

# Suppression Work Group Report

## INTRODUCTION

Mechanized fire suppression equipment, primarily tractor-plows and wildland engines, has long been the backbone of the WDNR fire management program. Many types, kinds and configurations of equipment are available and utilized throughout Wisconsin, the Great Lakes Region, and nationwide. In addition to mechanized ground equipment, aircraft, pumps with hoses, and various handtools are also commonly available suppression resources. The Suppression Work Group was tasked with taking a look at various types and kinds of fire suppression equipment and making recommendations regarding appropriate allocations of fire suppression resources at different levels of stratification to meet our agency goal of rapid initial attack response to fires. The Suppression Work Group also considered suppression resource availability from our partner agencies, volunteer fire departments and contractors; making recommendations on the appropriate roles these entities could or should play at varying levels of stratification.

### Items Assessed:

- Types and configurations of mechanized DNR fire suppression equipment including engines, tractor-plows, slip-on units, large dozers, wet-ground units, and other specialized equipment.
- Types of resources currently used in neighboring states, or states with similar fuel types and fire programs.
- Other ground based fire suppression hand tools, pumps, sprinkler kits, fire caches, extinguishing agents.
- Aerial suppression resources including SEATs, large air tankers, water bombers.
- Resource availability from volunteer fire departments, other partner agencies, contractors, hand crews.

### WORK GROUP CHARGE:

Provide alternatives and a recommendation for allocation of fire suppression resources, including appropriate type and mix of fire suppression resources (equipment, personnel, contractors, and partners.) Explain how this can be provided given changes in what we can invest, considering what role our various partners play or could play and different levels of stratification.

## DESCRIPTION OF OBJECTIVES

### Objective Introduction:

The main purpose of this work group assessment was to recommend the numbers, types and configurations of the various fire suppression resources used by WDNR. The Suppression Work Group also was tasked with recommending an appropriate mix and placement of such resources based on level of stratification.

**List of Objectives:**

- **Objective 1:** Evaluate and revise, if needed, current standards for DNR fire suppression equipment and air suppression resources based on resource capability and level of stratification.
- **Objective 2:** Identify specific numbers, types and configurations of both standard and specialized DNR equipment needed for each of the various levels of stratification.
- **Objective 3:** Develop a recommended mix and placement of aerial and ground based resources by levels of stratification.
- **Objective 4:** Identify the types and availability of suppression resources from VFD's, partner agencies, organizations and contractors. Determine how these could be used to complement DNR resources or replace the need for DNR resources where such DNR resources are not available.
- **Objective 5:** Explore and recommend use of new equipment technologies that could be incorporated over the next 10-15 years.
- **Objective 6:** Determine the costs of the various fire suppression resources (equipment, personnel, contractors, and partners).

## SUMMARY OF RECOMMENDATIONS:

- 1) The Division of Forestry should continue to be primarily a “ground based” suppression organization utilizing tractor/plows and engines, in conjunction with air attack for intelligence and safety. *(High)*
- 2) The current allocation model for placement of equipment should be revised and based on fire landscape considerations as opposed to historical “pine” vs. “hardwood” or “levels of protection.” *(High)*
- 3) Fire Cache and Equipment standards, once approved, must be documented in handbooks for effective program implementation. *(High)*
- 4) Cache inventories should be recorded in Fire Action Plans using a standard template to allow for consistent reporting and more effective utilization. *(High)*
- 5) Resources should be allocated throughout the state based on the fire landscape concept, utilizing a combination of a mathematical formula and professional fire manager judgment. *(High)*
- 6) Fire landscapes with a mean and median risk factor of less than 30 should not be allocated any dedicated DNR suppression equipment (tractor/plows or type 6 engines). These include fire landscapes 1, 2, 10, and 12. *(High)*
- 7) Fire landscapes with a mean risk factor over 43 and median risk factor over 46 should be allocated 53 tractor/plows in order to maintain a maximum 10 mile response radius. This includes fire landscapes 4, 7, 9, 13, and 15. The initial attack response configuration should be one DNR type 6 engine and two DNR heavy units per Fire Response Unit, with the exception of FL13 which would be one DNR type 6 engine and one DNR heavy unit. *(High)*
- 8) Fire landscapes with a mean and median risk factor of between 30 and 40 should be allocated 26 tractor/plows in order to maintain a 15 to 25 mile response radius. This includes fire landscapes 3, 5, 6, 8, 11, 14, and 16. The initial attack response configuration should be one DNR type 6 engine and one DNR heavy unit per Fire Response Unit. *(High)*
- 9) A total of 55 type 6 engines should be allocated based on an initial attack package as determined for each fire landscape. In general, this consists of a type 6 engine, one or two tractor plows and a fire department for each FRU within a given landscape. The number of type 6 engines per fire landscape would then be a function of the tractor/plow allocation and the initial attack package. *(High)*
- 10) A total of 47 type 8 engines should be allocated to fire landscapes that have been allocated type 6 engines and heavy units. In these landscapes, type 8 engines should be utilized to supplement primary suppression units on multiple fire days, assist on extended

attack fires, free up type 6 engines to respond to initiating fires and burning complaints, and to support prescribed burn activities. *(High)*

- 11) An additional four (4) type 8 engines should be allocated to fire landscapes 10 and 12 in recognition of suppression resource needs to support local fire departments during extended attack or complex fires. *(Moderate)*
- 12) All heavy units should be configured with a type 4 engine pulling a tilt-bed trailer that carries a tractor/plow. This will maintain maximum statewide mobility and ensure that all units are initial attack capable. In addition, all type 4 engines should be built primarily for wildland fire suppression including all-wheel drive. *(High)*
- 13) A total of seven low ground units should be allocated to landscapes 3, 4, 5, 6, 8, and 16 due to the prevalence of wet ground within these fire landscapes. *(High)*
- 14) Dedicate a type 4 engine and tilt-bed trailer to each piece of low ground equipment. *(Moderate)*
- 15) Dedicated DNR Air Attack Aircraft should be available to all fire landscapes that are staffed by DNR fire control resources. Fire landscapes 3, 4, 8, and 15 should have more dedicated air attack aircraft than others based on size of the landscape and associated risk. A total of 17 such aircraft are recommended. *(High)*
- 16) Aerial suppression resources should be utilized to supplement ground suppression resources for initial attack in the five highest risk landscapes (FL 4, 7, 9, 13 and 15), and for project fire support statewide. *(High)*
- 17) One SEAT should be allocated for fire landscape 7 and two SEATs for fire landscape 4, using exclusive use contracts. *(Moderate)*
- 18) Two type 3 helicopters should be allocated for fire landscape 15 to be shared with fire landscape 13. Exclusive use contracts, CWN contracts or interagency agreements should be utilized to provide these resources. It is recognized that fire landscape 9 should continue to have access to a type 3 helicopter which is currently in place with the USFS in that fire landscape. *(Moderate)*
- 19) Maintain access through interagency agreements to either CL 215 or CL 415 suppression aircraft from our Great Lakes Forest Fire Compact partners on an “as needed” basis for project fires. Large air tankers should be ordered as a pair when the need arises. *(Moderate)*
- 20) Establish a heavy air tanker base at Eau Claire to preposition two heavy air tankers when conditions warrant. *(Moderate)*
- 21) Implement the current (2007) fire cache standards in regards to types of cache equipment, tools, water supply and PPE if current Dispatch Group organization remains. *(Moderate)*

- 22) Maintain mobile fire caches in 14 of 16 fire landscapes plus maintain the LeMay Center cache. Fire landscape caches would require a total of 710 hand tools, 355 back cans, 14 water supply caches and 290 PPE caches. *(Moderate)*
- 23) Within Fire Landscapes 1, 2, 10, 12, local fire departments with appropriate wildland fire training should be able to routinely suppress wildland fires with only occasional/minimal DNR suppression resource assistance. *(High)*
- 24) Within Fire Landscapes 3, 5, 6, 8, 11, 14, and 16, it is important to have a strong DNR and fire department partnership. Fire departments should be utilized to provide initial attack services in concert with DNR suppression resources. *(High)*
- 25) Within Fire Landscapes 4, 7, 9, 13 and 15, DNR must respond as initial attack and be supported by fire departments. Fire departments should provide an important role in initial attack and in structural protection within these high risk fire landscapes. *(High)*
- 26) Continue to develop and foster relations with local hand-crews/squads where available. Utilize these crews on a more routine basis for prescribed fires, station stand-by assignments, and on smaller fires to promote more interest and experience, and to foster greater cooperation. *(High)*
- 27) Recognize and utilize as needed Compact, contracted, and/or national hand crews. *(Moderate)*
- 28) Each Fire Response Unit should identify one or two primary private equipment contractors or local units of government having heavy equipment and work more closely with them, rather than identifying every contractor that has a piece of equipment. *(Moderate)*
- 29) Continue to develop and foster working relationships with federal partners having suppression resources within Wisconsin. Look for opportunities to expand the availability of these resources to supplement our needs but do not include these resources as part of our initial attack allocation model. *(High)*
- 30) A main focus of the LeMay Center should be to continue to investigate, conduct research, and develop new technologies and equipment. *(High)*
- 31) Research the idea of incorporating Argo and/or Polaris UTV type units into our suppression effort. Recommend using 6 wheel + units that are more safe, stable and versatile than conventional ATVs currently used by many fire departments and other DNR staff. *(High)*

## DISCUSSION BY OBJECTIVE

**Objective 1:** Evaluate and revise, if needed, current standards for DNR fire suppression equipment and air suppression resources based on resource capability and level of stratification.

**Current Conditions:** Current status of, and standards for, ground based, air suppression and fire cache resources are as follows:

### Ground Based Resources:

Equipment and personnel allocations were made based on historical program needs and adjusted following the 1990's fire study under the premise of the areas being a pine area or a hardwood area. These allocations were based on a township classification, assigning each town a protection level between one and five with a value of one being the highest level of protection. Individual Fire Response Units (FRU) were then determined. Fire Response Units are geographical areas of varying size that a Forester/Ranger and Technician(s) cover for suppression purposes. Several Fire Response Units made up an "Area." Under the current model, each pine fire response unit was allocated two heavy units and one type 6/7 engine. The hardwood fire response units were allocated one heavy unit and one type 6/7 engine. Each "Area" was given one additional heavy unit to place where they felt it was needed most. In addition, type 8 engines and low ground equipment was placed throughout the state based on local need.

Using the system described above, Table 1.0 depicts the various types and kinds of fire suppression equipment owned and operated by the Division of Forestry. Current cost information is also included.

See SWG Appendix 1.1, 1.1a, 1.1b, 1.2, 1.2a, 1.2b, and 1.2c for detailed descriptions, costs, and locations of current equipment.

Current Ground Suppression Equipment Owned by the Division of Forestry

Equipment	Q'ty Current in field	Q'ty at LeMay	Unit 2009	Ext 2009
Type 6/7x Engine	61	1	\$58,800.00	\$3,645,600.00
Type 8x Engine	47		\$35,456.42	\$1,666,451.74
Type 4 Engine	84	1	\$144,700.00	\$12,299,500.00
Trailers	86	1	\$20,100.00	\$1,748,700.00
Tractor Plow	79	2	\$152,875.00	\$12,382,875.00
Heavy Dozer		1	\$266,775.00	\$266,775.00
Low ground	6		\$212,425.00	\$1,274,550.00
			<b>Total Value 2009</b>	<b>\$33,284,451.74</b>

Table 1.0

## **Air Suppression Resources**

The Division of Forestry currently operates ten Cessna 180 Series aircraft for detection and air attack purposes. These aircraft are stationed at five locations throughout the State. The location of these aircraft was originally based on Regional boundaries and determined based on overall Department needs, not just the Division of Forestry. These aircraft are owned by the Department of Administration (DOA). Aircraft charges are paid to DOA on an hourly basis for their use.

The Division of Forestry also contracts aircraft for suppression use. In recent years the Division has contracted four Single Engine Aircraft Tankers, (SEATs) for 40 day exclusive use contracts. However the FY 10 budget has recently been cut from \$325,000 to \$200,000 which will reduce SEAT availability either in total number, shortened length of availability, or both for the 2010 fire season and possibly beyond. Additional SEATs and heavy air tankers are available on a call when needed basis.

See SWG Appendix 1.3 and 1.4 for information regarding types of suppression aircraft and costs.

## **Heavy Air Tankers**

The Division of Forestry does not own, operate, or contract for the use of Heavy Air Tankers. These resources are generally available when requested through our partners in the Great Lakes Forest Fire Compact and have been utilized in the past for project fires.

## **Helicopters**

The Division of Forestry does not currently utilize helicopters although they have been used in the past. The last helicopter that had been contracted and stationed at Solon was dropped as the cost for the Solon unit was very high for the perceived benefit. We currently do have limited access to rotary wing assets from Minnesota and from the Forest Service in Wisconsin.

The *Final Report of the Air Operations Ad Hoc Team* from July 2007 stated that, "As of 2004 the only active contracted helicopter capable of hauling from 100 to 140 gallons of water was provided under national contract through the OAS office and was located at Solon Springs. This ship was a fine helicopter and operated well but the costs of approximately \$70,000.00 for a 21 day contract were high. This ship required a Helicopter Manager plus a crew member, since WDNR does not have any qualified managers these had to be brought in from out of state and became costly due to salary, motels and other travel expenses."

The Division has been researching utilizing military Blackhawk helicopters. However legal issues stalled, but that issue is still being researched.

Some support for continued use of helicopters in Wisconsin still exists. This support is most prevalent in the northwestern portion of the state where numerous lakes exist, forest cover types are more contiguous, tree canopies more dense and road access more limited. Additionally, the proximity to Minnesota where helicopters are routinely used makes their availability and effectiveness more practical than elsewhere.

## **Fire Cache Resources**

Current fire cache standards were initially proposed by an ad hoc team in July of 2000, and then revised by the Fire Suppression Specialist Team in February of 2006. These revisions were given final approval by the Fire Working Group in January of 2007.

These standards include a LeMay Forestry Center Cache, a Dispatch Group Handtool Cache, Dispatch Group PPE Cache, Dispatch Group Pump Cache, and a Station Normal Operating Inventory for each FRU.

As part of this Fire Assessment, an inventory of fire cache items was conducted to determine the location (by Area) and quantity of hand tools, back cans, personal protective equipment (PPE), and related cache items. Replacement costs for all items reported are \$858,749. A comparison between current Area inventories of hand tools, back cans, PPE, drip torches, Mark 3 pumps, and hose to the cache standards established in 2007 showed a surplus of cache equipment with a value of \$263,538. Specific results can be found in SWG Appendix 1.5.

## **Components Considered:**

### **Ground Based Suppression Resources**

- Current inventory and placement of Division of Forestry suppression resources.
- Current and projected costs of suppression resources.
- Forestry Heavy Equipment Fund Review.

### **Air Suppression Resources**

- Current inventory and placement of air suppression resources.
- Current and projected costs of air suppression resources.
- Final report of the Air Ad Hoc Team (2007).

### **Hand Tools/Fire Cache Resources**

- Current inventory and placement of Division of Forestry hand tools, PPE, and water handling equipment.
- Current fire cache standards approved by FWG in 2007.
- Survey/Café Comments.



**Recommendations:**

- 1) The Division of Forestry should continue to be primarily a “ground based” suppression organization utilizing tractor/plows and engines, in conjunction with air attack for intelligence and safety.
- 2) The current allocation model for placement of equipment should be revised and based on fire landscape considerations as opposed to historical “pine” vs. “hardwood” or “levels of protection.”
- 3) Fire Cache and Equipment standards, once approved must be documented in handbooks for effective program implementation.
- 4) Cache inventories should be recorded in Fire Action Plans using a standard template to allow for consistent reporting and more effective utilization.

**Changes in Investment with Additional Resources (in priority order)**

Not Applicable

**Changes in Investment with Fewer Resources (in priority order)**

Not Applicable

**Objective 2\*:** Identify specific numbers, types and configurations of both standard and specialized DNR equipment needed for each of the various levels of stratification.

**Objective 3\*:** Develop a recommended mix and placement of aerial and ground based resources by levels of stratification.

\*Because objectives two and three are very similar, the Suppression Working Group felt they should be addressed concurrently.

### **Current Conditions:**

The Division of Forestry currently allocates resources geographically based on a Dispatch Group/Fire Response Unit basis. There are currently 9 dispatch groups and 56 fire response units within organized protection areas. Within these 9 dispatch groups there are 10 aerial detection routes that correlate with the number of aircraft available for air attack services. On occasion, DNR fire suppression resources are dispatched to Co-operative areas of the State to assist fire departments on large or complex fires upon specific request.

### **Components Considered:**

#### **Mathematical Formula of Tractor/Plows by Fire Landscape:**

- Statewide Suppression Responsibility
- Fire Landscape Stratification
- Size of Response Area Relative to Risk
- Fire Behavior (Flame Length coefficient)
- Area and Risk that a Heavy Unit could cover

The mathematical formula was developed jointly between the Command & Control Work Group and the Suppression Work Group. This formula was designed to utilize the characteristics of a given fire landscape as developed by the Stratification Work Group then incorporates additional fire behavior and response time considerations to determine a recommended tractor/plow distribution by fire landscape.

Area that a heavy unit could effectively cover was determined based on a 30 minute desired travel time. An average risk circle factor was then applied based on the average mean sum of all fire landscapes.

Fire behavior is incorporated into this formula model through an average flame length coefficient based on the Scott and Burgan 40 Fuel Models and applying a four foot threshold where fire suppression traditionally transitions from hand tools to mechanized equipment.

The mathematical allocation formula is described in detail in the Command & Control Work Group report. This formula provides the basis for allocating tractor-plows to each fire landscape. Type 6 engines are then allocated based on the numbers of tractor-plow units assigned as part of an initial attack package.

Using the mathematical formula allocation method a total of 73 tractor/plows or heavy units are required to meet statewide fire suppression needs less USFS and military owned lands.

Table 2.0 Mathematical Formula Method - Allocation of Tractor/Plows by Fire Landscape

Fire Landscape	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Tractor/Plows allocated	1	3	4	14	1	2	7	11	7	2	3	1	2	2	11	2	73

**Professional Fire Manager Judgment:**

- Fire Occurrence
- Historical Project Fire Information
- Partner Resources and Availability
- Initial Attack Needs
- Extended Attack Needs (> 1 hour )
- Measures of Success Program Guidance Document
- Resource Capabilities and Limitations
- Survey Results and Café Comments
- Proximity to Neighboring Division of Forestry Resources

Rather than utilizing a formula method for allocating resources, this method is based instead on professional judgment and experience. This method considers the current model of allocating resources as a base, but also incorporates knowledge of past fire occurrence including historical project fires, and recognizes partner capabilities.

Landscapes were first grouped into one of three separate classifications using agreed upon breakpoints for the mean and median risk factors as determined by the Stratification Work Group. The five highest risk landscapes had median risk factor scores above 43.84, moderate risk landscapes had mean risk factors between 29.96 and 39.09, and lower risk landscapes had mean risk factors below 28.57.

An initial attack response configuration and one-hour resource needs for extended attack were developed by fire managers using an ICS 215 exercise applied to each Fire Landscape (see SWG Appendix 2.3). In the mathematical method, seven tractor/plows were originally allocated to Fire Landscapes 1, 2, 10, and 12. Using professional judgment, these tractor/plows were redistributed to the remaining fire landscapes in order to maintain statewide response capability.

Again, using tractor/plows as the base resource due to the highly specialized and more unique nature of this type of equipment, the Suppression Work Group felt that each piece of such equipment in a higher risk landscape should cover a smaller geographical area than a similar piece of equipment in a lower risk landscape. To support this, a response radius was calculated for each landscape ranging from 6.8 miles in fire landscape 15 to 20.04 miles in fire landscape 6. For the five highest risk fire landscapes the response radius ranges from 6.8 to 10.59 miles, and for the moderate risk fire landscapes the response radius ranges from 14.21 to 22.44. Details can be found in Appendix 2.3.

Using the professional judgment allocation method a total of 79 tractor/plows or heavy units are required to meet statewide fire suppression needs.

Professional Judgment Method - Allocation of Tractor/Plows by Fire Landscape

Fire Landscape	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Tractor/Plows allocated	0	0	4	20	1	2	8	13	7	0	3	0	4	1	14	2	79

Table 2.1

**Ground Based Resource Allocation Recommendations:**

- 1) The Suppression Working Group recommends allocating resources based upon the fire landscape concept utilizing a combination of the mathematical formula and professional judgment. (See SWG Appendixes 2.1, 2.2, and 2.3) The mathematical formula is focused on allocation of tractor/plows as a base resource due to their unavailability from other sources. The premise for this allocation is based on high fire danger days.
- 2) The Suppression Working Group recommends that fire landscapes with a mean (rounded) and median risk factor less than 30 will not be allocated any dedicated DNR suppression equipment. These landscapes are numbers 1, 2, 10, and 12. Fire department resources are adequate to handle most wildland fires in these fire landscapes (see Objective 4). The suppression resource requirements calculated by the formula method for these fire landscapes (7 tractor/plows) are reallocated into the remaining fire landscapes to maintain statewide fire suppression capability.
- 3) Fire landscapes with a mean risk factor over 43 and median risk factor over 46 should be allocated 53 tractor/plows in order to maintain a 10 mile response radius (approximately a 15 minute travel distance). This includes fire landscapes 4, 7, 9, 13, and 15. The initial attack response configuration should be one DNR type 6 engine and two DNR heavy units per Fire Response Unit, with the exception of FL13 which would be one DNR type 6 engine and one DNR heavy unit.
- 4) Fire landscapes with a mean and median risk factor of between 30 and 40 should be allocated 26 tractor/plows in order to maintain a 15 to 25 mile response radius (approximately a 16 – 30 minute travel distance). These fire landscapes are 3, 5, 6, 8, 11, 14, and 16. The initial attack response configuration should be one DNR type 6 engine and one DNR heavy unit per Fire Response Unit.
- 5) A total of 55 type 6 engines, should be allocated based on an initial attack package as determined for each fire landscape. In general, this package consists of a type 6 engine, one or two tractor plows and a fire department for each FRU within a given landscape. The number of type 6 engines per fire landscape would then be a function of the tractor/plow allocation and the initial attack package. For example, if a particular fire landscape was identified to have an initial attack package of one type 6 engine and two tractor/plows and that landscape was allocated 10 tractor/plows, then five type 6 engines would be allocated. This is a ratio of 2:1, tractor/plows to type 6 engines within the fire landscape. See table 2.2 for our recommendation of type 6 engines by fire landscape.

- 6) A total of 47 type 8 engines should be allocated, considering first hour extended attack needs, in fire landscapes that have been allocated type 6 engines. In these landscapes type 8 engines can be utilized to supplement primary suppression units on multiple fire days. In addition during extended attack fires (i.e. project or heavy mop up fires), the use of type 8 engines enables other type 6 engines to respond to other initiating fires and burning complaints. In fire landscapes 3, 6, and 11 additional type 8 engines were allocated based on size, risk and limited amount of type 6 engines.
- 7) While fire landscapes 10 and 12 do not have any type 6 engines allocated them, the Suppression Working Group recommends that four type 8 engines be placed in these landscapes in recognition of suppression resource needs to support local fire departments during extended attack or complex fires, such as multiple fires. See table 2.2 for our recommendation of type 8 engine allocation by fire landscape.
- 8) All heavy units should be configured with a type 4 engine, pulling a tilt bed trailer that carries a tractor/plow. This will maintain maximum statewide mobility and ensure that all units are initial attack capable. In addition, all type 4 engines should be built primarily for wildland fire suppression including all-wheel drive.
- 9) A total of seven low ground units should be allocated to landscapes 3, 4, 5, 6, 8, and 16 due to the prevalence of wet ground within these fire landscapes. These needs were based on fire landscape descriptions and history of fire occurrence within these landscapes.
- 10) Dedicate a type 4 engine and tilt-bed trailer to each piece of low ground equipment.

Recommended Ground Suppression Equipment Allocation Summary

Equipment Type	FL 4	FL 7	FL 9	FL 13	FL 15			
Tractor plow	20	8	7	4	14			
Type 6 Engine	10	4	4	4	7			
Type 8 Engine	7	5	5	3	6			
Low Ground Unit	1	0	0	0	0			
Type 4 Engine w/ trailer	21	8	7	4	14			
Equipment Type	FL 3	FL 5	FL6	FL 8	FL 11	FL 14	FL 16	
Tractor plow	4	1	2	13	3	1	2	
Type 6 Engine	4	1	2	13	3	1	2	
Type 8 Engine	4	3	2	3	3	3	3	
Low Ground Unit	1	1	1	2	0	0	1	
Type 4 Engine w/ trailer	5	2	3	15	3	1	3	
Equipment Type	FL 1	FL 2	FL10	FL12				
Type 8	0	0	2	2				

Table 2.2

**Air Resource Allocation Recommendations:**

See Table 2.3 for our specific recommendations on air resources by fire landscape.

- 11) **Air Attack:** Dedicated DNR Air Attack Aircraft should be available to all fire landscapes that are staffed by DNR fire control resources. Fire landscapes 3, 4, 8, and 15 should have more dedicated air attack aircraft than others based on size of the landscape and associated risk. A total of 17 such aircraft are recommended.
- 12) Aerial suppression resources should be utilized to supplement ground suppression resources for initial attack in the five highest risk landscapes (FL 4, 7, 9, 13 and 15), and for project fire support statewide.
- 13) **Air Tankers (SEAT):** The Suppression Working Group recommends utilizing exclusive use contracts for one SEAT for fire landscape 7 and two SEATS for fire landscape 4. This is the appropriate initial attack aerial resource with supporting facilities within each landscape.
- 14) **Helicopters:** In response to recommendations from the field during surveys, café experiences, and the *Final Report Air Operations Ad Hoc Team (2007)*, the Suppression Working Group recommends two type 3 helicopters for fire landscape 15 to be shared with fire landscape 13. Exclusive use contracts, CWN contracts or interagency agreements should be utilized to provide for these resources. It is recognized that fire landscape 9 should continue to have access to a type 3 helicopter which is currently in place with the USFS in that fire landscape.
- 15) **Heavy Air Tankers (CL215/415):** The Suppression Working Group recommends that the Division maintain access to either CL 215 or CL 415 resources from our Great Lakes Forest Fire Compact partners on an “as needed” basis for project fires. They should be ordered as a pair whenever the need arises.
- 16) **Heavy Air Tanker Base:** Establish a heavy air tanker base at Eau Claire to preposition two heavy air tankers when conditions warrant.

Recommended Suppression Air Resource Allocation Summary

Equipment Type	FL 4	FL 7	FL 9	FL 13	FL 15			
Air Attack	3	1	1	1	2			
Air Tanker (SEAT)	2	1						
Helicopter (T3)			1 USFS		2			
Equipment Type	FL 3	FL 5	FL6	FL 8	FL 11	FL 14	FL 16	
Air Attack	2	1	1	2	1	1	1	
Air Tanker (SEAT)								
Helicopter (T3)								

Table 2.3

**Cache Allocation Recommendations:**

- 17) Implement the current (2007) fire cache standards in regards to types of cache equipment, including hand tools, water supply and PPE if current Dispatch Group organization remains (maintain 9 Dispatch Group caches).
- 18) Maintain mobile fire caches in 14 of 16 fire landscapes plus maintain the LeMay Center cache. Fire landscape caches would require a total of 710 hand tools, 355 back cans, 14 water supply caches and 290 PPE caches (see Table 2.4 for details).

Recommended Cache Equipment Allocation Summary

Equipment Type	FL 4	FL 7	FL 9	FL 13	FL 15			
Hand Tools	120	30	30	30	120			
Backcans	60	15	15	15	60			
Water Supply	2	1	1	1	2			
PPE	40	20	20	20	40			
Equipment Type	FL 3	FL 5	FL6	FL 8	FL 11	FL 14	FL 16	
Hand Tools	120	20	20	120	20	20	20	
Backcans	60	10	10	60	10	10	10	
Water Supply	1	1	1	2	1	0	1	
PPE	40	10	10	40	10	10	10	
Equipment Type	FL 10	FL 12						
Hand Tools	20	20						
Backcans	10	10						
PPE	10	10						

Table 2.4

**Changes in Investment with More Resources (in priority order)**

- 1) Increase our fleet of type 8 engines from 47 to 51 at a total cost of \$141, 826. Amortized over 14 years for an annual program cost of \$10,130.
- 2) Increase air attack aircraft from 10 to 17. Total cost of \$44,800 annually.
- 3) Increase low ground units from 6 to 7 at a cost of \$212,425. Amortized over 20 years for an annual program cost of \$10,621.
- 4) Provide transports for the fleet of 7 low ground units, will need (2) type 4 engines and one trailer. Total cost of \$309,500. Amortized over 20 years for an annual program cost of \$15,475.
- 5) Establish a satellite heavy air tanker base at Eau Claire. Total cost of \$1500 annually.

- 6) Increase helicopter usage from 0 to 2 on a 21 day contract. Total estimated cost of \$170,000 annually.
- 7) Apply new cache standards to fourteen (14) fire landscapes as opposed to the present nine (9) Dispatch Groups. After re-distributing surplus items this would require the purchase of additional PPE, pumps and drip torches for a total increased cost of \$3,805. Amortized over 10 years for an annual program cost of \$381.

### **Changes in Investment with Fewer Resources (in priority order)**

- 1) Maintain three (3) mobile statewide fire caches to serve central, northwest and northeast Wisconsin. The cache contents would be 120 handtools, 60 backcans, 2 water handling pump kits and 40 PPE each. The LeMay cache would continue to be maintained as per 2007 cache standard. For a total cost savings of \$131,807. Amortized over 10 years for an annual program savings of \$13,181.
- 2) Maintain DNR air attack capability, but further reduce air suppression resources. Eliminate SEAT program altogether. Rely on Federal and GLFFC partners to provide air suppression support as needed for project fires. Cost savings \$200,000.
- 3) Reduce type 6 engines to the 2:1, 1:1 tractor/plow to type 6 engine ratio from 61 to 55. Type 6 engine cost \$ 58,800 x 6 engines. Savings of \$352,800. Amortized over 14 years for an annual program savings of \$25,200.
- 4) Reduce low ground units from 6 to 3. Reduce associated (2) type 4 engines and (3) trailers. Cost savings of \$986,975. Amortized over 20 years for an annual program savings of \$49,350. See table 2.5 for allocation locations by fire landscape.
- 5) Replace type 6 engines with type 8 engines at a cost savings of \$23,344 for each unit replaced. Full fleet replacement of 61 type 6 engines provides a cost savings of \$1,423,984. Amortized over 14 years for an annual program savings of \$101,700.
- 6) Reduce the current fleet of 79 tractor/plows to the formula recommended 73. With this mathematical formula method, fire landscapes 1, 2, 10, and 12 were collectively allocated 7 tractor/plows. These tractor/plows would be reallocated to fire landscapes 4, 7, 13 and 15. This reallocation was based on professional fire manager's judgment, still reducing the overall fleet of tractor/plows and associated type 4 engine and trailer (heavy unit) by 6. Heavy unit cost of \$317,675 x 6 results in a cost savings of \$1,906,050. Amortized over 20 years for an annual program savings of \$95,300. See table 2.5 for allocation locations by fire landscape.
- 7) With the reduction in heavy units in #6 follow the ratio recommendation of 2:1, 1:1 type 6 engine allocations with a reduction from 61 type 6 engines to 51. Cost savings of \$588,000. Amortized over 14 years for an annual program savings of \$42,000. See table 2.5 for allocation locations by fire landscape.



Reduction in Investment Ground Suppression Equipment Allocation Summary

Equipment Type	FL 4	FL 7	FL 9	FL 13	FL 15			
Tractor plow	18	8	7	3	13			
Type 6 Engine	9	4	4	3	7			
Type 4 Engine w/ trailer	18	8	7	3	13			
Equipment Type	FL 3	FL 5	FL6	FL 8	FL 11	FL 14	FL 16	
Tractor plow	4	1	2	11	3	1	2	
Type 6 Engine	4	1	2	11	3	1	2	
Low Ground Unit	1		1	1				
Type 4 Engine w/ trailer	5	1	3	12	3	1	2	

Table 2.5

**Objective 4:** Identify the types and availability of suppression resources from VFD's, partner agencies, organizations and contractors. Determine how these could be used to complement DNR resources or replace the need for DNR resources where such DNR resources are not available.

**Current Conditions:** The Wisconsin DNR partners with several groups and/or agencies in the suppression of forest fires throughout Wisconsin. These partners include Fire Departments, Federal and Tribal Agencies, Private Contractors, and Hand Crews.

**Components Considered:**

- Command and Control Fire Department Spreadsheet
- Fire Action Plans
- DNR Fire Staff Personal and Telephone Interviews
- Wisconsin Fire Department Survey (2009)
- Fire Department Advisory Council Café
- Interviews with Federal and Tribal Partners
- Surveys and Cafés

**Fire Departments:**

There are currently 858 recognized fire departments (both volunteer and full time) in Wisconsin. (see SWG Appendix 4.1) Each fire department provides wildland suppression services to a differing degree within the State. Some are solely responsible for wildland suppression in their respective jurisdictions; others work in partnership with DNR. Fire departments are relied upon to provide structural protection throughout the State, especially in the high fire hazard landscapes. However, fire department resources and response varies throughout the State.

The Suppression Work Group recognizes that allocation of fire department resources is beyond the control of the DNR, thus the following Table 4.0 and analysis is meant to provide insight on potential fire department wildland fire resource response capabilities as they currently exist. The analysis provides separation by fire landscape based on acres protected per fire department wildland suppression engine and landscape risk. A wildland suppression engine is defined as a 4x4 or 6x6 vehicle with a water tank and pump.

Fire Department Off-Road Wildland Fire Fighting Vehicles by Fire Landscape Acres

Fire Landscape	Acres	# FD's	# Brush Trucks	Ac/Brush Truck	# ATV's	# 6x6s	Other	# Brush Trucks and 6x6s Combined	Acres / engines combined (BTs+6x6s)	Fire Landscape Rank
1	2071530	150	152	13628	81	0	0	152	13628	15
5	467685	21	16	29230	0	4	0	20	23384	7
6	1614647	68	61	26470	21	3	12	64	25229	12
3	3750241	88	110	34093	33	3	14	113	33188	10
2	6294084	185	185	34022	91	0	0	185	34022	16
15	1301162	34	31	41973	9	5	1	36	36143	1
12	1006238	26	26	38701	12	0	0	26	38701	14
4	2789397	51	60	46490	21	5	9	65	42914	3
11	2741768	47	55	49850	32	1	1	56	48960	11
9	1496600	30	23	65070	9	6	4	29	51607	4
14	1011692	14	16	63231	10	3	0	19	53247	8
7	1035749	18	16	64734	5	1	1	17	60926	2
13	900896	13	13	69300	2	0	0	13	69300	5
16	811233	17	9	90137	7	0	0	9	90137	9
10	2099686	34	21	99985	18	0	0	21	99985	13
8	6497446	62	26	249902	12	3	4	29	224050	6
Average									59089	
Totals	35890054	858	820		363	34	46	854		

Table 4.0

\* "Other" refers to miscellaneous reported vehicles (ie: 4x4 with portable pump/handtools/foam; Argo; mini-pumpers)

**Fire Landscapes 1, 2, 10, and 12:** The gray shaded areas in Table 4.0 indicate the four lowest ranked fire landscapes. Fire Landscapes 1 and 2 are the two lowest ranked landscapes in the state, they are adjacent and are relatively large in combined acreage, and contain a large metropolitan component. Together the acres protected per wildland engine (4x4 brush truck or 6x6) are 24,824 which is a high ratio of protection when compared to the statewide average of 59,089 acres/wildland engine. Fire Landscape 12 is also considered low risk and is positioned between fire landscapes that are moderate risk. Here, the acres protected per wildland engine are 38,701. Fire Landscape 10 has a ratio of 1 wildland engine per 99,985 acres in comparison to the statewide average of 59,089 acres/wildland engine, however since this fire landscape is ranked 13<sup>th</sup>, it's risk is considered low given its heavy agricultural component and below average forest patch size which consists of mainly northern hardwoods. There is likely a higher risk along the southern edge of this landscape as it transitions to Fire Landscape 4.

**Recommendation #1:** Within Fire Landscapes 1, 2, 10, 12, local fire departments with appropriate wildland fire training should be able to routinely suppress wildland fires with only occasional/minimal DNR suppression resource assistance.

**Fire Landscapes 3, 5, 6, 11 and 14:** These five green shaded fire landscapes in Table 4.0 indicate moderate risk landscapes. They also indicate a fire department wildland engine per 23,384-53,247 acres which is at or below the statewide average of 59,089 acres/wildland engine. Approximately the southern half of Fire Landscape 14 and about the southern 1/3 of Fire Landscape 6 can be considered low to moderate risk based on significant composition of agriculture and urbanization. Here, local fire departments with appropriate wildland fire training should be able to routinely suppress wildland fires with only occasional/minimal DNR assistance. The balance of these two landscapes can be considered moderate to high risk given their transition toward high risk fire landscapes characteristics (FL's 7, 13, and 15). Here it will be important to have a strong DNR and fire department fire suppression partnership.

Fire Landscape 5 has a wildland engine to acres ratio of 1:23,384 which is well below the state average of 1:59,089, but this fire landscape has the potential for large tall grass marsh and peat fires. Here, DNR suppression resource assistance will likely be needed.

Fire Landscapes 3 and 11 have a fire department wildland engine to acres ratio of 1:23,384-53,247 acres. Steep forested terrain and the potential of large fires in tall grass fuels will limit fire department effectiveness and resources beyond initial attack in these two landscapes. Here it will be important to have a strong DNR and fire department fire suppression partnership.

**Fire Landscapes 8 and 16:** These two green shaded landscapes have fewer fire departments and wildland engine per acre than the previous described green shaded fire landscapes with a ratio of 1 wildland engine per 69,300-224,050 acres. This coupled with moderate risk and remoteness will limit fire department effectiveness and resources. For these reasons DNR suppression resources will be relied upon more heavily to provide initial attack response in comparison to previously discussed green shaded landscapes.

**Recommendation #2:** Within Fire Landscapes 3, 5, 6, 8, 11, 14, and 16, it is important to have a strong DNR and fire department partnership. Fire departments should be utilized to provide initial attack services in concert with DNR suppression resources.

**Fire Landscapes 4, 7, 9, 13 and 15:** These five orange shaded fire landscapes indicate the highest risk in terms of project wildfire history and potential. They have a ratio of 1 wildland engine per 36,143-60,926 acres which is at or below the statewide average of 1:59,089.

**Recommendation #3:** Within Fire Landscapes 4, 7, 9, 13 and 15, DNR must respond as initial attack and be supported by fire departments due to their high risk. Fire departments should provide an important role in both initial attack and in structural protection.

**Changes in Investment with Additional Resources (in priority order)**

None

**Changes in Investment with Fewer Resources (in priority order)**

None

**Hand Crews/Squads:**

For the purpose of this report, we will define “crews” in Wisconsin to be twenty persons in number including a crew boss and squad leaders. We will define “squads” to be a minimum of five persons including a squad leader.

The Suppression Work Group identified ten crews/squad entities in Wisconsin that are available to support fire suppression activities. (See SWG Appendix 4.2) One additional crew is in Duluth and while available, has never been utilized in Wisconsin. The crews/squads we researched are either state sponsored, tribal, academic, or private. They vary from five person high school squads without tools, to 20 person hand crews complete with tools, transportation, and personal protective equipment. A few have their own engines; some are available for prescribed burning and tornado cleanup. Others are trained to work as back up fire tower persons. All are available for fire suppression work, primarily mop-up.

In addition to the eleven crews/squads identified in or near this State, Wisconsin also has the opportunity to call on interagency crews through the Eastern Area Coordination Center. National Type 1 and Type 2 crews are available through this national mobilization system. Contract crews may also be available on a national basis or could be developed within state to meet our agency needs.

Limitations of hand crews/squads in Wisconsin:

- The crews/squads are scattered around the State in no particular organized fashion.
- Turnover with academic crews and even the personnel available for prison crews is a constant, requiring annual training to keep the crews up to standards.

- It is never a guarantee that a crew will be available when needed due to other obligations, transportation issues, whether or not academic crews are in session and organized.
- Hand crews/squads continue to be an integral part of Wisconsin’s fire suppression efforts, especially on project fires. While they are important, the Department can not guarantee their availability nor can we place them where needed most in the State.

**Recommendation #4:** The Suppression Working Group recommends that we continue to develop and foster relations with local hand-crews/squads and work with them where available. An active crew is an available crew. The more we can utilize these crews on prescribed fires, station stand-by assignments, and smaller fires, the more interest and experience they will have and the greater cooperation we will get.

**Recommendation #5:** Recognize the periodic need for, and develop procedures to utilize Great Lakes Forest Fire Compact crews, contract crews, and/or national hand crews on an as needed basis for project fire support or for extended mop-up situations.

Recommended Squad Allocation Summary

Resource Type	FL 4	FL 7	FL 9	FL 13	FL 15			
Squad(s)	8	4	4	4	8			
Resource Type	FL 3	FL 5	FL6	FL 8	FL 11	FL 14	FL 16	
Squad(s)	4	2	2	8	2	2	2	
Resource Type	FL10	FL12						
Squad(s)	2	2						

Table 4.1

**Changes in Investment with More Resources (in priority order)**

- 1) More training and recruitment should be made available to hand crews. Grant funding could be offered to help hand crews with training, equipment purchases, and transportation. Specific Department provided hands-on training could be provided on an annual basis to all hand-crews.
- 2) Develop procedures using the national interagency mobilization system already in place to use agency or contract crews in Wisconsin on an as needed basis for project fires or for use during extended mop-up situations.

**Changes in Investment with Fewer Resources (in priority order)**

- 1) Reduce or eliminate altogether the usage of hand crews. Rely on locally trained LTE’s or fire department firefighters to meet crew needs.

**Private/County Contractors:**

The Wisconsin DNR continues to look outside of the Department for specialized equipment for utilization on large or complex wildland fires. Historically we have contracted large dozers or

earth moving equipment to provide drivable breaks on project fires with either private contractor and/or with county owned resources. This is something our smaller tractor/plows have not been efficient at, especially in mature forests and slash.

Station personnel are supposed to update Fire Action Plans with private/county equipment availability and costs annually. While conducting this research it was evident that this has not always been updated adequately. In addition current Fire Response Areas have recorded this information inconsistently in their Fire Action Plans. Based on the research conducted, it appears that all Areas in the State have at least some type of access to a large compliment of non-DNR owned contracting equipment. (See SWG Appendix 4.3) This has been limited recently by new written agreements the State is requiring the contractors to sign. Some contractors have signed, but many have not.

Shortcomings of private/county contracted equipment:

- **Availability:** Private equipment may be at a job site a long distance from the fire or not available the day of the fire due to weekends, or other commitments.
- **Transportation:** Many private contractors don't have a truck and trailer to haul each piece of equipment. The transport may be many miles away from needed equipment.
- **Training:** Many of the contractors listed in the Fire Action Plans don't have any wildland fire training. The equipment must be paired with a trained operator or "boss" to function safely and effectively.
- **Lack of PPE and Communication:** Most private contractors don't have their own PPE for wildland use or a radio system to communicate with other fire line personnel.
- **Inspection:** There has been inadequate time on the day of the fire to inspect contracted equipment before it reaches the fire line. Damage claims can be made against the State without recourse due to inadequate inspections.

Based on research from Fire Action Plans and ground-truthing, there appears to be over 500 large dozers available to the Department throughout the State. Every area lists multiple pieces of large equipment available to them from County, Private, or DNR non-fire entities. However, this may be misleading and/or inaccurate as many of the contractors listed have not signed any agreements.

**Recommendation #5:** The Suppression Working Group recommends that each Fire Response Unit identify one or two primary contractors and work more closely with them, rather than identifying every contractor that has a piece of equipment. This will foster better relations with fewer entities allowing for enhanced training and communication opportunities, plus more accountability of equipment both with the contractor and in the Fire Action Plans.

Recommended Heavy Dozer Allocation Summary

Equipment Type	FL 4	FL 7	FL 9	FL 13	FL 15			
Heavy Dozer	5	3	2	2	4			
Equipment Type	FL 3	FL 5	FL6	FL 8	FL 11	FL 14	FL 16	
Heavy Dozer	0	1	0	4	0	1	0	

Table 4.2

**Changes in Investment with More Resources (in priority order)**

1. Provide fire landscapes 4, 7, 9, 13, and 15 with heavy dozers, including transport, during the fire season. See table 4.2 for allocation in those fire landscapes. This would increase the fleet from 1 heavy dozer to 16 at a cost of \$6,251,625. Amortized over 20 years for an annual program cost of \$312,581.
2. In fire landscapes not allocated heavy dozers, continue to work with private/county cooperators in providing this service.

**Changes in Investment with Fewer Resources (in priority order)**

1. Eliminate one heavy dozer at a cost savings of \$266,775. Amortized over 20 years for an annual program savings of \$13,400.

**Federal and Tribal Suppression Equipment:**

The State of Wisconsin partners with several Federal Agencies such as the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the U.S. Park Service. Other partners include Tribal entities such as the Menomonee and the Ho-Chunk Fire Suppression Crews. (See SWG Appendix 4.4 and 4.4a) Each agency has responsibility for their own suppression areas within the boundaries of the State, but has agreements to help each other when the need arises. The Command and Control Group will provide more information on the different types of agreements currently active in Wisconsin.

Most agencies listed above have a combination of type 6 and type 7 engines. The U.S. Forest Service has a majority of type 6 engines and less than a half dozen tractor plows to protect their interests on the National Forests.

The U.S. Fish and Wildlife Service has a variety of low ground equipment such as the Marsh Master, and Mat Tracks (see Figure 4.1 and 4.2) along with type 6 engines located primarily in Portage, Horicon, and Necedah.

Figure 4.1



Figure 4.2





Menomonee Tribal Enterprises has type 6 engines along with a type 4 engine pulling a tractor/plow.

The U.S. Park Service has a very small contingent of engines to protect their river corridors.

In addition, the Military has a variety of equipment, primarily located at Fort McCoy to protect their land interests.

While each entity has specialized forest fire suppression equipment scattered throughout the State each also has its limitations, primarily staffing and availability.

**Staffing:** Federal agencies often staff at different levels than does the Wisconsin DNR. Many of the Federal and Tribal fire staff is seasonal in nature, or are often deployed to national fire assignments, and not always available to us when needed.

**Equipment Availability:** Many of the Federal Agencies are also involved in prescribed burning. The U.S. Fish and Wildlife Service has been a very good partner for suppression purposes when they are available. The USFWS is involved in a great deal of prescribed burning, both in and out of State. This heavy involvement in prescribed fire has made it difficult to plan on their availability. The U.S. Forest Service has nationwide responsibility and is apt to be pulled out of State or moved around the State without advanced notice to DNR.

While the federal and tribal entities have specialized forest fire suppression equipment scattered throughout the State and have proven to be good partners, it is often difficult to rely on them due to decreased and seasonal staffing levels, other priorities such as prescribed burning during fire season, and the distinct possibility the equipment and personnel will be working out of State.

**Recommendation #6:** Continue to develop and foster working relationships with federal partners having suppression resources within Wisconsin. Look for opportunities to expand the availability of these resources to supplement our needs but do not include these resources as part of our initial attack allocation model.

**Changes in Investment with Additional Resources (in priority order)**

None

**Changes in Investment with Fewer Resources (in priority order)**

None

**Objective 5:** Explore and recommend use of new equipment technologies that could be incorporated over the next 10-15 years.

**Current Conditions:** The LeMay Forestry center staff are charged with researching new and innovative ideas in regards to our fire suppression equipment. This is done in collaboration with other states, recommendations from the field, and the Equipment and Safety Specialist Team.

**Components considered:**

- Research conducted by the Suppression Working Group was done by querying equipment used by other states and federal agencies with similar fuel types. See SWG Appendix 5.1 for more detail.
- Field surveys and café opportunities.

Various states and federal agencies use different types of large suppression equipment, however none of this equipment seems to offer significant innovation better than what we are currently using.

**Recommendations:**

- 1) A main focus of the LeMay Center should be to continue to investigate, conduct research, and develop new technologies and equipment.
- 2) The Suppression Work Group recommends that we research the idea of incorporating Argo Units and/or Polaris UTV type units into our suppression effort. We further recommend that rather than conventional ATV's, we should utilize 6 wheel + units that are more safe, stable and versatile than conventional ATVs currently used by the fire departments and other DNR staff. See SWG Appendix 5.2.

**Changes in Investment with Additional Resources (in priority order)**

1. Implement the use of Polaris Ranger 800 6x6 UTV's with a Le May Center manufactured skid unit for wildland fire applications. The associated cost for one UTV with skid unit and hose reel would be \$14,328.00. The associated cost for one UTV with skid unit less the hose reel would be \$13,844.00.

**Changes in Investment with Fewer Resources (in priority order)**

None

**Objective 6: Determine the costs of the various fire suppression resources (equipment, personnel, contractors, and partners).**

Current cost information, as well as projected costs, were included in the previous five objectives whenever applicable. Detailed cost information for Department equipment may be found in Appendix 1.1, 1.1a, 1.1b, 1.3, 1.4, and 1.5. A summary of replacement costs for suppression resources owned by DNR and rental costs for contracted equipment may be found in tables 6.0 and 6.1.

**Replacement Costs for Equipment Owned and Operated by the Division of Forestry**

Type of Resource	Quantity	Cost per Unit	Total Cost
Type 6/7 Engine	62	\$58,800	\$3, 645,600
Type 8 Engine	47	\$35,456.42	\$1,666,451.74
Type 4 Engine	85	\$144,700	\$12,299,500
Trailer	87	\$20,100	\$1,748,700
Tractor-Plow	81	\$152,875	\$12,382,875
Heavy Dozer	1	\$266,775	\$266,775
Low Ground Unit	6	\$212,425	\$1,274,550
Fire Cache (120 pers.)	5	\$19,866	\$99,300
Fire Cache (80 pers.)	4	\$13,244	\$52,976
Area PPE Cache	9	\$9,235	\$83,115
Area Pump Cache	9	\$6,160	\$55,440
LeMay Cache	1	\$29,132.78	\$29,132.78

Table 6.0

**Hourly/Rental Costs for Contracted Equipment Not Owned by the Division of Forestry**

Type of Resource	Quantity	Owned by	Cost
Aircraft -Single Engine Cessna 180 Series	10	DOA	\$156/hr. includes \$125 hourly rate plus \$30.92 per man hour for DNR pilot
Aircraft -Multi Engine	0	DOA	\$211/hr. includes \$180 hourly rate plus \$30.92 per man hour for DNR pilot
Air Tanker (Type 3) CL-215	0	MN DNR	\$6,098/day availability + \$3,501/hr flight time
Air Tanker (Type 3) CL-415	0	Ontario MNR	\$7,131/day availability + \$3,300/hr flight time + \$600/hr Bird Dog aircraft
Air Tanker (Type 4) - SEAT AT-802	3	Aerial Timber	\$1,803/day availability + \$848/hr flight time
Helicopter – Type 3	0	Various contractors	Rates are highly variable depending on contract type and duration. Daily availability can start around \$1,300/day and range upwards of \$2,400/day. Flight time can be \$800-1,000/hr.

Table 6.1

## **Appendixes:**

- 1) SWG Appendix 1.1 WDNR Fire Suppression Equipment Cost
- 2) SWG Appendix 1.1a Forestry Heavy Equipment Fund Review 10/20/08
- 3) SWG Appendix 1.1b Forestry Heavy Equipment Rotation Schedule and Costs to Achieve a 20 Year Rotation Age
- 4) SWG Appendix 1.2 2009 List of DNR Forest Fire Equipment
- 5) SWG Appendix 1.2a Southern map of 2009 statewide equipment location
- 6) SWG Appendix 1.2b Northwest map of 2009 statewide equipment location
- 7) SWG Appendix 1.2c Northeast map of 2009 statewide equipment location
- 8) SWG Appendix 1.3 Aircraft Status and Use
- 9) SWG Appendix 1.4 WDNR Fire Suppression Aircraft and Contract Aircraft Cost
- 10) SWG Appendix 1.5 Statewide Fire Cache Inventory, Replacement Cost, and Comparison
- 11) SWG Appendix 2.1 Extrapolated Statewide Fire Occurrence by Fire Landscape
- 12) SWG Appendix 2.2 Documented Fires Larger Than 100 Acres '75-'08
- 13) SWG Appendix 2.3 ICS-215 Equipment Allocation by Fire Landscape & Supporting data
- 14) SWG Appendix 4.1 Fire Department Wildland Fire Suppression Equipment Analysis by County and Fire Landscape
- 15) SWG Appendix 4.2 Handcrew Analysis
- 16) SWG Appendix 4.3 Private Equipment Analysis
- 17) SWG Appendix 4.4 Federal and Tribal Entities Fire Suppression Equipment Analysis
- 18) SWG Appendix 4.4a Federal and Tribal Entities Fire Suppression Equipment Map
- 19) SWG Appendix 5.1 Fire Suppression Equipment Beyond Our Borders
- 20) SWG Appendix 5.2 UTV Wildland Fire Applications Cost Estimate