
HB
469

HOUSE STATE AFFAIRS COMMITTEE

NEXT COMMITTEE: FINANCE

BILL: HB 469

CURRENT VERSION:

SCHEDULED: MARCH 25 1988

SPONSOR: KOPONEN

PHONE NO: 4992

CONTACT FILE: _____

BILL SUBJECT: GRANTING CERTAIN FIREFIGHTERS STATUS AS PEACE OFFICERS UNDER PERS

SPONSOR BACKUP: IN FOLDERS

AFFECTED AGENCIES:

DEPARTMENT	CONTACT/PHONE	COMMENT
ADMIN	PUSHPENDER/2200	NOTIFIED 2/24/88

FISCAL NOTES

AGENCY	REQUESTED	DATED	FY 88 AMT	FY 89 AMT
ADMIN	2/25/88 & 3/4/88	3/24/88	-0-	-0-
NATURAL RESOURCES		3/7/88	-0-	-0-

ACTION

DATE	COMMENT
3/11/88	TELECONFERENCE HEARING: HELD FOR FURTHER INFORMATION
3/25/88	CS PASSED FROM STATE AFFAIRS

Original sponsors: Koponen and Gruenberg

IN THE HOUSE BY THE STATE AFFAIRS COMMITTEE

CS FOR HOUSE BILL NO. 469 (State Affairs)

IN THE LEGISLATURE OF THE STATE OF ALASKA

FIFTEENTH LEGISLATURE - SECOND SESSION

A BILL

For an Act entitled: "An Act granting certain forestry or natural resource employees status as peace officers under the Public Employees' Retirement System; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. AS 39.35.680(28) is amended to read:

(28) "peace officer" or "fireman" means an employee occupying a position as a peace officer, chief of police, correctional officer, correctional superintendent, fireman, [OR] fire chief, or a state employee occupying a position as a forestry technician, natural resource manager in the division of forestry in the Department of Natural Resources, or forester;

* Sec. 2. An employee who was employed by the state as a forestry technician, natural resource manager in the division of forestry in the Department of Natural Resources, or forester before July 1, 1988, may convert the credited service for that position to credited service as a peace officer by claiming the service as peace officer service before the member is appointed to retirement and making retroactive contributions to the system. The indebtedness is equal to (1) the contributions to the system that the employee would have made if the service had counted as peace officer service, less (2) the contributions to the system that the employee actually made. Interest as prescribed by regulation accrues on this indebtedness beginning July 1, 1988. Any outstanding indebtedness that exists at the time a person is appointed to retirement will require an

Alaska State Legislature
House

Official Business

P.O. BOX V
State Capitol
Juneau, Alaska 99811

HOUSE STATE AFFAIRS COMMITTEE

HOUSE BILL 469

FILE CONTENTS

1. HB 469: AN ACT GRANTING CERTAIN FIREFIGHTERS STATUS AS PEACE OFFICERS UNDER THE PUBLIC EMPLOYEES' RETIREMENT SYSTEM; AND PROVIDING FOR AN EFFECTIVE DATE.

1A. COMMITTEE SUBSTITUTE FOR HOUSE BILL 469: WORK DRAFT

2. LETTER TO REPRESENTATIVE ULMER FROM COMMISSIONER ANDREWS: DATED MARCH 23, 1988

3. LETTER TO REPRESENTATIVE ULMER FROM COMMISSIONER ANDREWS: DATED MARCH 22, 1988

4. POSITION PAPER, DEPARTMENT OF ADMINISTRATION, DATED MARCH 24, 1988

5. POSITION DESCRIPTIONS: FOREST TECHNICIANS, FORESTER, AND NATURAL RESOURCE MANAGEMENT

6. PUBLIC OPINION: LETTERS, POM'S AND TESTIMONY

7. RESOLUTION OF ALASKA FIRE CHIEF'S ASSOCIATION AND ATTACHMENTS

FISCAL NOTE

A. DEPARTMENT OF ADMINISTRATION, DATED MARCH 24, 1988: -0-

STATE OF ALASKA

STEVE COWPER, GOVERNOR

2

DEPARTMENT OF ADMINISTRATION

P.O. BOX C
JUNEAU, ALASKA 99811-0200
PHONE: (907) 465-2200

OFFICE OF THE COMMISSIONER

March 23, 1988

Honorable Fran Ulmer
Chair, House State Affairs Committee
Alaska State Legislature
P. O. Box V
Juneau, AK 99811

Dear Representative Ulmer:

Re: Committee Substitute House Bill 469

In accordance with AS 24.08.036, I am providing the analysis below on Committee Substitute House Bill 469. The analysis includes the long-term and short-term impact to the State if the bill is adopted and the impact the bill will have on the actuarial soundness of the Public Employees' Retirement System (PERS) fund.

This bill would allow members who fight forest and grassland fires to participate in the the Public Employees' Retirement System (PERS) in the Peace Officers/Firefighters category. Currently, these members are participating in the PERS in the "All Other" category and are classified by State Personnel as Forestry Technicians, Natural Resource Managers, and Foresters.

There are approximately 200 PERS members in the three job classifications above. Fire fighting duties are assigned at the local level so not every one may be assigned duties in the field fighting fires. These positions are located throughout Alaska, high risk fire areas as well as low (or no) risk fire risk areas. The members may transfer to positions around Alaska. Under the current personnel system, the entire job classification(s) would have to be included in the Peace Officer/Firefighter category and not just those persons with fire fighting duties. Other than for a small core group, fire fighting duties are secondary and may or may not be assigned. For example, a Forestry Technician living in Glennallen may not be assigned to fighting forest fires during the months of May or June but because of a high number of fires and too few firefighters, may have fire fighting duty during July and August. The following year, this member may not be assigned to any fire calls.

It is estimated that this bill would increase the State's cost by 0.03%. This would result in an annual increase of $125.9 to the State. The $125.9 cost to the State is calculated as follows:

Increase in the contribution rate (0.03%) times the estimated FY 88 State payroll ($419,656,104):	$125.9

02-69LH

STATE OF ALASKA
1988 LEGISLATIVE SESSION

BILL VERSION : HB 469
PUBLISH DATE : 2-15-88

FISCAL NOTE

REQUEST:

Revision Date: _____
Title : An Act granting certain fire fighters status as Peace Officers under PERS.
Sponsor : Koponen and Gruenberg
Requestor : Koponen

Agency Affected : Natural Resources
BRU : Forest Management
Components : Forest Management

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	-0-	-0-	-0-	-0-	-0-	-0-
CAPITAL	-0-	-0-	-0-	-0-	-0-	-0-
REVENUE	-0-	-0-	-0-	-0-	-0-	-0-

FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-

POSITIONS:

FULL-TIME	-0-	-0-	-0-	-0-	-0-	-0-
PART-TIME	-0-	-0-	-0-	-0-	-0-	-0-
TEMPORARY	-0-	-0-	-0-	-0-	-0-	-0-

ANALYSIS : (Attach a separate page if necessary) There is no fiscal impact to the Department of Natural Resources; however, the Department of Administration may show fiscal impact.

Prepared by : George K. Hollett
Phone : 465-2491
Division : Forestry
Date : _____

Approved by Commissioner : Lenore Gorn
Date : 3/7/88
Agency : Natural Resources

Distribution (by preparer) :
- Legislative Finance
- Legislative Sponsor
- Requestor
- Office of Management and Budget
- Impacted Agency(ies)

(7)

HOUSE COMMITTEE REPORT

Date referred: 2/15/88 FURTHER REFERRALS: Finance

DATE: 3-25-88

The State Affairs Committee has considered HB 469

"An Act granting certain firefighters status as peace officers under the Public Employees' Retirement System; and providing for an effective date."

RECOMMENDS:

[X] replace with CS HB 469 (SA) [ ] the same title

[ ] attached amendment(s) [X] a new title

[ ] do pass

[ ] do not pass

[X] no recommendation

[ ] individual recommendations

[ ] additional referral to the _____ Committee

ADOPTS: [ ] _____ letter of intent

ATTACHES NEW FISCAL NOTE(s):

[ ] fiscal impact

[X] zero fiscal note

[X] zero with analysis

[ ] same as previous fiscal note published _____

[ ] same as previous zero fiscal note published _____

SIGNING DO PASS:

SIGNING OTHER RECOMMENDATIONS:

Chairman's signature

4

POSITION PAPER
Committee Substitute House Bill 469

This bill would allow members who fight forest and grassland fires to participate in the the Public Employees' Retirement System (PERS) in the Peace Officers/Firefighters category. Currently, these members are participating in the PERS in the "All Other" category. These members are classified by State Personnel as Forestry Technicians, Natural Resource Managers, and Foresters.

There are approximately 200 PERS members in the three job classifications above. Fire fighting duties are assigned at the local level so not every one may be assigned duties in the field fighting fires. These positions are located throughout Alaska, high risk fire areas as well as low (or no) risk fire risk areas. The members may transfer to positions around Alaska. Under the current personnel system, the entire job classification(s) would have to be included in the Peace Officer/Firefighter category and not just those persons with fire fighting duties. Other than for a small core group, fire fighting duties are secondary and may or may not be assigned. For example, a Forestry Technician living in Glennallen may not be assigned to fighting forest fires during the months of May or June but because of a high number of fires and too few firefighters, may have fire fighting duty during July and August. The following year, this member may not be assigned to any fire calls.

The Department is neutral on this bill.

Robert F. Stalnaker, Acting Director
Division of Retirement & Benefits

3/23/88
Date

Commissioner John M. Andrews
Department of Administration

3/24/88
Date

STATE OF ALASKA

STEVE COWPER, GOVERNOR

DEPARTMENT OF ADMINISTRATION

P.O. BOX C
JUNEAU, ALASKA 99811-0200
PHONE: (907) 465-2200

OFFICE OF THE COMMISSIONER

March 22, 1988

The Honorable Fran Ulmer
Chair, House State Affairs Committee
Alaska State Legislature
P.O. Box V
Juneau, Alaska 99811

Dear Representative Ulmer:

Re: Proposed Changes to House Bill 469

This is in response to the committee's request to the Division of Retirement and Benefits for additional information relative to the proposed changes to House Bill 469. The proposed amendment would allow "seasonal" Forestry Technicians, National Resource Managers, and Foresters to receive additional Peace Officers/Firefighters service credit in the Public Employees' Retirement System (PERS) for paid overtime hours. The Department of Natural Resources employs about 107 Forestry Technicians, 90 Natural Resource Managers, and 24 Foresters each season. The amendment would also affect about 400 seasonal employees of the Department of Fish and Game who are "grandfathered" in the Peace Officer/Firefighter retirement coverage.

Contrary to statements made to the committee by state employees favoring passage of the proposed amendment to HB 469, considering overtime for additional service credit would increase the cost of the bill. The overtime issue would increase the annual state cost by an additional $2,100.0 over that estimated for just including the "wildland" firefighter only under PERS Peace Officer/Firefighter coverage. This amendment alone would increase the State's PERS contribution rate by 0.12%. The Department of Natural Resources estimate that the hours of overtime range from 80 hours to 750 hours per year per seasonal employee with the average around 500 hours per year. We also estimate that the 400 Fish and Game seasonal Peace Officers work an average of 200 hours of overtime each season.

Pursuant to the request of the committee, I have enclosed copies of the class specifications for the Forestry Technicians, the Natural Resources Managers, and the Foresters. Also enclosed are copies of individual job descriptions representative of each job class. The individual job descriptions indicate that about 142 (64%) of the 221 employees working in the three listed classifications are actually involved in "fire suppression" from 20% to 40% of the time with an additional 20% to 30% in "presuppression" (maintaining equipment, etc.). The otner 30% to 40% of their duties include non-firefighting activities.

You had also expressed a concern about the potential for a "leap frogging" effect if this amendment was passed. The state hires many seasonal employees who are not covered as peace officers therefore not covered by this bill, but who would have a claim of being similarly situated regarding overtime. Many state agencies use a few seasonal workers at times during the year, but most of these seasonal employees work standard hours with little overtime. However, the departments of Fish and Game, Transportation (Marine Transportation), and Natural Resources have sizeable seasonal work forces working a substantial amount of overtime at some time during the year. About one third of the Marine Highway employees are seasonal and work substantial overtime hours during the summer months. The Department of Natural Resources employs an additional 100 seasonal workers who do not have to fight wildland fires. These employees also work considerable overtime during each season.

I feel that it is also important to note that under the PERS, we credit service on a day-to-day basis, not by the hour. A change of this type would require a major restructuring of crediting service under the PERS.

I hope that this information will be helpful to the committee. Please contact Robert F. Stalnaker, Acting Director, Division of Retirement and Benefits, at 465-4470 if there are any questions or if additional information is needed by the committee.

Sincerely,

John M. Andrews
Commissioner

JMA/DS/lc
Enclosures

STATE OF ALASKA
1988 LEGISLATIVE SESSION

Bill Version: CS HB 469
Publish Date: _____

A

FISCAL NOTE

REQUEST:

Revision Date: _____
Agency Affected: Department of Administration
Title: Granting certain firefighters peace officer status under Public Employees' Retirement System (PERS)
BRU: Retirement and Benefits
Components: Retirement and Benefits
Sponsor: Koponen
Requestor: _____

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES	0	0	0	0	0	0
TRAVEL	0	0	0	0	0	0
CONTRACTUAL	0	0	0	0	0	0
SUPPLIES	0	0	0	0	0	0
EQUIPMENT	0	0	0	0	0	0
LAND & STRUCTURES	0	0	0	0	0	0
GRANTS, CLAIMS	0	0	0	0	0	0
MISCELLANEOUS	0	0	0	0	0	0
TOTAL OPERATING	0	0	0	0	0	0
CAPITAL	0	0	0	0	0	0
REVENUE	0	0	0	0	0	0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0	0	0	0	0	0
FEDERAL FUNDS	0	0	0	0	0	0
OTHER	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0

POSITIONS:

FULL-TIME	0	0	0	0	0	0
PART-TIME	0	0	0	0	0	0
TEMPORARY	0	0	0	0	0	0

ANALYSIS: (Attach a separate page if necessary)

Prepared By: R.F. Stalnaker Robert F. Stalnaker, Acting Director
Phone: 465-4470
Division: Retirement and Benefits
Date: 3-9-88

Approved by Commissioner: John M. Andrews
Date: 3/24/88
Agency: Department of Administration

Distribution (by preparer):
- Legislative Finance
- Legislative Sponsor
- Requestor
- Office of Management and Budget
- Impacted Agency(ies)

Rev: 1/11/88

15/6D1/0309-02/1

STATE OF ALASKA

6605-07
6606-09
6607-11
6608-13
6609-14

FOREST TECHNICIANS I-V

Series Definition:

The Forest Technician series exists in order to assist the State forestry program in three general areas: to provide the base field data for professional foresters to appraise, research and plan for the conservation, protection, utilization, and development of the State's forestry resources; to implement recommendations and plans of foresters to conserve, protect, utilize and develop the forests; and to communicate to and assist the public with technical aspects of forestry management. Forest Technicians perform subprofessional and paraprofessional work in predefined and preestablished disciplines centered around field operations; where positions do not perform field work they are involved in supportive or administrative functions vital to the functioning of the field operations (such as, radio dispatching or map making).

Forest Technician I

Distinguishing Characteristics:

Forest Technician I is the trainee level class. Under immediate supervision, Forest Technicians I receive on the job training and classroom instruction in basic forestry field work routines, terminology, equipment and safety procedures. Training generally lasts one summer season (approximately five months); at the end of this period trainees are able to participate in a field crew performing routine tasks without specific instruction.

Examples of Duties:

In a learning context, under specific direction of a Forest Technician II or higher, participates in field crew work such as:

- Data collection
- Flagging
- Cruising
- Scaling
- Inventory
- Seasonal nursery work
- Planting, thinning, seed gathering
- Fire equipment usage in suppression of forest fires
- Learns safety procedures (forest and fire)
- Fire-fighting tactics
- Fire prevention and detection
- Evidence preservation

Attends basic forestry courses generally covering such subjects as:

- Aerial Photograph Interpretation
- Map Work
- Inventory
- Cruising
- Basic Fire Orientation
- Basic Fire Fighting
- Introduction to Fire Vehicles

Water and Pumps
Power Saws

Knowledges, Skills & Abilities:

Knowledge of: Basic arithmetic (+ - - x %); basic reading and writing (in order to maintain records).

Skill in: Operating a motor vehicle.

Ability to: Perform strenuous physical tasks (hiking, bending, carrying heavy loads); work cooperatively with others over extended periods of time; follow instructions; learn forestry field work routines; and respond effectively in emergency situations.

Minimum Qualifications:

Knowledges, skills and abilities as above.

Interest in and aptitude for forestry technician field work.

Possession of a valid Alaska Driver's License.

Forest Technician II

Distinguishing Characteristics:

Forest Technician II is the first working level class in this series. Under immediate supervision, positions perform the basic, core, routine field and office work in the Forest Technician series. Positions do not lead, direct or supervise others except to teach basic techniques to temporary crews hired to assist in the work at peak periods (such as Young Adult Conservation Corps groups or emergency firefighters). Positions typically work in field crews gathering data (measuring, counting, estimating, taking notes, identifying species, reading weather instruments, making maps, etc.) and in forest development (flagging, gathering seeds, planting, thinning, removing, felling, digging, slashing, operating water pumps, driving trucks, dispatching, etc.) Incumbents may be "red card qualified" to any level of fire boss depending upon personal fire experience; this in itself does not affect the classification of positions. Physical labor is incidental to carrying out the functions performed.

Examples of Duties:

Assists in data collection for timber sales as a field crew member, taking or recording information on wood type, tree size, distance from road, acreage, erosion, etc.

Flags and paints trees as specifically directed, to designate sale boundaries and roads.

Cruises trees by estimating gross volume of trees before cut.

Measures roads, culverts, trim, stump size, slash, etc. during and after timber sale removal by purchasers to assure compliance to

contract standards.

Scales timber by estimating gross volume of cut trees under immediate supervision of a higher level forest technician.

Inventories a specific plot by counting or recording tree and plant species.

Assists in nursery work at peak periods (spring and fall) by planting seeds, thinning trees, and packing for shipment.

Gathers cones and seeds; plants young trees in designated areas for reforestation; may teach YACC groups the techniques of tree planting.

Thins trees; removes diseased trees.

Makes general interpretation of aerial photographs for scale, distance, roads, distinctive timber types, muskeg; draws simple maps based on photographs; indexes photos.

Takes notes; records data in the field and recomputes in office; may assist in report writing as a training exercise.

Explains most elementary timber measurement techniques to private land owners.

Performs a routine check of fire equipment daily on assigned truck to assure working order.

Assists in fire suppression by operating small water pumps, felling trees, clearing areas, etc. and maintaining awareness of fires to predict directional changes, take safety precautions and communicate firefighting techniques and safety to emergency firefighters.

Relays information concerning fires detected to headquarters in absence of higher level technicians; may be located alone in a fire look out tower; dispatches information as directed concerning fire status and needs at the fire scene.

Participates as a crew member in prescribed burning, i.e. deliberately burning specified areas for ecological and/or major fire prevention benefits.

Protects areas after fires from damage to critical evidence which is used to establish cause of fires.

May do simple daily weather checks for computer input to interpret fire hazards.

Draws, or assists in drawing, basic fire maps showing roads, kinds of roads, accessibility, timber types, water sources, etc.

Assists in presenting fire prevention programs to schools or other agencies.

Issues burning permits.

Attends basic courses not taken at the trainee level.

Performs other related duties as assigned.

Knowledges, Skills & Abilities:

In addition to those at level I:

Knowledge of: Forestry and fire field work safety procedures; general forestry terminology; limited species identification; basic field work routines (such as: measuring, cruising, reading aerial photographs and maps, flagging, using a compass, operating fire fighting tools).

Minimum Qualifications:

One season of at least four months duration of forestry field work experience. Qualifying experience would include logging, forest fire suppression, timber sale layout, or related.

Substitution: Education at an accredited college or university in forestry; or fire science or fire management oriented toward forest or grassland fires may be substituted for the required experience on the following basis: field or lab oriented courses - one semester hour = one month.

Possession of a valid Alaska Driver's License.

Forest Technician III

Distinguishing Characteristics:

Forest Technician III is the full working level class in this series where incumbents make first level, elementary decisions and limited interpretations of plans and results. Positions are expected to understand the basics and purposes of forestry field operations, yet not required to make decisions regarding complex, difficult or unusual situations. For example, the Forest Technician III is able to pinpoint a location on an aerial photograph and guide him/herself to that spot when distinctive geographic features exist; the Forest Technician III would not be expected to locate his/her position in a flat, uniform forest as would the Forest Technician IV. This class receives general supervision, though at times positions may be placed in the field with no supervision immediately available. Positions have responsibility for the smallest technical projects and may lead crews of one to four lower level technicians while participating in the work of the crew.

Examples of Duties:

Leads a small crew in data collection for timber sales.

Leads a small crew in flagging trees, determining specific routes to take within established boundaries.

Cruises trees by estimating net volume of trees before cut (i.e. gross volume - defects = net).

Leads a small crew in measuring and checking timber sale removal by private companies for contract compliance.

Scales timber by estimating net volume of cut trees; may be a "certified scaler".

Leads a small crew in inventory of timber plots; identifies plots to be inventoried from aerial photographs or maps.

Leads crew in planting trees; determines number and location of trees to be planted within a given area; directs a large YACC crew in tree planting.

Leads crew in thinning trees; identifies diseased trees to be eradicated.

Interprets aerial photographs in order to identify his/her position in the field where distinguishing geographical features exist; draws basic maps.

Writes short reports (1-4 pages) on small crew projects summarizing purposes, data collected and conclusions, with charts attached.

Explains basic forest technician procedures to private land owners (such as elementary aerial photograph interpretation) to assist them with their own timber sales.

Has responsibility for a small firefighting crew and emergency firefighters; directs strategies for small fire suppression.

Relays information concerning fires detected to headquarters, requiring interpreting and reporting of accurate information; dispatches information concerning fire status and needs as directed by the fire boss.

Leads crew in burning specific areas as directed, assuring that necessary precautions are taken so fires will not burn out of control.

Draws basic fire maps.

Leads lower level technicians in presenting fire prevention programs to schools and agencies.

Inventories equipment of assigned truck after fires.

Performs other related duties as assigned.

Knowledges, Skills and Abilities:

In addition to those at the lower levels:

Knowledge of: Techniques of forestry field work; general firefighting strategies; elementary forestry ecology, protection, timber sales, mapping, and timber growth.

Skill in: Operating forestry and firefighting tools; writing reports.

Ability to: Work independently; lead others; make decisions, particularly in emergency situations; interpret general directions and data.

Minimum Qualifications:

Eighteen months of forest technician field experience including one year equivalent in kind and level to Forest Technician II. Experience must have included forest fire prevention or suppression AND technical aspects of forest management (e.g. timber sales, reforestation, inventory).

Substitution: Education at an accredited college or university in forestry; or fire science or fire management oriented toward forest or grassland fires may be substituted for the required experience on the following basis: field or laboratory oriented courses - one semester hour = one month (to maximum of six months); other or additional courses - one semester hour = two months to a maximum of twelve months.

Possession of a valid Alaska Driver's License.

Forest Technician IV

Distinguishing Characteristics:

Forest Technician IV functions as the independent working level in the series; this class frequently has lead responsibility over lower level technicians or over several crews which are each directed by a Forest Technician III. This level generally performs the highest level technical field work where the positions are not technical specialists as found at level V. Positions allocated to this class spend the majority of their time directing, assisting and checking the work of lower level technicians; solving the most difficult problems; consolidating information and writing reports; or doing similar administrative functions rather than actually participating in the basic field and office work as do the lower levels. Forest Technicians IV are frequently assigned general projects by professional foresters and are expected to complete them independently without other supervision.

Examples of Duties:

May direct several crews in data collection for timber sales; makes rough estimates from data collected for appraisals (such as: value of wood, kind and number of roads and bridges needed, distances to main roads); prepares routine timber sale contracts.

Leads several crews in sale layout, indicating general limits and routes for the crews to work with; implements more complex road and bridge designs; issues permits to homeowners requesting timber for private use.

May cruise more difficult timber; may be a "certified scaler."

Directs inventory work by ensuring crews have adequate equipment, identifying plots from maps, determining number of samples to take based on the uniformity of the timber stand, identifying unusual plant and tree species.

May be a full time nursery worker with responsibility for complete care of plants, taking foliage analyses to adjust soil, climate and water and identifying diseases and insects.

Distinguishes genetically superior trees from which to gather cones and seeds; recommends specific areas be surveyed for possible reforestation.

Determines percentage of trees to thin in given areas.

Makes difficult and complete interpretations of aerial photos (for specific timber types, road grades, etc.); identifies specific locations where non-distinguishing factors exist.

Consolidates small project reports into one area report.

Explains timber sale layout procedures to private land owners (such as: how to build roads and bridges, cruise and scale, write sale contracts, layout sales with least environmental damage).

May be a "small fire boss"; directs strategy tactics of small crews.

May direct lower level technicians to dispatch requests for assistance with fighting fires.

May provide ground supervision of prescribed burning programs.

Gathers evidence, takes pictures, maintains security, traces fire damage from source, notes wind direction, etc.. and draws general conclusions concerning fire causes; trains lower levels on techniques of evidence preservation.

Directs lower level technicians in map preparation; resolves more complex problems.

Determines prevention program content according to school age level; directs lower levels on how to present programs and what information to include.

Responsible for burning permit program, educating users on fire prevention and control; gathers evidence and takes to court those who have caused fire outbreaks; issues citations.

Inventories area fire equipment after fires; responsible for yearly area inventory.

Identifies individuals needing training in specific subjects; assures implementation and follows through on training programs.

Performs other related duties as assigned.

Knowledges, Skills & Abilities:

In addition to those at the lower levels:

Knowledge of: Basic principles of forestry ecology, inventory, development, timber sale administration, logging, fire prevention and suppression.

Minimum Qualifications:

Two and a half years of forest technician field experience including one year equivalent in kind and level to Forest Technician III.

Substitution: Education at an accredited college or university in forestry; or fire science or fire management oriented toward forest or grassland fires may be substituted for the required experience on the following basis: field or laboratory oriented courses - one semester hour = one month (to maximum of six months); other or additional courses, lower division - one semester hour = two months to a maximum of 18 months; other or additional courses, upper division - one semester hour = two months to a maximum of six months.

Possession of a valid Alaska Driver's License.

Forest Technician V

Distinguishing Characteristics:

Forest Technician V functions as a technical specialist class. Positions allocated to this level are unique and are the most knowledgeable persons regarding one or more technical program or specialty areas (such as: scaling, aerial photograph interpretation, bridge construction, or district/statewide training programs.) Although positions may function as either staff specialists or leaders of a large group of lower level technicians, all have responsibility for setting standards, defining work content and procedures, taking work samples and reviewing for quality, and identifying needs in administering one or more programs. These positions are not working field positions; they are distinguished from professional foresters by the fact that they work within predefined, preestablished disciplines and do not plan, manage, develop or research forests on a wide range scale. Forest Technicians V have district wide responsibility in one or more functions and may have statewide responsibility.

Examples of Duties:

Makes cost estimates from collected data for appraisals; prepares routine, timber sale contracts.

Defines and interprets the most complex bridge designs for sale layouts.

Determines priority areas to cruise.

May be an expert scaler, performing "quality control" checks on a district or statewide basis, setting standards for and teaching courses in scaling.

Determines priority areas, in conjunction with the area forester, to inventory for sale, reforestation or timber stand improvement.

May be an aerial photograph expert, solving the most difficult problems of interpretation.

Explains timber sale layout procedures to private land owners (such as: how to build roads and bridges, cruise and scale, write contracts, layout sales with least environmental damage).

Develops course content and standards for courses not "canned"; teaches or trains others to teach courses; identifies general training needs on a district or statewide basis.

Develops prevention program content; procures films; outlines presentations geared to different age levels.

Direct lower levels in creating fire maps, explaining procedures, assuring relevant information is included (timber types, natural fire breaks, equipment location, grades, length of time to reach a fire outbreak from specific locations, etc.)

Responsible for district wide inventory after fires; maintains property control numbers, determines supply needs.

May specialize in forest fire investigation handling more complex situations (unless arson is involved, in which case an outside specialist would be called in). May develop and teach courses on investigation.

Performs other related duties as assigned.

Knowledges, Skills & Abilities:

Same as those required at level IV.

Minimum Qualifications:

Three and one half years of forest technician field experience including one year equivalent in kind and level to Forest Technician IV.

Substitution: Education at an accredited college or university in forestry; or fire science or fire management oriented toward forest or grassland fires may be substituted for the required experience on the following basis: field or laboratory oriented courses - one semester hour = one month to a maximum of six months; other or additional courses, lower division - one semester hour = two months to a maximum of 18 months; other or additional courses, upper division - one semester hour = two months to a maximum of 18 months.

Possession of a valid Alaska Driver's License.

Orig: 05/01/77
Rev: 10/16/78 Series revised

STATE OF ALASKA

Class Specification

FORESTER I 6621-14

Definition:

Under immediate supervision, assists senior Foresters and learns procedures involved in a variety of forest management programs.

Distinguishing Characteristics:

This is the trainee level of the Forestry class series. Assignments are of limited scope, and often comprise segments of larger projects which are the responsibility of a senior level Forester. Assignments are usually routine, and do not require independent judgment and decisions since instructions are specific and geared toward familiarization with operating programs. Positions allocated to this class may be rotated among operating district sections, headquarters, and office and field assignments for training purposes.

Examples of Duties:

Makes stereoscopic interpretation of ground cover using aerial photographs and the application of photo interpretation techniques.

Assists in planning and determines forest inventory as to species, size and volume, age, percent of stocking, growth rate and quality.

Applies field data toward the preparation of statistical charts compiled for ground surveys.

Maps forest types using drafting equipment, aerial photographs and projectors.

Participates in field surveys for establishment of timber tracts, park areas, and other land classification.

Locates field plots on aerial photographs and determines azimuth, scale and distances to locations.

Keeps maps and photo indices up to date; assists in fire prevention and fire fighting activities; keeps records and prepares reports.

Participates in and may supervise small fire fighting, tree planting and other work crews.

May inspect logging and earthwork projects for compliance with regulations and sound resource management principles.

Performs other related work as required.

Knowledges, Skills and Abilities:

Knowledge of: the principles and practices of forestry, to include forest inventory procedures and classifications; plant nutrition, forest reproduction and growth cycles; logging methods consistent with sustained yield and conservation of ecological balance; fire prevention and control; surveying techniques.

Ability to: learn specific forest management practices, to include inventory, appropriate land use factors, and protection; take part in and learn specific procedures of surveying and mapping; participate in and contribute to timber cruise and land evaluation and classification programs; record and transcribe field notes accurately; work cooperatively with others; perform arduous physical tasks under difficult field conditions.

Minimum Qualifications:

Graduation from an accredited college or university with a Bachelor's degree in forestry.

Substitution: Completion of six semester hours of forestry courses in an accredited college or university.

AND

A. One year of experience equivalent in kind and level to Forest Technician IV

OR

B. Three years of experience equivalent in kind and level to Forestry Technician III.

Orig: 4/70
Rev: 7/01/76
Rev: 10/16/78 M.Q.'s

STATE OF ALASKA

Class Specification

FORESTER II 6622-16

Definition:

Under general supervision, performs a variety of journey level forest management projects, and participates with superiors in the accomplishment of major programs.

Distinguishing Characteristics:

This is the full professional level in the Forester series. Positions allocated to this class may be distinguished by independence of action. Supervision is not usually received while work is in process, although assignments are usually reviewed upon completion.

Examples of Duties:

Serves on the headquarters forest protecting staff, helps prepare statewide fire control plan; monitors cooperative agreements with other governmental agencies to assure cost effectiveness.

Identifies forest types by tree species, size and stand density, and locates boundries of a give forest inventory area.

Participates in timber sale planning and prepares timber appraisals and contract proposals; prepares sale prospectus, advertisments and final contracts.

Participates in land evaluation and access road planning; may supervise field survey parties.

Locates personnel and equipment, arranges transportation, and assigns crews to specific work areas.

Assists in preparing basic training programs and trains new employees in the interpretation of aerial photographs, fire suppression and timber cruising.

Checks aerial photographs to see that correct delineation of forest types has been made by subordinates.

Supervises fire control efforts cooperative forest management projects and timber sale field work at subdistrict level. Distributes and disseminates information to the public and industry regarding fire prevention programs, timber resources and forestry assistance available to private landowners and industry.

Distributes and disseminates information to the public and industry regarding fire prevention programs, timber resources and forestry assistance available to private landowners and industry.

Prepares reports and maintains records.

Performs other related duties as required.

Knowledges, Skills and Abilities:

Knowledge of: Principles and practices of forestry, to include forest inventory procedures and techniques, fire prevention and suppression, surveying, timber and land use appraisal and management planning, silviculture, logging practices and reforestation practices and land classification procedures; interagency forest management responsibilities; effective public relations practices.

Ability to: Independently perform forest management projects, to include field surveys, consultation with staff and other operating and administrative agencies, consolidation of information and use of sound judgment in preparation of complete and factual reports in consideration of available alternatives; prepare complete contract documents; lead and supervise the work of technicians; establish and maintain effective working relationships with others; perform arduous physical tasks under difficult field conditions.

Minimum Qualifications:

Graduation from an accredited college or university with a Bachelor's degree in forestry

AND

One year of experience as a professional forester or equivalent in kind and level to Forest Technician V.

Substitution: Graduate study from an accredited college or university may be substituted for the required experience on a year-for-year basis.

Additional experience as a forester or forest technician may substitute for the required undergraduate education on a year-for-year basis.

Orig: 5/70
Rev: 10/01/74
Rev: 2/16/76
Rev: 7/01/76
Rev: 10/16/78 M.Q.'s

STATE OF ALASKA

Class Specification

NATURAL RESOURCE MANAGEMENT SERIES

Natural Resource Technician I	6650 - 10
Natural Resource Technician II	6651 - 12
Natural Resource Officer I	6652 - 14
Natural Resource Officer II	6653 - 16
Natural Resource Manager I	6654 - 18
Natural Resource Manager II	6655 - 20
Natural Resource Manager III	6656 - 22
Natural Resource Manager IV	6657 - 23

Series Definition:

The Natural Resource Management series covers a variety of functions involved in managing land, water, minerals, timber, oil, gas, agriculture, parks, historical sites, and related surface and subsurface resources of the State. The management of each type of resource typically requires specialized knowledge peculiar to that resource. However, all positions in this series, in addition to sharing a common mission, are characterized by similar processes such as ascertaining the legal status of the resource; evaluating issues critical to the short-term and long-term management of the resource; identifying and resolving potential conflicts in status of resources; and administering specific transactions and use. Generally, positions in this series perform public information; adjudication (issuing permits, contracts, leases, etc.); research and planning; field work (primarily to collect or verify information); title administration; and conveyance functions. Positions share similar references, procedures, and methods in doing their work. Such common references include title reports, maps, status plats, statutes, regulations, planning and classification reports, historical records. In addition, many of the "subject areas" overlap with others to a great extent. Therefore, familiarity with other areas is important. For example, a position primarily issuing water permits may be asked to also issue land use permits. A position primarily focusing on public information may often need to answer questions about land use, firewood permitting, or the geology of the local area. A broad perspective is particularly needed at the higher class levels.

Positions excluded from the professional (Natural Resource Officer) series are those which primarily perform technical investigations that require application of a specific scientific background such as hydrology, geology or forestry; positions which primarily perform additional and specialized field services such as park/visitor protection or fire control; or positions in other specific disciplines covered by other job series. However, positions which are primarily involved in administrative or management functions relative to forest or park resources are included in this series, at the Natural Resource Manager levels.

There are three different kinds of job classes in the Natural Resource Manager Series: Natural Resource Technicians (I & II), Natural Resource Officers (I & II), and Natural Resource Managers (I, II, III & IV). They are differentiated based on the nature and level of work performed. Typically Natural Resource Technicians assist higher levels with routine documents processing, public information, field work in state parks, etc. They receive close supervision and are required to explain and understand the basics of resource management in particular subject areas. They

do not make decisions that may be controversial, or ones that are particularly complex. Neither do they administer programs or supervise other technicians or higher levels. They may have some supervisory responsibility for clerks. Nat Resource Officers do the independent and professional work of the series, exceeding the technical level assignments because they are expected to process difficult/complex transactions; be familiar with and draw on all regulations, policies, etc. pertinent to their area of expertise (e.g. lands, water, title, minerals); organize projects; independently investigate permit or other violations; etc.

Natural Resource Managers have, understandably, management responsibility. They may be responsible for managing park districts; land, water, or minerals planning and adjudication; or forestry programs. The primary focus of their jobs is on effective administration. They draw on their own experience and the expertise of subordinates to make decisions, yet are expected primarily to be effective managers.

Minimum Qualifications

For purposes of these minimum qualifications, Natural Resource Management is defined as the management of the land, water, mineral, timber, oil, gas, agricultural, park, historical site and related surface and subsurface resources of the state. Experience and/or education in natural resource management would mean involvement in the above resources exclusively. Those with experience or education in managing these resources may specialize in different management functions (for example planning, regulation, research and appraisal). All of this experience is applicable to the natural resource management definition.

Original: 9/24/82 (incorporates Land Management Technician I; Land Management Officer I-V; Deputy Director, NR; Park Technician I-II; Park Ranger III; Park Planner I-IV; Forester III-IV; State Recorder; Chief, Park Maintenance and Operations.)

Natural Resource Technician I 6650 - 10
Natural Resource Technician II 6651 - 12

Natural Resource Technician I is the first entry level into the Natural Resource Manager Series. It is a training level class. Incumbents learn to perform one or more technical functions of resource management. They learn to issue simple permits for a variety of uses, work at a public information counter, record property transactions, assist in patrolling a park area, etc. After a successful completion of the training period (normally six months) incumbents are promoted to Natural Resource Technician II. (Note: positions are covered by "flexible-staffing agreements.")

Natural Resource Technician II do routine technical work in any one or more of the following specific areas. Work is technical in the sense that assignments require reference to, and comprehension of, subject matter guidelines (i.e. beyond clerical work). Tasks at this level are summarized below in order to give a general idea of the work assigned at this level. Note that although many of these duties are characteristic of the Technician II level, they are also frequently performed by higher level Natural Resource Officers, in conjunction with other responsibilities. Also, positions at the Natural Resource Officer I or higher level who specialize in one area quite often do additional technician level tasks in other areas.

Examples of Duties:

PUBLIC INFORMATION tasks at this level include responding to verbal and written requests from the public for assistance; participating in public meetings or hearings to collect information on a particular resource issue, to speak on a topic of concern, or to assist in resolving an issue; preparing materials for exhibit; explaining historical features to a park visitor; assisting the public with complex permit applications. Substantive knowledge and research of the subject area(s) are critical.

TITLE SEARCH involves such duties as comparing case files against previous plats; abstracting land title status information; determining easements, rights-of-way, encumbrances, etc. that a parcel of land may be subject to; identifying and correcting erroneous information; and determining that the State has sufficient title before a particular action is taken. At this level, only simple title searching would be conducted, and conflicts would be resolved by the supervisor.

ADJUDICATION at the technician level involves preparing simple permits (i.e. a routine transaction for private use with only one party requesting an action) for land use, water use and mineral rights. Adjudicators review applications for proper signatures, data, etc. and then research the request by referencing maps and aerial photos to identify the location of the requested use; read legal descriptions, title reports, classification reports, etc; do field work if necessary;, identify sources of conflict with other resource users; prepare permits for approval of the technician's supervisor or identify conflicts that need resolution by the supervisor.

PARK MANAGEMENT activities that a technician would assist with, in addition to general public information, include general park maintenance; patrolling park areas to enforce park regulations; administering

first aid; identifying and warning visitors of park hazards; participating in search and rescue; assisting park managers with explaining park programs to other agencies; doing research for park programs, talks, informational brochures, etc.

Minimum Qualifications:

Natural Resource Technician I:

One year of:

a) college
b) clerical experience at the level of Clerk Typist III, Recording Clerk I or Documents Processing Clerk II
c) experience as a Drafting Tech I
d) field experience in a scientific subject area
e) any combination of the above

Natural Resource Technician II:

Six months of experience as:

a) a Natural Resource Technician I with the State of Alaska or the equivalent elsewhere
b) a College Intern in a natural resource management field (975 hours)

- or -

One year of experience:

a) equivalent in kind and level to Recording Clerk III or Documents Processing Clerk III where the work involved land transactions
b) in real estate work above the clerical level
c) equivalent in kind and level to Forest Technician II or III
d) equivalent in kind and level to Drafting Technician I where the work was primarily in lands (maps, surveys, plats, etc.)

- or -

Twelve semester or eighteen quarter hours of college coursework in natural resource management subjects.

Natural Resource Officer I 6652 - 14
Natural Resource Officer II 6653 - 16

Natural Resource Officer I is the first level of the professional Natural Resource Manager series. Generally, positions at this level either participate in complex projects (such as research projects, planning projects, and administrative projects [e.g. writing policy and procedure manuals]). Or they may be asked, for example, to complete small planning projects that would become a part of a land use plan. Positions may also be working leaders over technicians who are doing routine title/adjudications/public information work. Characteristically, positions either participate in completing major, professional projects, are responsible for small ones, or do complex or difficult adjudication or title work. This is the first level where general administrative tasks are assigned. For example, positions frequently assist in budgeting, planning, supervising and other personnel work. They frequently train lower level staff, evaluate program objectives, implement management plans, etc.

Examples are:

TITLE SEARCH duties would involve determining when title is inadequate or can be contested/opposed.

ADJUDICATION at this level typically involves processing complex permits and case files as well as preparing notices and decisions, sales, best interest findings, legal descriptions, etc. When the Natural Resource Officer encounters problems, he/she would make some preliminary attempts to resolve them, and if unsuccessful would forward them to his/her supervisor with a recommended solution. Natural Resource Officers I do not usually sign off permits, or make final decisions. They do work which may cause potential difficulties, requires special research, independent judgment, etc.

Natural Resource Officer II is the full professional level class in the areas of resource planning, adjudicating resource use, abstracting title and professional research related to the management of natural resources. While positions normally do not have substantial supervisory responsibilities, they do participate in the overall administration of programs by assisting with program planning and implementation, writing policies and procedures and recommending changes in policy and program operations as requested. Positions may in some cases be working leaders over technician work, or may occasionally supervise a few nonpermanent or permanent assistants. The primary focus of their jobs, however, is on accomplishing the professional assignments critical to carrying out these programs.

Examples are:

ADJUDICATION at the Natural Resource Officer II level usually involves processing difficult case files which involve several party interest or controversy; holding conferences to understand/resolve conflicts; identifying nonstandard solutions to problems; doing extensive research to understand problems; testifying in court cases; responding to appeals of permit decisions made at lower levels; being a team leader in field work investigations; etc.

PLANNING AND CLASSIFICATION involves such activities as researching land status; writing reports on resource issues; evaluating proposals for the use of resources to recommend policy alternatives; developing regional plans; soliciting public input; and providing planning assistance to local governments and other state agencies.

Minimum Qualifications:

Natural Resource Officer I:

One year of experience equivalent in kind and level to Natural Resource Technician II or Forest Technician IV.

- or -

A bachelor's degree.

Note: Specialized "registers" are being developed at this level (and will be continued at the NRO II and NR Manager levels). Preference will be given to those who have experience in any of the specific disciplines described in the Natural Resource Management series, specifically, those with one year minimum experience or 16 semester hours (24 quarter hours) college coursework in the subject matter needed as described in the above definition. To get on one or more of these special lists, the applicant needs to complete the natural resources supplemental application form.

Natural Resource Officer II:

One year of:

a) experience equivalent in kind and level to Natural Resource Officer I, Forester I, Park Ranger I, Geologist I, Hydrologist I, Agronomist I, Historian I, Archaelogist I, or other professional natural resources work at the NRO I level
b) experience as a Graduate Intern in a natural resource management field (1950 hours)
c) graduate study in natural resource management, law, public administration, or business administration. (One year of graduate study = 24 semester hours or 36 quarter hours of graduate level coursework.)
d) any combination of the above.

Natural Resource Manager I	6654 - 18
Natural Resource Manager II	6655 - 20
Natural Resource Manager III	6656 - 22
Natural Resource Manager IV	6657 - 23

Natural Resource Manager I is the first level at which significant administrative responsibility is assigned and where it is the major job duty. The following tasks are typical: supervising other professional, technical and/or clerical employees; managing one or more major projects (as defined in the department's operating budget); managing a work unit; developing a budget and controlling/accounting for expenditures; monitoring and accounting for personnel accomplishments/time restraints within the project responsibility; writing program guidelines; preparing monthly reports on project(s) status; developing contracts for additional services. Positions at this level have a clearly defined programmatic responsibility. This includes developing guidelines for work products, advising the supervisor on the effectiveness of guidelines (e.g. regulations, legislation) and recommending improvements that might be made. They evaluate management concerns and options that are complex due to multiple effect and interaction of laws, public and private interests, or potential for conflict or loss. Positions at this level do the work that is referred (by lower levels) to those technically knowledgeable about the particular field, such as analyzing and drafting regulations, developing program plans, providing information to other state agencies and coordinating projects with them, representing the division at public hearings involving resource management policy or regulations, developing and recommending policies and procedures to carry out certain resource management functions, advising the division director of areas within his/her expertise, etc.

Natural Resource Manager II, in addition to performing those duties characteristic of Natural Resource Manager I, has stronger supervisory responsibilities. All positions are supervisory with authority for appointing, promoting, transferring, suspending, discharging and adjudicating the grievances of subordinates. Typically, the II level supervises a staff or unit (including other professionals) with responsibility for significant, statewide resource management functions; or in a decentralized organization supervises several units through subordinate supervisors. Positions at this level have responsibility for managing at least one, often more than one, major project (specifically budgeted). Thus they are distinguished from the I level by greater programmatic and management responsibility, wider effect and interest.

Natural Resource Manager III are full section chiefs (sections are designated by the Commissioner). "Sections" are titled as such when responsibility for one or more major resources is involved and the section has responsibility for policy formulation and has line authority for implementation. Responsibilities include policy development for managing the particular resource, program administration (personnel and budget), representing the department's activities in the particular area of resource management, advising the Commissioner on policy alternatives, etc. Positions at this level are fully supervisory with authority for appointing, promoting, transferring, suspending, discharging, and adjudicating the grievances of subordinates.

Natural Resource Manager IV serves as the deputy director of one of the divisions in the Department of Natural Resources. Deputy Directors are classified in this series only when they have resource management responsibilities, and therefore must supervise lower level Natural Resource Managers. The deputy director exercises full line authority over all or the majority of division functions unless

the division is organized in such a way as to require two deputies, each responsible for administering one half of the division. Positions assist the director in formulating and administering divisional policies, procedures and programs, coordinating and prioritizing the work of subordinate staff, and leading special projects and studies; representing the director and/or division in contacts with other agencies; are authorized to act in behalf of the director, assisting and acting for the director in administering the division, including such functions as budget, personnel, supply, legislation and information services; and advising the director of administrative or operational problems in the division. This is a supervisory class with substantial responsibility for the exercise of independent judgment in appointing, promoting, transferring, suspending, discharging, and adjudicating the grievances of subordinate personnel.

Minimum Qualifications:

Natural Resource Manager I:

one year as a Natural Resource Officer II, Forester II, Park Ranger II, Geologist II, Hydrologist II, Agronomist II, Historian II, Archaeologist II, Cadastral Survey Assistant II, or other professional natural resources work equivalent in level to NRO II

- or -

A Master's degree in natural resources management, law, or public or business administration.

Natural Resource Manager II:

One year as a Natural Resource Manager I, Geologist III, Hydrologist III, Cadastral Survey Assistant III, Agronomist III, or other professional natural resource work at the NRM I level

- or -

Master's degree in natural resource management, law, or public or business administration and one additional year of graduate study or a doctorate in these subjects

- or -

A combination of a) one year of professional administrative experience in any field at the level of Natural Resource Manager I and b) either one year of professional natural resources experience equivalent in level to Natural Resource Officer II or a Master's degree in natural resource management, law or public or business administration.

Natural Resource Manager III:

One year of experience as a Natural Resource Manager II, Agronomist IV, Cadastral Surveyor II, Geologist IV, Hydrologist IV, or other professional natural resource experience at the NRM II level

- or -

A combination of a) one year of professional administrative experience in any field at the level of NRM II and b) either one year of professional natural resources experience equivalent in level to NRO II or a Master's degree in natural resource management, law, or public or business administration.

Natural Resource Manager IV:

Same as Natural Resource Manager III.

6

March 9, 1988

Rob Barbour
P.O. Box 871552
Wasilla, Alaska 99687

House of Representatives
Senate
P.O. Box V
Juneau, Alaska 99811

Subject: House Bill 469 + Amendment

Dear Senator:

I am in support of HB 469 which includes Wildland Firefighters as a part of the firefighter provision of the Public Employee's Retirement System. Nationally, each year several wildland firefighters are seriously injured and/or killed in the performance of their duties. Wildland firefighters are exposed, on a regular basis, to carbon monoxide levels of from 9 ppm (parts per million) to 54 ppm. Measurements of the total suspended particles (TSP) range from 827 to 4000 micrograms per cubic meter of air (U.S. Dept. of Labor). This poses significant health problems when exposure occurs over many years. The National Academy of Science and National Academy of Engineering rate COHb (carbon monoxide hemoglobin) levels greater than 5.0 ppm to cause cardiac and pulmonary functional changes, and 10.0 to 80.0 ppm can cause headaches, fatigue, drowsiness, coma, respiratory failure, and death. Cancer death among firefighters in the United States has doubled in the past 30 years. Lung disease strikes them more frequently than black lung strikes miners, and heart disease disables firefighters 55 percent more often than people they serve (International Association of Fire Chief's report).

During the 1987 fire season nearly all Division of Forestry firefighters were dispatched to California to assist with it's devastating fires that threatened many communities. Tragically, 10 firefighters lost their lives and hundreds more were injured during a 30-day period. Many Alaskans were injured, but thankfully, none lost their lives. The dangers faced in California fires are no different than those faced here in Alaska. Wildfires strike thousands of acres annually in remote areas as well as in the urban fringes. Dedicated firefighters then respond night or day under very arduous conditions to save lives and the resources of the State. For these reasons I ask your assistance in passing this much needed and overdue Bill.

Sincerely,

Rob Barbour

3-15-88

Representative Ulmer
Chair, House State Affairs Committee

Dear Ms. Ulmer
I am writing in support of HB 469 which includes wildland firefighters as a part of the firefighter provision of the Public Employees Retirement System.

The wildland fire program administered by the Division of Forestry is a recent addition to the land management programs of the State. Because the program is relatively new, State government is just beginning to recognize the efforts of this small group of 200 people. The recognition of hazards is just developing also. Hazards such as carbon monoxide, carbon dioxide, rapid fire spread, flying into unimproved landing areas with helicopters, and low level recon and air attack missions. Such situations and activities are hazardous and recognized as such by other Wildland Fire agencies in State and Federal government, who participate in 20 year retirement programs.

I urge your support of HB 469 and its amendments to establish a 20 year retirement program for those who participate in the Wildland Fire Protection Program.

Sincerely
Dennis C. Ricker
P.O. Box 872793 Wasilla Alaska 376-6544

1235 Heath
Fairbanks, Alaska 99712
March 10, 1988

House of Representatives
Senate
P.O. Box V
Juneau, Alaska 99811

Subject: House Bill 469

Dear Representative:

I support HB 469 which adds Wildland Firefighters to the firefighters provision of the Public Employee's Retirement System. I am a full time employee that is working in resource management most of the year, however when fire season comes I become a Wildland Firefighter. Last season I spent nearly 700 working hours on fires, during which I breathed in alot of smoke, spent many hours in helecopters, worked with bulldozers and chainsaws, beat out flames with spruce boughs and shovels, and avoided getting burned up. As part of the resource staff I spend much less time on fires than the fire staff people. We Wildland Firefighters spend as much or more time actually fighting fires than many city and volunteer firefighters. We face as many hazards and suffer the same heart and lung abnormalities brought about from breathing smoke (last year on the fires in California the smoke was 6 times worse than the smog in Los Angeles at it's worst). Those of us that survive 20 years of this punishment should be able to retire.

There is another amendment that would allow seasonal employees to add overtime hours worked to their yearly credit for retirement. This would not help me as I already work 12 months every year, but I can see where it is necessary for the seasonal firefighters. Some of the firefighters here have been working for 8-9 years and are just now getting vested. For them 20 year retirement means about 35 years of service. Firefighting is such demanding work physically and causes such detrimental effects to the body that I doubt that any of the seasonals will ever make it to retirement under the present rules. If they can count in all the hours they worked on fires, it should only take them 20-25 years to retire. Most of them put in 10 or more months of working hours every year but only get credit for 5 1/2.

Please feel free to contact me should you need any further information.

Sincerely,

William B Johnson

WILLIAM B. JOHNSON
Forester I

PUBLIC OPINION MESSAGE

DEAR: REPRESENTATIVE ULMER

NAME: CYNTHIA BETHUNE
TITLE:
ADDRESS: 141 NILGRUB
CITY: FAIRBANKS ZIP: 99712
PHONE: 457-6982
BILL NO: HB 469
SUBJECT: EXPANDING PERS PEACE OFFICER DEFINITION
MESSAGE: I SUPPORT PASSAGE OF HB 469 TO INCLUDE WILDLAND FIREFIGHTERS IN THE STATE PEACE OFFICERS RERTIREMENT SYSTEM. YEAR AFTER YEAR THESE FIREMEN RISK THEIR LIVES PROTECTING THE PEOPLE AND RESOURCES OF THE STATE FROM WILDLAND FIRES. THE STATE LEGISLATURE SHOULD RECOGNIZE THEIR CONTRIBUTION TO THE STATE AND ITS' PEOPLE BY PASSING HB 469. THANK YOU.
ECM/MJO/C

POMID: 07095806
DATE: 03/10/88
TIME: 09:58:06
LIONAME: FAIRBANKS LIO

COPIES:

REPRESENTATIVES	REPRESENTATIVES	SENATORS
ADAMS	BARNES	ABOOD
BOUCHER	BOYER	BINKLEY
BROWN	CATO	COGHILL
COLLINS	COTTEN	DUNCAN
DAVIDSON	DAVIS	ELIASON
DONLEY	ELLIS	FAHRENKAMP
FRANK	FURNACE	FAIKS
GOLL	GRUENBERG	FANNING
GRUSSENDORF	HANLEY	FISCHER
HERRMANN	HOFFMAN	HALFORD
HUDSON	KOPONEN	HENSLEY
LARSON	MARTIN	JONES
MENARD	MILLER	JOSEPHSON
NAVARRE	PEARCE	KELLY
PETTYJOHN	PHILLIPS	KERTTULA
POURCHOT	RIEGER	RODEY
SHULTZ	SPRINGER	STURGULEWSKI
SUND	SWACKHAMMER	SZYMANSKI
TAYLOR	WALLIS	UEHLING
ZAWACKI		ZHAROFF

Alaska State Legislature

Please enter into the record my testimony to the House State Affairs Comm. committee name

committee on HB #469 bill/subject, dated 3/11/88.

I am in support of HB #469. However, I would like to see this bill amended to add a section that defines a "wildland firefighter". I am a full time employee whose main job is not fighting wildland fires. But I spend a portion of my time responding to initial attack fires as a fire fighter, as well as a member of overhead teams supporting extended attack fires. Initial attack of a wildland fire is one of the most dangerous times of a fire. The fire is undefined and you can find yourself in a life or death situation real easy. During these periods I find myself in the same health hazards as the actual line fire fighters: I breath the same smoke, I'm in the same danger of a fire burning over the base camp, and other hazards that come with low level flight, etc.

I believe that a "wildland firefighter" should be defined to include anyone that has the responsibility to respond to fires as initial attack as well as part of the overhead teams on extended attack.

Signed: Richard F Baird
Testifier

O Myself
Representing (Optional)

P.O. Box 1062 Delta Jct AK 99737
Address

895-4225 or 895-4504
Phone No.

2.

Alaska State Legislature

Please enter into the record my testimony to the House State Affairs Committee
committee name

committee on HB469, dated 3/11/88.
bill/subject

I support Bill HB469. Wild land fire fighters, Breathe and work in much more smoke and hazardous conditions than a structural fire fighter with much less Protective gear and no breathing appliances. Wild land firefighters deserve at least the same retirement benefits as structural firefighters.

Signed: Don Fabian
Testifier

Representing (Optional)

Po Box 1010 Delta Jct AK.
Address

895-4725
Phone No.

3.

Alaska State Legislature

Please enter into the record my testimony to the House STATE AFFAIRS COMM. committee name

committee on HB 469 bill/subject, dated 3/11/88.

I WOULD LIKE TO SUPPORT THIS BILL FOR ALASKA WILDLAND FIREFIGHTERS. THIS WOULD BENIFIT THE EMPLOYEE RETIREMENT TO A LEVEL THAT WOULD BE MORE JUST.

Signed: Richard L. [illegible]
Testifier

Representing (Optional)

P O Box 1133 DELTA JCT. AK
Address

Phone No.

4.

Alaska State Legislature

Please enter into the record my testimony to the House State Affairs committee name

committee on HB 469 bill/subject, dated March 11, 1988.

Wildland Fire Fighter are exposed to many hazardous chemicals and conditions Theie include ash, polycarbons suspended in the smoke and carbon monoxide, Conditions include: loud noises from chainsaws pumps and Helicopters all of which cause hearing loss. (proven) Exposure to these harmful conditions range from 1 day to 8 weeks at any given time. This has totaled up to 90 days of exposure each year. Several of the Delta Forestry Technicians have been fighting fire for 20+ year. Their health deteriorated is showing a decline. I do think that it should not be limited to just Fire Fighters who are in that position now. I have been fighting fire for 12 years. Now I'm an area Forester. I still am exposed to these hazards each year and have suffered hearing loss or lung damage Thank you for your concern

Signed: _____
Testifier

Representing (Optional)

P.O.Box 1256 Delta Jct. Ak 99737
Address

895-4043
Phone No.

5.

Alaska State Legislature

Please enter into the record my testimony to the House State Affairs committee name

committee on HB 469 - PERS bill/subject, dated March 11, 1988.

I am in support of House Bill #469. I am a forestry Tech and spend over half of my time employed fighting wild land fires and pretty over half of that time is actually spent in smoky conditions and dangerous conditions. In my opinion the wildland ~~fire~~ fire fighting breath more smoke and are put in critical situations way more than any structural firemen because of the great amount of time we spend on fires.

Signed: Larry Dorshorst
Testifier

Representing (Optional)

Box 389 Delta Jct. AK. 99737
Address

895 - 4225
Phone No.

6.

Alaska State Legislature

Please enter into the record my testimony to the House State Affairs committee name

committee on House Bill No. 469 bill/subject, dated March 11, 1988.

I support House Bill No. 469, My reasoning is due to the occupational safety hazards that the Division of Forestry wildland firefighter employees face in there normal duty. Often times the employees work in thick smoke and other safety hazards.

The term wildland firefighter needs to be more accurately described so that it includes only those who annually and on a regular basis work on the actual fire line.

Signed: Steven J. Joslin Steven J. Joslin
Testifier

Representing (Optional)

P.O. Box 377 Delta Jct. Ak 99737
Address

895-4565
Phone No.

Alaska State Legislature

Please enter into the record my testimony to the House STATE AFFAIRS committee name

committee on HB-469 bill/subject, dated MARCH 11, 1988.

I FRANK V. COLE support this Bill wholly for the following reasons. I have been A "Wildland Firefighter" for approximately 10 years with the State of Alaska. I breathe, work, sleep in fire scenes. We are exposed to smoke, flames, exploding cylinders, burning structures within the wildlands etc. etc. We carry fire shelters & supervise multiple emergency firefighters. 2½ yrs of my time was spent at Fairbanks in "enforcement" of woop cutting areas. I firmly support this Bill and urge its passage to provide equity to other Agency's which are under this retirement system. The Stress level is very intense with no relief in a mile. Thank You

Signed: Frank V. Cole

Testifier

State of Ak. DV of Forestry

Representing (Optional)

Dist. Fct. Ak P.O. Box 1149 9937

Address

895-4225

Phone No.

7.

Alaska State Legislature

Please enter into the record my testimony to the House STATE AFFAIRS Comm.
committee name

committee on H.B. 469, dated 3-11-88.
bill/subject

State employees who work in the field of fire suppression face unique hazards and stressful situati: Under the current retirement system this is not adequate addressed. I think H.B. 469 is an excellent attempt to rectify the situation. The major problem with the bill is that "wildland firefighter" is not defined. Under section 1 (one) a clause should be added:

(29) "wildland firefighter" means all state employees, full time and seasonal, who carry an "Interagency Fire-Job Qualifications Card."

This would solve any problems. Thank you.

Signed: W R Johnson Jr.
Testifier

Self
Representing (Optional)

M. 292.5 Rich. H: SR #10 Delta AK
Address

895-4039 (home) or 895-4225 (work)
Phone No.

Alaska State Legislature

bill/subject

Signed

Testifier

Representing (Optional)

Address

Phone No

2.1

Alaska State Legislature

Testifier

Representing (Optional)

Address

Phone No

3.

Alaska State [illegible]

Signed _____
Testifier

_____
Representing (Optional)
P.O. Box [illegible]
Address

_____
Phone No

Alaska State Legislature

Address

Phone No

5.

Alaska State [illegible]

Signed _____
Title

_____
Representing (Optional)

_____
Address

_____
Phone No.

6.

Alaska State Legislature

Signed _____

Testifying _____

Representing (Optional) _____

Address _____

Phone No. 465-4843

Tester

Address

Phone No.

Testifier

Address

Phone No

FYI

February 26, 1988

Representative Fran Ulmer
P.O. Box V
Juneau, AK 99811

Dear Representative Ulmer:

As a registered voter in District 21, I object to Niilo Koponen introducing House Bill 469 and the recent admendment to House Bill 469 (see attached copy).

House Bill 469 is a bill which only caters to a select group of individuals within the Division of Forestry and Interior Fire Chiefs Association. The seasonal firefighter technicians within the Division of Forestry work an average of 4-5 months with 1,000 hours of overtime and make a gross salary of $35,000 to $40,000 per year. These individuals are the creme de la creme of State employees. You should audit their salaries and the amount of overtime these individuals make a year. Many of these seasonal employees hold down jobs on the slope during the winter. When they are offered full time employment with the Division of Forestry the full time jobs are turned down in favor of the more lucrative overtime that can be made fighting fires.

In the Admendment to House Bill #469 it speaks of our aging seasonal firefighters. One reason these individuals are aging so fast is from spending too much time under the sun in Hawaii or getting jet lag flying to Australia, New Zealand or India. After all, these firefighters are not like Alaska State Troopers whose life is on the line for 365 days a year.

Ninety-nine percent of the employees within this division have the qualifications to initial attack fires. Each one of us are red carded. Your Amendment to HB 469 in its wording limits early retirement and overtime hourly conversion to just seasonal forestry technicians. What about the clerk-typist III in Delta Junction that initial attacked fires this past season? What about the forestry technician in the timber program who assists fighting fires all summer? What about the timber technician who is walking a Cat along the fireline or flying in a helicopter

scanning the fireline with an infra red camera. I thought overtime was part of the job and when you took the job it was with the understanding that this was seasonal employment.

You as a representative of this State have an a responsibility to see that the Suppression Fund is used wisely. A bill like this will only create more division within our Division for this select group. If our firefighters are aging on the job then encourage them to take the full time employment with the Division of Forestry when positions become available.

Please do not pass this bill. If this HB bill is passed it would discriminate against the full time employees. This bill should offer the same opportunity to all employees within this division.

Sincerely,

Ruth Earnshaw

cc: Representative Niilo Koponen
Representative Lyman Hoffman
Representative H. A. Boucher
Representative Cliff Davidson
Representative Dave Donley
Representative Terry Martin
Representative Curt Menard

ADMENDMENT TO HB# 469

Sec. 2 In order for the state to maintain a youthful, healthly, agressive cadre of emergency personnel, seasonal peace officers and firemen may use authorized overtime worked within any particular year towards accumulating, but not to exceed, a full year's credited service as if those extra hours had been worked within regular scheduled work weeks during the year. This section is retroactive to January 1, 1979.

(The presently proposed Sec. 2 would be reassigned as Sec. 3 under this admendment)

January 1, 1979 was the first time that seasonal employees became eligible to be in the state retirement system.

Under this admendment there should not be a fiscal note involved as the employees already have retirment taken out and the state's part contributated on all the overtime earn already.

The section is needed to encourage older seasonal firefighters to become vested in the retirement system and muster out of state service before booming very elderly.

The Division of Forestry currently has several wildland firefighters who are 50 years old and numerous others approaching that age. Currently the seasonal firefighters are accuring only about 3.75 years towards retirement each 10 years under the normal 4.5 man-mounts worked each year. A person coming on board with the state at the age of 40 would become vested about the age of 55.

Passage of HB#469 with the above amendment would allow the average wildland firefighter to become vested with only about 10 years of firefighting. They could get the group health insurance and eliminate the chances of becoming a ward of the state as they grow very old without health insurance.

1065 Smallwood Trail
Fairbanks, AK. 99712
3/9/88

Representative Niilo E. Koponen
P.O. Box V
Juneau, AK. 99811

Dear Niilo,

I am writing to ask your support for a bill that is extremely important to myself and other wildland firefighters employed by the Alaska Division of Forestry. HB 469 would permit Forest Technicians and Foresters to be included under the Public Employees Retirement System as "Firemen".

The work that I do as a wildland firefighter is extremely hazardous. In September of 1987 I spent 8 weeks in Northern California on wildfires. Ten firefighters were killed while I was there and hundreds more were injured. I have personally had minor injuries numerous times on fires and been subject to severe dust and smoke conditions for long periods. Wildland firefighters have very little protection from heavy smoke. The men and women who perform my job do <u>not</u> have the luxury of Scott Air Packs with self contained oxygen. A moistened bandana over my face is all I've had for long hours at the head of a spreading fire.

Our work takes us to dangerous places such as canyon bottoms and peat bogs. To work for hours beneath World War II aircraft dropping thousands of pounds of water retardant directly over our heads or untangling cargo nets under hovering helicopters is both physically and mentally stressful.

The amendment to allow overtime to be credited towards retirement (only up to a full year) is an important part of this bill. As it is many firefighters would never be able to reach 20 years of service before retirement age, <u>even though retirement contributions are withheld at the same rate on all overtime payments earned.</u> Our firefighters average 400-500 hours of overtime per season. This is not "easy money". We earn every penny of that overtime!

I will end this letter with an experience I had while fighting a forest fire several years ago. On a steep slope I had one crew above me and another below. As a supervisor I was talking on the radio directing the crew below when a rock about the size of a grapefruit was dislodged a hundred yards above me. Even though the crew above yelled a warning, I couldn't hear due to talking on the radio. The rock whistled by not less than six inches from my head. Six inches meant life or death for me. It

meant death for a firefighter on another crew a few days later. I think of this instance often when I wonder whether to continue as a firefighter and perhaps you can ponder it as you consider whether my profession is dangerous enough to warrant passage of HB 469 and it's amendment.

Your support would be appreciated by many.

Sincerely,

Guy Shuman

1460 Old Richardson Highway
North Pole, Alaska 99705
March 9, 1988

Representative Niilo E. Koponen
P.O. Box V
Juneau, Alaska 99811

Dear Representative Koponen:

I am asking that you support HB 469 which would permit wildland firefighters to be included as peace officers under the Public Employees Retirement System.

I have worked for the Alaska Division of Forestry as a seasonal forestry technician since 1981. Fighting forest fires is hazardous and physically demanding. The job we perform is not only stressful to ourselves, but to our wives and children. We are required to maintain year-around physical fitness in order to run 1 1/2 miles in under 11 minutes 50 seconds. The most obvious hazard we face is that of being burned or physically injured on each fire we respond to. Other lesser known hazards involve long hours of physically demanding work, low level aircraft flight, landing in unimproved landing sites, hooking cargo nets under hovering helicopters, camping in remote areas without sanitation facilities, encounters with bears, exposure to mosquitoes and wasps, operation of emergency vehicles at high speeds, aircraft fueling, transport of hazardous materials heavy lifting, exposure to high concentrations of smoke and dust, high levels of noise from portable pumps, chainsaws, and helicopters, chainsaw operation with associated hazards of falling, limbing and bucking, working in close proximity to bulldozers, operation of backfiring equipment, riverboat operations, working under helicopters dropping water and airplanes dropping aerial fire retardant, working in steep, rough terrain, and use of firearms.

We are required to have considerable specialized training in fire behavior, strategy and tactics, use of pumps and saws, communications equipment, supervisory techniques, aircraft operations, the Incident Command System, first aid, fire investigation, enforcement of statutes and regulations, firearm proficiency, physical fitness, and fire business management. The decisions we make on rapidly spreading forest fires can cost or save the State millions of dollars, as well as the lives and homes of our residents.

Additionally, I ask that you support amendments that would permit seasonal firefighters to use accumulated overtime worked towards credit for retirement. Most of the wildland firefighters are only employed about five months a year. During this time it is not uncommon for us to work over 500 hours of overtime. This is equivalent to 3 1/2 months of work which should be allowed to be credited towards retirement. Many dedicated firefighters have worked for the State Division of Forestry since 1979 and are still not vested for retirement. This amendment would allow firefighters to become vested in about seven re seasons rather than twelve.

There are only about 140 forestry technicians and foresters within the State Division of Forestry that would be affected by this legislation. Please show your support and appreciation for these dedicated persons by passing HB 469 with the amendment to allow overtime worked be credited towards retirement of seasonal firefighters.

Please feel free to contact me should you need any further information.

Sincerely,

Michael G. McGowan

MICHAEL G. McGOWAN
Forest Technician IV

ALASKA FIRE CHIEF'S ASSOCIATION

POST OFFICE BOX 304 • CORDOVA, ALASKA 99574 • TEL. (907) 424-7475

RESOLUTION 87-5

TITLE: Wildland Firefighter's Retirement Benefits

WHEREAS fire protection is recognized as a hazardous profession; and

WHEREAS each year several wildland firefighters are seriously injured and/or killed in the performance of their duties; and

WHEREAS the State of Alaska, Division of Forestry, employs personnel in the capacity of wildland firefighters; and

WHEREAS those persons are not covered under the firefighter provisions of the Public Employees Retirement System (PERS):

Therefore, be it resolved that

The Alaska Fire Chief's Association and the Alaska State Firefighter's Association consider it essential that appropriate action be taken to include those persons whose primary duties are wildland firefighting to be included in the firefighter provisions of the Public Employee's Retirement System.

Recommendation: Pass

Adoption: Pass x No Pass _____

Distribution: Governor Cowper
Commissioner of Administration

Dewey Whetsell, Pres., A.F.C.A.

Gaylen Grevik, Pres., A.S.F.A.

141 Milgrub Avenue
Fairbanks, Alaska 99712
February 18, 1988

Representative Niilo E. Koponen
P.O. Box V
Juneau, Alaska 99811

Subject: House Bill 469

Dear Representative Koponen:

I am in support of HB 469 which includes Wildland Firefighters as a part of the firefighter provision of the Public Employee's Retirement System. Nationally, each year several wildland firefighters are seriously injured and/or killed in the performance of their duties. Wildland firefighters are exposed, on a regular basis, to carbon monoxide levels of from 9 ppm (parts per million) to 54 ppm. Measurements of the total suspended particles (TSP) range from 827 to 4000 micrograms per cubic meter of air (U.S. Dept. of Labor). This poses significant health problems when exposure occurs over many years. The National Academy of Science and National Academy of Engineering rate COHb (carbon monoxide hemoglobin) levels greater than 5.0 ppm to cause cardiac and pulmonary functional changes, and 10.0 to 80.0 ppm can cause headaches, fatigue, drowsiness, coma, respiratory failure, and death. Cancer death among firefighters in the United States has doubled in the past 30 years. Lung disease strikes them more frequently than black lung strikes miners, and heart disease disables firefighters 55 percent more often than people they serve (International Association of Fire Chief's report).

During the 1987 fire season nearly all Division of Forestry firefighters were dispatched to California to assist with it's devastating fires that threatened many communities. Tragically, 10 firefighters lost their lives and hundreds more were injured during a 30-day period. Many Alaskans were injured, but thankfully, none lost their lives. The dangers faced in California fires are no different than those faced here in Alaska. Wildfires strike thousands of acres annually in remote areas as well as in the urban fringes. Dedicated firefighters then respond night or day under very arduous conditions to save lives and the resources of the State. For these reasons I ask your assistance in passing this much needed and overdue Bill.

Sincerely,

Fredric J. Bethune

FREDRIC J. BETHUNE

ATTACHMENT

NH2 769

DEADLY SMOKE

Smoke-Eaters are Dying from Cancer

Reprinted from The Register, Orange County, California

By Chuck Cook and Marla Cone

"Deadly Smoke" is the result of three months of investigation by reporters Chuck Cook and Marla Cone and photographed by Rick Rickman. It was first published in December 1983 as a three-part report.

For firefighters, smoke eating once was a badge of courage. Now it has become a death sentence.

The cancer death rate among firefighters in the United States has doubled in the past 30 years. The disease strikes their lungs, stomachs, brains and prostate glands, leaving the once-strong crippled or dead.

Lung disease strikes them more frequently than black lung strikes miners.

And heart disease disables them 55 percent more often than the people they serve.

The stark bottom line for firefighters today is that their decision to take a job protecting lives and property means that they will live an average of 10 fewer years than other Americans.

Of the 2,435 full-time firefighters in Orange County, 937 of them can expect to die from cancer — 440 more than would die if firefighters died of cancer at the same rate as the U.S. population, according to recent firefighters mortality studies in the United States and Canada.

Firefighters are accustomed to being smoked, baked and burned. They are used to filling their lungs with so much smoke they spend sleepless nights after fires vomiting black phlegm. They don't worry about burned wrists and charred earlobes where the gloves and helmets don't reach.

But they are not accustomed to watching fellow firefighters die of cancer. In the Orange County Fire Capt. Howard Smith said, "It's only been about a year since we've said, 'Holy smoke, what are we creating?' We have to take responsibility for these chemicals and hazardous materials we are creating."

No one knows the dimensions of the threat to firefighters. About all researchers have determined is that the almost 1.5 million public and private firefighters in the United States are dying from heart and lung diseases and cancer much more frequently than they used to.

We have to take the responsibility for these chemicals and hazardous materials

Thirty years ago, when synthetic chemicals were not widespread, firefighters had a cancer-death rate nationwide on average 2 percent higher than nonfirefighters. But by 1980, firefighter cancer-death rate had increased to almost twice that of the general population.

The threat may be even greater, because the average firefighter is younger and stronger than ever before, part of the "super-healthy" work force.

Fewer firefighters smoke cigarettes now and as a group they are more resistant to disease. They undergo stringent physical examinations when they are hired, and most departments require them to stay in top condition.

Deaths linked to toxic fumes "are only the tip of the iceberg," said Orange

The curse of the firefighter's job is the repeated exposure to toxic and cancer-causing chemicals.

"If it was only a one-time thing, in most cases the body's normal defenses shouldn't be overwhelmed," said Dr. Linda Morse of San Francisco General Hospital, who studies firefighter health hazards.

"Firefighters may be exposed hundreds of thousands of times. The danger is much greater for firefighters who have multiple exposures," Morse said.

Plastics industry officials say they are being unfairly blamed for the soaring firefighter cancer-death rate.

"Our competitors try to tag us as a ticking time bomb, but we are not," said John Lawrence, technical director for the Society of the Plastics Industry in New York.

Plastics contribute to the toxic gases in fires because they are present. There is no body of medical studies on this subject that we consider significantly valid."

Lawrence said studies done to date on firefighter disease and death are preliminary and not conclusive.

"We take the position that let's not get too excited about a health study or two. Let's look at it from the standpoint of maybe we have discovered something here that needs to be looked at."

He said the studies are a "valid reason for firefighters to determine if they are at a higher risk."

He said the plastics industry is sponsoring research into the problem.

Any new research will add tremend-

Firefighters in Los Angeles have received more disability pensions for heart disease than police, although there are twice as many policemen as firefighters.

When a fire alarm is sounded — often while a firefighter is sleeping — pulse rate increases to the equivalent of an hour of aerobics wrapped into one second. While firefighters are in the heat of battle — usually carrying about 70 pounds of equipment — their hearts often work at 95 percent of maximum for extended periods.

The Los Angeles cancer study has prompted similar research across the nation, said Los Angeles Battalion Chief Johnny Sampton, former safety officer for the department.

Most firefighters take for granted that they will suffer lung problems. But they don't realize how serious the damage can be until it's too late.

"Most firemen who are injured don't make it to medical care. They cough a little at the scene and go back to work," said Dr. Guy Randazzo, a lung specialist in Orange. "But now, fire departments are becoming very, very careful."

Firefighters have long been aware they are employed in a very dangerous profession, said Santa Ana's Mahany, but the awareness of the consequences of long-term exposure to smoke and toxics is "something that is very new."

Firefighters also are realizing how poorly protected they are.

Ironically, the suits designed to shield firefighters may themselves be a source of cancer.

Early protective suits were made of asbestos, a known carcinogen. They were

Fatal and Near-Fatal Forest Fires
The Common Denominators

by Carl C. Wilson

Fighting large forest fires often is compared to military operations. Each involves a highly structured organization with a "general" at the head, massive movements of men and equipment, tactical aerial support and long periods of combat and stress until the enemy finally is conquered. Yet, there is one major difference between military and firefighting strategy: in suppressing large fires we do not take the calculated risk of losing fire fighters. In spite of this policy, many people have lost their lives in forest fires in the United States.

The concern is with the differences and the similarities between those fires in which someone dies and those in which someone has a very narrow escape. As this article will show, the line is thinly drawn and depends on many factors, the most vital and most uncertain being that of human behavior.

A review of the U.S. Forest Service's records between 1926 and 1976 shows that 145 men died on 41 fires from fire-induced injuries. There have been no heavy losses in recent years. The largest losses on single fires occurred on the Blackwater fire in Wyoming in 1937 and on the Rattlesnake fire in California in 1953 (Table 1). In each case, 15 people died. A similar analysis made of people lost on fires in areas protected by other Federal agencies and State, county and private agencies reveals 77 fire-induced fatalities on 26 fires. The one fire responsible for the largest number of lost lives was the 1933 Griffith Park Fire in southern California, which accounted for 25 fatalities and 128 injured people (Table 2).

The data in these tables and in the two additional tables listing "near-fatal" fires (Tables 3 and 4) help demystify these related fire types. It is possible to identify some common denominators of fire behavior in both fatal and near-fatal fires. It should be stressed at the very beginning, however, that all fires differ and the change of one small factor can result in an entirely different picture. A glance through the four tables should convince any reader of the immense variability between the circumstances surrounding each fire. The tables also show that fatal and near-fatal fires often involve so-called "erratic fire behavior" and occur under seemingly innocuous conditions. Finally, we need to examine the potential for future tragedy fires and offer some suggestions and guidelines to the man who is going to be out there on the fire line tomorrow.

Common Denominators of Fatal Fires

Based on personal knowledge and information obtained from reports and reviewers, the following generalizations can be made about the fatal fires in Tables 1 and 2:

1. Most of the incidents occurred on relatively small fires or isolated sectors of larger fires.
2. Most of the fires were innocent in appearance prior to the "flare-ups" or "blow-ups". In some cases, the fatalities occurred in the mop-up stage.
3. Flare-ups occurred in deceptively light fuels.
4. Fires ran uphill in chimneys, gullies, or on steep slopes.
5. Suppression tools, such as helicopters or air tankers, can adversely modify fire behavior. (Helicopter and air tanker vortices have been known to cause flare-ups.)

In Tables 3 and 4, near-fatal fires are those close calls which involved a potential threat to life. A review of these tables shows that most of the generalizations made concerning fire behavior apply to near-fatal fires as well as to fatal fires. The hairline difference between the two groups of fires is determined by the individual's reaction to his suddenly critical situation. Escapes may be said to be due either to luck, circumstances, advance planning, a person's ability to stay cool and not panic, or a combination of these factors. Whatever the reasons, individual behavior and circumstances determine between life and death. For the individual fire fighter and crew boss, it becomes increasingly important to be able to identify those conditions under which so many close calls and fatalities occur.

Surprising Factors

Many fire fighters are surprised to learn that fatal and near-fatal incidents occur in fairly light fuels, on small fires or isolated sectors of large fires, and that behavior is relatively quiet just before the incident. The general belief is that the high-intensity crown fire in timber or heavy brush is most likely to trap and kill forest fire fighters. Yet, with rare exceptions, such as the disastrous Sundance fire (north Idaho, 1967), the Blackwater fire (Wyoming, 1937) and King's Canyon fire (western Nevada, 1967), most of the fires in this study were innocent-appearing just before the accidents.

Why, then, do these tragedies and near-fatalities occur under so-called "easy" fire behavior conditions? First, fire spread and intensity can change much more quickly in light fuels than in heavy fuels. Thus, finer fuels tend to be more responsive to changes in atmospheric conditions than heavy fuels. Second, hot, dry weather or Santa Ana (föehn-type) winds dry out the lighter fuels with the result that any change of wind, slope, or other environmental factor may lead to a drastic and unanticipated change in fire behavior. For example, in some areas in the West, downslope winds may occur normally during the afternoon or following thunderstorms. In such cases, an "unexpected wind" or "erratic fire behavior" is blamed for the disaster. In addition, there are few visual clues to warn of fire behavior changes, because dry fuels burn with little or

no smoke. Under such conditions, the obvious signs of a change, such as smoke and crackle of flames, are only noticeable once the situation already has become critical. It is, therefore, important that the fire fighter be alert and sensitive to the fire's behavior, particularly under those environmental circumstances in which a sudden change in fire behavior may occur.

Topography, like wind, has a major influence on fire behavior. A fire spreading uphill resembles a fire spreading before a strong wind. The rate of spread will usually increase as the slope increases. Not only are the flames closer to the steep slope, but also convection is more likely to carry firebrands and start spot fires. For example, other factors remaining constant, a fire burning on level ground (0 to 5%) will spread twice as fast when it reaches a 30 percent slope. The rate of spread will double again as the slope reaches 55 percent.

Topography also has another major effect on fire behavior. Box canyons, narrow canyons and gulches tend to act like the chimney of a stove. Radiation, convection and spotting speed up as if a damper were opened in a chimney.

The external signs and warnings are important, but the internal state of the fire fighter also must be considered in an examination of fatal and near-fatal fires. A glance through the 'remarks' section of the fatal tables shows some very strange behavior by well-trained fire fighters. A person reading about these incidents may think, "I would never do that. . . I know what to do in such a situation. . . ." However, conditions on the line are not the same as in a classroom. There are reasons why so many well-trained fire fighters often are unaware of a dangerous situation until it is too late, and reasons why they often act foolishly and fatally once they do become aware.

Also, there may be physiological reasons for fire fighters' blindness to their potentially dangerous situation. They may be tired and their senses dulled by a long, fatiguing shift on the fire line. Or they may be fresh, but with their "sensing system" not yet tuned to the early warning signals which precede changes in wind direction, velocity, or both. Another physiological factor which is currently gaining attention is the adverse effects of carbon monoxide upon wildland fire personnel. It is a fact that relatively high concentrations (800+ ppm) in the environment can cause death within several hours. Carbon monoxide can occur in and around wildland fires in low-level amounts.[1] Carbon monoxide readings of 50 ppm were taken on a grass fire at a place where a tanker or initial attack crew usually would be operating. On a five-acre prescribed burn at the North Mountain Experimental Area, measured concentrations of 30 ppm were found about 200 feet from the fire front. Research and experience show low-level carbon monoxide poisoning can impair alertness, judgement, vision, and some psychomotor functions. The fire fighter is less likely to be capable of detecting the warning signals associated with drastic changes in fire behavior when he or she is being affected by carbon monoxide.

Carbon monoxide studies made on the Deadline fire (Sawtooth National Forest) and Outlaw fire (St. Joe National Forest) during the 1974 fire season showed that on one fire, most of the fire fighters were exposed to levels of carbon monoxide higher than those permitted by the standard proposed by the National Institute of Occupational Safety and Health (35 ppm during an 8-hour period).[2]

Since the effect of carbon monoxide is cumulative, it becomes a matter of great concern to fire fighters. They should be aware of the kinds of topography which encourage the build-up of carbon monoxide. Since carbon monoxide is heavier than air, this includes areas such as saddles, deep canyons and depressions.

Potential for Loss of Life

The potential for loss of life on forest fires because of burns or other fire-induced causes, is higher now than ever before. There are twice as many people in the United States in 1977 as there were in 1926, and many of these people live or play in the wildlands. As a result, "protection of life and property" has begun to dominate fire suppression action plans. The relative safety of "perimeter fire strategy" often must be sacrificed in favor of people and their possessions. This puts forest fire agencies and fire departments at a disadvantage since most training in the past has concentrated on perimeter strategy. Additional hazards arise as the state, city, and county fire departments confront the extraordinarily flashy grass, brush, and timber fuels in the urban-wildland border.

New fire suppression technology, including air tankers, helitack, chemical fire retardants, and other new tools and techniques have contributed indirectly to the problem by reducing the number of fires which escape initial attack. There are fewer opportunities for training assignments for young people on large fires. As a result, many do not have the chance to use fire behavior training knowledge learned in the classrooms. Moreover, some of the new firefighting tools, such as helicopters and air tankers, create vortices which can adversely affect fire behavior. An analysis of the Timberlodge fire (Sierra National Forest) showed that vortex turbulance created by an aircraft can be projected to the surface.[3] A small fire can then blow up, particularly if the wind is light and the atmosphere unstable.

In summation, there seems to be a strong justification for being pessimistic about the future. There is another side to the story too however, one that includes some hope for the future. Firstly, there are better fire behavior courses now, and more people from all agencies are being trained. Under the auspices of the National Wildfire Coordinating Group, interagency teams are developing new fire behavior courses. Secondly, strengthened fuel management programs and the integration of fire into forest land use planning are reducing the threat to fire fighters and to the people who live and play in the forests.

New developments in the field include major improvements in aerial support for ground forces. New air tanker systems, better fire retardants, larger and faster helicopters, and the potential for "first-night control" using night-navigational systems for helicopters, all can

(Continued on page 15)

[1] Countryman, C.M. 1971. Carbon monoxide: a firefighting problem. U.S. Forest Service, Pacific Southwest Forest and Range Exp. Stn. 6 p., illus.

[2] Tietz, John G. 1975. Firefighters' exposure to carbon monoxide on the Deadline and Outlaw fires. ED&T 2424 (Smoke Inhalation Hazards), Forest Service, USDA Equip. Dev. Center, Missoula, Mont. 3 p., illus.

[3] Davis, James B., and Craig C. Chandler. 1965. Vortex turbulance—its effect on fire behavior. Fire Control Notes 25(1):4-7, illus.

TABLE 1 Common Denominators of Fire Behavior On Fatal Forest Fires

Name of Fire, National Forest And Year	Deaths By Burning	Erratic Fire Behavior	Remarks
Romero Los Padres 1971	4	Strong "Sundowner" Santa Ana evening wind pushed fire downhill	Bulldozer operator and 3 men burned as they burned downhill to find safety
Banning San Bernardino 1971	1	Fire ran upslope in early evening	Member of tanker crew was dying nose downhill from road at night
Canyon Angeles & L.A. Co F.D. 1968	3	Santa Ana weakened and unexpected wind pushed fire upslope in late morning	Men tried to outrun fire uphill after flareup in brush below them
Williams Cleveland 1968	1	High temperatures, local gusty winds-cumulus clouds near fire.	Burned trying to outrun fire.
Daughter Mosche 1967	1	Fire became intense in pre-commercial thinning slash.	Fire boss tried to outrun fire and couldn't hear warning calls from crew on road.
Sundance Kootenai 1967	3	Fire blew up and made major run upward north under strong wind conditions.	Operator and man with tractor were ahead of fire and tried to hide under blade.
Barrett San Bernardino 1967	1	Flareup at night in light fuels on steep slope.	Fire fighter fatally injured when he fell trying to escape flareup.
Loop Angeles 1966	12	Unexpected upslope wind in afternoon after Santa Ana stopped.	Fire fishhooked under crew in a chimney and part of the crew could not reach safety in time.
Coyote Los Padres 1964	1	Downslope wind through Romero Saddle in early afternoon.	Man panicked and ran to lower part of saddle where the temperatures and carbon monoxide concentrations were too high.
Timberlodge Sierra 1962	4	Hot, dry, unstable atmosphere and light fuels. Loaded B-17 air tankers blew low over fire.	Tornado-like action from air tanker vortices probably caused fire to blow up and trapped men.
Silver Creek Nezperce 1961	2	Fire spotted in extremely steep terrain in light fuel under gusty wind conditions near the bottom of the fire.	Crew went to a chute above spot fire, but all except two men left chute when danger was obvious. One man had asthma and had to move slowly.
Sierra Angeles 1961	1	Sudden, unexpected wind change.	Man unable to gain safety in time.
Cummings Cr. Umatilla 1960	1	Unexpected wind change in light fuel on ridge.	Man dropped behind and couldn't keep up with crew when fire flared up below them.
Dry Deduct 1959	2	Unexpected downslope afternoon wind on east-facing slope.	Two men were returning after going downhill to get water. Fire came downhill and trapped them.
Cable San Bernardino 1959	1	Very hot and dry unstable atmosphere.	Tried to outrun fire but apparently had heart attack.
Decker Cleveland 1959	5	Downslope afternoon wind stopped and fire came upslope in early evening.	District Ranger and four men were on state highway when fire came upslope and caught them in the open.
Sun Angeles 1959	1	Minor flareup. Fire in front country canyon and wind changed.	Man was taking nose uphill was caught by fireline run.
Albert Ranch Angeles 1958	1	Minor flareup as wind changed at night.	Man was trapped ahead of fire.
Stewart Cleveland 1958	1	Minor flareup in chaparral under weakening Santa Ana conditions.	Out-of-region man scouting in brush ahead of fire.
Inaja Cleveland 1956	11	Upslope wind in evening when Santa Ana winds eased. Fire ran uphill.	Crew working on indirect line of canyon. Fire fishhooked under them, ran upslope and caught them before they could reach safety.
East Highlands San Bernardino 1955	1	Upslope winds in light fuels after Santa Anas tapered off at night.	Tractor operator trapped before he could reach safety.
Sagebrush Cactone Malheur 1955	1	Fire was being mopped up in sage and grass. Down drafts from cumulus cloud caused unexpected wind.	Man was separated from crew and tried to outrun fire.
Johnson Prescott 1955	1	ERC "Extreme," and fire made run in light fuels.	Man tried to outrun fire uphill.
Tunnel No. 6 Tahoe 1954	3	Moist (dry east) winds caused flareup at night.	Men were sleeping in unburned area at edge of fire.
Rattlesnake Mendocino 1953	15	Unexpected evening upslope wind caught entire crew eating lunch on a spotfire.	Part of crew tried to outrun fire downhill.
Mann Gulch Helena 1949	13	Rapid spread in light fuels burned upslope, hot, dry weather.	Smokejumpers jumped into unburned basin, and fire fishhooked below them. Most men failed to use area (burned area) and were caught going uphill.
Hells Canyon Payette 1949	1	Fire fanned by high winds.	Man stumbled and fell into fire.
Warm Springs Payette 1949	1	Unexpected strong winds caused flareup.	Man dropped behind crew to eat lunch and was trapped.
Walton Spur Stanislaus 1949	1	Swirling winds in light fuels in Tuolumne River Canyon.	Tractor operator trapped above fire.
Barrett Dam Cleveland 1948	1	Winds changed at night from SW to East, and fire flared up.	Man became separated from crew.
Strawberry Canyon Angeles 1947	2	Spotfire below men burned upslope trapping men in unburned fuel.	Burning rat ran out of main fire into nest. Spotfire spread uphill under men.
Hot Springs Payette 1944	1	Man found in sitting position on trail. Fire burned around him.	Suspected heart attack or other health problem.
Hauser Creek Cleveland 1943	11	Sudden wind shift under blackening Santa Ana conditions-maximum wind 8 miles/hr. SW.	Crew of Marines caught in small canyon off main Hauser Creek. (12 were saved).
Williams Hill Los Padres 1943	1	Fire made a run in chamise and buckwheat.	Cat operator was bunding line in advance of fire. Cat threw track, and operator tried to escape fire.
Silver Plume Lincoln 1940	1	Sudden wind change and fire flared up.	Man sweeping outside fireline.
Rock Creek Humboldt Toiyabe 1939	5	Sagebrush and grass fire made an unexpected run upslope and trapped 5 CCC boys from Paradise Camp were burned to death on fire near head of Rock Creek.	

(Table 1 continued on next page)

Name of Fire, National Forest And Year	Deaths By Burning	Erratic Fire Behavior	Remarks
Blackwater Shoshone 1937	15	"Sudden wind" caused fire to blow up in heavy Douglas-fir re-burn. Spotfire made a run uphill toward men.	Men went in from top toward spotfire - then it flared up. Part of crew found safety on rocky point.
Welcome Lake Huron 1937	1	Early spring fire, strong, dry winds from West. Fire crowned in jack pine and red pine plantation.	CCC foreman was pulling his crew out when it started to crown. He was rescuing for 2 of his men and was trapped and died 100 feet from safety.
Kamus Burn Okanogan 1933	2	Fire in light fuels, and wind changed direction.	Men tried to outrun fire but failed.
Doctor Mt. Cowlitz 1929	1	Sudden wind change in reactivery light fuels.	Man tried to outrun fire uphill.
King's Canyon Tonopah 1925	5	Unexpected downslope wind on lee side of Sierra pushed fire into second-growth forest with understory of brush.	Men had gone downhill for water and were trapped on road when wind changed.

TABLE 2

Common Denominators of Fire Behavior On Fatal Forest Fires (State, County and Local Agencies)

Name of Fire, State And Year	Deaths By Burning	Erratic Fire Behavior	Remarks
Battlement Mesa Colorado 1976	3	Rapid upslope fire on a steep draw with Southwest exposure on mixed mountain shrub type.	Four men were trapped on narrow fireline on ridge and three died.
Morgan Co. Tennessee 1972	1	Small 24-acre fire. Wind gusts 20-25 mph. Fire crossed plowed line.	Plow operator trapped and suffocated on bench on upper side of fire.
Horns Ridge Idaho 1972	2	Steep, rocky terrain. Dry grass and brush and scattered trees. Thunderstorms caused "squirrely winds."	Two men on fire line. A rolling log hit the men, and they rolled into the fire and died of suffocation.
Banks Arkansas 1972	1	Medium fuels, moderate winds, very high FDR.	Man was knocked unconscious by falling tree. He was fatally burned.
Eagle Rock Virginia 1971	1	Reburn in snapped timber, steep slope.	Three men were felling snags.
None N. Carolina 1968	1	Unknown	Man, age 64, tried to beat fire with pine boughs, clothes caught fire; was dead when found.
None Florida 1968	1	Heavy palmetto and wiregrass. Unexpected wind.	One-man suppression crew - tractor lodged on stump, and man couldn't escape.
None N. Carolina 1968	1	Unknown	A county ranger was suppressing fire. Died of 3rd degree burns.
None Mississippi 1967	1	Small fire, flashy fuels, gusty winds.	Man backfiring out lost backfire. Died after 3 days in hospital.
Windsor S. Carolina 1967	1	Weather dry and windy. Fire (4,000 acres) was fast-moving and erratic in pine.	Man was trapped by fast-moving head fire in dense smoke. Couldn't escape.
[illegible] N. Carolina 1965	1	Wind speed increased. Fire in broom sedge.	Was helping on control burn. Was caught in wire fence and burned to death.

Name of Fire, State And Year	Deaths By Burning	Erratic Fire Behavior	Remarks
Fairview Hollow Kentucky 1965	3	Small fire (26.6 acres) near town, light wind. Fire burned in a small hollow with 40-65 degree slope. Fuels were light carpet of leaves of beech, oak, maple, basswood, and poplar.	Men ran up the hill ahead of fire but were trapped on steep slope.
Joshua Falls Virginia 1964	1	Fire burned up crew toward men.	One man apparently refused to follow leader and was killed by heat.
None Georgia 1963	1	Control burn escaped.	Man overcome by smoke and/or coronary.
Unnamed Georgia 1960	3	Ordinary control burn escaped.	All 3 men were shown as dying of heart attacks. (Ages 3 were 70+)
None Florida 1960	1	Light fuels and unexpected wind change.	Two men on head. One ran to safety.
Siler City N. Carolina 1960	1	Fire in grass.	Man burned to death while attempting to put out grass fire.
Pennington Texas 1959	1	High winds in grassy fuels.	Man on road grader got in front of head of fire and was killed.
Hacienda California 1955	5	Light fuels, high temperatures, low humidity and unstable atmosphere. Fire threatening homes.	Foreman and crew were in downhill area when flashover occurred.
Gap Creek Tennessee 1954	3	Strong winds pushed fire upslope and it crowned.	Men were trapped on slope above fire.
None N. Carolina 1953	2	Woods fire.	Woman (age 62) and child (age 11) were burned in woods fire trying to put it out.
Bonnie Blue Virginia 1953	1	Fire burned rapidly up steep slope.	Man became separated from main crew and was burned.
Glenville Cost Arkansas 1952	1	Sagebrush & grass, high winds, high FDR and fire threatening homes.	Individual igniting fire fell in path of fire from ex-Assistant and died.
Kawaihae Hawaii 1941	2	Flashy fuels and the wind changed unexpectedly.	Two men were unable to gain safety in thick sisalgrass field.
Pepper Run Pennsylvania 1938	8	Fire burning in mixed-hardwood leaves on fairly steep slope. Wind shifted and crossed fireline behind men. Final size 134 acres.	Squad foreman told men to run for safety. All ran up the hill and were caught by the fire.
Griffith Park California 1933	25 killed plus 129 injured	Fire burned in light chaparral near Griffith Park. Wind changed.	Men tried to run for safety, but 25 failed.

TABLE 3

Common Denominators of Fire Behavior On Near-Fatal Forest Fires

Name of Fire, National Forest And Year	Number Involved	Erratic Fire Behavior	Remarks
Meyers Fire San Bernardino 1970	Sector Boss and crews	Fire burning in steep country and dense chaparral at night and spotted across line.	Crews and cats were building fire downhill when fire blew up. They found safety in cat line.

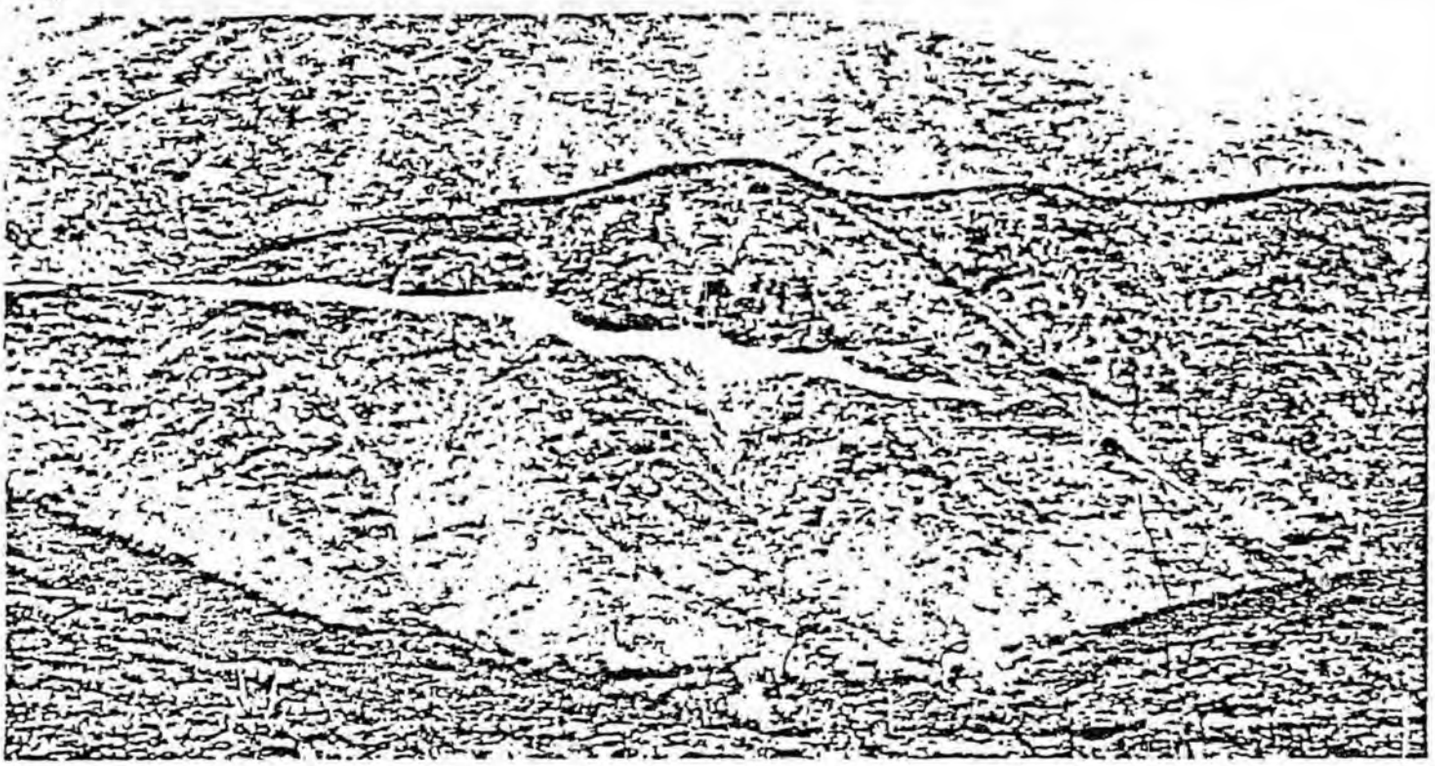
(Table 3 continued on next page)

Name of Fire, National Forest And Year	Number Involved	Erratic Fire Behavior	Remarks
Mitchell Creek Fire Wenatchee 1970	Line boss and crews	Unexpected strong, upslope winds at midnight caused fire to jump line.	Crews were pulled out. time.
South Tommy Fire Wenatchee 1970	Crew	Fire spotted below crew and came "roaring up mountain." Weather hot, dry and windy.	Crew in unfamiliar country found refuge in burned-over rock slide for two nights.
Fourth of July Mt Fire Wenatchee 1967	Foreman and crew	Fire in light fuels was quiet in early morning (2:00-3:00 a.m.), then humidity unexpectedly drooped and entire canyon burned out.	All men were pulled into safety zone.
Payette Forest Fire Payette 1967	5-man crew	Lodgepole pine blowdown. Gusty winds caused blow-up from cat piles.	Three men found safety in clearing, and 2 went into burn. No one hurt.
Boot Strap Fire BLM Elko District 1964	Foreman and inmate crew	Fast-moving fire in sagebrush and grass moving on wide front.	Foreman was driving across front of fire with crew when they encountered edge of fire and drove through safely.
Maggie Fire Malheur-Whitman (near Izee) Canyon 1963	Fire Boss and 20 men	Fire was in mop-up stage when there was a sudden increase in wind - blowing upslope. Fire burned in dense stand of grass.	Crew working downhill on steep slope in heavy, dry grass. Found safety in 30 ft. burned out strip on the ridge top.
River Bend Fire Deschutes 1962	Division Boss and Tractor Operator	Fire burning in open ponderosa pine and manzanita brush. Fire crowned in ponderosa pine.	Man ran uphill along dozer line and buried face in soil. Wind let up, and he escaped.
Fresno Co. Fire-Calif. Div. of Forestry 1962	4 men (3 received burns)	Strong winds in light fuels (grain field), 90° F temp. Wind shifted unexpectedly.	Fire outflanked 4-man pumper crew. 3 men found safety in truck cab. One man went to burnt out area.
Salmon River Fire Payette 1961	Crew Boss and Pumper Crew	Fire burning in cheatgrass then crowned in brush and timber on steep slopes of Salmon River.	Fire jumped road, but crew moved back and forth on road to avoid being burned.
Tenus Gorge Fire Wenatchee 1961	Crew	Fire in heavy cheatgrass and scattered brush in areas of Columbia River. Spotfire started below crew.	Crew burned out a safety area on a knoll. In a few minutes main fire passed, but no one was injured.
Oregon Protection Agency Fire Ore. Prot. Agency 1960's	Crew Boss and 37 men	Daytime temperature was 105° and fire was burning in scrub oak and light brush at night. Unburned fuels inside perimeter caused spots across cutline.	Crew moved to safety in time - while 200 acres more burned.
Fire in Region 4 1960's	Two men	Fire had burned downhill on ground then crowned uphill toward men.	Men abandoned fireline in time to reach safety.
Cottonwood Para Fire Medicine Bow 1960's	Crew Boss and 13 men	Fire was in mop-up stage. Temperatures rose, and unexpected winds blew fire across firelines - because of unburned fuels inside.	Crew scrambled to safety as fire burned 1,200 acres more.
Brush Patch Fire Salmon 1960's	Sector Team and 40 men	Fire burning in logging slash in steep canyon at night with up-canyon winds.	Sector boss and 5 men found safety at helispot as fire ran uphill - rest stayed on fireline.
Sutters Meadow Fire Payette 1957	Foreman and brush crew	Fire burning in spruce logging slash at 7,000 ft. elevation. Winds picked up and blew fire across line.	Foreman and crew had pre-determined line of retreat to small meadow and ex-wallow.
Sagebrush Maine Forest 1955	One crew	Downdrafts from thunderstorm created strong winds on a sagebrush fire.	Experienced logger got separated from crew and he tried to outrun fire uphill. Rest of crew went into burned area.
Mudpost 324 Plumas 1949	One	Fire made run in sagebrush and grass.	Wind shifted briefly and fireboss ran back through burn to safety.

TABLE 4

Common Denominators of Fire Behavior On Near-Fatal Forest Fires

Name of Fire, National Forest And Year	Number Involved	Erratic Fire Behavior	Remarks
Freezeout Oregon 1973	50-70	Fire came up slope at night into grass-covered area.	Crew pulled away from edge of canyon into safety area. Crew isolated from camp for 8 hours.
Laguna Cleveland 1970	15 men 2 tractors and 4 tankers	Fuels were grass and brush. Wind from S-NE 40 mph. Spotfire outside of line. Blew up. About 40 acres enclosed.	All men ran for cat line and semi-burned area. Nobody hurt, but all had singed hair and eyebrows.
Canyon Angeles 1958	3 tanker crews	Backfire operation triggered flareup of main fire in canyon below men at night. Tankers surrounded by unburned fuels.	Tanker crews retreated to burned out area near powerline and waited out the flareup.
Alaska Interior Bureau of Land Mgmt Territory 1958	25 men	Temperatures continued high at night because sun didn't set. Flareup in peat bogs surrounded crew.	Line was abandoned and men moved into a swamp, waist-deep in water. Fire burned in grasses covering swamp, but no one was burned.
Stash Colville 1967	Scout	Reburn below saddle in 250-acre cut-block blew through saddle.	Ran downhill through fire in saddle and got second & third degree burns on face, neck and hands.
Indigo Siskiyou 1967	1	Fire in Douglas-fir reproduction and in clear-cut block. Fire crowned in reproduction and blocked line of retreat.	Scout ran down cat line between fire in cut-block and flare-up in Douglas-fir reproduction. But was not injured.
Evergreen Mountain Rogue River 1967	Crew Foreman and Crew	[illegible] area rolled downhill below crew. Fire "disappeared" up slope during mid-day.	Crew foreman and crew ran to the clear-cut burned area for safety and had to stay 24 hours.
Winter Rim Fremont 1966	Sector Boss & 50 men	Light gusty winds at night caused fire to jump line in reproduction patches.	Crew pulled out, and went to fire perimeter because of erratic behavior.
Maggie Ridge Oregon 1960's	4 men	Main fire was contained, but it blew up and headed uphill toward crew on small spot fire on slope.	Crew ran toward ridge top but one man fell and had to be carried - made safe area with 5 minutes to spare.
Woodwardia Angeles 1959	13	Fire was smouldering in canyon below helispot in light fuels.	Eighteen men dug in on lee side of helispot and fire spotted overhead. Steep downhill situation without planned escape route.
Lakeview Fremont 1958	Sector Boss & 25 men	Fresh logging slash and pine reproduction. Wind stepped and direction changed unexpectedly.	Sector boss and crew rushed back into burned area and suffered minor burns.
Alder Creek Oregon 1955	One crew	Fireline being built in bottom of heavily-timbered canyon. Fire crossed canyon and surrounded crew.	Crew ran down canyon to edge of fire. One tractor burned up.
Horseshoe Basin Santiam 1953	Crew Boss & 10 men	Unburned islands of sub-alpine fuels & small meadows. Unburned islands burned out when numerous spots developed over fire.	Fire was spotting all around men so they sat in pothole with water up to their necks and fire blew over.



View of disaster scene in Rattlesnake Canyon, Mendocino National Forest, California where 15 men lost their lives in 1953. Circle in left center of photograph marks the spot where crew was working before fire overran them. Photo courtesy of U.S. Forest Service

(Continued from page 10)

speed up suppression and reduce threats to the fire fighters on the ground. Finally, more effective use of the National Fire Danger Rating components under pre-suppression and suppression conditions is helping to alert all concerned to potentially explosive conditions. For example, a high ignition component will indicate the high probability of spot fires. Similarly, a high burning index will tell the fire fighter that rapid fire spread can be expected in the light fuels where possibility of getting trapped is the greatest.

The final picture, therefore, includes some positive and some negative aspects. The individual fire fighter must realize that this year's fire season is bound to be the worst one ever. Modern technology, however, will help make the job of firefighting as safe as possible. But, the final responsibility rests with him and his fellow fire fighters. Once they are conscious of which situations are potentially dangerous, and once they know what to do in a blow-up or flare-up, their chances for avoiding a fatal fire increase.

Conclusions

There are four major common denominators of fire behavior on fatal and near-fatal fires. Such fires often occur:

1. On relatively small fires or deceptively quiet sectors of large fires.
2. In relatively light fuels, such as grass, herbs, and light brush.
3. When there is an unexpected shift in wind direction or in wind speed.
4. When fire responds to topographic conditions and runs uphill.

Yet, these factors should not be considered all inclusive. A sudden change of wind, and the fire may change direction, regardless of the topography.

Each set of circumstances has the potential for creating a fatal or near-fatal fire. Often, human behavior is the determining factor. The fire fighter, who "keeps his or her cool" when the wind direction changes, moves back into a burned area, will survive. The fire fighter who panics and tries to outrun a fire under similar conditions may die. The difference between a fatal and a near-fatal fire may be luck, skill, or advanced planning. But in all cases, it pays to be alert and aware of certain conditions which may signal a sudden change in fire behavior. In a few words—

Be alert. Watch out for:

Light fuels
Wind shifts
Steep slopes and chimneys

The person who is not caught unaware has the best chance for survival.

Portions of this paper were originally prepared for the National Advanced Fire Behavior Course, Sunriver, Oregon, April 1974, and for the National Fire Behavior Officer's Training Course, Marana, Arizona, March 1976.

Carl C. Wilson joined the U.S. Forest Service in 1946. In 1950 he transferred to the Pacific Southwest Forest and Range Experiment Station of the U.S. Forest Service and, in the following year, became Chief of the Division of Forest Fire Research. He was named Assistant Director of the Experiment Station in 1962, and eleven years later transferred to the Cooperative Fire Protection Staff of State and Private Forestry where he serves as National Fire Specialist. He has done work across the development of fire management programs for the Food and Agriculture Organization of the United Nations.

Mr. Wilson is the author of more than 30 professional and technical publications of forestry and forest fire matters. In 1975 he received an Outstanding Fire Management Award from the Chief, U.S. Forest Service and President, National Association of State Foresters.

FROM: COMMON DENOMINATORS OF FIRE BEHAVIOR ON TRAGEDY AND NEAR MISS FOREST FIRES. by Carl C. Wilson

Based on analysis of 40 tragedy fires from 1926-1974 (136 deaths) average 3-1/2 men per year.

1. Most of the incidents occurred on relatively small fires or isolated sectors of larger fires.

2. "Unexpected" or "unpredicted winds" were often given as the major cause of "erratic behavior".

3. Most of the fires were innocent in appearance -- in some cases the mop-up stage -- prior to the "flare-ups" or "blow-ups."

4. Flare-ups occurred in deceptively light fuels.

5. Fires ran uphill in "chimneys, gullies, or on steep slopes."

6. Suppression tools, such as helicopters or air tankers, can adversely modify fire behavior. (Helicopters and air tanker vortices have been known to cause flare-ups.)

7. There are no erratic fire behavior situations. Our inability to predict fire behavior causes us to fall back on the term "erratic."

HB 469

California: The Siege of '87 at a Glance*

The Final Total

"What we're focusing on here is a natural disaster of the first magnitude."—George Dunlop, assistant secretary of agriculture

- 775,000 acres burned, 700,000 in national forests.
- 19,000 fire fighters involved.
- $160,000,000 in suppression costs.

The Human Cost

"This is like being in a war and not knowing if on any given day you're going to die."—Dr. Thomas Curtis, psychiatrist and specialist in hazardous work conditions

- 10 fire fighters' lives lost.
- 28 homes and 36 other structures destroyed.
- More than 6,000 people evacuated.

The Resource Loss

"Probably in my lifetime, I will not see Tuolumne County as it was when I came here 20 years ago."—Clifton White, Tuolumne County resident

- 100 recreational facilities burned.
- 274 miles of trails damaged.
- 63 archeological sites damaged.
- 155 miles of riparian habitat lost with as yet unknown but inevitable effects on anadromous and resident fisheries.
- $1,000,000 of range improvements incinerated.
- 1.9 billion board feet of timber blackened.

The Task Ahead

"Just as people are seeing nature recover at Mount St. Helens, they will be able to see the miraculous operation of nature's forces, with assistance from man."—Richard Benjamin, assistant regional forester, Region 5, USDA Forest Service

Emergency Burn Rehabilitation (immediate work designed to help stabilize soils and control water, sediment, and debris movement)

- Aerial seeding of 80,000 acres.
- Construction of more than 500 erosion-control structures.
- Construction of 1,500 miles of drainage facilities.

Long-Term Recovery

- Reforestation of 200,000 acres requiring 100 million seedlings.
- Renovation and stabilization of 274 miles of trails.
- Salvage of 1.6 billion board feet of timber.
- The list is longer and estimates are still being made.

Estimated long-term recovery costs run more than $150 million. The time frame for full recovery extends beyond our generation. Faced with such an enormous task, it is easy to forget that 96 percent of California's national forests are still green and still offer all we have come to expect from national forests. The challenge is to care for that land while healing the wounds from the siege of '87.—*Robert Tribble, Office of Information, USDA Forest Service, Region 5, San Francisco, CA.*

*Initial assessments have not been completed for all forests. Figures presented here are estimates and are subject to change.

how the fire fighters did it," one resident said. "It was like a war."

Some 160 miles to the south, residents of nine communities—about 14 percent of Tuolumne County's 42,000 people—were asked to leave their homes. Most of the evacuations were precautionary as fires burned within striking range of homes and towns. But for Carl Grindstaff of Buck Meadows, it was a nearer thing: "Just before dark the fire came over the ridge at us like gangbusters, with 70-foot flames .... You could feel the heat. Like staring the devil in the face. It scared us to death."

By the end of the first week, the Stanislaus fires had merged into one massive 100,000-acre blaze. But the threat to structures eased, and the fire-fighting strategy changed. "Once we got out of the structures, we were able to go on the offensive," explained Robert Monsen of the California Department of Forestry. Statewide priorities changed too.

Stanislaus National Forest. One of almost 2,000 fire fighters on the line. Containing the Stanislaus fires alone took 15 days, 5,000 people, 378 engines, 111 bulldozers, 100 water tenders, 12 airtankers, and 11 helicopters.

Health Hazards of Smoke

UB 469

Inhalation of smoke, whatever the source, can result in damage to health, both acute and chronic. The acute, or immediate, symptoms are caused by exposure to high concentrations of smoke over short periods. Manifestations range from irritation of the eye and respiratory tract to impaired judgment, semiconsciousness, unconsciousness, and even death.

More insidious are repeated exposures to relatively low concentrations. These may result in respiratory allergies, bronchitis, emphysema, and cancer. Chronic health hazards are by far the most significant, because these problems usually take 15 or more years before the victim is diagnosed.

The hazards vary with the kinds of smoke inhaled. Smoke is a complex mixture whose components depend in part on the type of fuel, its moisture content, additives to the fuel (for example, pesticides sprayed on trees or foliage), and, of course, the temperature of combustion. Burning forest fuels discharge hundreds if not thousands of chemical compounds into the atmosphere—including carbon monoxide, total suspended particulates, hydrocarbons, nitrogen oxides, and water vapor.

Also given off are polycyclic organic materials such as methyl anthracene, pyrene, chrysene, benzotrianthracene, fluoranthene, methylchrysene, and benzo(a)pyrene. Other constituents include volatile oxygenated organic compounds, acids, ketones, alcohols, aldehydes (including formaldehyde), and furans. Many of these are absorbed in, or adsorbed on, condensing smoke particles. Penetration of these particles into the lung increases the chemicals' toxicity. Researchers consider particles with diameters of less than 10 microns to be respirable. Ninety-two percent of particulate emissions from logging slash are 3 microns or less in diameter.

The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight produces ozone and organic oxidants, which are potent irritants.

The effects of the important dangerous chemicals can be placed in the categories below.

The next step is to determine if the chemicals have a threshold limit value (TLV). The TLV represents conditions under which it is believed that nearly all workers may be repeatedly exposed to airborne concentrations day after day without adverse effects. The value is not absolutely safe. Because of wide variations in individual susceptibility, a small percentage of workers may experience discomfort within the threshold; a smaller percentage may be affected more seriously by aggravation of a preexisting condition or by development of an industrial disease at concentrations at or below the TLV.

The TLV is usually given as a time-weighted average that depends on length of the period during which a person is exposed or as a ceiling value not to be exceeded. The TLV for carbon dioxide, for example, is 5,000 parts per million. For ozone it is 0.1 p.p.m.

Depending on the extent of exposure, protective measures can safeguard workers' health by shielding respiration, eyes and face, and skin. In addition, all exposed persons should be adequately informed of the potential hazards, the importance of wearing the protective equipment, and, of course, the steps to be taken in an emergency. Stand-by equipment, along with well-trained crews, should be immediately available for emergencies during fires. Finally, all persons routinely exposed to smoke should have an annual physical examination.

Although periodic exposure to forest-fire smoke over a long time can be dangerous, recognition and evaluation of the hazards, adequate controls, employee training, and an annual physical examination will go a long way toward minimizing the deleterious effects.

Peter A. Breese
Department of Environmental Health
University of Washington
Seattle

Irritants
- upper respiratory: ammonia, sulfur dioxide
- lung: nitrogen dioxide, ozone

Asphyxiants
- simple inert gases that replace oxygen in the atmosphere: methane
- chemical: prevent body from using available oxygen: carbon monoxide, hydrogen cyanide, hydrogen sulfide

Anesthetics and narcotics
- intoxicants (simple anesthetics without serious systemic effects): acetylene hydrocarbons

Systemic poisons
- damage to liver and kidneys: carbon tetrachloride
- damage to blood system: phenol
- damage to nervous system: methyl alcohol, carbon disulfide
- toxic metals: lead, mercury
- toxic nonmetals: compounds of arsenic

Particulates and liquid droplets (other than systemic poisons)
- fibrous dusts: silica
- inert dusts: carbon
- allergic dusts and liquid droplets: pollen, certain dusts
- skin irritants: acids and caustics
- microorganisms: fungi, molds

Carcinogens
- known: asbestos, vinyl chloride
- suspected: formaldehyde, chrysene, benzo(a)pyrene

Teratogens
- nitrous oxide

From ... the USFS Pacific Northwest Region, Jan. 1976

HB 469

FACTORS AFFECTING FIREFIGHTER PERFORMANCE

Firefighter Fatigue

Industrial hygienists and safety specialists have long recognized the direct relationship of fatigue to accidents. There is a point at which everyone eventually wears down and is forced to stop and rest. Medical research has shown that although the fatigue point differs from person to person, it is lower in the young and old. The person who has not yet reached physical maturity and the person who neglects to keep his body in condition are our greatest concern. Physical maturity is achieved in the average American male at ages 24 to 26, and in the average American female at ages 21 to 23. With the majoriyt of our pickup summer crews being under 26, we must consider fatigue as a major area of concern in accident prevention.

The factors that combine to cause fatigue, and finally exhaustion, begin as the muscles burn the sugars stored in the muscles. This produces heat, lactic acid and carbon dioxide (CO_2). The CO_2 is dispersed through the body by the lungs and the other detrimental products saturate the body. These by-products can be flushed out of the tissue only so fast.

When strenuous muscle activity produces these by-products faster than the body can eliminate them, the body can become oversaturated causing muscle failure or exhaustion. Exhaustion reamins until the body is given sufficient time to automatically flush out the lactic acid buildup and CO_2. Only sleep does a thorough job.

A. Factors Contributing to Fatigue

1. Arduous work.
2. Long hours.
3. Monotony.
4. Constant strain.
5. Faulty posture.
6. Pressing or holding objects against the body.
7. Irregular hours of sleep.
8. Working at a fast pace.
9. Excessive heat.
10. Noxious dusts, fumes, and gases.
11. Unhealthy living conditions.
12. Emotional disturbances.
13. Loss of body heat.
14. Excessive loss of body water.
15. Food and salt intake.

B. There are no definite symptoms of fatigue. However, the following are indirect indicators of fatigue.

1. Decrease in amount of work.
2. Increase in frequency of small accidents or near misses.
3. Inability to feel refreshed after several hours of sleep.
4. Loss of interest in the work.
5. Constant struggle to keep up with the rest of the crew.

6. Poor reflex action, recurring stumbling, poor control of arms and legs.
7. Need for frequent and prolonged rest stops.
8. Dazed and careless attitude, decreasing attention span and frustrati
9. Failure of the pulse rate to recover to 110 before work is resumed a a short rest.

Hazardous work requires alertness. The person who continues to work while unduly fatigued is not fully alert to the existence of danger and the precautions he must take to avoid injury, nor is he meticulous in his observance of safe practice rules. Fatigue must be avoided not only to maintai quantity and quality of production, but because of the injurious physical effects on workers. The workman with a fatigued mental, nervous, or muscular system is a bad risk for himself and his co-workers. This is evident by the increase of more serious injuries and near misses after the fourth day of a large fire.

Firefighting and the fire camp introduces a new culture and environment t the worker. The Occupational Safety and Health Act (OSHA), makes manage responsible for controlling the unsafe acts of employees. Therefore, it is necessary to remove, or at least minimize, the sources of fatigue and in turn reduce illness and accidents.

C. Methods to reduce fatigue (and in turn reduce exposure to accidents).

1. Physical Examinations - Employees exposed to the demands of firefighting should be given periodic physical examinations. It is especially important that all fire-going personnel over 45 be given a complete physical every two years while those over 55 be on an annual schedule

2. Physical Fitness - At the beginning of every fire season, assess the physical fitness of each person and enter into a comprehensive progra of physiological fitness, exercise, and weight control. Dr. Brian J. Sharkey's guide to the prescription of exercise, "Physiological Fitness and Weight Control", should be used as a basic approach.

3. Strength and Agility - Use of strength and agility tests to determine that an individual is capable of functioning under long periods of excessive demands on their system. Persons incapable of getting into condition to pass these tests will constantly be working at an output greater than they are capable of and deeper into a fatigued condition.

4. Crew Boss Training - Include a greater emphasis on crew welfare, hygiene, fatigue, and smoke symptoms. Crew Bosses should tell their crew people how to condition themselves, conserve energy, relax, and live comfortably in a fire situation. Refresher courses should be required every three years.

5. Work Assignments - Assign workers only to tasks for which they are conditioned and trained. All fire personnel should be physically and mentally capable of coping with their fire assignments. Within crew activities, crewmembers acting as lookouts must be familiar with able to recognize all emergencies.

6. Work Hours - Adopt a regular schedule of working hours as soon as possible. The schedule should allow for a reasonable amount of time for rest and relaxation away from the job.

7. Rest Periods - As soon as the fire allows, provide for 15 or 20 minute rest breaks in the morning and afternoon, and deliver coffee, pop or juice to the people on the line. Encourage them to relax completely during the break.

8. Rest and Recuperation - On a rotational basis, and right in camp if done properly, begin giving individuals or crews a day off every 48 to 60 hours. A specialist should be assigned to each project fire to set up the rest and recuperation (R&R) and provide follow through.

9. Meal Time - Shorten the waiting time in meal lines by providing more service areas. Provide more servers to keep the lines moving. Construct tables with benches so crew can sit and relax while they eat.

10. Showers - Provide showers and laundry facilities close enough so time is not lost moving people back and forth or waiting in lines. Encourage workers to cleanup, shower, and shave daily.

11. Sleeping Facilities - Provide ground cloths, shelters, comfortable sleeping bags, and air mattresses. Furnish a cool shaded sleeping location for day sleepers and a warm dry spot for night sleepers.

12. Vitamin C - Encourage fire going personnel to use vitamin C to reduce their susceptibility to summer colds that tend to unduly wear a person down.

13. Canteen - Most men involved in slash burning or other arduous District work will relax with a cold beer or some other refreshment as soon as they come home. The same opportunity ir fire camp could have therapeutic effects. We should contract with someone to provide canteen facilities for after work hours. Ice cream bars, sodas, malts, and snacks, to break up the camp routine, would give men a chance to relax. Top feature movies at twilight are also possiblities, especially during R&R.

A person in good physical condition is less likely to become fatigued than one in poor physical condition. The ultimate responsiblity for keeping fit is the individual's. We must do everything we can to provide the facilities to help him discharge that responsibility.

he Smoke Inhalation Problem

ittle is known about the dangers to firefigners from prolonged exposure to smoke nile fighting wild or controlled fires. Studies that have been used as refernce include a literature search conducted by Missoula Equipment Development Cener, controlled burning studies by the Pacific Southwest Forest and Range Experment Station, and numerous reports and articles from scientific research conucted by and for the International Association of Firefighters.

An insight into the health hazard of smoke inhalation may assist supervisors in preventing problems. It is reasonable to assume that firefighters will not be exposed to lethal concentrations of carbon monoxide or other harmful gases. However, scientists agree that the effects of low concentrations of carbon monoxide can be a pressing concern. The effects of carbon monoxide and smoke particles are summarized separately.

A. Carbon Monoxide

The gaseous portion of smoke is far more hazardous than the particulate portion. Carbon monoxide (CO) is present in varying concentrations in all smoke from burning hydrocarbons (such as wood, leaves, and gress). CO is a good example of a gas that enters the body through the lungs but exerts toxic effects on other parts of the body. This gas rapidly combines with hemoglobin (Hb) -- the oxygen-carrying part of the blood. CO reacts with hemoglobin to form carboxynemoglobin (COHb). This COHb interferes with the transfer of oxygen to living tissues.

Since CO combines with red cells 200 times more easily than oxygen, the inhalation of very low concentrations of CO can quickly dispel all oxygen from the cells causing hypoxia, the lack of oxygen. This affects all organs and systems of the body but primarily the brain. The main effect of low concentrations of CO is on the central nervous system. Alertness, vision, and time perception are affected. Judgement and the ability to do psychomotor tasks -- tasks requiring thinking and doing -- are impaired. Apparently, these effects are more pronounced when the victim is subjected to distractions or must attend to more than one task, the kind of situation that often faces supervisory personnel, aircraft pilots, and operators of motor vehicles and equipment.

There is evidence that people subjected to low concentrations of CO are more likely to have vehicle accidents than others. People may be temporarily knocked out or made sick from its influence. Once CO occupies the red blood cells, many hours are required for removal. Repeated small exposures to the gas tend to have a cumulative effect.

Symptoms to watch for are red skin coloring (although a person in an advanced stage of CO may be blue due to a lack of oxygen), headache, dizziness and nausea with possible collapse. Pump operators standing near the exhaust of an operating pump for prolonged periods, may also experience high saturations of CO. Scientists have determined that CO does clear from the blood, but slowly. The time required depends on the amount of CO absorbed and the times between exposure. A better understanding of these relationships is needed, together with a means of speeding up clearance of CO from the blood stream. Exposure to fresh air and sunshine helps speed the clearance of CO from the blood.

EFFECTS FROM VARIOUS LEVELS OF CARBOXYHEMOGLOBIN:

As COHb levels or duration of exposure increase, health effects become more serious.

COHb Level, Percent	Demonstrated Effects
Less than 1.0	No apparent effect.
1.0 to 2.0	Some evidence of effect on behavioral performance.
2.0 to 5.0	Central nervous system effects. Impairment of time interval discrimination, visual acuity, brightness discrimination, and certain other psychomotor functions.
Greater than 5.0	Cardiac and pulmonary functional changes.
10.0 to 80.0	Headaches, fatigue, drowsiness, coma, respiratory failure, death.

Source: National Academy of Science and National Academy of Engineering

3. Ways to Minimize Effects of Carbon Monoxide

The possibility of CO poisoning is a fire control occupational hazard that cannot be eliminated, only minimized. Because low-level CO poisoning impairs alertness, judgement, vision, and some psychomotor functions, it affects fire control operations and fireline safety. To reduce the hazard of CO, these steps can be taken:

1. Inform key personnel of the hazards of carbon monoxide - Low-level CO poisoning is most likely to have serious consequences if fireline supervisors, aircraft pilots, equipment operators, and vehicle drivers are affected. If they recognize that CO can reduce their capability, they can consciously try to compensate for this.

2. Shorten tours of duty in hot-line situations - In most wildfires the highest CO concentrations are likely to be found where the smoke is the heaviest, such as at the head of the fire. Crews working in these areas should be relieved, or rotated to less dense smoke areas at frequent intervals, to permit at least partial recovery from CO effects. Short or intermittent tours of duty in hot-line situations are particularly important for supervisory personnel since mistakes and errors in judgement by these people can have far-reaching results. Short tours of duty for equipment operators working in dense smoke should also be given special consideration.

   During breaks away from hot line situations crew members should be encouraged not to smoke. Smoking adds to the CO content of the body and diminishes the advantage of the break.

3. Provide for close monitoring of supervisory personnel in critical fireline situations - If line overhead must be exposed to possible high CO concentrations, or to lower concentrations for long periods of time, their actions and decisions should be monitored closely by their supervisors. This will allow correction of errors in judgement that might otherwise result in injuries or death.

4. Limit operation of vehicles by persons likely to be exposed to carbon monoxide - Carbon monoxide is very likely to affect driving ability. Operation of motor vehicles by fireline personnel should be kept to a minimum and eliminated entirely if possible. When motor vehicle drivers are exposed to smoky conditions their tour of duty should be shortened, particularly at night, since CO can affect vision.

5. Locate fire camps in smoke-free areas - Carbon monoxide poisoning is a reversible process, but the reduction of the COHb level of the blood requires considerable time. Also, the reduction of COHb will proceed only to a point where it is in balance with the existing CO concentration. A fire crew starting its shift with above-normal COHb level will be affected more quickly than usual.

   Fire camps partially or wholly surrounded by smoldering fires are most likely to have significant levels of CO, since smoldering fires produce more CO for the amount of fuel burning than do more active fires. If it is not feasible to provide smoke-free fire camps for all fire personnel, then such areas should be provided for at least supervisory personnel, aircraft pilots, equipment operators, and motor vehicle drivers.

C. Smoke

Smoke is the suspension of small particles in heated gases. While the heat and toxic qualities of fire gases can be injurious, the solid and liquid particles in suspension in the gases can also have harmful effects. The particles may vary and be of such color, size, and quantity that they can obscure the passage of light, thus blocking escape paths or paths to safety. Because they are coated with irritating substances, the trapped particles produce temporary inflammation of the eyes, nose, and throat.

On the other hand, the visible density of smoke is not an index of toxicity. Smoke particles can be irritating when inhaled, and long exposure to them may cause damage to the respiratory tract. Particles lodged in the eyes cause tears and irritation, which may impair vision and when lodged in the nostrils and throat, may cause sneezing and coughing. Smoke particles in the air stream may cool to the point where water vapor, acids, and aldehydes will condense on them. Particles trapped in the mouth and throat can be swallowed and irritate the stomach often to the extent that nausea, vomiting and diarrhea may result. While these symptoms are not particularly damaging they may incapacitate the firefither for at least a short time. These unpleasant symptoms can usually be relieved promptly by any common antacid that is available in fire emergency medical kits.

Thus, smoke inhalation may present a number of problems, ranging from irritation of the eyes, nose and gastrointestinal tract, asphyxia, and hypoxia to pulmonary damage. The diagnoses and treatment of exposed patients is further complicated because many times there are many symptoms present. Also, the whole picture may be obscured by contributions from hyperventilation, heat exhaustion and heart attack. These three may produce the same symptoms such as difficult breathing, collapse, unconsciousness, and cyanosis.

II. Water Requirements

Water requirements of the human body vary with the environmental condition and the amount of exercise. At high temperatures a person who is resting may lose as much as a pint of water per hour by sweating. If he is working, his water loss and water requirement will increase in proportion to the amount of work being done. The supply of water must, therefore, be sufficient to provide for the heaviest type of work which the crew may be doing. Workers engaged in heavy work in extreme heat may require 4-1/2 gallons or more of drinking water per person during a 24-hour period. A water requirement guide to be used for planning purposes only is shown below.

Water requirements should be increased above the levels shown in this guide when workers are performing heavy labor in temperatures of 100°F., or greater, with low humidity. The hotter the environment, the greater the fluid loss by sweating and the greater the chance of denydration. Crew Bosses must provide optimum amounts of water at all times for drinking purposes. Workers should be encouraged to drink more water and to drink it more frequently than is necessary to quench their thirst, especially during periods of acclimatization. Thirst is not an adequate drive to stimulate one to drink that much more water. An ample supply of cool water must be readily available to the workers and they should be encouraged to take a drink of water each 15 to 20 minutes. Each crew member must have his own canteen and be responsible for filling it and keeping it in his possession. This is the only method for knowing how much water each person has consumed.

GUIDE FOR DETERMINING AVERAGE DRINKING WATER REQUIREMENTS

	Activities	Quarts of Water Per Man Per Day	
es	Examples	Moderate*	Severe**
nt	Desk work; camp security	6	10
erate	Working on level ground, around camp; tanker operation	7	11
y	Firefighting and all arduous work	9	13

Desert: Air temperature below 105°F.
Tropical: Air temperature below 85°F.
Desert: Air temperature above 105°F.
Tropical: Air temperature above 85°F.

Intake of water below the amount needed for proper cooling will result in rapid loss of efficiency, reduction in the ability to work, and deterioration of morale.

Other important problems are disorders of water and electrolyte balance. The principle disorders in this category are water-depletion heat exhaustion, and salp-depletion heat exhaustion. Both disorders can occur following continued heavy sweating. It is not uncommon for workers to lose 20 to 25 pints of sweat each day and if that much water is not replaced, water depletion occurs. Irrespective of whether water depletion occurs rapidly (e.g., in a day) or progressively (over many days), the end result is the same. In extreme examples, as for people lost in a desert with no water to drink to replace sweat losses, death can occur in 12 hours and is usually inevitable within 48 hours. Even for individuals in a temperatue climate, such as castaways at sea, water deprivation will usually result in death in seven to ten days. Death from water depletion will occur if 18 to 20 pints is lost from the body, and loss of eight pints without replacement leads to intense thirst, a rapid heart rate, and a high body temperature.

Water intake must equal the water lost by sweat if this disorder is to be avoided. workers exposed to hot climates must be encouraged to drink an ample supply of water, flavored drinks, or tomato juice, which must be readily available to them. There is no advantage in the use of thirst quenchers such as chewing gum or fruit drops. For any given amount of work under high temperature conditions, water depletion is substantially the same whether water is taken only at mealtimes or whenever one is thirsty. Those who delay drinking until mealtime may experience considerable discomfort without any apparent advantage in water economy. The greatest benefit will be obtained and the maximum efficiency will result if water is taken at short rather than at long intervals. Drinking in small amounts when thirsty is the best practice, thus preventing discomfort which may result from drinking large quantities of water at one time.

When the water supply is limited, Crew Bosses should conserve it by having the men do the required heavy and strenuous work during the coolest periods of the day or at night, if possible, when heat stress and water requirements will be less. Up to 40 percent of the daily fluid requirement may be saved by this method. The human body cannot be trained to function with less than the minimum amount of water it requires for cooling, waste elimination, and metabolism; any attempt to train the body to do so can be harmful.

IV. Salt Requirements

When water is lost through perspiration vital body salt is also lost in the sweat. The concentration of salt in the sweat is higher in unacclimatized people than in acclimatized people, but the concentration also depends on the dietary salt intake, which is usually in excess of the body's needs. An ordinary diet contains enough salt to make up for this loss when a person's water intake is less than one gallon a day. If the daily water intake is increased to 1-1/2 gallons, it is still possible to take in an adequate amount of salt which a person can spread over his food in three meals without spoiling the taste is approximately one-half teaspoon.

Even though a full diet is eaten, the salt stores in the body will have to be replenished. If salt lost in the sweat exceeds the dietary intake, a salt depletion occurs. If this is not corrected, a vicious cycle can occur, since salt depletion can lead to loss of appetite and nausea, leading in turn to a further salt depletion; moderately severe salt depletion results in vomiting and diarrhea, with further loss of salt. If this cycle is not interrupted, death inevitably follows. Those who suffer salt depletion complain of weariness and

weakness and may suffer muscle cramps, headaches, giddiness, and other symptoms. While those who are not acclimatized face a greater risk, the disorder can occur in any individual who sweats a lot and whose dietary salt intake is low.

Supplementary salt of 5 to 15 grains daily may be required by unacclimatized men to avoid salt depletion, though this may be reduced by half (or more) after 10 days of work in the heat. If there is a shortage of drinking water, extra salt should not be taken.

Healthy people, well acclimatized to working in high temperatures, on adequate fluids and a general diet, rarely need to take salt tablets. The acclimatized individual loses much less salt in his sweat. Salt can be replaced by liberally salting one's food or by useing a 0.1% salt solution drinking water. It is particularly important that salt depletion is prevented by supplemental salt intake during the first few days of heat exposure when the worker is not yet acclimatized.

Enteric coated salt tablets which are made to dissolve slowly in the intestines are available. These tablets will prevent the nausea and sick feeling sometimes felt after taking the plain salt tablets. They must be taken while drinking water or eating and should be swallowed whole. SALT TABLETS SHOULD BE MADE AVAILABLE WITH THE WARNING THAT THEY SHOULD ONLY BE USED WITH EXTREME SWEATING, SHOULD ONLY BE TAKEN WITH PLENTY OF WATER, AND THEN NO MORE THAN ONE TABLET WITH MEALS. To insure their proper use, they should only be dispensed by medical technicians with full instructions that no more than 3 a day should be taken and with adequate water to balance the supplementary salt.

Some people prefer to take their extra salt in the form of lightly salted water. This is an excellent method. The amount of table salt used to make a 0.1% salt solution for different water containers is as follows:

(1) One pound of salt to a tank (100 gallons) of water.

(2) Three-tenths pound of salt to a purification bag (36 gallons) of water.

(3) One level tablespoon of salt to 15 quarts of water.

(4) One-fourth teaspoon of salt to a canteen (quart) of water.

(5) Two 10-grain plain salt tablets dissolved in a canteen (quart) of water.

Whenever possible, each employee exposed to heat should weigh himself at the beginning and end of the workday to insure that fluid intake has been sufficient to prevent serious denydration. Weight loss at the end of the workday should not exceed 1.5% of the worker's body weight.

Water and Salt Balance

A. Excessive consumption of salt must be avoided in attempting to maintain water and salt balance. Excessive salt can have serious consequences just as inadequate salt can. The goal is balance, neither too much nor too little.

B. Some persons assume that consumption of salt tablets would somehow let the body tolerate a smaller water intake. The contrary is the case. For salt and water balance, more salt requires more water and more water requires more salt. Furthermore, there are upper and lower limits to the amount of even balanced salt and water which the body can accept without impairment of performance.

C. It is necessary to make people aware that massive salt intake is not the answer to heat problems. Very recent studies indicate that when a normal diet is consumed, the ingestion of up to 2 grams of additional sodium chloride (rougnly 3 salt tablets) per day does NOT reduce the incidence of heat cramps or heat stroke and only slightly reduces the incidence of heat exhaustion. When more than 2 grams of additional salt were taken daily, the incidence of all 3 types of heat illness increased.

VI. Salt, Water, and Rations

A. Persons working in a hot environment must not miss meals if they are to avoid heat illness. During the first 4 or 5 days of acclimatization to hot environment, a person may require up to 2 grams of salt in addition to that provided by normal food. This is best provided by use of the salt shaker.

B. It is important to be aware that field rations such as "C" rations and Long Range Patrol Rations are not "normal Food". They are heavily loaded with salt, which has been added primarily as a preservative. They average 25 grams of sodium chloride per day plus 5 grams of additional salt in packets. Persons eating such rations are on a high salt intake, and should be observed for symptoms of salt excess as described below. They should not take salt tablets.

VII. Excess Salt Symptoms

Symptoms of excess salt include gastrointestinal distress, muscular soreness intensified after physical work, fatigue and decreased work capacity. Metabolic efficiency is impaired and there is decreased cardiovascular function characterized by depressed heart rate when it should be elevated, decreased diastolic and mean arterial pressure. Total vascular resistance and cardiovascular reserve may be reduced to near shock levels during physical work. Progressive loss of potassium is reflected by serum electrolytes and electrocardiogram changes suggestive of hypokalemia and left ventricular dilation. There is increasing stress on the kidneys with progressive urinary loss of potassium, calcium, sodium, and chloride. Hematuria may appear after exhausting work. Heat acclimatization and temperature regulation are impaired. Mental function may deteriorate and disorientation may occur.