# Fuels Analysis Techniques

**FOR 480B, 2 Semester Credits, 36 hours**

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<th>Instructor:</th>
<th>Art Benefiel</th>
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| Office:     | PO Box 2141, Bend OR 97709-2141  
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| Required Text: | Course Packet provided |
| Course Description: | This course provides methods of fuels analysis using advanced *debris prediction, surface and crown fire behavior and fire effects models* as required by NEPA and the National Fire Plan. |
| Prerequisites: | S-390, Intermediate Fire Behavior (or equivalent), and Basic computer skills (especially file management) are required. FOR 480B “Quantification of Wildland Fire/Fuels Analysis Inputs” recommended. |
| Grading: | >92% A  
89-92 A-  
86-88 B+  
Quizzes: 2 @ 30 pts. ea. 60 pts.  
82-85 B  
Exercises: 2 @ 20 pts. ea. 40 pts.  
79-81 B-  
Final Project Report/Presentation: 50 pts  
76-78 C+  
70-75 C  
<70 F  
**Total course points 150** |
| Instructor policies: | No make up of quizzes or the final project will be given without contacting me prior to the assignment. Obtaining answers from another student will result in a grade of 0 for the activity. A second occurrence will result in a failing grade for the course. |

## Competencies:

**Upon completion of this course students will be able to:**

1. Identify how fire acts as a disturbance and interacts with basic ecologic processes and stand development.
2. Predict the amount and character of debris generated from a management activity or natural event.
3. Determine percentile weather for use in fuels analysis using FireFamilyPlus and historic fire weather records.
4. Based on existing and predicted fuels, determine fire behavior characteristics.
5. Identify changes to fuel profiles based on fuel treatment methods.
6. Determine the likelihood of crown fire initiation and propagation.
7. Determine first order fire effects associated with a fuel and fire behavior condition.
8. Identify potential projects based on laws, policy, management direction.
Fuels Analysis Techniques
Course Outline
Day 1: 08:00 – 12:00

Introductions, Logistics, etc. 1 hour

Introduction to Project Fuels Analysis: Broad level 1 hour
Assessment, Project level objectives, Assessment of current situation, Treatment effects, Fire Behavior VS Ecosystem Restoration Objectives

Fire Policy 1 hour
Background legislation: USDA Forest Service, USDI BLM, NEPA, RPA, NFMA

Purpose and Need Statements, Objectives, Quantifiable Measurement Criteria 1 hour

Homework:
Graded Class Exercise: Writing Project Objectives (20 points)
Due Tuesday 08:00

Day 1: 13:00 – 17:00
Ecology: Ecosystems, Watersheds, Watershed Functions, 2 hours
Landscapes, Landscape Dynamics, Structural Strategies/Trajectories, Diversity, Diversity Strategies
Fire as a Disturbance: Fire Regimes, Condition Classes

Fuel Modeling/Profiling:
Fire Behavior: Modeling, Behavior Prediction, 3 hours
Rothermel Spread Equation, Equation Assumptions/Limitations
Environment Variables: Fuel Moisture, Mid-flame Windspeed, Slope, Percentile Weather, Percentile Weather Analysis Variables
Fuels Treatments: Treatments, Utilization or Fire, Treatment Effects on Fuel Beds (Fuel Quantity, Particle Size, Compactness, Horizontal/Vertical Continuity), Other Considerations (E.G. No Treatment, Decomposition)
Day 2: 08:00 – 12:00

Finish Fuel Modeling/Profiling: 2 hours

Fuel Treatments 1/2 hour
Placing Treatments across the Landscape

Prepare computers and software 1/2 hour

Obtaining Percentile Weather 1 hour
FireFamilyPlus, Importing weather records, Seasonal Reports, Percentile Weather Data

FMAPlus Master Fuel Model Set 1 hour

Day 2: 13:00 – 17:00

Assessing fuel strata, FMAPlus 3 hours

Inputs: Assumptions, Analysis Area and Plots, Tree Lists
Results: Summaries, Standard Deviations, Standard Errors, Percent Errors

Fire Behavior Assessments: Canopy characteristics, Surface Fuels, Environmental Parameters, Fire Behavior Results

Fire Effects: Scorch Heights, Mortality, Crown Volume Impacted, Fire Size

Report Generation: Inputs, Outputs, Summaries

Take home quiz Fuel Modeling/Profiling (30 points)

Day 3: 08:00 – 12:00

Exercises working with CrownMass 4 hours
Familiarization with the application, Data Entry (Tree lists, Surface fuels), Overstory data reduction, Fuel Model suggestions, Simulating stand treatments (thinning, blowdown, whole-tree removal, insect defoliation), Fire Behavior predictions, Fire Effects predictions

CrownMass workbook exercises (20 points)
Take home CrownMass Quiz (30 points)
Day 3: 13:00 – 17:00

Class Exercise: CrownMass exercises 1 hour

Project Level Fuels Analysis Desk Guide: 1 hour
1. Considerations: Values to Protect, Target Fire Behavior/Effects, Burning Conditions, Desired/Acceptable Fire Behavior/Effects, Treatment Locations/Distribution, Maintenance of Treatments
2. Existing Condition: Fuels, Weather, Topography, expected behavior under given Wx, conflicts of behavior/effects with mgt. Objectives.
3. Existing VS Desired: Goals, Relationship to higher level plans
4. Purpose and Need: Measurable project objectives, recognize differences between fire behavior and fire effects objectives
5. Treatment Alternatives: Reasonable approaches, fire or other tools, maintenance of post treatment conditions, spatial distribution, economics
6. Efficacy of treatments on objectives: Relative to purpose/need/objectives, constraints
7. Effects on other resources: Direct, Indirect, Cumulative, effects of treatment, effects of modification of fire behavior/fire effects
8. Monitoring: Tracking objectives, effectiveness, implementation

Other “Tools” used for Fire Analysis 1 hour
FOFEM, FVS-FFE, BEHAVE, ETC.

Graded Class Exercise: Case Study Project, begin work (50 points)

Day 4: 08:00 – 18:00

Finish and present Case Study Results 8 hours

Course ends 18:00