OCEAN
1995	750	WARREN
1997	100	BURLINGTON
1997	150	OCEAN
1997	702	OCEAN
1997	1900	ATLANTIC
1997	350	MORRIS
1999	375	WARREN
1999	100	MIDDLESEX
1999	623	WARREN
1999	11765	BURLINGTON
1999	300	BURLINGTON
1999	278	OCEAN
1999	500	BURLINGTON
2000	158	CAPE MAY
2000	150	BURLINGTON
2000	110	CAMDEN
2000	350	CUMBERLAND
2001	120	CAMDEN
2001	151	MIDDLESEX
2001	765	CUMBERLAND
2001	1600	OCEAN
2002	740	CAMDEN
2002	1277	OCEAN
2002	2600	OCEAN

NEW JERSEY FOREST FIRE record 1872-2000

1872-1950

1951-2000

Year	1872-1950			Year	1951-2000		
	Number of Fires	Acres Burned	Average Acres Per Fire		Number of Fires	Acres Burned	Average Acres Per Fire
1872		100,000		1951	1148	15,007	13.1
1880	54	71,074		1952	1348	13,407	9.9
1885		128,000		1953	1133	16,838	14.9
1895	49	66,120		1954	1822	37,981	208
1902	66	98,850		1955	1333	21,460	16.1
1903	79	85,046		1956	885	4,067	46
1904	81	41,530		1957	1697	34,022	20.0
1905				1958	749	3,236	4.3
1906	81	41,530	512.7	1959	1280	13,374	10.4
1907	167	11,525	69.0	1960	1136	20,414	18.0
1908	553	52,978	95.8	1961	876	4,835	5.5
1909	563	93,525	166.1	1962	1758	19,512	11.0
1910	611	81,452	133.3	1963	2102	202,116	962
1911	528	64,404	122.0	1964	1946	19,825	10.2
1912	545	26,291	48.2	1965	1752	16,173	9.2
1913	678	53,823	79.4	1966	1684	13,587	8.1
1914	847	78,655	92.9	1967	926	2,986	32
1915	1016	150,258	147.9	1968	1748	8,564	4.9
1916	586	51,654	88.1	1969	1237	3,528	29
1917	871	92,479	106.2	1970	1487	3,477	2.3
1918	796	67,272	84.5	1971	1632	40,393	24.8
1919	607	46,927	77.3	1972	994	1,931	1.94
1920	563	35,497	63.0	1973	1535	3,767	2.45
1921	890	90,104	101.2	1974	1742	7,076	4.06
1922	1097	106,086	96.7	1975	1690	4,936	2.92
1923	1087	137,743	126.7	1976	2516	13,726	5.45
1924	1165	46,373	39.7	1977	2315	39,387	17.01
1925	1186	74,102	62.3	1978	1455	5,106	351
1926	1091	89,787	82.3	1979	1380	2,919	2.11
1927	1042	32,433	31.1	1980	2376	10,983	4.62
1928	975	30,900	32.8	1981	2355	14,429	6.0
1929	1145	25,716	22.5	1982	1666	11,591	6.95
1930	1620	267,547	165.2	1983	1091	7,129	6.53
1931	1591	50,563	31.8	1984	961	1,805	1.88
1932	1395	57,893	41.5	1985	1830	10,329	5.64
1933	793	14,744	18.6	1986	1654	10,724	6.48
1934	1057	16,920	16.0	1987	1001	2,268	2.26
1935	1228	65,216	53.1	1988	1839	3,564	1.93
1936	1212	68,021	56.1	1989	1003	6,758	6.73
1937	1425	15,975	11.2	1990	1226	2,635	2.14
1938	1584	16,152	10.2	1991	1847	4,265	2.3
1939	1936	13,145	6.8	1992	1410	16,650	11.8
1940	1551	16,851	10.9	1993	1511	2,667	1.76
1941	2472	80,769	32.7	1994	1449	3,018	2.08
1942	1870	16,119	8.6	1995	2008	22,597	11.3
1943	1811	39,941	22.1	1996	915	1,019	111
1944	1295	28,062	21.7	1997	1,689	4,922	2.91
1945	1041	10,795	10.0	1998	1,653	1,469	.88
1946	1486	35,751	24.1	1999	2,060	16,444	7.98
1947	1149	14,002	12.2	2000	1,240	2,066	1.66
1948	908	7,274	8.0				
1949	1437	8028	5.6				
1950	1178	12,026	10.2	5 Yr. Average	1,511	5,184	2.9



Greenwood Wildfire, April 4, 1995 Manchester Twp, Ocean County

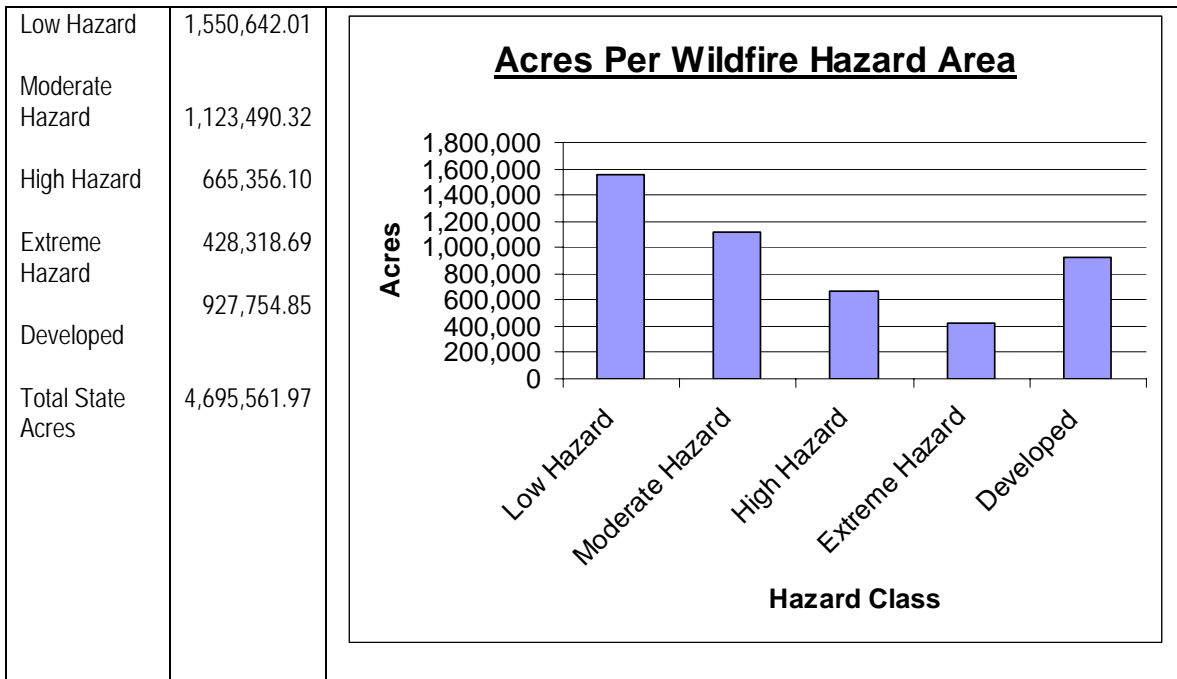
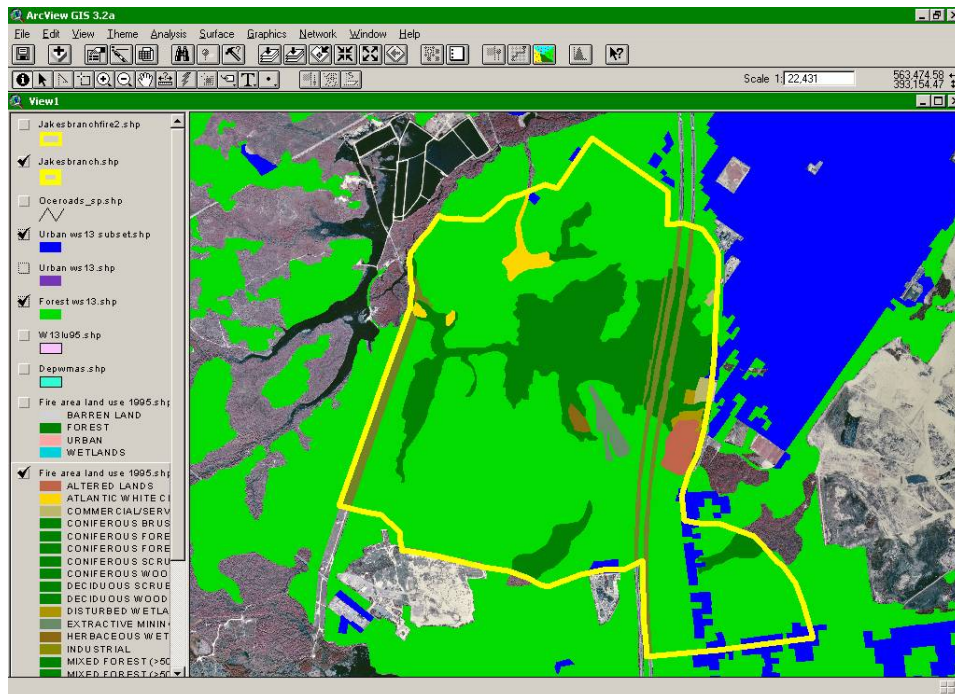
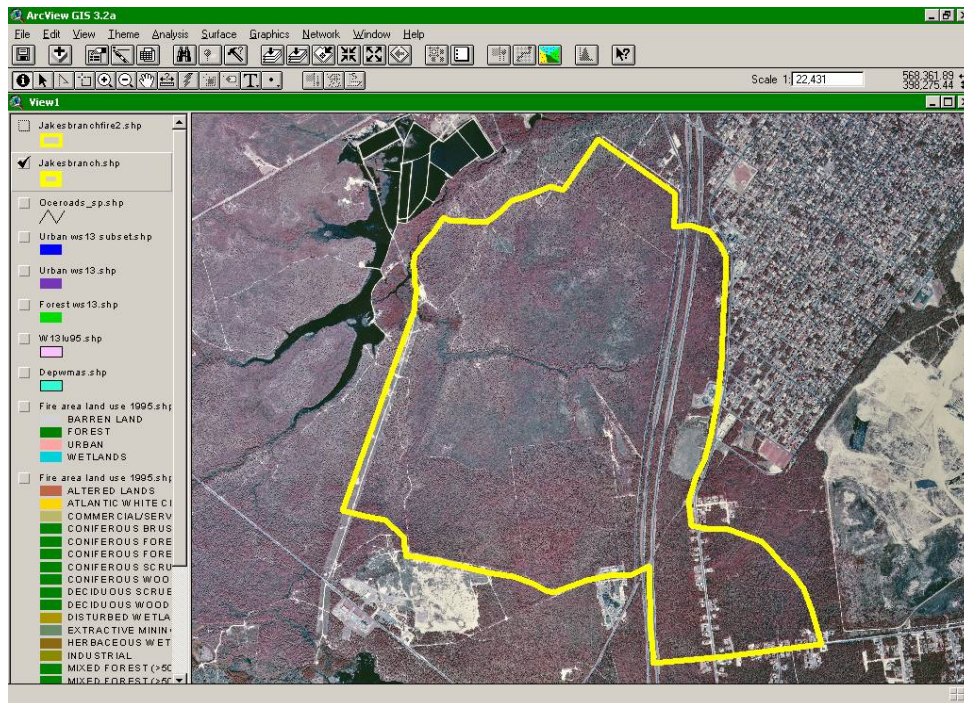


Figure 1: Jake's Branch Forest Fire Area Analysis



Although it is not necessary for a fire to be large to possess a serious threat or loss to homes and improved property, the NJ Forest Fire Service regard fires over 100-acres as “major”. Analysis of fire data for the last several years reveal trends that can help predict the probability of major fire events. It can be argued that the probability of wildfire events will follow the “average” year as long as neither significant weather changes nor human ignition factors become more severe.

Defining the potential losses by wildfires in New Jersey is difficult. Weather, the main influence on how a wildfire burns, is a variable that can only be predicted on a short- term basis. Actual dollar loss, therefore, will be specific to each wildfire and each year. During 2001, the latest year for which estimates were available, these losses to improved property totaled \$266,025. Suppression costs to the state for that year totaled \$955,907. Property losses for the 2002, Jakes Branch wildfire exceeded one million dollars. Other indirect losses must also be considered.

The primary forest product industry, in other words the actual harvest and processing of forest products, is limited within the state. Therefore, the value of timber products lost to wildfire is not recorded. Additionally, the dollar loss of the recreation experience to a forest visitor from a wildfire is subjective, as well as is the losses to commerce from the effects of road closures and evacuations in the area of the wildfire.

Using the data that can be found in the previous tables, the following information can be highlighted:

- The NJ Forest Fire Service has continued to meet its goal of limiting the number of fires to below 2000 annually.
- The Forest Fire Service has also kept the acreage lost to wildfire below its goal of 18,750.
- The probability exists that New Jersey will continue to face an average of three fires greater than 100- acres each year.
- Ocean County leads the state in the number of fires, total acreage, and number of fires greater than 100-acres. Burlington County follows closely behind.

b. Drought-Aggravated Forest Fires

In those years when drought was prevalent, wildfires were a major concern. Several large fires struck the Pine Barrens and other forested areas. Fire services have employed isolation and pre-burn techniques to limit the total acreage affected. This has had excellent results, and now that we are climbing out of drought conditions and groundwater tables are returning to better levels, our forest have rebounded well. Fire coordinators continue these programs throughout the dry season.

One of the most consistent and serious impacts of drought is the contribution to conditions conducive to forest fires. This applies particularly to the Pine Barrens, where drying conditions favor the combustion of forest fuels. Generally, a relative humidity of less than 40 percent, winds greater than 13 miles and hour, and precipitation of less than 0.01 inches during a month are ideal conditions for forest fires in the Pine Barrens. Given the proper conditions, stray cigarette butts, improperly extinguished campfires, and intentional matches can all start fires in the Pine Barrens. The season of greatest fire threat runs from March through May, though extensive fires have occurred in the summer and autumn months.

A complete forest fire hazards analysis for all State-owned lands has been prepared in a document published by the New Jersey Bureau of Forest Fire Management, of the Division of Parks and Forestry of the Department of Environmental Protection entitled the *New Jersey Forest Fire Management Plan*.

c. Industrial Fires

When an industrial facility catches fire, complications exist on top of complications. In addition to a fire fed by highly flammable chemicals, the smoke itself can be toxic. Using water to put out the fire can spread toxic chemicals into the soil and eventually the groundwater. Workers may suffer from chemical poisoning and need to be treated for exposure. However, because of the large number of chemicals on a site and their mixing during the fire, uncertainty may exist as to what workers were exposed. Because New Jersey still retains many of its chemical and manufacturing facilities, industrial fires do occur in the state.

d. Urban Fires

Fighting urban fires is often difficult, especially in older neighborhoods where homes were built to lower fire standards and more belongings which serve as fire fuel has collected in attics and basements. In addition, because of their close spacing and older, the drier nature of the buildings, urban environments are well known for multiple building fires because of spreading flames. In addition, intense development means higher traffic volumes, causing greater difficulty in reaching urban fires.

e. Fire Prevention and Responsible Agencies

Both the State and localities are responsible for fire data collection and analysis, "hot spot" identification, and mitigation development. As discussed earlier in this chapter under Drought-Aggravated Forest Fires, the *State Forest Fire Hazard Reduction Plan* sets out ways to suppress and mitigate forest fires. In addition, a full forest fire management plan titled the *State Forest Fire Management Plan* also prepared by the Bureau of Fire Management, further describes hazard areas, establishes authority and administration of forest fire management and fully explains the organization for fire suppression and mitigation for all of New Jersey-owned forest land.

Outside of forest lands, municipalities are responsible for fire management with State or county assistance on a per request basis.

Statistical data collection and hazard analysis for all fires in New Jersey is overseen and coordinated by the State Fire Marshals Office, Division of Fire Safety, Department of Community Affairs. The State Fire Marshal is New Jersey's administrator of all fire reporting to the United State Fire Administration (USFA), which is part of the Federal Emergency Management Agency (FEMA).

The State Fire Marshal is mandated by Governor's Executive Order 86 to collect and report all statistics on fires from the State Bureau of Forest Fire Management and all local fire companies and input the information into the National Fire Reporting System (NFIRS). Today, most fire incidents are reported into this database.

With most fires now recorded in the NFIRS, the State can now begin the process of analyzing where fires are most common, what their main causes are and what mitigation measures can be taken to prevent fires.

f. Fire Bibliography

United States Fire Administration, Federal Emergency Management Agency, "National Fire Incident Reporting System", 1999, Emmitsburg, Maryland

New Jersey Office of Emergency Management, Population Protection Planning Unit, New Jersey State Police, "Hazard Analysis New Jersey." 1984, Trenton, New Jersey