THE REDI

Jedi Master Program

Butte County Fire Safe Council

Nature journaling and place-based learning to enhance fire awareness

Program and illustrations created by Miriam Morrill @Pyrosketchology

Photos from the pilot Nature Journaling Fire Workshop at the Klamath Prescribed Fire Training Exchange event in 2019.

- **R: Recognize patterns, signals and signs in nature and how they relate to fire.**
- **E: Engage senses and elaborate on experiences and emotions that enhance fire awareness.**
- **D: Direct attention to field observation skills and creative journaling techniques.**
- **I: Illuminate fire readiness, response and resilience efforts with place-based knowledge.**

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INTRODUCTION TO THE GUIDE & REDI MASTER PROGRAM

The educator guide distills fire science and combines it with illustrations to enhance understanding of complex fire concepts and has a range of nature journaling exercises and examples to help youth and adults build their personal and place-based fire awareness and understanding.

This program can be used to create a deeper connection to more traditional fire education programs and fire readiness efforts. Traditional fire education programs focus on key concepts and terminology in a classroom or virtual setting, while nature journaling emphasizes place-based engagement with the environment. The REDI program integrates important and observable elements of fire, with full-bodied and full-brained nature journaling practices. You could consider the REDI program as an expansion of SEL. It builds social emotional learning but also:

S: Situational awareness of fire conditions, hazards, and risks
E: Environmental and systems thinking about fire
L: Learning through experienced placed-based practices (nature journaling)

Eight lessons in the guide contribute to the creation of a student story zine (11x 17 page size recommended but an 8.5 X 11 page can be used). Either size will have 8 sections/pages) as an additional education product. The zine template can be printed for students to use and copied after completion, and before assembly, submit for recognition or program certification, as appropriate to program scope.

The Butte County Redi Master program has a character that integrates with the current Fire Ready Racoon and youth education program. The Redi Master is a Great Aunt to Ready Racoon. She is looking for new apprentices in Butte County and other areas interested in deepening their fire awareness.

The Redi Master program focuses on the following abilities and actions:

R: Recognize patterns, signals and signs in nature and how they relate to fire.

E: Engage senses and elaborate on experiences and emotions that enhance fire awareness.

D: Direct attention to field observation skills and creative journaling techniques.

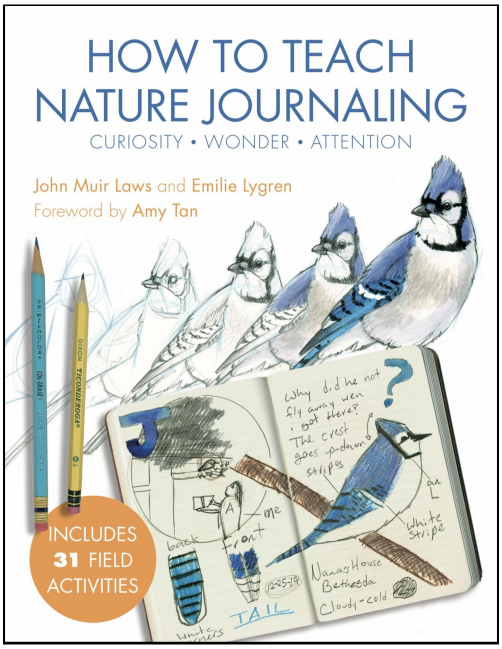
I: Illuminate fire readiness, response and resilience efforts with place-based knowledge.

What's important is that children have an opportunity to bond with the natural world, to learn to love it and feel comfortable in it, before being asked to heal its wounds... If we want children to flourish, to become truly empowered, let us allow them to love the earth before we ask them to save it. -- David Sobel, American education writer

How do you define a natural world? Is it one without human management or influence? I would say that our lives are intertwined. After a century of wildfire suppression and exclusion of Indigenous burning practices, nature has become starved of the fire functions necessary for long term survival of ecosystems, and many of us have developed fanciful and failed relationships with nature and fire. Indigenous peoples applied fire practices with mutual benefits as a form of reciprocity. How do others develop awareness and build balance and reciprocity with the local fire environment? I think it is important for children to have the opportunity to not only bond with the natural world, but to form real and resilient awareness and connections to the local fire environment. Few people will have access to active and adaptive fire management practices and observations, but the environmental elements that influence fire can be observed and our awareness enhanced through nature journaling practices. --Miriam Morrill, Pyrosketchology

EDUCATIONAL GOALS

The Redi guide uses the core nature journaling principles developed by John Muir Laws in his various nature journaling guides and workshops and it is highly recommended that teachers and programs looking to articulate educational standards and evaluation rubrics reference the How to Teach Nature Journaling guide that can be purchased or downloaded in a free pdf format. The Redi guide is not intended as a comprehensive nature journaling guide but offers insights, illustrations, and exercises that demonstrate how nature journaling can be used as a tool to enhance awareness and understanding of the fire environment. The guide is intended as an educational tool but does not include explicit educational standards and rubrics, which can be found in the Law's guide and easily expanded and applied to the different lessons in this guide.



The Redi guide integrates observable elements of fire science, applies various sensory engagement and sensory-motor exercises to engage the brain and build observations and journaling skills. For example, hands are used to estimate angle and slope of a hillside or student height to estimate and analyze ladder fuel arrangement. More formalized mathematical formulas and monitoring protocols could be integrated but the guide primarily focuses on the mind-body connection to nature and fire.

Lessons are intended to create deeper awareness and connections to the local fire environment and help build intentional curiosity and critical thinking skills. The goal is not for students to memorize fire concepts and terminology nor to create art, but to learn how to observe, ask questions, and record the internal and external experience. See the REDI Guide Content & Learning Integration Table below for more information about the various knowledge and experience approaches that have been integrated in the lessons.

The Butte County Fire Safe Council has a 6th-Grade fire education program called Wildfire in the Foothills which was updated in 2021 to support students who live in fire-prone areas and to build more fire-resilient communities in Butte County. The program consists of seven one-hour lessons with accompanying PowerPoint presentations for projection in the classroom. The program also offers a Jeopardy-style review game and a culmination activity in the form of a Firewise community meeting and discussion. The Redi guide and Wildfire in the Foothills programs integrate well and offer fire education lesson plans that outline standards and rubrics for traditional fire education approaches.

Fire and Journaling Content & Learning Integration Table

Learning Goals	Key Fire Environment Information	Relevant Field Observations	Key Learning Visuals/ Illustrations	Targeted Journaling Exercises
Lesson #1 Spatial sense of fire- fire size, shape and associated patterns across the landscape. Fire story setting (story zine cover page)	Patch and pattern definitions and types Patch dynamics Fire size, shape and patterns	How to observe different scales of landscape patches and patterns- need a high level viewpoint or AlertWildfire camera view of landscape. Differentiate terrain, forest and plant scale observations	Example landscape with mosaic vegetation Simplified landscape pattern types examples Example icons for symbolizing patch and pattern differences Example landscape sketch	Comparison tables Small landscape sketch with foreground, midground and background areas with different sketch/art types for differentiating space and distance.
Lesson #2 Sense of place and position in context of the fire environment- sense of direction, elevation and aspect. Fire story character context within the setting	Elevation and aspect differences in vegetation and fire patterns in Butte county, California and North America.	How to observe basic vegetation differences (forms) by aspect and elevation such as needle versus broad-leaves, smaller trees at higher elevations, etc.	3-D county landscape diagram illustration with key forest zones and elevation/aspect forest type illustration inserts.	Landscape map diagram Directional landscape and personal associations
Lesson #3 Temporal sense of fire- seasons and	Seasonal phenology and associations with fire and fuels	Compare simple plant changes such as amount and type of	Vegetation seasonal changes illustration (seasons).	Simple change observation table using different colors to associate

stages and the different time scale influences on the fire environment Observing changing levels of risk (changing energy)	Vegetation community succession and associations with fire and fuels Fire energy release component and fire seasons	vegetation over time and evaluate in context of the fire season.	Seasonal and successional stages as an integrated and changing system (vegetation community gear system) Examples of visuals to track and communicate a changing fire environment including a monthly fire weather wheel and comparison of a historic versus contemporary landscape with change elements.	labels for sense of changing conditions.
Lesson #4 Sense of terrain influences on fire - generalized/ threshold for steep slope and intense fire behavior and generalized sense of fire speed (rate of spread) over a landscape.	Slope analysis in relation to fire behavior- 10 degree angle and 20% slope important threshold for fire behavior. Basic heat transfer types General/typical fire rate of spread comparison compared with speed of example animals.	Looking out at a landscape scale (view of hills or mountains) to assess slope. Looking at vegetation elements arranged on slope.	Degree angle overlaid with slope and burning vegetation to see the difference of fire and heat influences. Hand/finger associations with degree angle. Heat transfer types illustration using a campfire Tortoise and sea turtle speed comparison with typical fire rate of spread range.	Use biometrics to gain sense of degree angle and percent slope (hands and fingers used to measure angle)- also to enhance learning with sensory-motor engagement Creating a simple small landscape sketch identifying slope. Comparison table for discussing radiation, convection and conduction heat transfer with landscape elements observed.
Lesson #5 Sense of weather and fire with emphasis on wind Fire situational awareness with changing	Light introduction to red flag concept Atmospheric instability (vertical instability) Wind observations (Beaufort wind scale) key to fire behavior (over 10	Sky observations for vertical atmospheric instability signs such as cloud build up, thermals, dust whirls, etc. Horizontal sky and wind observations such as clouds	Fire situational awareness elements illustration Past and present wind signs examples illustration Example vertical/horizontal wind journaling	Key sky observations targeted at vertical instability Modified and simplified Beaufort scale observations using sight and sound of wind in trees or across the

weather conditions	miles per hour). Fire situational awareness elements.	stretched and pulled, trees swaying, leaves rattling to gauge wind speed. Past and present wind signs to help gauge wind direction.	diagram	landscape. Observations of past and present wind influences on vegetation and animals (sculpted trees versus lee side shelter)
Lesson #6 Sense of moisture influences on vegetation and fire ignition/combustion Understanding of how the size and condition of vegetation influence fuel moisture and how relative humidity and vapor pressure deficit influences plants/fuels and fire ignition/combustion.	Introduction to the fire triangle with emphasis on fuels and fuel moisture (fuel size and moisture time lag) Descriptions of relative humidity and vapor pressure deficit and influences on fuel moisture and fire ignition potential	Looking at fuel size (fine fuels) and assessing surface area to volume ratio and potential influence of heat and oxygen. Looking at subtle differences in fuel moisture comparing live and dead fine fuels. Watching teacher/facilitator demo of different fine fuel ignitions.	Illustrations of the fire triangle associated with the fuel size and examples of size comparison (e.g. size of a quarter, etc.) Illustration visualizing relative humidity influences on dead fuel moisture. Illustrations visualizing vapor pressure deficit influences and live fuel moisture. Example nature journal page of a campfire and the fire combustion process.	Assessing fuel size and shape (surface area to volume) and varying fuel moisture Using multiple senses and creative descriptions to key in on subtel fuel moisture differences in live and dead vegetation. Using word art to associate sensory and observation differences.
Lesson #7 Sense of vegetation arrangement and its influences fire behavior.	Key fire types (ground, surface, crown) and fire behavior terms associated with fuels arrangement such as surface fuels, jackpots, and ladder fuels. Generalized flame-length calculation (4 foot flame for every 1 foot of vegetation height)	Observing horizontal and vertical vegetation/fuels continuity, concentrations and arrangement. Observing carrying fuels and ember materials.	Illustration of key fire types and fire behavior. Example nature journaling vegetation percent cover and cross section diagrams. Example fuel models and associated fuel measurements and flame lengths (timber understory, chaparral and short grass)	Using biometrics to gain a sense of vegetation height and ladder fuels. Creating a simplified personal character (star person) for inclusion in the nature journal and for biometric data labels. Creating a simple diagram for percent cover and basic vegetation elements (trees, shrubs and grass)

				Creating a cross-section diagram to capture and visualize important vegetation elements with estimated flame lengths and ember spread.
Lesson #8 Sense of plant and animal responses and adaptations to fire and heat. Idea of plant and animal signs integrated with personal sensory observations-shared experiences and awareness.	Describes different types of effects (direct, indirect, cumulative) and components for evaluating vulnerability to fire and heat (exposure, sensitivity, and adaptive capacity) Describes some differences of immediate response versus adaptations. Describes some plant and animal heat indicators (insect thermometer)	Looking at various local plant and animal signs, characteristics and conditions (structures and functions). For example, comparing bark thickness and thinking about exposure and sensitivity to potential fire or looking for signs of plant stress such as wilting or sap and considering responses to heat.	Illustration of positive indirect effect- smoke influences on water temperature and benefiting salmon. Image collage of plant elements that can be used for looking at responses and adaptations associated with fire and heat. Illustration of plant and animal heat responses and information for calculating temperature based on cricket calls.	Observing and documenting plant and animal signs, structures and functions and associating them with fire. Using words, pictures and numbers along with key nature journaling prompts such as I notice, I wonder, and It reminds me of, to make observations that can be linked to effects and vulnerability to fire and heat.
Lesson #9 Sense of information integration-using place-based knowledge Using nature journaling approaches and practices to enhance fire readiness and response (extra credit-family evacuation planning/journaling)	Information about key fire management programs and approaches: fire prevention, fire mitigation, fire readiness. Fire ready-set-go elements	Not required as a field exercise but reviewing and integrating past lessons and field exercises. The lesson can be outdoors for part or all of the time if that helps trigger ideas and considerations.	Example nature journal page with page design and symbols for reminders and tracking key field observations. Example nature journal pages used to evaluate evacuation routes and planning using nature informed observations.	Group, individual and family approaches and exercises to evaluate and brainstorm nature observations that can support ready-set-go planning and activities.

Intergenerational Approaches

Place-based and outdoor educational programs like the REDI guide are great opportunities to use intergenerational learning approaches. Although the lessons in this guide have some advanced concepts and terminology more appropriate for older middle school, high school, and college students, the nature journaling exercises are fairly simple and lessons can be modified to accommodate a broad age group. If the facilitator or instructor is comfortable adapting information and exercises in the guide, here are some tips for adapting to different age groups from Bethan Burton's nature journaling approach.

- Adults and teens should be able to complete the entire lessons as outlined or expand with more advanced math and monitoring protocols.

- Primary age children (5 to 12 years old) may prefer to do the active and interactive exercises and some time for more creative exploration of the sketching and art skills.

- Children under five, would be better encouraged to watch an adult or older children work through the exercises while discussing what they are working on and providing time for play with art materials or hands-on activities like gathering natural materials.

Trauma-Informed Exercises

The REDI guide introduces some warm-up or meditative exercises, intended to help relax and focus attention in a positive way when fire topics could have emotionally triggering influences, displacing the learning and experience goals. Some of these exercises will naturally integrate emotionally deep discussion and expression to create therapeutic opportunities, but most exercises aim to reduce potentially traumatic or triggering topics and observations in a way that benefits and balances learning goals.

There are many support resources and organizations that focus on reducing the effects of trauma and there is a list in the appendices. You may consider working with local partners or groups in fire affected areas that have experience with these sensitive topics to identify key messages that can be framed and used to guide trauma-resilience discussions. I believe nature focused observations can help reframe how we associate and relate to loss associated with fire. I have noticed that when making focused nature observations, my mind lets go of emotions and I can integrate emotions and memories in more controlled, creative and targeted ways. I also believe that learning and looking at nature outside of our personal concepts of experience, can help reframe the scope of environmental change. For instance, the time for a forest to recover from a wildfire may seem devastating to us, but from a 'nature' perspective of time, may be considered part of a natural cycle that builds resilience. The size or severity of fire may seem devastating to us, but may have a mosaic of impacts with many environmental benefits. Separating and adding context to environmental changes and losses can be a foundation for integrating nature journaling exercises and trauma-resilience curriculum.

EQUIPMENT AND SUPPLIES

There are many approaches and attitudes about the equipment and supplies for nature journaling. It can be fun to explore and experiment but most of the experienced nature journalers recommend starting simple and cheap. When you're in the field trying to journal observations it can be challenging to dig through lots of supplies. For nature journaling about the fire environment, most of what you'll be sketching is the sky, mountains, and vegetation, with a few fire related sketches. Most of these diagrams and sketches can be created with a graphite pencil, pen, or one to two colored pencils. An ideal starting point for supplies is to have a mechanical pencil, a waterproof ink pen, a small watercolor paint set, a regular sized water brush (a paint brush with water in a fat plastic handle functioning like an ink pen), a small set of colored pencils (3-5 colors), a mixed media sketch pad (small to medium sized) and an over-the-shoulder tote bag. Adding a cheap measuring tape, ruler and magnifying glass are helpful and eventually getting equipment like binoculars and a weather Kestrel or small weather kit. The John Muir Laws website has a page with lots of tips and recommendations for specific supplies and brands that can be ordered directly from his website.

FIELD SAFETY TIPS

Addressing field safety is important on many levels. Protecting students from injury is obvious but reducing stress and anxiety for students less familiar or experienced with being outdoors will provide a better learning environment. The following field safety tips come from the Back to Nature Network Intro to Nature- A Guide to Teaching in Nearby Nature. Safety is as essential to the outdoor learning experience as it is to teaching indoors, but there are several differences to consider:

a. Have a do's and don'ts discussion and a list of all things you want to cover and add subjects your students would like to discuss. The list could include:

- Things to avoid and the reasons, for example poison oak can cause itchy, spreadable, fluid-filled blisters on skin.
- How to interact with things found in nature using our senses: observing, smelling, and touching (but not eating) natural objects.
- Responsible handling of animals such as insects after confirming with the teacher that it is safe to do so.

b. Be weather-aware:

- Wearing appropriate clothes and footwear for the conditions.
- Weather limits for outdoor learning experiences, e.g. need for shade during excessive heat, class procedures in the case of extreme weather such as lightning and high winds.
- Symptoms of hypothermia and heat stroke.

c. Discuss how to react if a physical or mental injury occurs:

- Create a step-by-step procedure for all to follow if physical or mental injury occurs.

- Post the procedure for regular review and print off a reminder sheet for outdoor student kits.
- Consider inviting a First Aid teacher or social emotional emotional expert to visit the class prior to the start of a field program.

d. Let the office or a teaching partner know every time the class is going outside, and establish a method for communicating with the school at all times while outside (see next section for specific suggestions).

SITUATIONAL AWARENESS

A major goal in developing this guide was to gather information and develop exercises to enhance fire situational awareness (SA) skills along with building a deeper place-based sense of fire. Stated simply, SA is being aware of the potential hazards and risks in your surroundings. SA is discussed in work with potential safety hazards, and should be included in outdoor activities and when framing an educational subject that has changing levels of risk-- how we relate to and respond to something. This is important in teaching and learning in a way that helps build trauma-resilience and adaptive actions. The following outline was used in helping to frame the information and exercises in this guide and can be used as a field safety prompt to help enhance situational awareness skills.

PLAN for Enhancing (Fire) Situational Awareness

- **P**ause before proceeding into a field location or activity and consider what is most important for your time and safety. Identify the path and position of most value for observation and safety goals.
    - Ideally, you should do a hazard assessment prior to traveling to a location to better frame your time and activities.
- **L**ook and listen to what's happening around you before starting and throughout the field or nature journaling activity.
    - Develop prompts and practices that train you to observe potential hazards and changing conditions. For example, learning the cloud signs that can foretell incoming storms and how to use the Beaufort wind scale to observe wind shifts and increased risk of falling branches and trees.
- **A**ssess the immediate and potential threats (risks) to your nature journaling experience, especially working around an active fire and within a burned area.
    - Train your brain to recognize nature signs and patterns that can inform you of changing levels of risk. Consider building in baseline metadata like weather forecasts with scheduled local weather observations to compare and assess expected, normal, and elevated conditions.
- **N**arrow negative effects by implementing safety measures and alternatives and enhance responses and reactions to potential hazards and threats by preparing for field activities based on the place, people joining you, and your personal strengths, weaknesses, opportunities, and threats. Discuss/consider threats and responses prior, during, and after a field exercise.

LESSONS OUTLINE

Lessons by Fire Topic with Information, Examples & Exercises (Separate Documents)

1: Landscape Patterns, Patches, and Fire (Spatial Sense of Fire)

This lesson will focus on observing a landscape in the real-world or over an AlertWildfire Camera or Google Earth. Participants will learn how to describe and journal landforms and landscape patches and patterns. Understanding and observing patterns and patches across a landscape are relevant in recognizing scales of influence on the land. There are global, regional and local weather patterns that interact with terrain and vegetation communities and create various scales of patterns. We are primarily focusing on personal observations of patches and patterns at a landscape scale. A grounding exercise is used as a trauma-informed approach to seeing a landscape that may have been burned. The subject of fire will be discussed at the landscape scale and add context to fire's role in creating patches and patterns. Several illustrations and tiny fire history maps will be used to observe differences in fire size and shape. A landscape sketch will be added to a story zine that accompanies most of the lessons in this guide.

2: Nature-Informed Landscape Location (Positional Awareness of Fire)

This lesson will focus on observing, measuring and journaling spatial elements and position within the real-world and over Google Earth or a printed map. Where you are positioned has meaning for the fire regime and fire behavior you might expect. Positional awareness is foundational for fire awareness and readiness activities such as evacuation planning. Information and exercises will utilize the cardinal directions, points of reference and distance estimates, as well as natural elements that help identify location such as forest types and species associated with elevation and aspect. Several illustrations will be used to observe elevational gradients and landscape aspects with the associated forest zones, vegetation types and environmental conditions in Butte County. The lesson will end with a creative writing exercise that integrates the location data and observations with remembered experiences and senses associated with their position within the landscape.

3: Seasons, Stages, and Fire (Temporal Sense of Fire)

This lesson will focus on observing and journaling seasons, phenology, forest succession, fire regime, fire season and fire danger, within the real-world. Information and exercises will emphasize nature journaling techniques that can be used to track changes related to fire danger and environmental changes over

time. This section will include some climate change discussion as it relates to changing seasons, vegetation conditions and fire season. The lesson includes examples and exercises using visual language elements like words, images, color, texture and patterns to relate and represent changing natural elements.

4: Terrain, Heat Transfer, and Fire Rate of Spread (Foundational Fire)

Students learn how the steepness of terrain (slope) and heat transfer influences fire behavior. They will observe, measure and journal the relative steepness of the terrain by using angles estimated with hands, fingers, body position and movements.

5: Weather (Wind) and Fire Behavior (Foundational Fire)

Students observe and journal temperature, humidity and wind and learn how these observations relate to fire behavior. Students will use a diagram to journal vertical atmospheric gradients (temperature/moisture) and horizontal air movements (high and low winds) observed outdoors. Students will use nature journaling prompts to discuss mixed sensory observations associated with a relative wind speed scale. A sketch will be added to a story zine that captures key weather observations. No grounding exercise will be used in this lesson since the fire discussions and observations themselves are grounding. This lesson could be expanded or include homework that focuses on cloud identification and cloud painting and sketching techniques. Visit the UCAR Center for Science Education (UCAR SciEd) website for resources and lesson plans on clouds. A recorded workshop by Rosann Hanson on nature journaling clouds is available on the Field Arts website.

6: Plant Moisture and Fire Combustion (Foundational Fire)

Students review basics (observable aspects) of the fire triangle and how that relates to fuel moisture, humidity, and vapor pressure deficit and what that means for fire ignition and spread. Students will gather live and dead vegetation elements (grasses, leaves, etc) using a comparison table to study differences in plant moisture using hearing, sight, smell, and touch. The teacher uses plant materials for an ignition and burning experiment that students observe and journal. Students will choose one of their live/dead vegetation observations and sketch the shapes on their story zine, adding key descriptive words and phrases that differentiate between the live and dead plant elements. Students then add a few notes on thoughts relative to fire ignition and spread based on plant moisture.

7: Vegetation Arrangement and Fire Behavior (Foundational Fire)

Students review key fire and fuels terminology and what that means for fire behavior and spread over the landscape. Students will assess horizontal fuels and surface fire types like creeping, backing, advancing by creating a bird's-eye view diagram and vertical fuels and transitional fire types like torching and embers with a cross-section diagram. Students will learn how to use symbolized human figures (star people) in journaling practices and apply biometrics (body

measurements) and quick mathematical calculations to estimate fuel levels and potential flame lengths and fire types.

8: Plant and Animal Signs: Fire and Heat Indicators (Nature Interconnections)

Students review some climate and fire effects considerations (effects, vulnerabilities and adaptations associated with form and function) along with observable plant and animal signs of the fire environment (heat signs). Students will also learn a little about biophonies and geophonies and how to use those to help enhance fire environment observations.

9: Illuminating Fire Practices: Place-Based Knowledge (Knowledge Integrations)

This lesson gives an introduction to some fire readiness actions (Ready-Set-Go), risk perceptions, and trauma resilience and integrates elements learned in this guide. There is an optional homework evacuation planning exercise. The lesson would be best served in teams or group discussions and if able to integrate parents and fire partners would be greatly enhanced. Although, this can be done alone or as an individual.