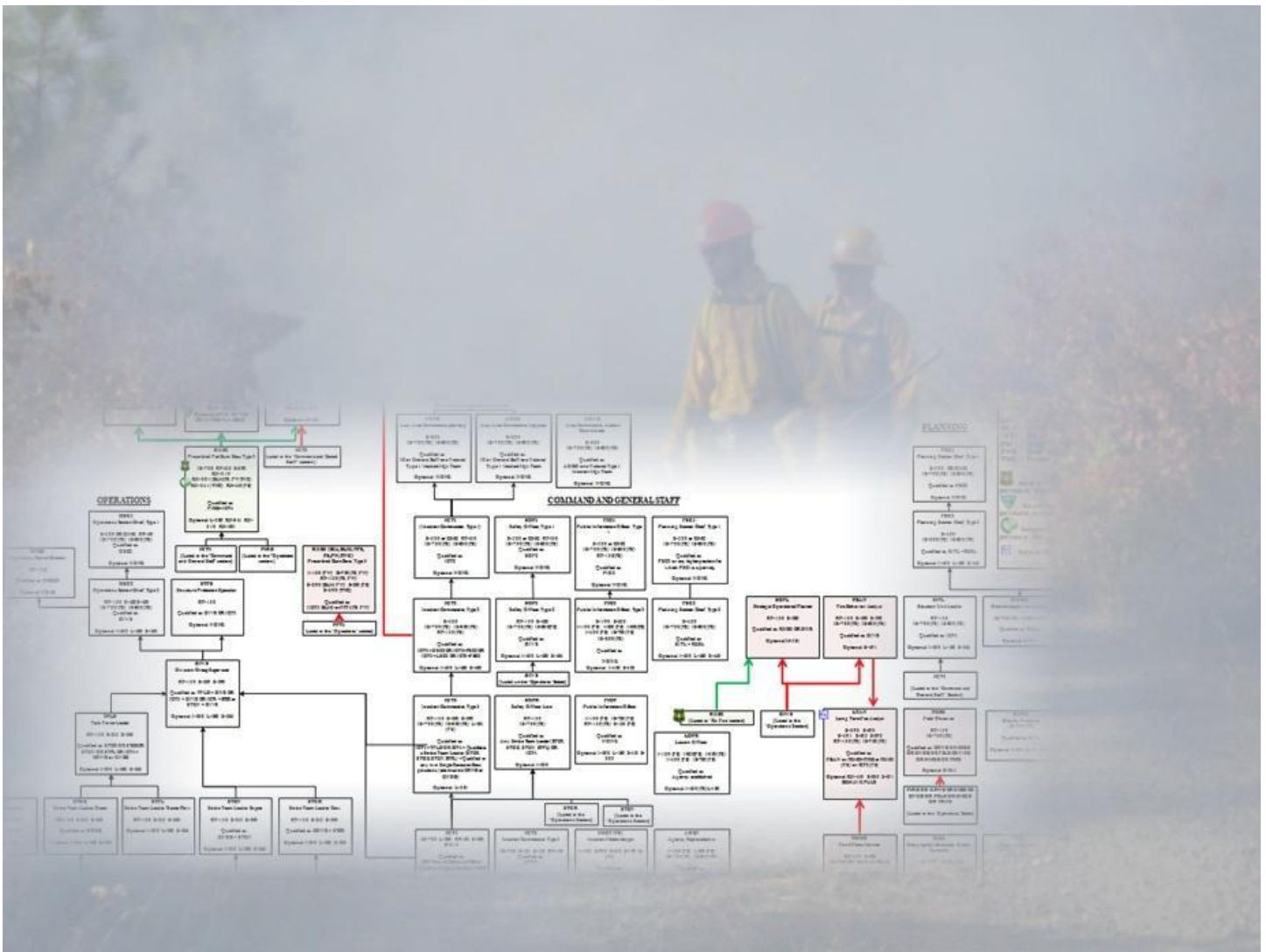


An Assessment of NWSG Wildland Fire Training and Position Requirements for Smoke and Air Quality



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List of Acronyms

ACMG	Initial Attack Lead Dispatcher & Assistant Manager
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CAA	Clean Air Act
CMGR	Center Manager
CRWB	Crew Boss
DIVS	Division/Group Supervisor
DOZB	Dozer Boss
EMLS	Engine Module Supervisor
ENGB	Engine Boss
EPA	Environmental Protection Agency
FELB	Felling Boss
FEMO	Fire Effects Monitor
FFT1	Fire Fighter Type 1
FFT2	Fire Fighter Type 2
FIRB	Firing Boss
FML	Fire Management Leadership Training
FOBS	Field Observer
FUM	Fire Use Manager
FSH 5109.17	Forest Service Handbook
GFPM	Geographic Area Fire Program Manager
HEMG	Helicopter Manager
HMGB	Helicopter Manager
IADP	Initial Attack Dispatcher
ICS	Incident Command System
IFPM	Interagency Fire Program Management
IHCS	Interagency Hotshot Superintendent
IQCS	Incident Qualification Certification System
LFML	Local Fire Management Leadership Training
LTAN	Long Term Analyst
NAAQS	National Ambient Air Quality Standards
NFPM	National Fire Program Manager
NIIMS	National Interagency Incident Command System
NPS	National Park Service
NWCG	National Wildfire Coordinating Group
PTB	Position Task Book
PFFS	Prescribed Fire and Fuels Specialist
PMS 310-1	Document title for the NWCG's Wildland Fire Qualification System Guide
RX-310	Course abbreviation for Introduction to Fire Effects
RX-341	Course abbreviation for Prescribed Fire Plan Preparation
RX-410	Course abbreviation for Smoke Management Techniques
RXB1	Prescribed Fire Burn Boss Type 1

RXB2	Prescribed Fire Burn Boss Type 2
RXB3	Prescribed Fire Burn Boss Type 3
RXM1	Prescribed Fire Manager Type 1
RXM2	Prescribed Fire Manager Type 2
SFF	Senior Firefighter
SmoC	NWCG's Smoke Committee
SEOP	Supervisory Engine Operator
SOPL	Strategic Operational Planner
TFLD	Task Force Leader
TNC	The Nature Conservancy
TRPB	Tractor Plow Boss
UFPM	Unit Fire Program Manager
USFA	United States Fire Administration
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WFOS	Wildland Fire Operations Specialist

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Executive Summary

Increasingly stringent National Ambient Air Quality Standards (NAAQS) promulgated by the Environmental Protection Agency (EPA) present greater challenges for Federal, State, Tribal and Private land managers responsible for managing wildland fire (both planned and unplanned ignitions). Agencies managing wildland fire must consider smoke and air quality impacts in their decisions, strategies and tactics. However, prior to the development of recommendations on how these smoke management and air quality goals can be accomplished, an assessment of the National Wildfire Coordinating Group's (NWCG's) training courses and position task books (PTB's) was needed. These courses and PTB's are the main source of information for land and fire managers.

This assessment reviews the occurrence of smoke and air quality information within 91 courses and 125 PTBs. Smoke management context, detail, and conformity of position requirements among agencies are assessed. Of the 91 NWCG courses assessed for key words and information, 70 contained relevant key words. Of those, 19 courses contained at least 50% or more hits relevant to "smoke management and air quality", but only 2 courses contained content that enabled a working knowledge of smoke management and air quality principles. These two courses, shown below in bold, are Smoke Management Techniques and Prescribed Fire Plan Preparation. The other three courses listed below would have met these requirements however they are revised annually, so the information within them may vary in depth from year to year. Advanced Fire Management Applications (S-482) also contained limited material on smoke, however this course, and the degree of detail devoted to smoke issues, changes each year. The version supplied for this review did not provide a working knowledge of smoke and air quality.

- **Rx-341, Prescribed Fire Plan Preparation**
- **Rx-410, Smoke Management Techniques**
- M-580, Fire in Ecosystem Management
- M-581, Fire Program Management
- S-482, Advance Fire Management Applications

Of the 125 position task books processed through the protocol 10 were found to be significant in their intent of giving the individual insight into proper management of smoke and air quality related issues:

- Field Observer (FOBS)
- Fire Effects Monitor (FEMO)
- Fire Behavior Analyst (FBAN)
- Long Term Analyst (LTAN)
- Strategic Operational Planner (SOPL)
- Prescribed Fire Burn Boss Types 1,2 and 3 (RXB1,2 & 3)
- Prescribed Fire Managers Types 1 and 2 (RXM1 & 2)

Of these, FOBS has fairly light smoke management responsibilities, and low requirements for smoke management background. FEMOs may also come into the position with a relatively little smoke management background, as do LTANs. The position of SOPL has multiple routes by which it may be entered, some requiring more smoke management background than others. NWCG does not require smoke management training for SOPL; however it may be present for personnel in the position who arrived via a USFS Fire Use Manager or Prescribed Burn Boss position. Personnel arriving to this position via similar routes in other agencies, or via the Division Section chief may not have the same level of smoke management background, as RX-410 is not a requirement for those routes. As with SOPL, prescribed burn bosses and managers may have various levels of smoke management knowledge based on their home agency and the route through which they arrived at their current position. For example, in the case of burn bosses, NWCG does not require RX-410 for these positions, while the Forest Service does. A query of the Incident Command Qualification System to determine what positions currently have RX-410 and RX-341, will follow this report to provide finer detail into where smoke management education is dispersed throughout the current command structure.

Extending the evaluation to Interagency Fire Program Management (IFPM) standards we evaluate positions such as fire program managers, which are divided into geographic, national, and unit managers. Unit managers correspond to the position of fire management officer. All three of the fire program managers and prescribed fire and fuels specialists are described by IFPM standards as requiring the most smoke management background. Any of these positions may be reached via RXB2, in which case USFS personnel will have had RX-410. The RX-410 course is also a recommended developmental course for geographic fire program managers and prescribed fire and fuels specialists.



Flaming and smoldering stumps following a training prescribed fire in northern Idaho.

Introduction

Agency personnel at all levels of fire management are tasked with planning, implementing, and responding to wildland fires (both planned and unplanned ignitions) on a daily basis. These tasks must be carried out while simultaneously managing impacts from pollutants generated by fire; meeting both these objectives successfully requires sufficient background and education to understand the legal and operational aspects of smoke management.

The Clean Air Act (CAA) is the legal foundation for managing smoke impacts on air quality and related issues. The primary focus of the CAA is public health, followed closely by general public welfare and environmental quality. It is the CAA which provides the Environmental Protection Agency (EPA) the authority to set National Ambient Air Quality Standards (NAAQS), these are the guidelines that address the concentrations of specific pollutants generated in airsheds. Of these pollutants, carbon monoxide, ozone, and particulate matter are the primary pollutants which result from wildland fire. While these and other pollutants impact the airshed, particulate matter is perhaps the one addressed most often when considering pollutants from smoke. Particulate matter of a very fine size can easily penetrate deep into lung tissues; this can cause severe respiratory problems and cardio-vascular diseases. This impact on public health is directly related to the primary focus of the Clean Air Act.

In addition to directly impacting human health, particulate matter can greatly reduce visibility due to its ability to scatter light. This reduction in visibility can create a significant public safety hazard when it occurs on public roadways and airways, and impact visibility in national parks and historic sites, areas where visibility is addressed by the Regional Haze Rule. These, and the health effects above, are issues which strike directly at the secondary standard of the CAA, general public welfare and environmental quality. In order to comply with the standards in the Clean Air Act wildland fire personnel must understand how the pollutants in smoke affect the public, what options are available for managing smoke, and what applicable policies exist to facilitate smoke management.

To meet these management standards, all federal fire personnel must meet the position requirements within the National Interagency Incident Management System (NIIMS), a standardized list of positions and requirements for each fire management position. To achieve a given position in this system, personnel must demonstrate knowledge and competency by successfully completing required trainings developed by the National Wildfire Coordinating Group (NWCG), and demonstrate on the job competency which is verified by superiors and recorded in a Position Task Book (PTB); These are the two standardized ways for agency administrators and fire managers to advance their career within the NIIMS, in addition to a series of non-standardized approaches.

Training course material has been developed and standardized by the NWCG to facilitate the professional development of fire personnel across all federal, state and tribal agencies (Table 1). These training courses have been given a variety of alpha numeric abbreviations that designate

certain areas of responsibility for overall management of wildfires and prescribed fires. For example, the “S” courses deal with suppression strategies and tactics, “I” courses aid in understanding the Incident Command System (ICS), and Rx courses are specific to the planning and management of prescribed (Rx) fires. Other course prefaces include “D” for dispatch actions, “FI” for fire investigation, “G” for gap courses intended as a bridge for structural firefighters, “L” for leadership, “P” for fire prevention work, and “M” for management. As illustrated in Table 1 and Figure 1 the “S” courses dominate the training landscape.

Table 1. Courses included in this assessment

D	FI	I	G	L	P	M	Rx
D-110	FI-110	I-100	G-130	L-180	P-101	M-410	RX-301
D-310	FI-210	I-200	G-131	L-280	P-301*	M-480	RX-310
D-311	FI-310*	I-300	G-231	L-380*	P-310	M-580	RX-341
D-312		I-400	G-330	L-480*	P-410	M-581	RX-410
D-510		I-402					RX-510
S							
S-110	S-211	S-244	S-273	S-346	S-360	S-404	S-481
S-130	S-212	S-245	S-290	S-349	S-371	S-420	S-490
S-131	S-215	S-248	S-300	S-354	S-372	S-430	S-491
S-133	S-230	S-258	S-330	S-355	S-375	S-440	S-495*
S-134	S-231	S-260	S-336	S-356	S-378	S-445	S-520
S-190	S-232	S-261	S-339	S-357	S-390	S-450	S-580
S-200	S-233	S-270	S-340	S-358	S-400	S-460	S-590
S-203	S-234	S-271	S-341	S-359	S-403	S-470	S-620*

*Courses omitted from this review because content was proprietary or otherwise unavailable.

In conjunction with this training material, position task books (PTBs) were developed under the auspices of the NWCG to gain uniformity across various Federal, State, and Tribal agencies as they cooperatively manage wildfires and plan and implement prescribed fires. The task books considered in this assessment are listed in Table 2. Full lists of course and position task book titles may be read in Appendices A and B.

This assessment evaluates courses and position task books to meet two of six tasks designed to assess and make recommendations to current smoke management educational resources. Tasks to follow this report include a querying of the Incident Qualification Certification System (IQCS)

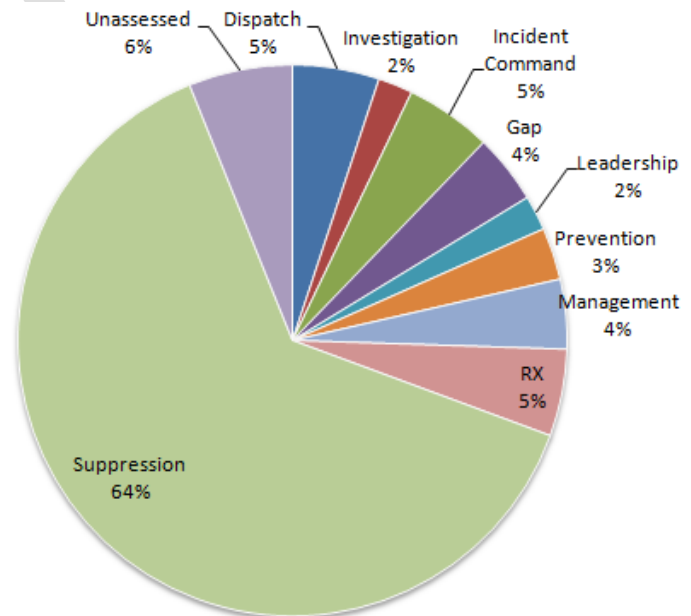


Figure 1. Percentage focus of NWCG courses assessed.

database to assess current education levels, recommendations of changes to position and course content, course delivery assessment, and an assessment of non-standardized courses. These tasks are outlined in greater detail in Appendix C. This assessment evaluates the 125 PTBs within and supporting the NIIMS, and the 91 NWCG courses, to determine if the current structure and requirements adequately address the smoke and air quality needs which fire personnel must address. Additionally, a revised flow chart based on the NIIMS Wildland Fire Qualification System Flow Chart (PMS 308) is presented which considers the training requirements for positions based upon guidelines provided by the NWCG (PMS 310-1), US Forest Service Handbook (FSH 5109.17), US Fish and Wildlife Service Fire Management Handbook, the Bureau of Land Management Training Information Job Aid Chapter Two, and online training guidelines from the Bureau of Indian Affairs, National Park Service, and Nature Conservancy. This visual aid outlines the positions which are accountable for smoke and air quality, and the trainings required for each.

Table 2. Position Task Books reviewed for this assessment

Air Ops	Command	Dispatch	Logistics	Operations	Planning	Prevention
AOBD	ACDR	ACDP	ACLC	CREP	ACPC	PETL
ASGS	ICT1	CORD	BCMG	CRWB	DMOB	PETM
ATBM ⁴	ICT2	EDRC	CDSP ⁴	DIVS	DPRO	INVF
HLCO	ICT3	EDSP	COML	DOZB	DOCL	INTM
ATGS	ICT4	EDSD	EQPM	ENGB	FOBS	
ABRO	LOFR	IADP	FACL	ENOP ³	FEMO	Rx Fire
ACAC	PIOF		F/AFCMR ⁴	FALA ³	FBAN	RXB1
DECK	PIO1	Finance	FDUL	FALB ³	LTAN	RXB2
FWBM ⁴	PIO2	CLMS	GSUL	FALC ³	GISS	RXB3 ²
HEB1/2	SOFR	CMSY	INCM	FELB	HRSP	RXM1
HECM	SOF1	COMP	LSC1&2	FFT1	PSC1/2	RXM2
SEMG	SOF2	COST	WHHR ⁴	FIRB	RESL	
TOLC		EQTR	WHLR ⁴	FIRL ⁵	SITL	Other
		FSC1/2	MEDL	HMGB	SCKN	ESFA ¹
		IBA1/2	ORDM	ICT5	SOPL	ESFW ¹
		INJR	RADO	OSC1/2	TNSP	INTS ⁶
		PROC	RCDM	STAM		IRIN ⁶
		PTRC	SECM	STCR		IMET
		TIME	CAST ⁴	STDZ		
			CASC ⁴	STEN		
			SPUL	STPL		
			COMT	STPS		
				TFLF		
				TRPB		

¹Specific to BIA, BLM, NPS, USFA, USFS, USFWS

²Specific to BIA, BLM, NPS, USFS, USFWS

³Specific to BLM, NPS, USFS, USFWS

⁴Specific to BLM and USFS

⁵Specific to BLM

⁶Specific to USFS

The agencies and entities considered within this assessment include the Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Natural Resource Conservation Service (NRCS) National Wildfire Coordinating Group (NWCG), National Park Service (NPS), U.S. Fire Administration (USFA), U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), and The Nature Conservancy. Published tasks books and trainings through April 2011 were evaluated.

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Assessment Procedures

Given the sheer number of documents to be evaluated (216 courses and PTBs) the assessment methodology was defined in a simple, repeatable, and robust manner. The protocol used a word search process which scanned the texts of NWCG course materials and PTB's. The protocol searched for words and phrases identified by SmoC and the review team to be reflective of the kind of knowledge and training that would invest the latest information about smoke and air quality management to wildland fire personnel. Twenty-nine words and phrases were identified by SmoC and the review team. (Table 3).

Table 3. Key words and phrases central to Air Quality and Smoke Management. Appropriate descriptions are derived from the SmoC Smokepedia resource.

Word/Phrase	Description
Air quality	The concentration of pollutants in the air.
Air regulatory agency	A federal or state entity responsible for air quality regulation.
Air toxics	Airborne pollutants not addressed by NAAQS that may be reasonably expected to negatively impact human health
Airshed	Analogue to a watershed this is the physical space that a part of the atmosphere behaves in a coherent way with respect to dispersion of emissions.
Atmospheric stability	The degree to which vertical motion in the atmosphere is suppressed or enhanced
Carbon monoxide	A molecule of one carbon and one oxygen atom - fatal under high exposure conditions
Class 1	Areas in which visibility standards are higher than other regions of the country such as national parks, wilderness areas monuments and other areas of national or cultural significance
Clean air act (CAA)	Federal act mandating NAAQS and requiring state implementation plans outlining compliance with NAAQS
(Fuel) Consumption	Refers to the quantity of fuel removed by burning.
Criteria pollutant	The seven most common pollutants that effect human health. These include carbon monoxide, lead, nitrogen oxides, ozone, PM 10 and 2.5, and sulfur dioxide
Dispersion	Decreasing concentration of a specific substance.
Emissions	All the smoke and aerosols present due to the fires
EPA	Environmental Protection Agency
Haze	An aerosol of particles and gases that reduce visibility
Inhalation	Breathing into the lungs pollutants and aerosols emitted in fires
Inversion	A departure from the usual rate of change of atmospheric properties given the increase or decrease in altitude of an

	airmass.
Lapse rate	The decreasing of pressure with height.
Mixing height	The height above the ground that mixing of the air occurs - low mixing heights indicates stagnant air where pollutants are close to the ground.
Ozone	A molecule of three oxygen atoms - at ground levels ozone decreases visibility and can irritate and damage the lungs
Particulate matter	Refers to all particulate matter - i.e. PM10 and PM2.5
Pollution	The presence of substances in the environment that create negative health impacts or disrupt the natural function of the environment.
Public health	All forms of public health affected by air quality and smoke management
(Sensitive) Receptor	Population centers affected by smoke and other fire emissions.
Respiration	The act of gas exchange through breathing
Smog	A pollutant that occurs when smoke and fog mix.
Smoke	The collection of all airborne solid and liquid particles and gasses emitted by fires.
Smoke management	The policy and practice of minimizing the quantities of emission from fires.
Ventilation	The replacing of stale or contaminated air in a given space with fresh air.
Visibility	The greatest distance at which specific objects may be identified.

The context of each occurrence (i.e. hit) of the word or phrase was also evaluated. When an occurrence of a word or phrase was determined, the surrounding text was evaluated to determine whether it had the intent of delivering appropriate smoke/air quality information to the student taking the course.

In many cases a “hit” resulted in text that did not reasonably reflect the intent of learning or displaying smoke/air quality management knowledge or skills. These “hits” were referred to as a “*poor hit*”. On the other hand if text adjacent to a “hit” clearly reflected the intent of delivering solid information or clearly allowed the owner of a PTB to demonstrate to a reviewer their proficiency in smoke/air quality management this “hit” was recorded as a “*good hit*”. A complete breakdown of all “hits” can be found in Appendices F and G.

An example of a good hit for the word “smoke” may be seen in text from RX-310 which stated in the introduction:

“In addition, the Smoke Management Regulations of the Clean Air Act have limited the number of acceptable burning days. This concern and the regulations have almost eliminated the use of prescribed fire in certain areas.”

In contrast, an example of a poor hit for the word “smoke” is included in text of S-203, which stated:

“The 5,000-acre Elkins Ranch Fire, now burning out of control 10 miles east of Reno, is the result of a carelessly discarded cigarette. Conditions are very dry and people who work or recreate outdoors should smoke only in their vehicles or cleared areas.”

Assessment Observations

Training Courses

There were six NWCG courses that were not assessed as the research team could not gain access to them. This was because they either contained proprietary information that contractors delivering the course material would not divulge, were law enforcement course that contained legal information that was not releasable, or designed for a one time delivery based on the experience levels of the students.

Of the 91 NWCG courses processed through the protocol there were 70 courses that had “hits” on the key words. Of these, 19 were found to have at least 50% or more hits relevant to “smoke/air quality management”. A careful review of the course and unit objectives yielded two courses that had objectives designed to teach a competent working knowledge of “smoke/air quality management”. These two courses were:

- **Rx-341, Prescribed Fire Plan Preparation**
- **Rx-410, Smoke Management Techniques**

Three additional courses contained relevant material applicable to smoke management and guiding policies, however their format and specific content may vary depending upon the year they are offered, as they are not associated with standard guidebooks. In these examples, listed below, smoke management and air quality information was conveyed to the participants, though not to the same levels as RX-341 and RX-410. It should be noted that S-580 is now offered as S-482 and is taught on a regional basis to support the position of strategic operational planner.

- **M-580, Fire in Ecosystem Management**
- **M-581, Fire Program Management**
- **S-482 Advanced Fire Management Applications, regionally taught (Formerly S-580)**

Course objectives for RX-341 and RX-410 may be seen in Appendix D. Although outdated in terms of specific policies such as NAAQS, the material in RX-410 clearly covers a comprehensive series of smoke management and air quality topics. While the standard version of the course reviews favorably it should be noted that it is not uncommon for offerings of RX-410 to include additional content specific to current smoke policies, or regional concerns. Such additions have allowed instructors to further support the objectives of the training. For example, local burners or regulators may be brought into the class to speak or answer questions, or updated modeling tools may be demonstrated for the class. An in-depth assessment detailing potential changes to course content will be provided in a later task.

Position Task Books

Of the 125 position task books processed through the protocol 10 were found to be significant in their intent of giving the individual any insight into proper management of smoke and air quality related issues. These 10 PTB's are for the positions of:

- **Field Observer (FOBS)***
- **Fire Effects Monitor (FEMO)***
- **Fire Behavior Analyst (FBAN)**
- **Long Term Analyst (LTAN)***
- **Strategic Operational Planner (SOPL)***
- **Prescribed Fire Burn Boss Type 1 (RXB1)**
- **Prescribed Fire Burn Boss Type 2 (RXB2)**
- **Prescribed Fire Burn Boss Type 3 (RXB3)***
- **Prescribed Fire Manager Type 1 (RXM1)**
- **Prescribed Fire Manager Type 2 (RXM2)**
-

In assessing the combination of position requirements and educational requirements we have flagged five of the above positions which incorporate some level of smoke and air quality responsibility, however are either not currently requiring substantial course work in this area, or may be arrived at via more than one route. These are indicated in the above list by an asterisk (Table 4). Where multiple routes may be taken to arrive at a position, Route 1 refers to a path which includes smoke and air quality education, while Route 2 requires less smoke and air quality background.

Table 4. This table described the key smoke and air quality positions and possible alternative routes. X indicates no alternative route via NIIMS.

Position	Smoke and Air Quality Responsibility	Route 1	Route 2
FOBS	Monitor smoke information and recognize visibility concerns.	X	Advancing through the route as an operational boss (FIRB, CRWB, ENGB, FELB, HEQB, HMGB)
FEMO	Monitor smoke management information. Recognize and report visibility problems.	X	Advance through FFT2. RX-310, which contains limited information on smoke and air quality, is mandatory for BLM personnel and optional under NWCG criteria.
LTAN	Monitor smoke emissions for health, safety and visibility. Provide decision making support and evaluate smoke management impacts.	X	Enter through the position of FBAN or FEMO and FIRB. These positions have limited smoke responsibility and training
RXB3	Provide Go/no go decisions taking air quality	X	Enter through FFT1

into consideration. Identify and implement mitigation measures for emissions when needed

SOPL	(Formerly Fire Use Managers) Anticipate and evaluate impacts from smoke. Use appropriate emissions prediction systems.	Enter through DIVS and RXB2. Only USFS requires RXB2 to take RX-410.	Enter through DIVS and RXB2. RXB2 may not have taken RX-410 or RX-341 in all agencies.
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In evaluating these five positions we see multiple routes and backgrounds leading to similar positions. Smoke and air responsibilities for FOBS are mainly observatory, so a detailed background may not be necessary. FOBS personnel may have more opportunity to voluntarily take RX-310, as the position must be entered as a single resource boss. For the case of FEMO, some smoke and air knowledge may be acquired through participation in RX-310, which is required for BLM personnel, but optional under the NWCG requirements observed by other agencies and The Nature Conservancy. RX-310 conveys a limited amount of smoke information, though this subject is not the main intent of that course. The position of RXB3, responsible for making “go/no go” decisions and mitigating smoke impacts when necessary, enters through FFT1 and requires no courses which address smoke and air quality in depth.

The position of LTAN may be entered by either an FBAN or a combination of FIRB and FEMO. RX-410 is an optional training for the LTAN position, but not required by NWCG standards. FBAN, FIRB, and FEMO are not required to have training in smoke management; these positions focus on operations, behavior, and effects. Smoke responsibilities for the position of LTAN focus on monitoring; however a dedicated smoke monitoring training was not detected within the NWCG course structure evaluated by this assessment.

Of the five positions discussed here SOPL has the greatest potential to have smoke a management background, though this is heavily dependent upon home agency. Recent amendments to the NWCG PMS 310-1 require entry into SOPL via both DIVS and RXB2, the latter has the option of taking RX-341. Within the USFS framework, where RX-410 is a required course for RXB2, than the individual in this position will have had smoke management training in the form of RX-410.

An important note with regard to SOPL is that it incorporates the former USFS positions of Fire Use Manager (FUM). The FUM positions were arrived at via two routes; one route through prescribed burn boss positions which would have had RX-410, and the other through Incident Commander positions which do not have smoke management training requirements. Thus, in the event an individual entered SOPL as a former FUM, their level of smoke management experience would depend on the route through which they entered that position (Figure 2).

In comparing the different agencies, the USFS requires the greatest background in smoke and air quality, with RXB1, RXB2, RXM1, and RXM2 requiring completion of RX-410 during or prior to instatement into these positions. The BLM also requires RX-410 for the position of RXB1. All

other agencies and The Nature Conservancy follow NWCG protocol where enrolling in RX-410 as RXB1 and/or RXM1 is optional but not required (Figure 3).

A position not directly captured in these position task books is that of agency administrator. NWCG defines this position as the managing officer of an agency, division, or jurisdiction having statutory responsibility for incident mitigation and management. This position is interchangeable with the term 'Line Officer' and some examples include NPS Park Superintendent, USFS Forest Supervisor, BIA Agency Superintendent, BLM District Manager, and FWS Refuge Manager. In the capacity of agency administrator, these positions may be tasked with making decisions which impact smoke management; however they do not necessarily come from a fire or smoke background. A training tool available to these positions is the Fire Management and Leadership (FLM) course. Versions of this course are offered annually by the National Advanced Fire and Resource Institute and targets agency administrators; the course has been described by the 2011 course coordinator as broad in scope, not going into specific depth on smoke management, as the agency administrator would rely on their fire staff to address those concerns.

Figure 2. Interagency planning and command positions with varying degrees of smoke background.

KEY


(Black solid line) Routes to positions where smoke management and air quality are critical task book signoffs.


(Red dotted line) Route to position in which smoke management or air quality was a critical task book signoff to qualify, however no formal Smoke trainings are required


(Green Dashed) Route to position in which smoke management or air quality was a critical task book signoff to qualify, and at least one agency requires RX-341 or RX-410 in or prior to this position .


(Dash Dot Border) Position which can be achieved via multiple routes within an agency, some with and some without a smoke management background

(BIA) Training or position specific to the BIA
(BLM) Training or position specific to the BLM
(NPS) Training or position specific to the NPS
(FS) Training or position specific to the USFS
(FWS) Training or position specific to the USFWS
(TNC) Training or position specific to The Nature Conservancy (TNC)

 Indicates USFS specific requirement of RX-410 or RX-341 for, or previous to, this positions.

 Indicates BLM specific requirement of RX-410 or RX-341 for, or previous to, this positions.

 Indicates TNC specific requirement of RX-410 or RX-341 for, or previous to, this positions.

 Indicates RX-410 or RX-341 is optional for, or previous to, this position

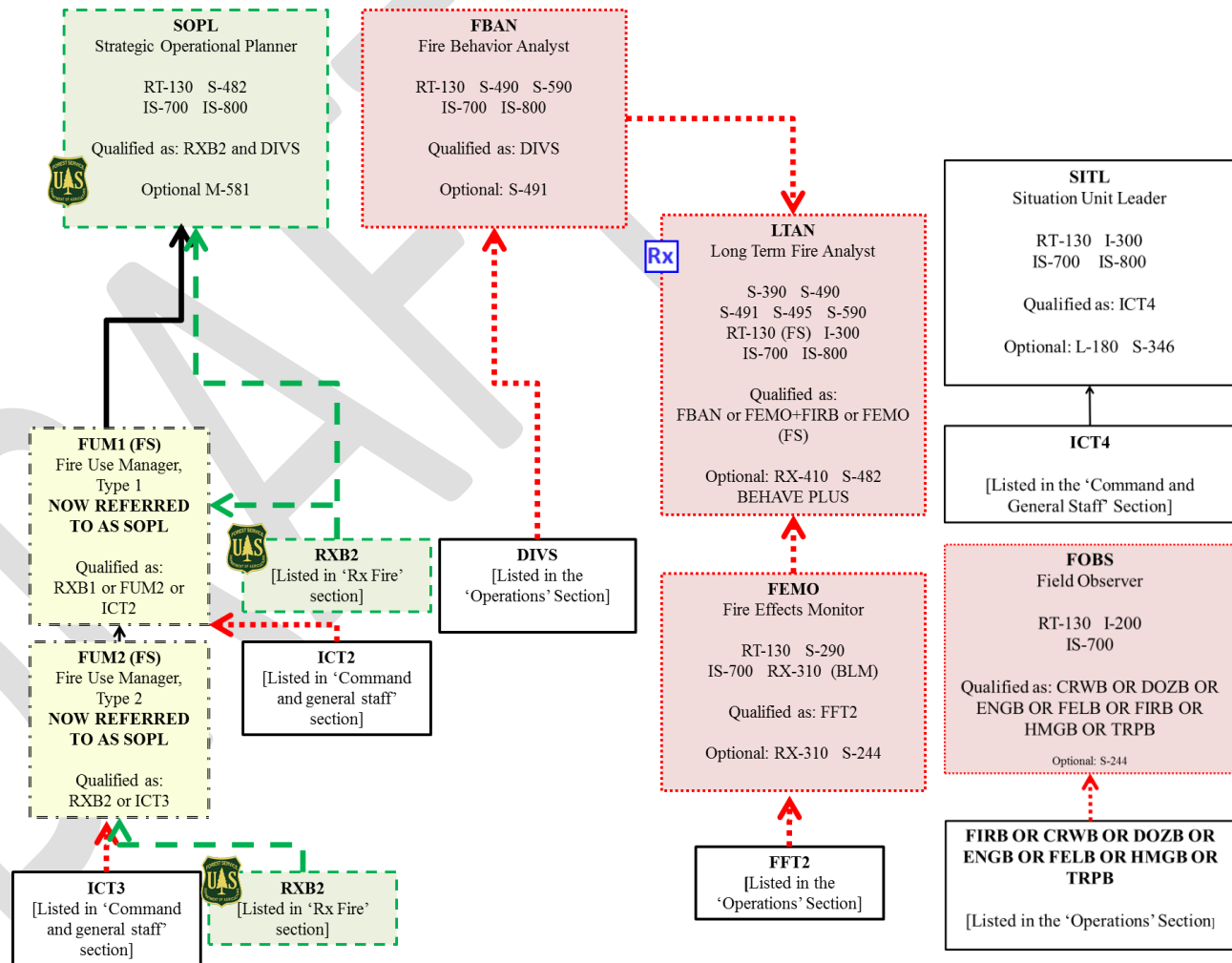
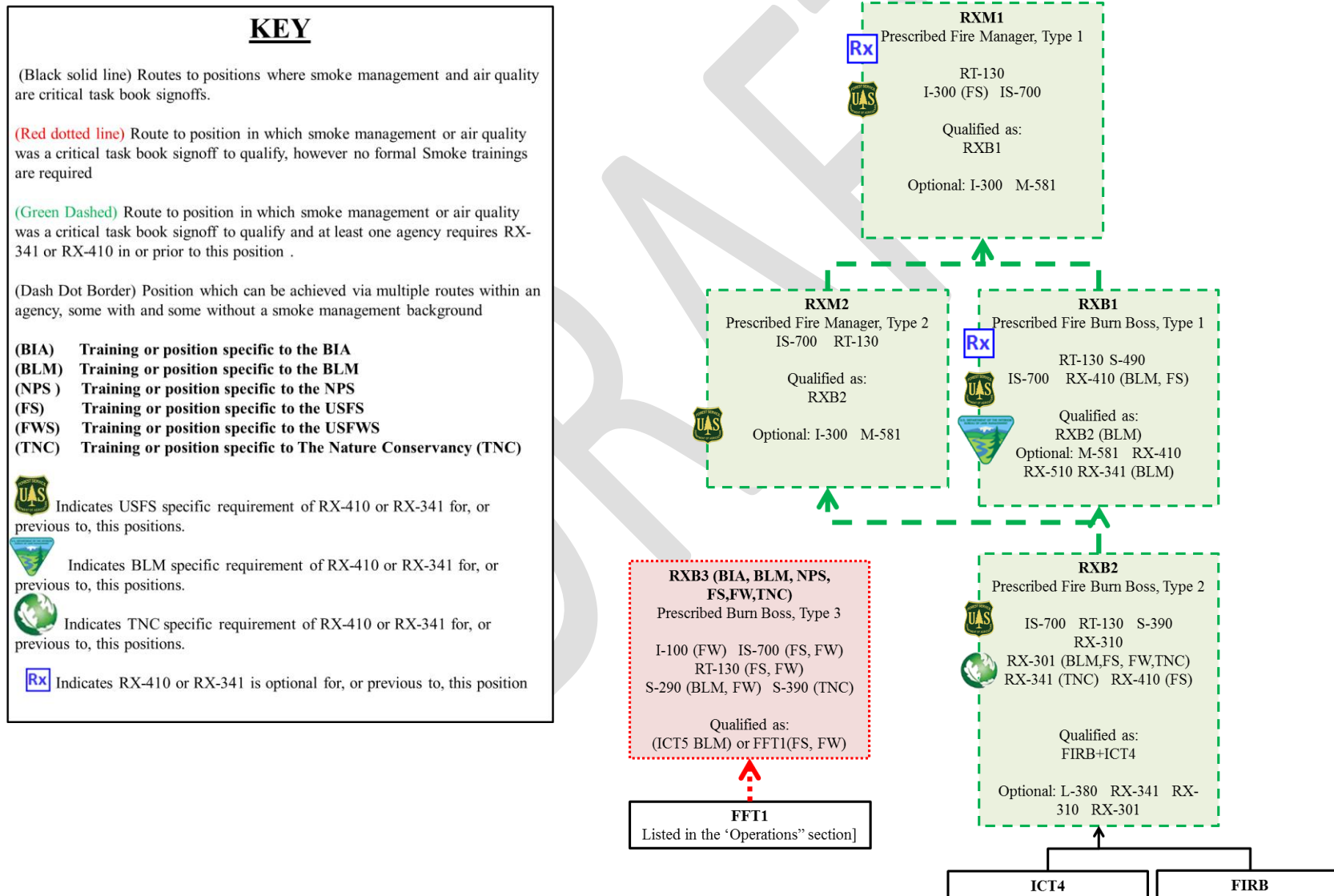


Figure 3. Prescribed fire branch of NIIMS with selected positions from the command branch.



Interagency Fire Program Management Standards

The Interagency Fire Program Management (IFPM) standards are used by the Office of Personnel Management to ensure program managers and specialists hired for fire positions conform to consistent safety and professional requirements. Though outside of the NIIMS framework, IFPM standards apply to fire management and specialist positions, and thus need to be considered when considering the training background of fire professionals. There are 13 fire management positions specifically addressed by these standards. Each position standard was run through the same assessment methods to determine what smoke management responsibilities are required. Following this, a more detailed review of background and training requirements was conducted. The 13 positions reviewed are displayed in Table 5.

Before reporting the findings within this system, a brief summary is necessary. The requirements each position must meet depend upon the complexity of the program being managed. Program complexities are ranked ‘low’, ‘medium’, and ‘high’. The method for ranking these is outside of the scope of this report, but is described in detail within the IFPM website (NWCG Operations and Workforce Development Committee Interagency Fire Program Management Subcommittee 2011). To meet the demands of varying levels of complexity a list of competencies was been created. In IFPM terms, ‘competency’ refers to the combination of knowledge, skills, and abilities which allow a person to perform to a level. The levels of proficiency for competencies include ‘working’, ‘journey’, and ‘expert’; they match up with low through high complexity levels, respectively. Working describes the minimum level required to produce acceptable work, journey indicates a seasoned employee with advanced training in the function being considered, and expert reflects the skills and training needed to perform the most challenging aspects of the job.

Table 5. List of management positions addressed by IFPM standards

Position	Acronym
National Fire Program Manager*	NFPM
Geographic Area Fire Program Manager*	GFPM
Unit Fire Program Manager*	UFPM
Wildland Fire Operations Specialist*	WFOS
Prescribed Fire and Fuels Specialists*	PFFS
Interagency Hotshot Superintendent	IHCS
Supervisory Engine Operator/Engine Module Supervisor	SEOP & EMLS
Helicopter Manager	HMGR
Senior Firefighter	SFF
Center Manager	CMGR
Initial Attack Lead Dispatcher / Assistant Center Manager	ACMG
Initial Attack Dispatcher	IADP

* Positions with smoke management responsibilities are indicated by an asterisk.

Table 6. IFPM standards related to smoke management. W represents working knowledge, J represents journey level knowledge, and E represents expert knowledge.

IFPM standards related to smoke management												
Requirement	NFPM	GFPM	UFPM	WFOS	PFFS	IHCS	SEOP EMLS	HMG R	SFF	CMGR	IACM	IADP
Knowledge of federal legislation regarding resource management such as NEPA, CAA, Threatened and Endangered Species Act, and the Natural Historical Preservation Act	E	E	J	J	W-E	W	W	W	W	W	W	W
Knowledge of various smoke management regulations, including EPA/federal, state, tribal, local, and agency, specific.	J	J	J		W-J					W	W	
Knowledge related to weather and fire behavior and resultant smoke conditions	J	J	J		W-E							
Knowledge of smoke modeling Processes	J	W			W-E							
Knowledge of particulate samplers			W		W							
Skill in using smoke emission models			W-J		W-E							

Of the positions evaluated, NFPM, GFPM, UFPM, PFFS require the greatest amount and expertise of smoke knowledge based upon the checklists presented on the IFPM website (Table 6). The recommended training and qualification routes for these positions was then evaluated, with special attention to the NWCG and multiagency backgrounds for the RXB2 position and the level of smoke management materials in RX-341, RX-410, and M-581 (Table 7). We found that NFPM, GFPM, UFPM, WFOS, and PFFS in moderate and high levels of complexity may have smoke management backgrounds. As in the NWCG standard assessment, this depends upon their home agency. IFPM standards list RX-410 and RX-341 under employee development training which is recommended to meet the competency requirements for GFPM, WFOS, and PFFS. If these development trainings are taken the personnel in these positions will have familiarity with smoke management if they don't already.

The above stratification of required background makes sense given the positions which do not require smoke management background tend to be logistics and dispatch program based. For many of the management level positions, having taken the training is required, however having had a current version of the course is not (Table 7). It should be noted that the final implementation date for all agencies for this system was October 2010. Due to this recent date,

some agencies may still be in the process of making changes, for example the latest USFS implementation plan for incorporating these guidelines into their fire program management structure was created in December of 2010, is still considered a ‘draft version’ (USFS 2011) determining the complexity levels of their programs, a determination which affects the level of training required.

Table 7. IFPM required background and training for management positions.

Position Code and Name		Position Complexity	Selective Placement Factors			Currency required
			Primary core requirement	Secondary core req.	Required training	
NFPM	National Fire Program Manager		TFLD	ICT3 or T2 C&G or RXB2	M-581 or FML or LFML	No
GFPM	Geographic Area Fire Program Manager		TFLD	ICT3 or T2 C&G or RXB2	M-581 or FML or LFML	No
UFPM	Unit Fire Program Manager	High	DIVS	ICT3 or RXB2	M-581	No
		Moderate	TFLD	ICT3 or RXB2	M-581	No
		Low	ENGB or CRWB	ICT4 or RXB2		Yes
WFOS	Wildland Fire Operations Specialist	High	DIVS	ICT3 or RXB2		Yes
		Moderate	TFLD	ICT3 or RXB2		Yes
		Low	ENGB or CRWB	ICT4 or RXB2		Yes
PFFS	Rx Fire and Fuels Specialist	High	RXB2			Yes
		Moderate	RXB2			Yes
		Low	ENGB or CRWB or FIRB	ICT4		Yes
SEOP	Supervisory Fire Engine Operator	Supervising ≥ 3 crewmembers	ENGB	ICT5	S-211	Yes
EMLS	Engine module Supervisor	Supervising ≥ 4 crewmembers	ENGB	ICT4		Yes
IHCS	Interagency Hotshot Crew Superintendent		TFLD and ICT4 and FIRB			Yes
HEMG	Helicopter Manager		HEB2	ICT4		Yes
SFF	Senior Firefighter		FFT1		S-290	Yes
CMGR	Center Manager	High	EDSD	90 days wildland firefighting experience	S-491	No
		Moderate				No
ACMG	Initial Attack Lead Dispatcher/Assistant Center Managers		EDSD	90 days wildland firefighting experience		No
IADP	Initial Attack Dispatcher		EDRC	Same as above		NO

Non-standardized trainings

Agencies offer non-standardized trainings to supplement the knowledge presented in the assessed courses. For example, fireline refresher courses are common in nearly all agencies, and the Nature Conservancy, for fire personnel. Additionally, the Natural Resources Conservation Service (NRCS) offers a series of weeklong courses focusing on prescribed burning in various ecosystems to its personnel. There are also online materials available dealing specifically with smoke management. These include Effective Communication for Smoke Management in a Changing Air Quality Environment and Smoke and Air Quality for Land Managers, both developed through the University of Idaho by the NWCG Smoke Committee (SmoC). These trainings help serve to supplement existing NWCG trainings by focusing on changing policies and approaches to smoke management. A closer assessment of this and other non-standardized trainings is scheduled to take place in a later report.

Recent and upcoming changes

In recent months some trainings have been amended to support changes within the position task book requirements for fire positions. Specifically, Fire Effects Monitor (FEMO) and Field Observer (FOBS) task books are now merged into one task book, and Strategic Operational Planner has undergone changes to its task book via suggestions from the Fire Use and Operations and Workforce Development Committees of NWCG.

To better support the task book combining FEMO and FOBS, S-244 has been undergoing updates in which a series of 'patches' or additional supporting content has been developed for online delivery, and was approved by NWCG in March 2011. Smoke and air quality is addressed in the Lesson 4 Smoke Observations patch. This patch sufficiently addresses visual monitoring of smoke, and slide notes indicate that participants are made aware of particulate matter, and visibility reduction, this information appears sufficient for the amount of smoke responsibility afforded to FEMO and FOBS in the PTB. Additionally, S-580 has been re-assigned S-482 and will be taught regionally to support the SOPL position. These changes illustrate an ongoing effort to ensure fire personnel are prepared to meet the responsibilities of their positions.

Conclusions

The position task books that outline smoke management responsibilities fall within the prescribed fire and planning branches of NIIMS and include Field Observer, Fire Effects Monitor, Fire Behavior Analyst, Long Term Analyst, Strategic Operational Planner, Prescribed Burn Bosses Types one through three, and Prescribed Fire Managers Types one and two. In considering background and training requirements that support these positions we find that Field Observers and Fire Effects Monitors may arrive at their positions via routes with little smoke management background, however their position task books contain fairly light smoke management duties. Fire Behavior Analysts and Long Term Analysts have many duties, among which is smoke monitoring, however this assessment did not detect a training resources dedicated to smoke monitoring in the NWCG structure.

Strategic Operational Planners have more than one route to reach this position, some requiring more smoke management background than others, depending upon home agency and the routes they choose to arrive at this position. Prescribed Fire Burn Bosses and Managers must meet different training and experience requirements based upon their home agency. As a result, on a large burn with personnel representing a variety of agencies it is possible to have the same position occupied by personnel with varying levels of experience and expertise in smoke management. The Operations branch of NIIMS, though responsible suppression actions and many of the implementation aspects of fire management, does not currently contain these responsibilities.

This assessment indicates a select body of trainings which contain smoke management and air quality information to support the existing PTBs. Prescribed Burn Preparation, RX-341, and Smoke Management Techniques, RX-410, are substantial in their smoke management content. Additionally, M-580, M-581, or S-482, may convey knowledge of smoke management; however the extent may be more limited, as this topic is often just one or two units in a larger training context and trainings may vary in their content from year to year. Smoke Management trainings appear to be directed mainly toward prescribed fire positions.

Interagency Fire Program Management standards are the mechanism by which the Office of Personnel Management is ensuring incoming program managers bring with them a background sufficient to meet the levels of complexity inherent in the individual fire programs. Program managers who have been either an RXB2 or taken RX-410 or RX-341 include National, Geographic, Unit, and Prescribed Fire and Fuels Managers. We find that fire program managers (geographic, national, and unit) and prescribed fire and fuels specialists, are described as requiring most smoke management backgrounds. Any of these positions may be reached via RXB2, in which case USFS personnel will have had RX-410, which is also a recommended developmental course for geographic fire program managers and prescribed fire and fuels specialists.

The standardized NWCG courses and task books have, over time, made significant positive advances in the training and education of wildland and prescribed fire managers for a vast number of specific topics. Future research, described and listed in the Statement of Work (Appendix C), includes querying the IQCS database to evaluate which positions have key smoke trainings (RX-410 and RX-341), determining if, and what, changes are recommended for existing course content and PTB's, and aiding in the development of additional options for the delivery of this information.

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Appendix A – Full List of Course Titles

Name	Number
Dispatch	
Expanded Dispatch Recorder	D-110
Expanded Dispatch Support Dispatcher	D-310
Initial Attach Dispatcher	D-311
Aircraft Dispatcher	D-312
Expanded Dispatcher Supervisory Dispatcher	D-510
Fire Investigation	
Wildland Fire Observations and Origin Scene Protection for First Responders	FI-110
Wildland Fire Origin and Cause Determination	FI-210
Fire Investigator Class with arson sensitive materials	FI-310
Gap courses	
wildland Training (FFT2) for Structural Firefighters	G-130
Wildland training (FFT1) for Structural Firefighters	G-131
Wildland Training (ENGB) for Structural Firefighters	G-231
Wildland Training for Structural Firefighters	G-330
Incident Command	
Introduction to Incident Command Systems	I-100
Basic ICS for Single Resources and Initial Attack Incidents	I-200
Intermediate ICS for Expanding Incidents	I-300
Advanced ICS for Command and General Staff Complex Incidents	I-400
ICS for Executives	I-402
Leadership	
Human Factors in the Wildland Fire Service	L-180
Followship to Leadership	L-280
Fireline Leadership	L-380
Organizational Leadership in the Wildland Fire Service	L-480
Management	
Facilitative Instructor	M-410
Multi-Agency Coordinating Group	M-480
Fire in Ecosystem Management	M-580
Fire Program Management	M-581
Prevention	
Fire Prevention Education 1	P-101
Prevention class under revision	P-301
Fire Prevention Education Team Member	P-310
Fire Prevention Education team Leader	P-410
Prescribed Fire	

Prescribed Fire Implementation	RX-301
Introduction to Fire Effects	RX-310
Prescribed Fire Plan Preparation	RX-341
Smoke Management Techniques	RX-410
Applied Fire Effects	RX-510
Suppression	
Firefighter Training	S-130
Firefighter Type 1 Training	S-131
Look up, Look down, Look around	S-133
LCES	S-134
Introduction to Wildland Fire Behavior	S-190
Initial Attack Incident Commander	S-200
Introduction of Incident Information	S-203
Portable Pumps and Water Use	S-211
Wildland Fire Chain Saws	S-212
Fire Operations in the Wildland/Urban Interface	S-215
Crew Boss (Single Resource)	S-230
Engine Boss (Single Resource)	S-231
Dozer Boss (single Resource)	S-232
Tractor/Plow Boss (Single Resource)	S-233
Ignition Operations	S-234
Field Observer	S-244
Display Processor	S-245
Incident Communications Technician	S-258
Status/Check-In Recorder	S-248
Interagency Incident Business Management	S-260
Applied Interagency Incident Business Management	S-261
Basic Air Operations	S-270
Helicopter Crewmember	S-271
Single Engine Air Tanker Manager (SEMG)	S-273
Intermediate Wildland Fire Behavior	S-290
Extended Attack Incident Commander	S-300
Task Force/Strike Team Leader	S-330
Tactical Decision Making in Wildland Fire	S-336
Division/Group Supervisor	S-339
Human Resource Specialist	S-340
GIS	S-341
Situation Unit Leader	S-346
Resources/Demobilization Unit Leader	S-349
Facilities Unit Leader	S-354
Ground Support Unit Leader	S-355
Supply Unit Leader	S-356
Food Unit Leader	S-357

Communications Unit Leader	S-358
Medical Unit Leader	S-359
Finance/Administration Unit Leader	S-360
Helibase Manager	S-371
Helicopter Management	S-372
Air Support Groups Supervisor	S-375
Aerial Supervision	S-378
Introduction to Wildland Fire Behavior	S-390
Incident Commander	S-400
Information Officer	S-403
Safety Officer	S-404
Command and General Staff	S-420
Operations Section Chief	S-430
Planning Section Chief	S-440
Incident Training Specialist	S-445
Logistics Section Chief	S-450
Finance/Administration Section Chief	S-460
Air Operations Branch Director	S-470
Incident Business Advisor	S-481
Advanced Fire Management Applications	S-482
Advanced Wildland Fire Behavior Calculations	S-490
Intermediate National Fire Danger Rating System	S-491
Advanced Incident Management	S-520
Advanced Fire Behavior 2008 Course	S-590

Appendix B – Full List of Position Task Book Descriptions

Air Operations	Logistics continued
Air Operations Branch Director (AOBD)	Receiving / Distribution Manager (RCDM)
Air Support Group Supervisor (ASGS)	Security Manager (SECM)
Airtanker Base Manager (ATBM) ⁴	Supervisory Supply Clerk (CAST) ⁴
Helicopter Coordinator (HLCO)	Supply Clerk (CASC) ⁴
Air Tactical Group Supervisor (ATGS)	Supply Unit Leader (SPUL)
Aircraft Base Radio Operator (ABRO)	
Area Command Aviation Coordinator (ACAC)	Operations
Deck Coordinator (DECK)	Crew Representative (CREP)
Fixed Wing Base Manager (FWBM) ⁴	Crew Boss (CRWB)
Helibase Manager Type 2/Type 1 (HEB1/HEB2)	Division/Group Supervisor (DIVS)
Helicopter Crewmember (HECM)	Dozer Boss (DOZB)
Single Engine Air Tanker Manager (SEMG)	Engine Boss (ENGB)
Takeoff and Landing Coordinator (TOLC)	Engine Operator (ENOP) ³
	Faller Classes A,B, and C (FALA, FALB, FALC) ³
Command	Felling Boss (FELB)
Area Commander (ACDR)	Firefighter Type 1 (FFT1)
Incident Commander Type 1 (ICT1)	Firing Boss (FIRB)
Incident Commander Type 2 (ICT 2)	Firing Leader (FIRL) ⁵
Incident Commander Type 3 (ICT3)	Helicopter Manager, Single Resource (HMGB)
Incident Commander Type 4 (ICT4)	Incident Commander Type 5 (ICT5)
Liaison Officer (LOFR)	Operations Section Chief Type1/2 (OSC1/OSC2)
Public Information Officer (PIOF)	Staging Area Manager (STAM)
Public Information Officer Type 1 (PIO1)	Strike Team Leader Crew (STCR)
Public Information Officer Type 2 (PIO2)	Strike Team Leader Dozer (STDZ)
Safety Officer, Line (SOFR)	Strike Team Leader Engine (STEN)
Safety Officer Type 1 (SOF1)	Strike Team Leader Tractor/Plow (STPL)
Safety Officer Type 2 (SOF2)	Structure Protection Specialist (STPS)
	Task Force Leader (TFLD)
	Tractor/Plow (TRPB)
Dispatch	
Aircraft Dispatcher (ACDP)	
Expanded Dispatch Coordinator (CORD)	Planning
Expanded Dispatch Recorder (EDRC)	Assistant Area Commander, Planning (ACPC)
Expanded Dispatch Sup. Dispatcher (EDSP)	Demobilization Unit Leader (DMOB)

Expanded Dispatch Support Dispatcher (EDSD)	Display Processor (DPRO)
Initial Attack Dispatcher (IADP)	Documentation Unit Leader (DOCL)
	Field Observer (FOBS)
Finance	Fire Effects Monitor (FEMO)
Claims Specialist (CLMS)	Fire Behavior Analyst (FBAN)
Commissary Manager (CMSY)	Long Term Fire Analyst (LTAN)
Compensation/Claims Unit Leader (COMP)	Geographic Information System Specialist (GISS)
Cost Unit Leader (COST)	Human Resource Specialist (HRSP)
Equipment Time Recorder (EQTR)	Planning Section Chief Type 2/Type 1 (PSC1 &2)
Finance/Administration Section Chief Type 1/2 (FSC1/FSC2)	Resources Unit Leader (RESL)
Incident Business Advisor Type 1/2 (IBA1/IBA2)	Situation Unit Leader (SITL)
Compensation-For-Injury Specialist (INJR)	Status / Check-in Recorder (SCKN)
Procurement Unit Leader (PROC)	Strategic Operational Planner (SOPL)
Personal Time Recorder (PTRC)	Training Specialist (TNSP)
Time Unit Leader (TIME)	
	Prescribed Fire
Logistics	Prescribed Fire Burn Boss Type 1 (RXB1)
Assistant Area Commander, Logistics (ACLC)	Prescribed Fire Burn Boss Type 2 (RXB2)
Base/Camp Manager (BCMG)	Prescribed Fire Burn Boss Type 3 (RXB3) ²
Cache Demobilization Specialist (CDSP) ⁴	Prescribed Fire Manager Type 1 (RXM1)
Communications Unit Leader (COML)	Prescribed Fire Manager Type 2 (RXM2)
Equipment Manager (EQPM)	
Facilities Unit Leader (FACL)	Prevention
Fire Cache Manager and Asst Manager (F/AFCMR) ⁴	Fire Prevention Education Team Leader (PETL)
Food Unit Leader (FDUL)	Fire Prevention Education Team Member (PETM)
Ground Support Unit Leader (GSUL)	Wildland Fire Investigator (INVF)
Incident Communications Center Manager (INCM)	Wildland Fire Investigation Team Member (INTM)
Incident Communications Technician (COMT)	
Logistics Section Chief Type 2/Type 1 (LSC1 & 2)	Other/Supporting Positions
Material Handler (WHHR) ⁴	Emergency Support Function 4, Administrative Support (ESFA) ¹
Materials Handler Leader (WHLR) ⁴	Emergency Support Function 4, Wildland Support (ESFW) ¹
Medical Unit Leader (MEDL)	Intelligence Support (INTS) ⁶
Ordering Manager (ORDM)	Infrared Interpreter (IRIN) ⁶

Radio Operator (RADO)	
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¹Specific to BIA, BLM, NPS, USFA, USFS, USFWS

²Specific to BIA, BLM, NPS, USFS, USFWS ³Specific to BLM, NPS, USFS, USFWS

⁴Specific to BLM and USFS ⁵Specific to BLM ⁶Specific to USFS

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Appendix C - Original Statement of Work from SmoC

To achieve this assessment a series of six tasks were identified by SmoC:

Task 1 (“Position Smoke/AQ Requirements”): Identify all air quality and smoke requirements in wildfire and prescribed fire positions as found in position task books, requirements found in NWCG 310-1 and FS 5100.17 documents. Include the NWS Incident Meteorologist (IMET) position in the assessment.

Task 2 (“Standardized Course Assessment for Smoke/AQ”): Assess all NWCG courses where smoke and air quality are included and outline course and unit objectives.

- Includes the “S” through “Rx” courses
- “Standardized” course materials

Task 3 (“IQCS Queries”): Identify Positions taking smoke/AQ coursework and Positions that are required to take AQ/smoke coursework through queries of the IQCS.

- Query the IQCS database to determine the Positions that take courses with smoke/AQ included (to be conducted by Smoke Committee with assistance of SME).
- Identify the Positions that are required to take courses that include smoke/AQ
- Then determine how the results of the first two bullets relate. For example, RXB1 and LTAN Positions are required to take Rx410 – have most RXB1’s and LTAN’s done so? Is it mostly RXB1’s and LTAN’s in the Rx410 class or are other Positions often taking the class?
- Execute queries looking at who has taken RX-410 (and its ancestor versions), and what they are now qualified for and currently doing (recent experience records) in both prescribed fire programs as well as on wildfire IMT’s. They may NOT actually now be working in positions we might ID in Tasks 1 and 2 as needing the training and yet may have learned the skills along the way..This will support assessment of whether we hit the right audience with past training delivery.

Task 4 (“Recommendations of Changes to Positions and Course Content ”): Identify and recommend Positions that should include smoke/AQ training and identify training goals. Identify possible positions and responsibilities that will facilitate meeting the goal of considering air quality and smoke impacts in wildfire decision-making. Identify changes that need to be made as well as opportunities for improvements for course delivery. Utilize an SME that has IMT experience and long-term wildfire management experience to insure potential feasibility of recommendations. .

- This will probably be a combination of SmoC and Contractor(s) interaction
- Assess possible positions and responsibilities in the IMT, Area Command and Agency Administrator role to facilitate meeting the goal of considering air quality and smoke impacts in wildfire decision-making
- For example, based on the IQCS (Incident Qualifications and Certification System) queries and the results of the gap analysis, it may be determined that RXB2’s should have

Rx410 – need to do the query analysis before making such determinations, and identification of material for online delivery may help with the argument as well.

Task 5 (“Course Delivery Assessment”): Assess course content to identify what could be delivered online and what is best delivered via classroom instruction

- Identify those training elements/units which may be delivered via on-line or other means as well as in-person traditional training.
- Assess NOAA COMET Meteorological On-line Training Packages and recent NWCG on-line packages.

Task 6 (“Non-standardized Course Assessment”): Evaluate other regional or non-standardized courses that include smoke and air quality for utility in meeting objectives stated above, for example:

- Thomas Dzomba’s smoke modeling course (Region 1 FS)
- Regional Burn Boss refresher courses
- NRCS air quality and prescribed burning courses
- State smoke management courses (NC, FL, others)

Appendix D – Course Objectives for RX-341 and RX-410

RX-341 Lesson Objectives

Unit 0 – Introduction

OBJECTIVES:

During this unit the instructor will:

1. Introduce the cadre and students.
2. Discuss course logistics.
3. Explain the course objectives.
4. Identify course reference materials.
5. Explain student evaluation methods.
6. Discuss the final project.
7. Review the pre-course work.

Unit 1 – Policies and Guidelines

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Identify the policies that direct prescribed fire planning.
2. Identify the responsibilities of the prescribed fire plan preparer, technical reviewer, and agency administrator as they relate to plan preparation.
3. Define the purpose of a prescribed fire plan.
4. Describe the processes involved in preparing the prescribed fire plan.

Unit 2 – Goals and Objectives

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Define land management goals and project objectives.
2. Develop S.M.A.R.T. (Specific, Measurable, Achievable, Relevant, Time Bound) objectives to meet project goals.
3. Describe how the prescribed fire plan relates to fire management plans and land management plan goals.
4. Identify information sources used to develop project goals and objectives.

Unit 3 – Description of the Prescribed Fire Area

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Identify information required to accurately describe the prescribed fire area.
2. Define the concept of project boundary as it relates to landscape prescribed fire planning.
3. Identify the mapping requirements and standards for a prescribed fire plan.

Unit 4 – Risk Assessment and Preliminary Complexity Analysis

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Define the risk management process and describe how it relates to the complexity analysis.
2. From the NWCG Prescribed Fire Complexity Rating System Guide:
 - a. Identify the three factors of the complexity analysis.
 - b. Identify the 14 elements that apply to the three risk factors of the complexity analysis.
 - c. Describe how mitigation measures may change the rating of complexity element(s).

Unit 5 – Prescription Development and Scheduling

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe ranges of acceptable prescription parameters to produce fire behavior that meets fire effects objectives and control limitations.
2. Identify the components of fuels and weather that contribute to the development of the prescription.
3. Demonstrate how fire modeling outputs may be used to develop prescriptions.
4. Discuss how the assumptions and limitations in the fire spread model relate to prescribed fire.
5. List supporting documentation that may be required for the prescription.

Unit 6 – **Smoke management** and **Air quality**

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe the relationship between **smoke management** and prescribed fire objectives.
2. Identify principal **smoke management** mitigation strategies.
3. Describe the steps for identifying **smoke** concerns and mitigation techniques for managing **smoke** production and **dispersion**.
4. Identify available tools and technologies that help develop the **smoke management** element of the prescribed fire plan.

Unit 7A – Implementation: Pre-burn Considerations and Briefing

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Identify on- and offsite actions that must be completed and documented prior to implementation.
2. Identify considerations that must be addressed in the prescribed fire plan.
3. Identify actions, timelines, and responsibilities for interagency and intraagency coordination and public notifications.
4. Identify briefing criteria to be covered in the prescribed fire plan.

Unit 7B – Implementation: Organization and Equipment

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Identify appropriate resources, or resources capabilities, equipment, and organization necessary to implement the prescribed fire plan.
2. Identify required staffing qualifications based on prescribed fire complexity.

Unit 7C – Implementation: Test Fire and Ignition Plan

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe the test fire process and documentation requirements.
2. Describe ignition strategies used to meet fire behavior objectives and control limitations.

Unit 7D – Implementation: Holding Plan

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe general procedures to be used for operations to maintain the fire within prescription and project area, until the fire is declared out.
2. Describe critical holding points and potential mitigation actions.

Unit 7E – Implementation: Contingency Plan and Wildfire Conversion

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Identify the importance of the contingency plan as it relates to risk management and burn objectives.
2. Identify contingency plan elements.
3. Describe the concepts of trigger points for contingency planning.
4. Describe the process of converting a prescribed fire to a wildfire.

Unit 7F – Implementation: Communication

OBJECTIVE:

Upon completion of this unit, students will be able to:

- Identify the communications needs to implement a prescribed fire plan.

Unit 7G – Implementation: Public and Personnel Safety, Medical

OBJECTIVE:

Upon completion of this unit, students will be able to:

- Describe considerations for personnel and public safety, and emergency procedures.

Unit 8 – Monitoring

OBJECTIVE:

Upon completion of this unit, students will be able to:

- Identify and discuss the four levels of monitoring and what needs to be covered in the prescribed fire plan.

Unit 9 – Funding, Post-Burn Activities (Rehabilitation and Reports), and Appendices

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Identify the funding source(s) and estimated costs for all phases of the prescribed fire.

2. Identify post-burn rehabilitation to be detailed in the prescribed fire plan.
3. Identify required and optional reports to be completed for the prescribed fire plan.
4. Identify required and optional appendices to be attached to the prescribed fire plan.
5. Describe the prescribed fire plan project file requirements.

Unit 10 – Final Complexity Rating

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. From the NWCG Prescribed Fire Complexity Rating System Guide:
 - a. Describe how to develop the summary complexity rating and the rationale for that rating.
 - b. Describe the process of finalizing the complexity analysis.

Unit 11 – Reviews, Approvals, and Signature Page

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Describe the prescribed fire plan review and approval process.
2. Explain the amendment process.
3. Describe the importance and process of the Agency Administrator Pre-Ignition Approval Checklist and the Prescribed Fire Go/No-Go Checklist.

RX-410 Lesson Objectives

Unit 0 - Introduction

OBJECTIVES:

1. Discuss administrative requirements of the course.
2. Introduce instructors, course coordinator and students.
3. Present course objectives.
4. Explain course process and identify student expectations.
5. Discuss completed pre-course work assignments.
6. Explain course evaluation system.

Unit 1 - The **Smoke management** Challenge

Why are we here?

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Discuss, in general, the legal, social, safety reasons and challenges for managing **smoke**.
2. Discuss, in general, our need to use fire as an ecological tool and reduce hazardous fuels.
3. Discuss, in general, our need to be available to predict, monitor, and minimize the amount and impact of **smoke** produced from prescribed fire.
4. Discuss how having trained staff to manage **smoke** will determine our ability to retain prescribed fire as a land management tool.

Unit 2 - Leadership in **Smoke management**

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Discuss the relationship between leadership principles and **smoke management**.
2. Use the Incident Response Pocket Guide to define leadership and specific leadership tasks.

Unit 3 - Ecological and Historical Role of Fire

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Identify major differences between the pre-European settlement and post-European settlement fire regime periods in the United States as they relate to fire **emissions**.
2. Describe the need to reintroduce and maintain fire in fire dependent ecosystems and the resulting **smoke management** implications.
3. Describe the magnitude of prescribed fire occurrence and **emission** levels in the United States.
4. Describe current policies that govern fuels treatment and fire management.

Unit 4 - Characteristics of **Smoke** from Wildland Fire

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Describe the key compounds of **smoke** as a pollutant.
2. Identify **emission** factors for various chemical compounds, particle size distribution and possible air toxins.
3. Relate major concerns about **smoke** to its physical and chemical characteristics.

Unit 5 - **Smoke** Impacts

Lesson A - **Public health** Impacts

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. List three human health impacts of wildland fire **smoke** to the public.
2. Describe common concerns voiced by the public during **smoke** episodes.
3. Discuss the land manager's role in mitigating and/or minimizing health impacts.

Unit 5 - **Smoke** Impacts

Lesson B - Fire Personnel Impacts

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Discuss the impact of **smoke** exposure on fire personnel.
2. Describe different techniques to reduce fire personnel exposure.
3. Describe methods for evaluating fire personnel exposure to **smoke**.

Unit 5 - **Smoke** Impacts

Lesson C - Effects of **Smoke** on **Visibility**

OBJECTIVES:

Upon completion of this lesson, the student will:

1. Describe how **smoke** contributes to impaired **visibility** and regional **haze**.

2. Discuss how **visibility** impairment relates to the **Clean air act**, National **Visibility** Goals, and **Class I** areas.

Unit 5 - **Smoke** Impacts

Lesson D - Safety and Nuisance Impacts

OBJECTIVES:

Upon completion of this unit, students will be able to:

1. Define nuisance **smoke** impacts and list five examples.
2. List three public safety issues related to **smoke**.
3. Describe the current guidance for determining highway safety relative to **visibility**.
4. List three ways to monitor nuisance **smoke** impacts
5. List two ways to document nuisance **smoke** impacts.

Unit 5 - **Smoke** Impacts

Lesson E - Public Relations

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Identify public relation opportunities for **smoke management**.
2. Develop public contact contingency plans and coordinate with the media.
3. Discuss the importance of being knowledgeable and proactive about **smoke management** issues to establish credibility with the public and air regulatory agencies.

Unit 6 - Regulations

Lesson A - Legal Requirements for Managing **Smoke** from Wildland Fire

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Discuss the present and potential **air quality** legal requirements for managing **smoke** from wildland fire.
2. Define regional planning organization (RPO) and how their activities may impact the use of wildland fire.
3. Describe how to become effectively involved in the development of air quality regulations at a local level.

Unit 6 - Regulations

Lesson B - State **Smoke management** Programs

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Define the purpose of a state **smoke management** program.
2. Explain EPA's role in state **smoke management** programs.
3. Identify local **air quality** regulations and programs that impact prescribed fire operations.

Unit 7 - **Smoke management** Meteorology

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Define weather terms and concepts important to **smoke management**.
2. List three key weather factors that affect **smoke** behavior.

3. Verify **smoke** behavior forecasts using visual indicators and on-site measurements.
4. Describe the types of weather forecasts available and their limitations

Lesson 8A - **Fuel Consumption** and **Smoke** Production

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Describe the four phases of combustion.
2. Describe how different fuel characteristics affect combustion.
3. Describe how fuel moisture affects **consumption**.
4. Describe methods of estimating **fuel consumption**.
5. List five reasons why we need to estimate **emissions**.
6. Define an **emission** factor.
7. Predict **emissions** from wildland fires.

Unit 9 - **Smoke Emissions** and **Dispersion** Modeling

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Identify common **smoke emissions** and **dispersion** modeling systems available to help the fire practitioner plan for and communicate the impacts of **smoke**.
2. Describe the difference between **emission** production and **dispersion** models.
3. Describe the data and expertise needed to run **emissions** and **dispersion** models.
4. Identify which models are most appropriate for your area and application.

Unit 10 - Operational **Smoke management** Strategies

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Define two general approaches to managing the impacts of wildland fire **smoke** (reduce **emissions** and redistribute **emissions**).
2. Discuss specific techniques within each approach and when they could be applied.
3. Discuss the tradeoffs between meeting planned objectives and applying **smoke management** strategies.

Unit 11 - **Smoke** Monitoring and Evaluation of Impacts

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. List reasons wildland fire managers monitor **smoke**.
2. Clarify and list specific **smoke** monitoring objectives.
3. Describe particulate and **visibility** monitors and their availability.
4. Locate **particulate matter** and **visibility** data available through the Internet.

Unit 12 - **Smoke management** Planning

Lesson A - NEPA Documentation

OBJECTIVE:

Upon completion of this lesson the student will be able to:

1. Discuss NEPA requirements in relationship to fire and **air quality**

2. List three criteria for identifying **air quality** as an issue in scoping.
3. Discuss a process to identify, describe, and quantify air impacts from prescribed fire and wildland fire use.

Unit 12 - **Smoke management** Planning

Lesson B - Incorporating **Smoke management** into a Burn Plan

OBJECTIVES:

Upon completion of this lesson the student will be able to:

1. Describe how **smoke management** concerns are incorporated into a burn plan.
2. Describe how to integrate prescribed fire objectives and **smoke management** strategies to meet project objectives and minimize/mitigate **air quality** issues.
3. Identify the trigger points and contingency planning needed to mitigate impacts or terminate a burn due to **smoke**.

APPENDIX E – NATURE CONSERVANCY TRAINING NOTES

TNC OFFERED TRAININGS
Crew boss academy http://tncfire.org/training_fire_cba.htm <ul style="list-style-type: none"> • I-200 • L-280 • S-200 • S-230 • S-234
Engine academy http://tncfire.org/training_fire_engine.htm (Focus is mainly on engine and pump function, operations, etc.)
Southern Advance Fire and Aviation Academy http://www.fs.fed.us/r8/r8academy/ (TNC involvement with this resource in minimal)
RX fire burn boss/workshop on ecological burning (RX-300/WEB)
RX-310 Introduction to fire effects
RX-341 Prescribed Fire Plan Preparation
S-290 Intermediate wildland fire behavior
S-390 Introduction to wildland fire behavior calculations

Crew Boss Academy

Of the NWCG courses incorporated in to this S-234 puts a high priority on ecological effects of operations. Also incorporated are smoke mitigation and fuel effect on smoke. Crews of 6 per group must create ignition plans for a unit. Emphasis is on smoke minimization, and where the smoke goes from a fire (“its your smoke”).

Participants are sent out on training fires and actual fires to get bigger picture perspectives, including: a) assessing the smoke situation, b) assessing what is happening downwind c) determining the need for observers or law enforcement officers in the event the smoke is impacting safety/visibility on a roadway or similar.

Rx 300

This training is in the process of being re-designed, as RX-300 no longer exists. This offering, as well as NWCG competencies for fire positions are under discussion at this time. The tentative plan is to link this offering to at least one NWCG certification; the conservancy will probably use RX-301 for this training. The training is geared toward burn boss positions. The main focus is on the ecology of RX fire, it’s the next step up in training from Crew Boss Academy. Smoke is usually involved via in a health and safety context to personnel, and ecological effects.

FIRELINE REFRESHERS

These were not listed on the web site. They have little information on smoke, and when it comes up it is generally covered in the context of health and safety for personnel (recognizing signs of CO exposure, etc).