Chautauqua Wildfire Mitigation Plan
Phase 1
Final Report

September 27, 2022

Form+Works Project No. 22-021

form+works
design group, LLC

Chautauqua Wildfire Mitigation Plan

Phase 1

September 27, 2022

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I. PROJECT OVERVIEW / SCOPE

A. PURPOSE & NEED STATEMENT:

The Colorado Chautauqua, a National Historic Landmark (NHL) located in Boulder, Colorado, is one of the few chautauquas in continuous use since its inception in the late 1800s. With 102 historically contributing resources, the Chautauqua campus is designated an NHL for its high level of historic integrity and its role in the broad social patterns established by the Chautauqua Movement. In the Nomination to become an NHL, Chautauqua is referenced as “an outstanding representation of America’s first truly national mass educational and cultural movement”; satisfying the criterion of “Properties that are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history and from which an understanding and appreciation of those patterns may be gained.”

Loss of historic integrity (through alteration, addition, or demolition) is the most common reason for the withdrawal or loss of the National Historic Landmark designation. The designation may be impacted by changing construction materials that alter the appearance of the structures, loss of character-defining features, or significant changes to the cultural landscape. Wildfire is a risk that can impact Chautauqua’s NHL designation. A wildfire mitigation plan can reduce that risk.

Colorado is well known for high wildfire risk. In 2020 alone, the state recorded 25 wildfires that burned 625,000 acres and leveled hundreds of buildings, including historic buildings. The National Historic Landmark District of Chautauqua is a 40 acre site owned by the City of Boulder and is located adjacent to approximately 840 acres of open space owned and managed by Boulder County Open Space and Mountain Parks (OSMP). With direct adjacency to wildfire prone landscapes and with a mission statement to preserve the historic site, the Colorado Chautauqua Association sought to pursue a Wildfire Mitigation Plan to review past and current wildfire mitigation efforts and inform them on any additional steps, recommendations, and best practices that might be considered. A major consideration for this effort was focused on maintaining the historic integrity of the site and buildings while balancing modern fire mitigation techniques.

B. PROJECT TEAM AND PARTNERSHIPS:

The project consultant team was led by Natalie Lord, RA, LEED AP BD+C, of Form+Works Design Group, LLC. Form+Works Design Group was started in 2017, to specialize in Historic Preservation Architecture in Colorado. Ron Anthony, FAPT, of Anthony & Associates provided expertise in the preservation of historic wood structures, the field of wood science and wildland fire.

This project involved consultation with various groups to obtain information and have discussions. The Colorado Chautauqua Association (Owner) participated in the majority of the discussions. Consultation was conducted with the Chautauqua Firewise Coalition, a group of CCA staff and board members, Chautauqua private cottage owners, and the Boulder Fire Department.

II. BACKGROUND INFORMATION

A. WILDFIRE RISK OVERVIEW

Risks from wildfire drive the importance of developing and implementing a mitigation plan for any cultural resource that could be impacted by wildfire. Reducing risks is more urgent as fire season now extends through all months of the year in Colorado and fire behavior becomes more extreme. However, not all wildfires are of such intensity or result in the degree of destruction seen in the news. The vast majority of wildfires are controlled within the first few days after ignition. Mitigation efforts often contribute to minimizing the damage from these incidents. For extreme incidents, such as the Marshall Fire in 2022, few mitigation efforts prior to the fire, if any, could have reduced the damage suffered by many. It is not those fires that we want to address with a mitigation plan but the much more frequent lower-intensity incidents that could damage Chautauqua. The goal of mitigation is to keep the small fires small. Achieving that goal begins with the work that can be done by the Chautauqua stakeholders.

1. BASICS OF FIRE BEHAVIOR

It is not the objective of this wildfire mitigation plan to present a dissertation on fire behavior but only to provide sufficient information for CCA stakeholders to understand why there is a risk to their cultural resource from wildland fire. Additionally, the goal is not to make CCA stakeholders fire behavior experts but rather to give them a clear, concise understanding of the factors that impact fire behavior and stakeholders can do on site to reduce the risk of loss or damage due to fire. **Most of the recommendations focus on actions that should be taken well before a wildland fire threatens Chautauqua, not during an incident where the presence of well-intentioned actions of individuals serve to impede responders from safely fighting the fire.**

Chautauqua is located within what is known as the Wildland Urban Interface (WUI), a transition zone between largely unoccupied land and human development. It is a geographic zone where structures or other human development, interspersed with undeveloped wildland or vegetative fuels, are present. According to the U.S. Fire Administration, between 2002 and 2016, an average of over 3,000 structures per year were lost to WUI fires in the United States and the

WUI area continues to grow by approximately 2 million acres per year[1]. While the number of losses is significant, the number of structures and cultural resources saved, in part, through mitigation efforts is far more significant.

Fuels, weather, and topography are the key factors in wildland fire behavior. As shown in the well-known fire triangle in **Figure 1**, it is the interaction of these three variables that responders must address when allocating resources to protect life and property.

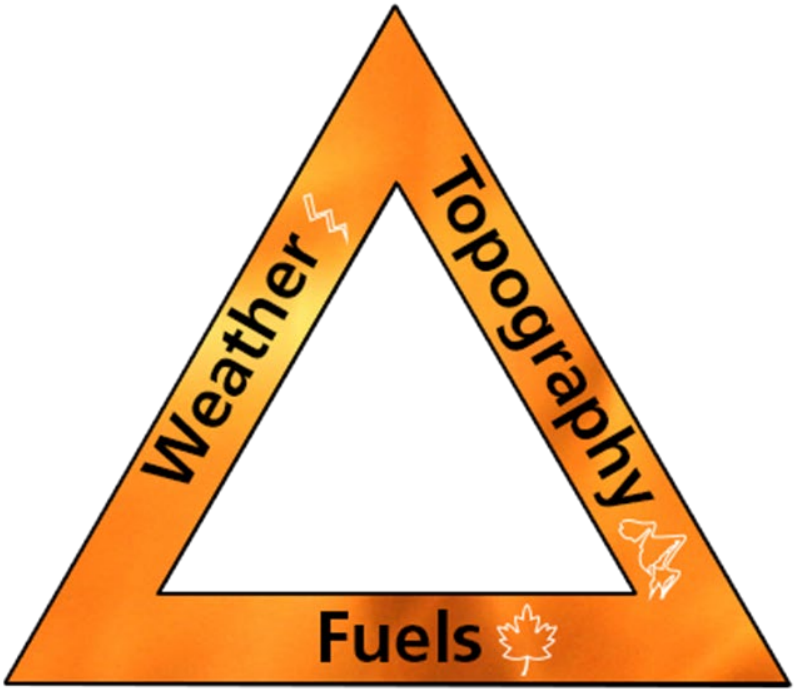

Figure 1. The fire triangle.

What is fuel? Fuel is anything that is combustible. Most commonly, vegetation is the primary fuel for a wildfire. The vegetation may be wild, as in the open space around Chautauqua, or trees, shrubs, and plants that make up the cultural landscape of Chautauqua. Fuels are categorized by size and how rapidly they can adapt to changes in relative humidity and temperature (affecting the moisture content of the fuel). Grasses are considered fine fuels because they are easy to ignite and will dry very quickly (within hours) as temperatures increase and relative

[1] U.S. Fire Administration Website, Accessed August 22, 2022. https://www.usfa.fema.gov/wui/what-is-the-wui.html

humidity decreases. **Structures are fuel.** While the materials used on the exterior of the structure affect the probability of ignition, the contents on the interior are subject to ignition from radiant or convective heat from a fire. One of the features that gives Chautauqua a sense of place for people is the closeness of the cottages and vegetation that make up the cultural landscape and, thus, the site has a fairly high fuel load (the volume of combustible material in a given area).

What is topography? Topography is the form and features in a landscape. Canyons, mountains, steepness of slope, and elevational differences are examples of topographic features that will influence fire behavior. In most cases, the topography of a site cannot be altered or controlled. Chautauqua does not have much variation in topography or significant differences in elevation that can increase fire intensity or rate of spread. There is a slight north-facing aspect (the direction the landscape faces), with approximately 200 feet of elevation gain from the north end to the south end of the property (approximately 1750 feet north to south) which is noticeable to anyone walking up the hill. This area is roughly from Baseline Road to the south edge of Boggess Circle. Fire behavior due to this slight grade would be influenced more by fuels (the cottages, vegetation, etc.) and wind during an incident than the topography of the property. However, adjacent to the Chautauqua property the topography varies significantly in terms of steepness of slope, elevation, aspect, and other features that can significantly affect fire behavior, particularly, fire intensity and rate of spread.

What is weather in the context of wildfire behavior? Temperature, relative humidity, and wind are the primary weather factors that affect fire behavior. Precipitation, exposure to ultraviolet radiation, and lightning are other factors that can influence fire behavior. Understanding the impact of changes in weather patterns, primarily higher temperatures, lower precipitation, and high wind speeds in many fire-prone areas is key to anticipating fire behavior on a given site. Many of the recent devastating wildfires in Colorado (and elsewhere) have been the result of extreme winds which carry embers (a phenomenon called spotting) much further distances than during fires from only a few decades ago. It is the embers during a wind-driven fire near Chautauqua that are the greatest risk to the site.

2. REDUCING THE RISK BY MODIFYING POTENTIAL FIRE BEHAVIOR

The two primary means of significantly reducing the immediate risk to Chautauqua are by fuels mitigation and creating defensible space. Fuel mitigation involves removing or trimming vegetation to reduce the total volume of material that can burn (the fuel load) while reducing the horizontal and vertical continuity of the fuel to lower the likelihood of the fire being able to spread without interruption (as across a grassy meadow). Horizontal fuel continuity is vegetation or other fuel that is continuous, or touching, across the horizontal plane, e.g., there is little or no separation from tree to tree, shrub to shrub, or grasses in a large meadow. Similarly, vertical fuel continuity is a lack of separation vertically, e.g., grass to shrubs to tree branches to the crowns of the trees would be a typical example.

During and throughout this project, fuels mitigation has been conducted at Chautauqua through the efforts of CCA and that work continues. Much of that work has been along the western

boundary of Chautauqua (**Figures 2 and 3**). Although very beneficial, the volume of fuels that is removed through trimming or cutting should be more extensive. No one appreciates hearing that the volume of vegetation that should be removed is three times what was done but that is the situation with the Chautauqua mitigation work. It needs to be more extensive to reduce fuel load and horizontal and vertical continuity. That can be accomplished while balancing the aesthetic nature of the campus. Open Space & Mountain Parks (OSMP) also conducts fuels reduction, most recently in the drainage to the east of Chautauqua Reservoir Road (**Figure 4**).

Figure 2. Western boundary where fuels mitigation has been conducted. Note there has been a reduction in fuel load and thinning of some of the horizontal and vertical continuity. However, enough vegetation remains, mostly shrubs, to allow for spread of a fire from the west onto Chautauqua property.

Figure 3. Western boundary where fuels mitigation is yet to be conducted. Note the horizontal and vertical continuity of the vegetation which would allow for a fire to easily spread.

Figure 4. OSMP property on eastern boundary where fuel mitigation work was done. However, this area would benefit from further removal of vegetation to reduce horizontal and vertical continuity as well as fuel load.

Defensible space around a structure to reduce the likelihood of significant damage or loss of the structure is a concept that has been promoted for decades, along with an understanding of the role of building materials on the risk of damage or loss due to fire. **Figures 5 and 6** show examples of what are promoted as best practices for establishing defensible space around residential structures in fire-prone areas. These recommendations are good guidance for many residential structures or other buildings in the WUI but not so appropriate for Chautauqua. The designation as a National Historic Landmark needs to be balanced with standard recommended mitigation practices. As is seen in **Figure 8**, it is not possible to achieve the recommended defensible space between buildings at Chautauqua because of the close spacing of structures.

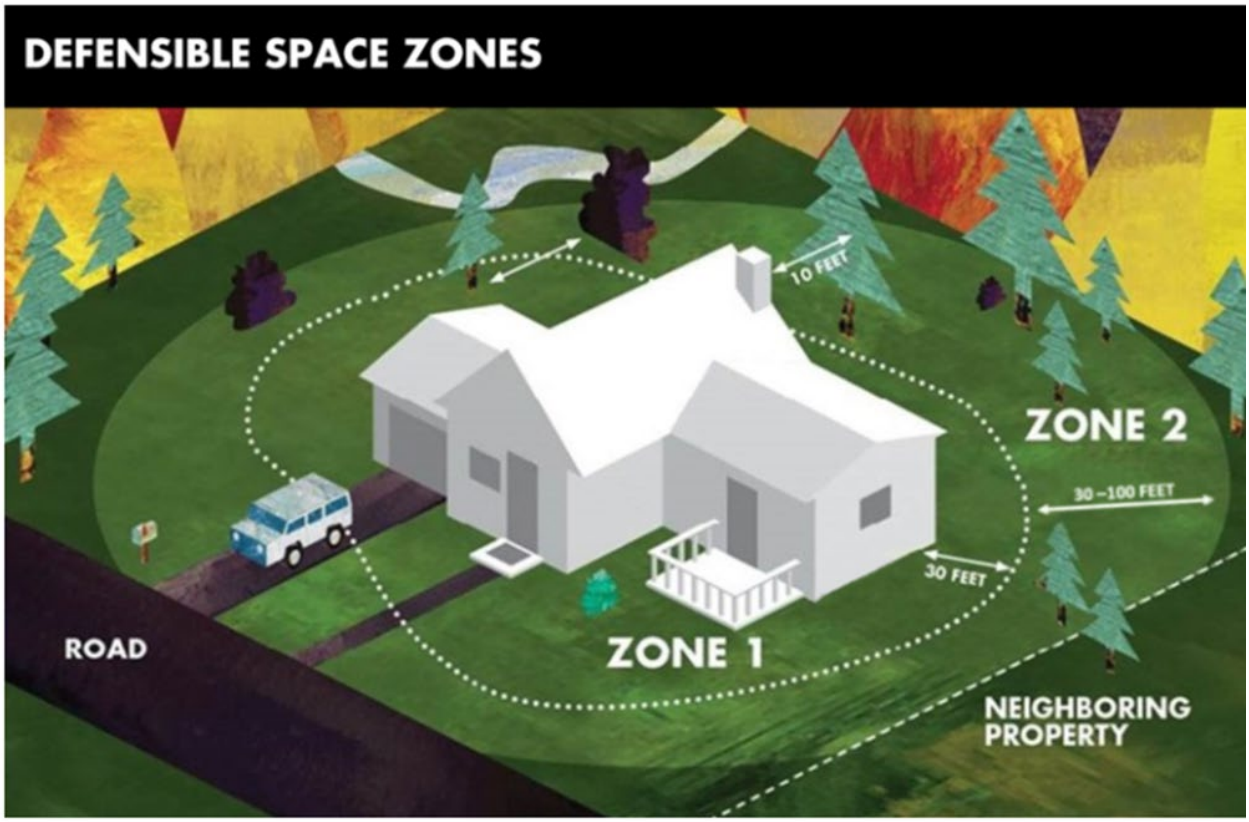

Figure 5. Idealized defensible space that is recommended around a single structure.

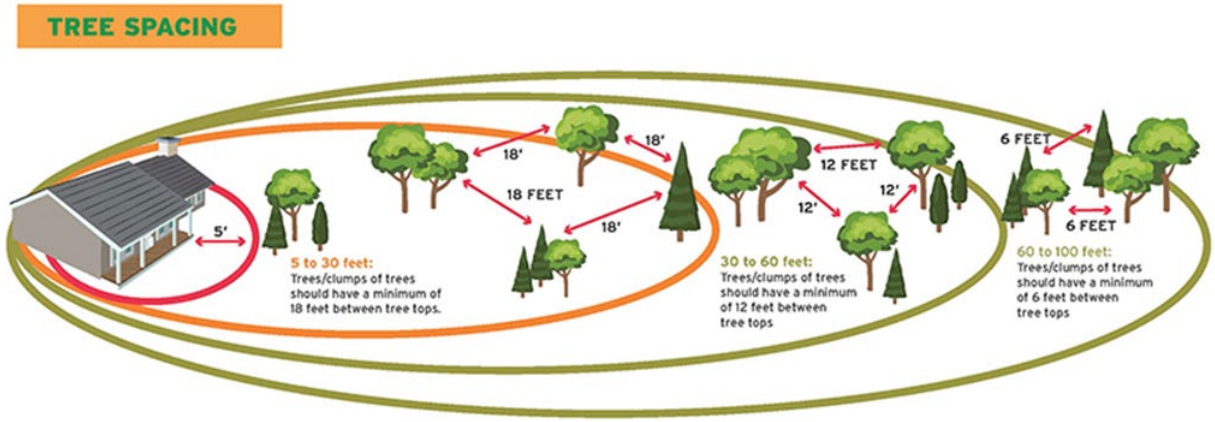

Figure 6. Defensible space as recommended by removing or trimming vegetation to eliminate horizontal and vertical fuel continuity to reduce the risk of the fire spreading and making fire operations more challenging and less safe.

These examples of defensible space will, generally, not work well within Chautauqua property. They will be effective around the perimeter, but the cottages and other structures are too close to allow for the recommended fuel reduction without dramatically altering the cultural landscape that is Chautauqua.

3. HEAT TRANSFER AND IGNITION

Fuel ignites from a variety of means during a wildfire. Most people are concerned with surface fires where there is direct flame contact. Fuels adjacent to a home (vegetation, wood, and structures) that are in direct contact with the flame front may ignite. However, it is easy to confuse heat transfer and ignition during a wildfire. Said another way, “it might get hot, but it doesn’t necessarily burn.” By reducing the fuel load, fuels mitigation and defensible space can reduce the possibility of something (a cottage) burning even though it may “get hot.”

Heat transfer occurs through convection, radiation, or conduction. Convection is the movement of hot air due to heating of the air molecules. Convection is the primary means of fire spread by pre-heating fuels in advance of the fire, including the upper crowns of trees in the explosive fires seen in the news. Radiation is the movement of heat energy as waves passing through the air. The heat is transferred when the wave reaches a physical object that conducts heat. Radiant heat from a wildfire can ignite combustible materials inside a structure from a distance of several hundred feet in extreme events. Conduction occurs when heat is transferred from molecule to molecule through direct contact, as when one touches a hot skillet.

Ignition occurs when a combustible material reaches a temperature sufficient to support combustion of that material. The rule of thumb is that the majority of fuels will ignite during a wildfire at a temperature of approximately 500 degrees Fahrenheit. Embers (firebrands) that

travel through the air due to wind or air currents (such as a convective column often seen on large wildfires) are the most common source of structure ignition through spotting. If the embers are large enough to retain heat or are burning when they land on a combustible material, an ignition can occur. Addressing the probability of ignition to or in a structure is critical to reducing the potential impact of embers, particularly during wind-driven fires. Erratic winds can put embers in tight openings that, through conduction, will result in an ignition. Continued maintenance of structures is critical to prevent embers from getting into openings. Ensuring that paint is maintained on exterior woodwork and conducting regular visual inspections to determine entry points for embers should be part of routine maintenance (**Figure 7)**.

Figure 7. Deteriorated fascia board that provides an entry for wind-blown embers can result in an ignition on the interior of the structure.

B. CHAUTAUQUA VULNERABILITIES & VALUES AT RISK

1. SITE, SIGNIFICANCE AND HISTORY:

The first historic protection for Chautauqua was created by the City of Boulder in 1978 when the city created the Chautauqua Park Historic District. In 1989, the City's Landmarks Preservation

Advisory Board and the Colorado Chautauqua Association Collaborated to devise and adopt design guidelines that aimed to further protect the historic character of the site. The Colorado Chautauqua became a designated National Historic Landmark on February 10, 2006. The designation cites “Under the authority of the Historic Sites Act of 1935, this site has been found to possess exceptional significance in illustrating or commemorating the history of the United States for the benefit and inspiration of the American people”.

As outlined in the National Historic Landmark Nomination form, the Chautauqua Park Historic District has the following resources identified within the property:

	Contributing	Noncontributing
Buildings	87	20
Sites	7	3
Structures	7	5
Objects	1	7
Total	102	35

The nomination outlines the importance of the surrounding site and context noting that “the historic district has a spectacular natural setting at the base of the Flatirons, some of the most dramatic massive rock uplifts along the foothills of the Rocky Mountains.” The nomination discusses the high degree of integrity that Chautauqua possesses due to its location, design, and setting. Workmanship and materials are noted as important aspects of the district’s integrity. The period of significance for the Chautauqua district is 1898-1930.

The nomination discusses the intricate Ownership / Management relationship that makes the Chautauqua District unique. The City of Boulder owns all the land (approximately 40 acres) that comprises Chautauqua Park. Of this land, the city leases 26 acres to the non-profit Colorado Chautauqua Association (CCA). The Auditorium, Dining Hall, Academic Hall, Community House, Columbine Lodge, Missions House, Preservation Office (Primrose Apartments) and 61 cottages are part of the CCA leasehold area. An additional 38 privately-owned cottages are located within the district boundaries. The private owners own the physical improvements on the city-owned / CCA-leased land[2]. **Figure 8** below outlines the property management for the Chautauqua site. CCA manages the majority of the land within the district boundaries, Boulder Parks and Recreation Department manages the land to the north of the district comprising the Chautauqua Green, the playground, and a tennis court. Open Space and Mountain Parks (OSMP) manages the area east of Chautauqua Reservoir Road, south of the district edge and

[2] NPS Form 10-900 Colorado Chautauqua National Historic Landmark Nomination. https://npgallery.nps.gov/GetAsset/5c494c9e-c5c8-4297-813f-fef862e5995f

west of Bluebell Road, with a small section of OSMP to the east of Bluebell between the road and the cottages.

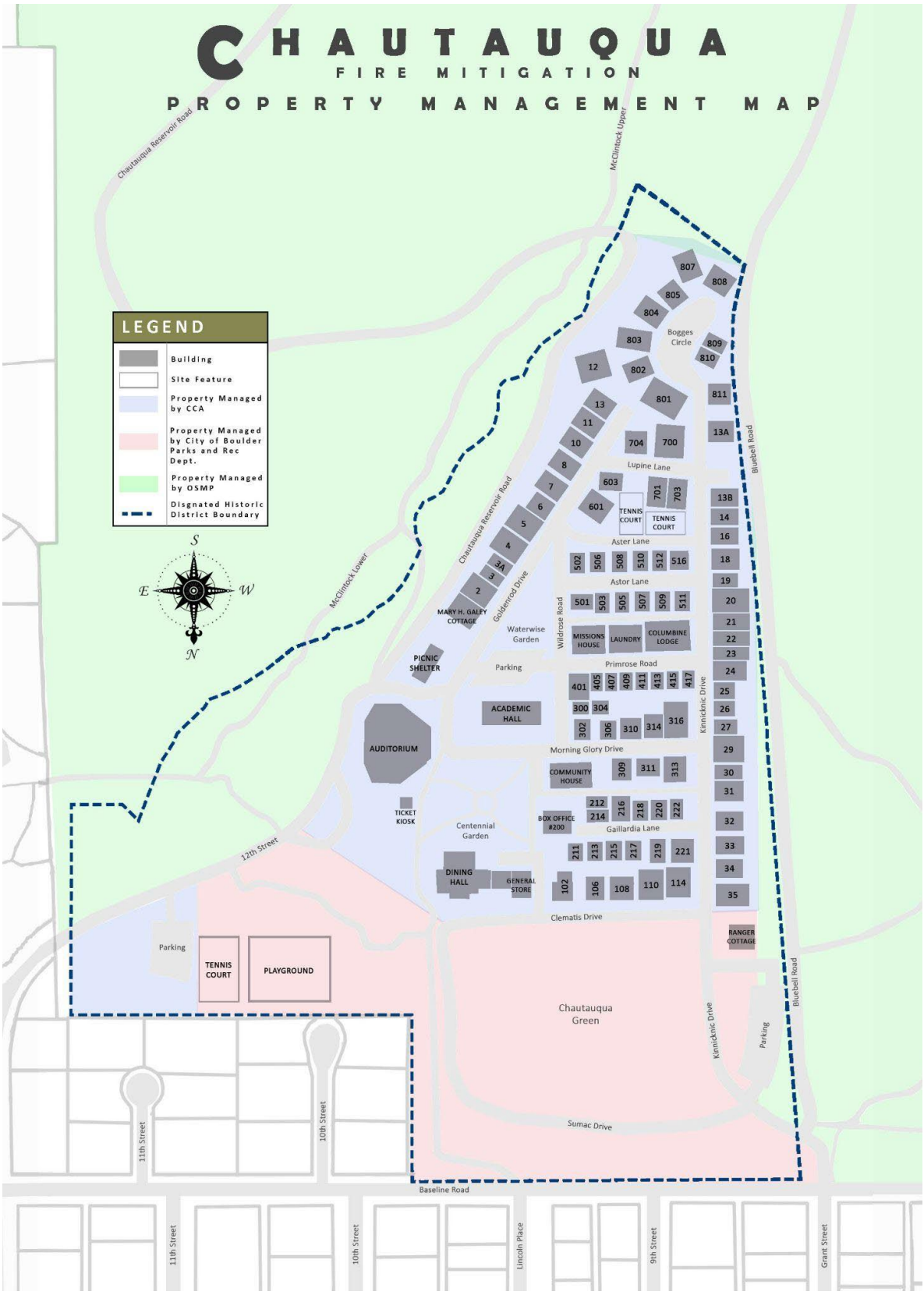

Figure 8. Property Management Map of Chautauqua.

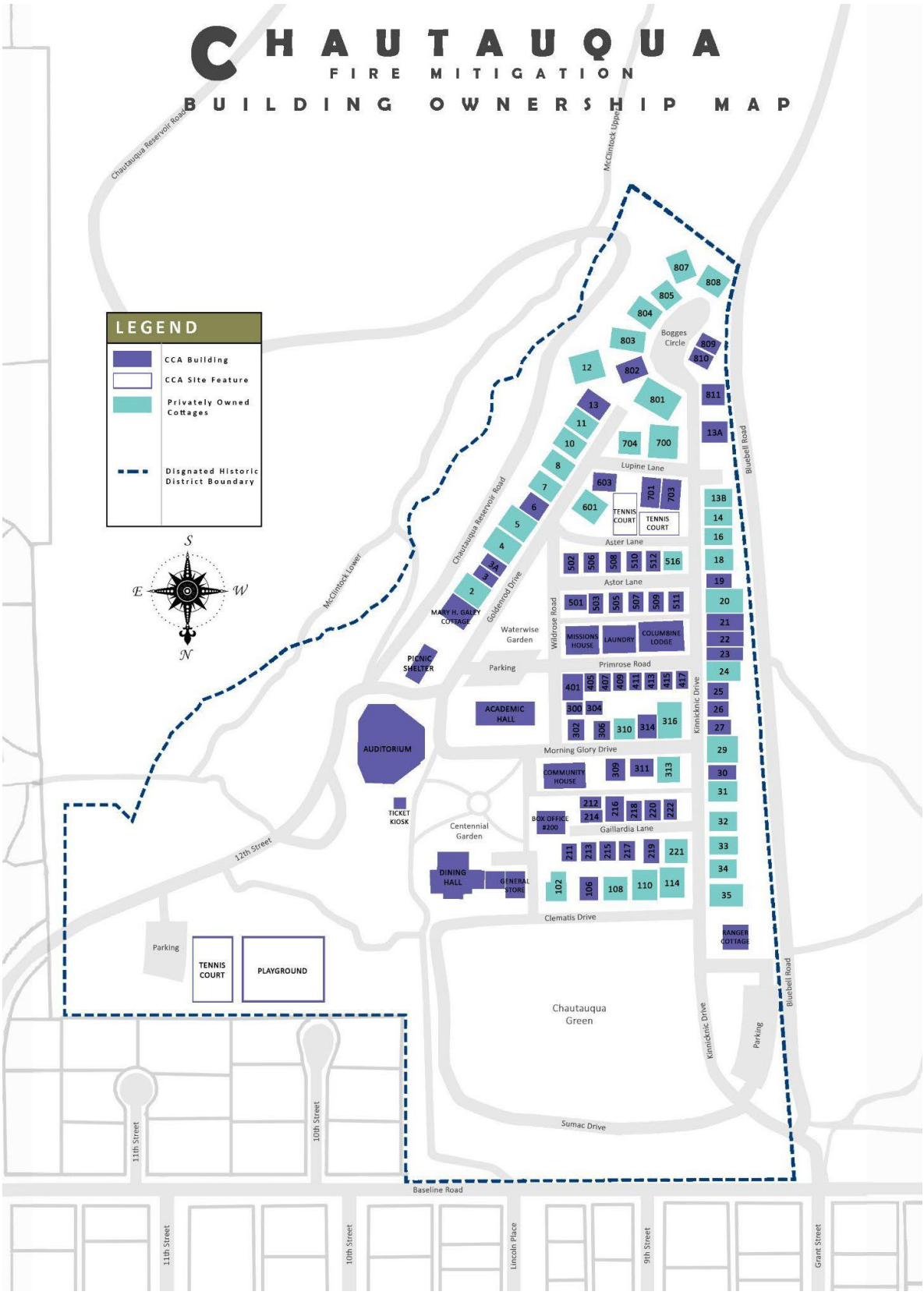

Figure 9. Building Ownership Map of Chautauqua

2. PRIORITY BUILDINGS:

As part of this project, the Team worked with CCA to determine a list of priority buildings. The thinking behind this effort was, in the event of an oncoming fire, if firefighters are able to only save a single structure, what would that be? With this starting point the Team then listed the next highest priority structures for firefighters should the opportunity allow for additional structures to be saved. The following is the list of prioritization and location maps, the intent is that this section of the document could be removed as a standalone document to be distributed to local and visiting emergency services:

	Name	**Address**
1	**Auditorium**	**198 Goldenrod Drive, Boulder, CO 80302**
2	**Dining Hall / General Store**	**100 Clematis Drive, Boulder, CO 80302**
3	**Community House**	**301 Morning Glory Drive, Boulder, CO 80302**
4	**Academic Hall**	**298 Morning Glory Drive, Boulder, CO 80302**
5	**Missions House**	**400 Primrose Road, Boulder, CO 80302**
6	**Columbine Lodge**	**410 Primrose Road, Boulder, CO 80302**
7	**Cottage 200 (Box Office)**	**212 Chautauqua Trail, Boulder, CO 80302**
8	**Mary H. Galey Cottage**	**1 Chautauqua Trail, Boulder, CO 80302**
9	**The Rest Cottage (#401)**	**401 Chautauqua Trail, Boulder, CO 80302**

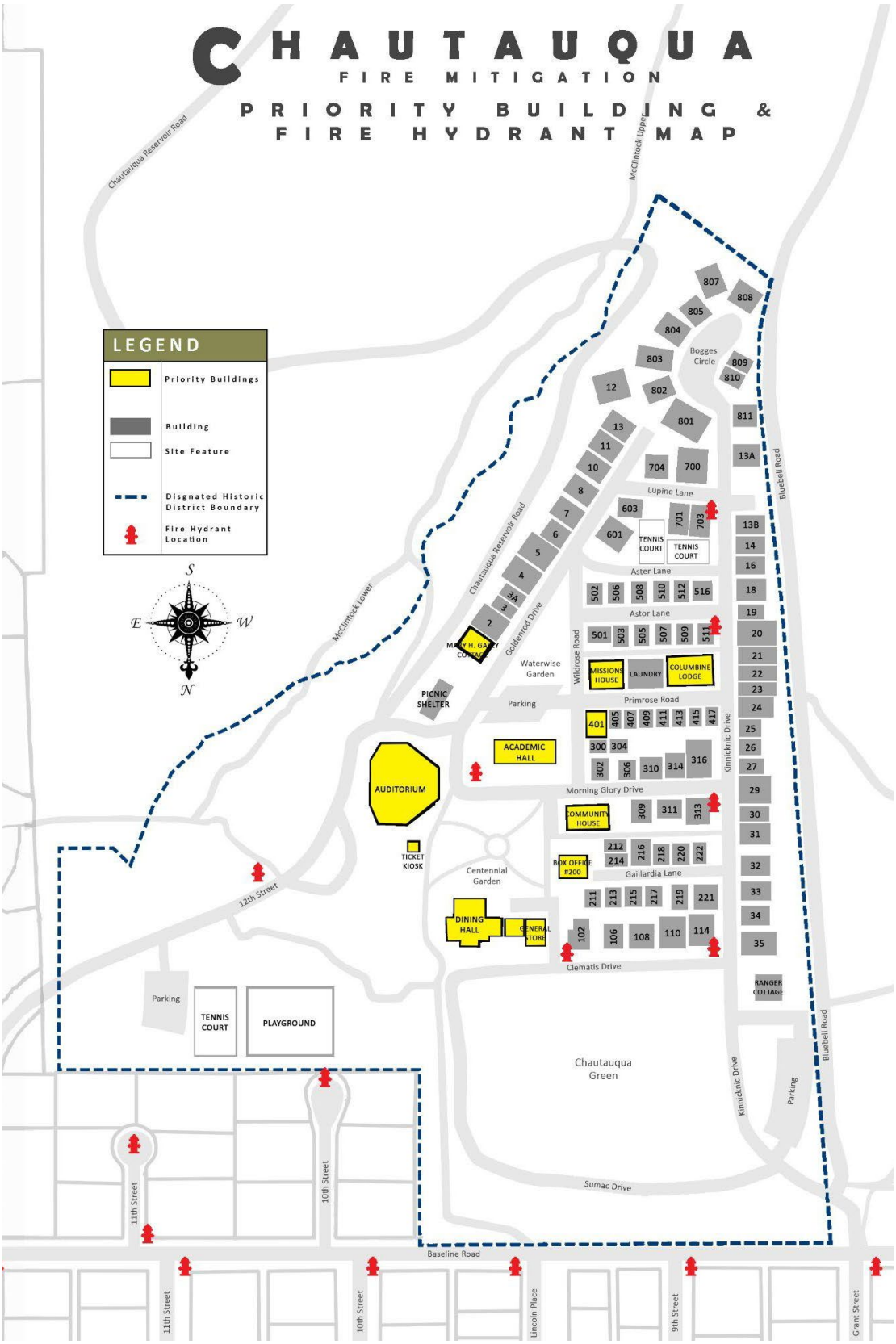

Figure 10. Chautauqua Priority Buildings and Fire Hydrants Map

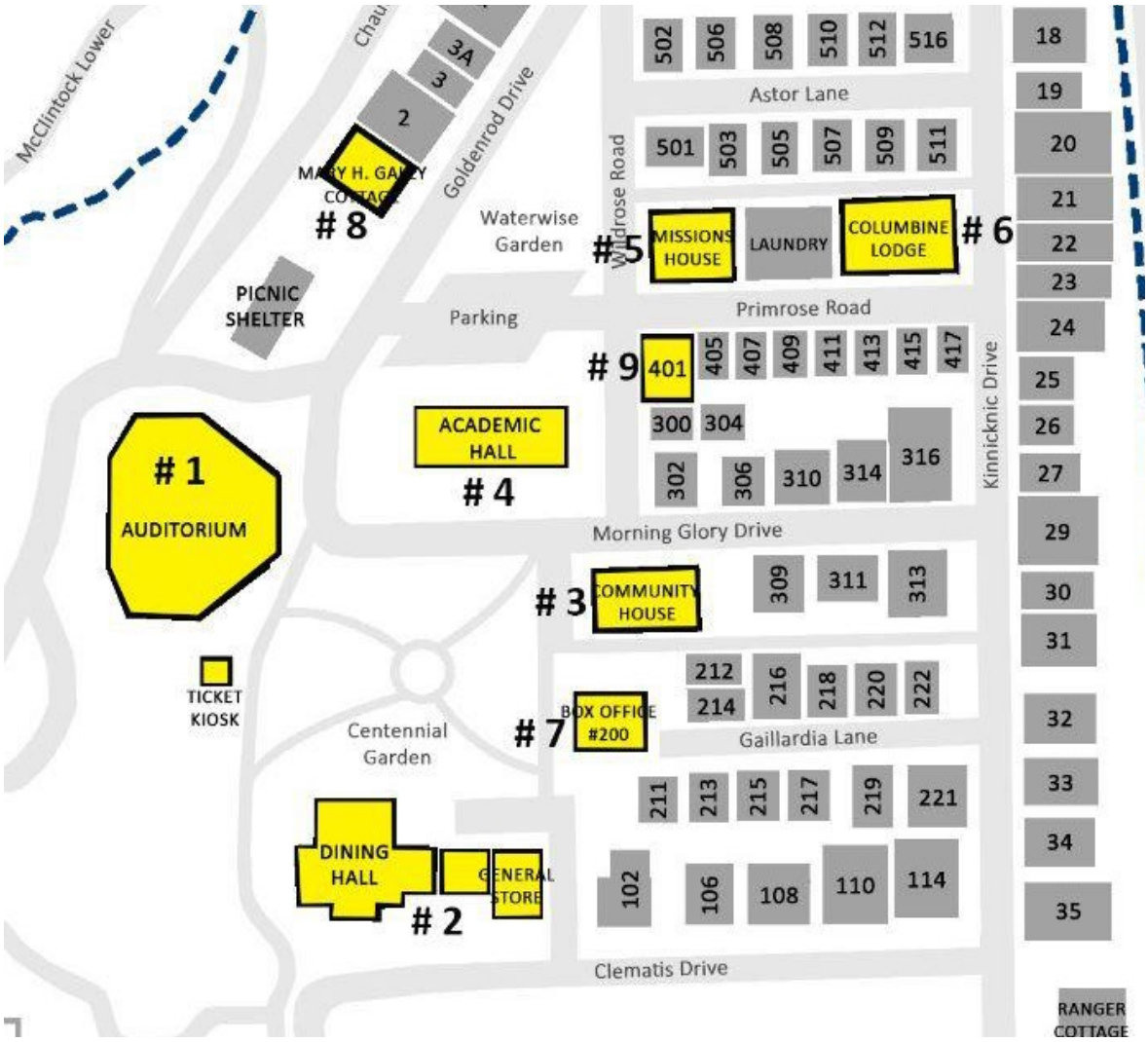

Figure 11. Order of Priority Buildings

3. DOCUMENTATION AS A MEANS OF MITIGATION:

As noted in the NPS Landmark Nomination, wood-framed construction is a defining feature of the buildings in the Colorado Chautauqua District. Of the buildings on-site, all but the Community House, Columbine Lodge and Cottage #200, have wood siding. The Community House, Columbine Lodge, and Cottage #200 have stucco exterior walls; however, like the other buildings on-site, they still have wood trim, windows, doors, and roof eaves. The materiality of Chautauqua is a character defining feature. Although it may be tempting to call for wholesale replacement of the wood materials to reduce fire risk, this would likely risk Chautauqua from losing its historic designation status.

As-built drawings or LIDAR scanning, as described below, are means of documenting the buildings; in the unfortunate event of partial or total destruction, reconstruction using documentation would be possible. Chautauqua has existing as-built drawings for the Auditorium and Galey Cottage. **It is recommended that at minimum, CCA maintain accurate documentation of the priority buildings on campus. Consideration should be given to documentation of all CCA buildings, sites, structures, and objects identified in the NHL nomination, both contributing and non-contributing.**

Field measuring all of the buildings / structures in the Chautauqua district boundary may be time-consuming and/or cost prohibitive. But there are some modern alternative means of documentation that could be considered.

LiDAR scanning: This method consists of a high-powered laser set-up on a tripod, and it is moved to various locations inside and outside of a building to create a point cloud model. Similar to echolocation, LiDAR involves the laser hitting surfaces and objects around it in rapid succession, at a rate of many thousands of pulses per second, and the time it takes for the light to return to the source is recorded to document exact distances. LiDAR is said to be accurate to within 1/8 inch. LiDAR scanning companies can provide only the point cloud model (see **Figure 12**), but their services are often quite extensive, offering a combination of point cloud / photogrammetry and following through with modeling services to provide an as-built document for a structure.

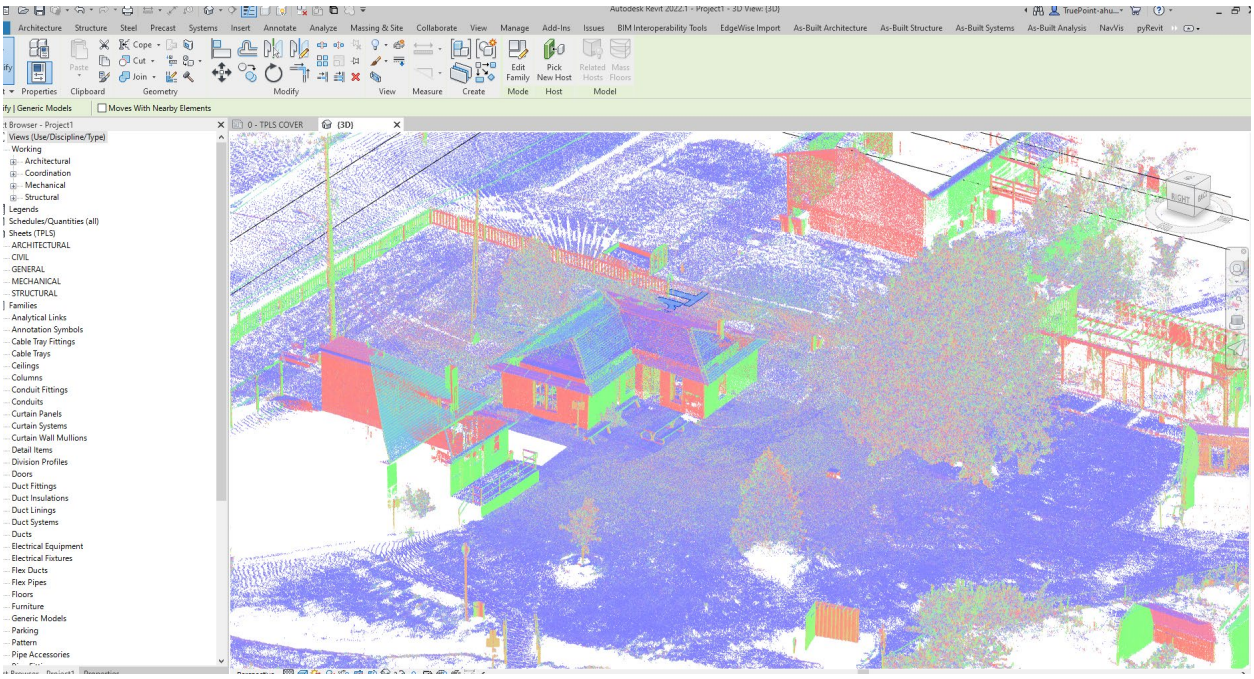

Figure 12. A point cloud file from a LiDar scan imported into Revit (an AutoDesk program utilized to create architectural and engineering 3D models and drawings of buildings).

Careful consultation with the LiDAR company is recommended to ensure that the quantity and quality of information received following a scan is achieved. Proper set-up of the point cloud is imperative to ensure that the files are easily used.

Another benefit of LiDAR scanning that is in the early stages of research for Historic Buildings, is that multiple scans can be taken over time and compared to investigate building movement / changes. With proper set-up of GPS location that is part of LiDAR scanning future models from consecutive scans can be overlaid and compared.

The point cloud information would be most critical and important to capture as a preliminary step for the structures at Chautauqua. This digital file could be saved in the CCA digital archives as a first step that would then allow 3-D models and as-built drawings to be created for the buildings in the future if needed.

Photogrammetry: Where LiDAR scanning collects more detailed and accurate depth information, there is another documentation method commonly used today known as Photogrammetry.

Photogrammetry uses high resolution photography and stitches them together to create a 3D map of a building. According to recent conversations with Matterport, a photogrammetry company, the use of their proprietary professional camera produces a 3D image model that is accurate to within about 1 inch. The image file that is created by their camera can then be processed by their company into a point cloud model that could then be imported and used to create as-built drawings.

There are other photogrammetry companies and products, some even able to be created using a smartphone or tablet. But it is important to understand what product and accuracy results from these types of systems. It is our understanding from current research that photogrammetry models produced from smartphone/tablet applications are not usable for accurate as-built drawings but are more commonly used for virtual walkthroughs of spaces, a tool most often utilized in the real estate field.

As mentioned, there are scanning companies that have the ability to produce a LiDAR scan in conjunction with photogrammetry of a building. This may be a consideration for CCA to evaluate the benefits and costs of various methods and results.

C. MITIGATION EFFORTS TO DATE

1. FUEL REDUCTION:

Utilizing grant funding, CCA has conducted fuel mitigation around the perimeter of the property. These efforts were documented in the Meeting Minutes from Meeting #1, May 6, 2022 (See **D APPENDIX**) and Meeting #2, June 21, 2022 (See **E APPENDIX**). Fuels mitigation to reduce fuel load and horizontal and vertical fuel continuity on the CCA property should continue. Establishing a long-term fuels reduction plan for the Chautauqua campus based on vegetation growth and available funds should be part of CCA's strategic planning process.

RECOMMENDATION: The fuels reduction should be reviewed annually based on progress and increased threats due to higher fuels loads.

2. ADJACENT PROPERTIES:

Work with adjacent property stewards, primarily Open Space and Mountain Parks, to coordinate fuels reduction adjacent to Chautauqua property. For 2022, the heavy fuel load in the OSMP property south of Chautauqua, the strip of OSMP property east of Bluebell Road that touches Chautauqua property, and the ravine area west of Chautauqua Reservoir Road should be priorities for collaborative fuels reduction effort as a fire that spreads from OSMP property threatens Chautauqua and a fire that originates on Chautauqua property threatens OSMP land.

RECOMMENDATION: Enter into more specific discussions with Boulder Fire Department and the Boulder Office of Emergency Management to get CCA priorities into BFD's Structure Response Plans. The current Structure Response Plans would benefit from updating and could include CCA information. Provide the same information to the Boulder Office of Emergency Management for the City of Boulder/Boulder County.

3. OVERHEAD POWERLINES:

Overhead powerlines are scheduled to be placed underground starting in 2023. Depending on the work schedule, trimming trees in contact with conductors or at risk of arcing is recommended. However, if the underground work is scheduled to begin in 2023, it is likely that the power company would conduct tree trimming.

RECOMMENDATION: Ensure that placing the electrical services underground is on schedule.

4. CCA COTTAGE / CAMPUS WILDFIRE MANAGEMENT CHECKLIST:

CCA prepared a Cottage / Campus Wildfire Management Checklist, See **A APPENDIX**, to distribute to private cottage owners and to conduct analysis of CCA owned buildings. Most of the items on the checklist will be assessed in Phase II to consider the return on investment for implementing each item.

D. CHAUTAUQUA WILDFIRE MITIGATION PLAN

1. PRE-FIRE ACTIVITIES
    a) CULTURAL RESOURCE INVENTORY - Maintain an inventory of the Cultural Resources at Chautauqua. As noted during this project, the buildings themselves are the top priority and concern of CCA. Conduct visual evaluations of each resource to determine what maintenance may be required to reduce risk of fire. Revisit the resources at least every three years to ensure that the inventory and documented conditions are current.
    b) MAINTAIN AND DISTRIBUTE LIST OF PRIORITIES - The list of priority buildings outlined in this document should be revisited at least every three years. Maintain and distribute the list of priorities to assist first responders with protecting assets. At annual fire inspections it is recommended that CCA walk through the priority buildings and ensure Boulder Fire has the list and maps in their Structure Response Plan.
    c) AS-BUILT DOCUMENTATION: Document and/or creating as-builts for all buildings / features in the district. Immediate priority should be given to the list of 9 priority buildings outlined in this document. Next priority should be given to the contributing historic buildings, features, sites, and objects listed in the NHL nomination. However, documentation of non-contributing elements is also recommended, as in time, these elements may be eligible to be included in the list of contributing features. Whatever method, be it field measuring, LiDAR or photogrammetry, the recommendation for Chautauqua is to achieve a high quality and accurate drawing set (or point cloud model) that could be archived for use in reconstruction.

d) EVACUATION PLAN & TRIGGER POINTS: The Boulder Office of Emergency Management (OEM) has established trigger points that will result in issuing specific instructions to CCA. Boulder OEM will provide advisories, warnings, orders, or all clear instructions associated with a wildfire. CCA should maintain evacuation plans for the site. With only two means of egress from the site, 12th Street and Kinnikinnick Drive, and considering there are one-way lanes within the district, having clear evacuation maps is critical. Since short term cottage renters are likely the population least familiar with the site, there is opportunity at check-in to discuss the evacuation plan, map, and Boulder OEM instructions with visitors. Private cottage owners and CCA staff are most familiar with the site, however opportunities at annual meetings should be utilized to revisit evacuation plans and Boulder OEM procedures to ensure everyone has a current understanding. Evacuation of the campus would be challenging because of the number of vehicles and narrow streets. It is imperative that a trigger point, such as a pre-evacuation notice from a fire official, be communicated to residents and visitors so that traffic congestion does not impede the efforts of first responders to protect the values at risk and the rest of the campus.
e) COMMUNICATION PLAN: Notifications of emergency alerts and warnings are communicated through Amber Alerts, Local Emergency Messaging (so-called reverse 911), and Internal SMS initiated by the CCA HR Department. CCA staff announcements and protocols have been established which include walking around the site and knocking on doors. Again, utilizing guest check-in and annual meetings as touchpoints to review and discuss the communication plan is recommended.
f) RECOVERY PLAN: The Colorado Department of Local Affairs (DOLA) has a Resiliency Office that manages Wildfire Recovery. In the unfortunate event of a wildfire that affects CCA, information, resources and announcements will be located here: https://www.coresiliency.com/co-recovery-resources-wildfire

E. RECOMMENDATIONS FOR STRUCTURES

1. CLASS A FIRE RATED ROOFING: The roofs of the buildings at Chautauqua consist of asphalt shingles. The Auditorium is an exception where a recent roofing project replaced the roof with a combination of Class A rated asphalt shingles and Class A rated membrane roofing. **All the roofs at Chautauqua have a Class A fire rating and all future replacements will be Class A.**

2. REFLECTIVE BUILDING ADDRESS NUMBERS: Reflective building address numbers allow first responders to quickly identify a building when it is dark. This recommendation was discussed early in the Phase 1 Fire Mitigation Project and has been implemented. **Reflective building address numbers are in place on all CCA managed buildings, and the recommendation was passed on to the private cottage Owners for implementation. An additional recommendation for this item is to periodically check that the building address numbers remain visible (remove vegetation growth or replace when lost/damaged).**
3. LANDSCAPING MANAGEMENT
    a) REMOVE DEAD TREES: If a dead or dying tree is identified within the CCA district, it should be removed. **Conduct annual visual inspections within the district and remove the entire tree where dead or dying.**
    b) PRUNE TREES / VEGETATION: **Conduct annual visual inspections within the district and prune tree branches hanging over building roofs and remove all fuels within 10 feet of chimneys.**
    c) REDUCE TREE SPACING: **Thinning of tree density is recommended, but it is also understood that this may not be achievable at Chautauqua due to the cultural landscape**. The Colorado Forest Service recommends crown spacing of trees to be 6-10 feet. Chautauqua has a series of Witness Trees and Donated Trees that are significant. These trees should be identified (via tags attached to the tree) to determine if removal of adjacent non-historic trees could work towards the goal of thinning out the tree density within the district.
    d) REMOVING SLASH: Avoid large accumulations of surface fuels such as logs, branches, slash, and mulch. **Conduct annual visual inspections within the district and remove any slash on the site**.
    e) REMOVE COMMON GROUND JUNIPERS: Common ground junipers are highly flammable. **If any exist within the Chautauqua boundaries, they should be removed.**
4. GUTTERS: Ignition of organic materials that build-up in gutters is one of the greatest structural risks. CCA recently received a grant that will fund the installation of gutter covers at all CCA buildings. This project is planned to proceed in 2022. Gutter cover manufacturers will advertise that their products eliminate the need to clean gutters. However, there is no guarantee that small debris will not find a path and build up to create an ignition point. **Therefore, even following the installation of the gutter covers, as a minimum recommendation, our team recommends checking and cleaning gutters several times per year to ensure they are clear. Gutters should be cleaned in Spring and**

early Fall and after any major weather event that may knock down leaves, needles and/or sticks. Because of the maintenance implication for both CCA managed and privately owned structures, our team would propose that additional discussion and consideration should be given to the elimination of gutters entirely. The implication of this effort would trigger the need for an alternative drainage design at the ground level surrounding the buildings in order to ensure that protection from water infiltration can still be achieved. Most of the buildings at Chautauqua do not have continuous foundations, with the majority sitting on stacked stone piers or walls. Introducing water from the roof at the base of the buildings and accounting for poorly draining soil conditions at Chautauqua, eliminating gutters and downspouts would likely result in increased risk to the integrity and longevity of the historic structures. A holistic approach to preservation of the historic assets at Chautauqua needs to be considered beyond just wildfire risk reduction. The design and cost implications of this change would need to be considered and discussions had with History Colorado, Boulder Landmarks Design Review Committee, and CCA to determine the feasibility of this proposal. This would also need to be reviewed on a per building basis from the Secretary of the Interior Standards standpoint. Reviewing some historic photos that exist, a few of the buildings appear to not have had gutters originally, however some did. It would need to be determined if gutter removal would be achievable at some or all of the buildings based on this consideration as well.

5. DECKS: **It is recommended that CCA remove all vegetation, needles, and any stored materials from below decks and within 3-5 feet around decks.** Installation of 1/8-inch metal mesh screen should be considered at all open stilt decks, similar to the mesh that was incorporated in the Mary H. Galey Cottage Rehabilitation Project (**Figure 13**). The visual impact and cost implications of this recommendation would need to be considered and discussions had with History Colorado, Boulder Landmarks Design Review Committee, and CCA to determine approval. However, from the Secretary of the Interior Standards philosophy, adding metal mesh would be a reversible modification to a building that would offer better protection from fire.

Figure 13. Mary H. Galey Cottage deck enclosure. The enclosure uses fire-retardant-treated wood and metal mesh to reduce combustibility and the likelihood of large embers causing ignition under the deck.

6. SCREENING VENTS AND EAVES: Installation of 1/8-inch metal mesh screen at exterior building vents should be considered. The Colorado State Forest Service recommends adding 1/8-inch metal mesh screens to open roof eaves. **The visual impact and cost implications of this recommendation would need to be considered and discussions had with History Colorado, Boulder Landmarks Design Review Committee, and CCA to determine approval. However, from the Secretary of the Interior Standards standpoint, adding metal mesh would be a reversible modification to a building that would offer better protection from fire.**
7. BUILDING FOUNDATION / PERIMETER: **Where achievable, it is recommended that all vegetation and mulch be removed from within 5 feet of the building foundation.** Replacement of wood mulch with crushed stone or gravel with a metal landscape edge will help to prevent grass and vegetation from growing back up against the building. **Where achievable, reduce/ regrade around buildings to ensure that a minimum of 6 inches of vertical clearance between the ground and wood siding/trim is established. This recommendation would need to be reviewed on a per building basis to determine if it is achievable with existing foundations/base materials.**
8. FENCING: **For non-historic fencing, it is recommended that combustible fencing and gates within 5 feet of a building be removed or replaced with non-combustible materials**. This recommendation would need to be considered on a per building basis.

F. ITEMS FOR FURTHER STUDY / DISCUSSION:

1. WINDOWS AND DOORS: Due to Chautauqua's historic designation, wood framed windows and doors would be considered defining features and therefore should be maintained. Similarly, window and door glazing would historically have been single-paned glazing, and this would be considered defining features to the historic designation. Therefore, wholesale replacement of window and door glazing would not be recommended and use of multi-pane glazing, although an industry recommendation for better fire resistance, would not be appropriate at Chautauqua. However, single pane tempered glass could be considered if/when a broken pane would need to be replaced in an existing window or door. This being said, tempered glass is thicker and heavier than traditional single paned glass. Therefore, careful consideration would be needed to determine the impact of replacement. Routing out larger glazing beds in windows and doors would be a non-reversible impact. However, this impact could perhaps be reconciled with the added fire protection for the structure. This could be discussed further with History

Colorado, Boulder Landmarks Design Review Committee, and CCA. **However, at this time, modifications to windows and doors materials or glazing is not recommended as an item to be pursued at Chautauqua, due to the risk of loss of historic designation.**

2. EXTERIOR SIDING MATERIALS: Similarly, to Windows and Doors and as previously discussed, the materiality of the wood exterior siding (including eaves, soffits and trim) on the buildings Chautauqua is a character defining feature. Whereas modern recommendations for fire resistance would suggest replacement of wood exterior siding with fiber cement siding, steel siding, aluminum siding, stucco, brick, or stone, this would significantly change the visual character of Chautauqua and if a campaign to replace materials was pursued, it would likely eliminate Chautauqua's historic designation. **Therefore, replacement of wood exterior elements on the buildings at Chautauqua is not recommended.**

A APPENDIX CCA COTTAGE / CAMPUS WILDFIRE MANAGEMENT CHECKLIST

Colorado Chautauqua Association Wildfire Mitigation Checklist

Building/Cottage #: _____ Inspection Date: _____ Inspector: _____

Boulder Fire Department Recommendations	Yes	No	Comments
Keep vegetation green and watered			
Maintain minimum of 5ft. wide path around perimeter			
Be sure cottage address # is clearly visible			
Keep garden hose connected to outdoor hose bib			
Clean gutters and clear leaf debris off roof			
Keep tree limbs trimmed and not in contact with roof or ground			
Keep firewood away from house and cover with flame resistant tarp			
Clear any vegetation under deck and/or install lattice/screen or rock to prevent growth			

Keep barbecue grills a minimum of 5ft. away from building when in use			
Rake yard and clear out all dead branches/ leaf litter			
Maintain exterior paint (curling paint is more surface area for fire)			
Ensure wooden fences are not connected with combustible material (e.g., mulch)			
Additional Notes:			

B APPENDIX: PHASE 1 SCOPE OF WORK TASKS

The following outline was identified for the project:

- Meet with Chautauqua Leadership Team and Sustainability & Resiliency Committee to discuss status of ongoing wildfire mitigation grants, on-going vegetation management strategies, cottage/campus wildfire management checklist, and local contacts/resources. (February 11, 2022)
- Walk site with CCA representatives and stakeholders to observe mitigation work to date, buildings and their current functions, overall site conditions, and contiguous Open Space areas, to understand exposure risks and on-going mitigation work. Collect pertinent data: Cultural Landscape Assessment, emerald ash bore treatment/removal plan, donated trees, and witness trees. Establish criteria and conduct initial prioritization of the buildings, collection(s), equipment, and office resources, to inform the wildfire evacuation and protection plan. Review Chautauqua wildfire mitigation resources and partnerships and their areas of responsibility. Identify gaps that require attention for developing an effective mitigation plan.
    - Define the objectives of the mitigation plan for Chautauqua based on information gleaned from #2.
    - Review prior wildfire mitigation plans/proposals/recommendations specific to Chautauqua and make recommendations, or establish priorities and recommendations that are applicable to CCA.
    - Expand discussions with Boulder County Fire and Emergency Services staff that have coordinated with Chautauqua on wildfire issues, with emphasis on how a site wildfire mitigation plan can be communicated through channels if an incident goes beyond the leadership of local resources.
    - Review and refine project approach, schedule, and deliverables for Phase One.
    - Develop the following, in draft form:
        - Wildfire mitigation map – prioritizing remaining vegetation management and sitework
        - Wildfire evacuation plan – addressing the issues of collections, archives, equipment, and office resources
        - Building prioritization plan – addressing which buildings should receive priority protection based on historical significance to CCA, in the context of an advancing wildfire (and how best to achieve that)
        - Review cottage/campus wildfire management checklist, recommend any improvements, develop a communication plan to share overall CCA and Cottager performance. Initiate discussion of CCA's critical resources and criteria for prioritizing their protection.
            - Present draft plans and recommendations to CCA staff, the CCA S&R Committee and the CCA board, for review and comment.
            - Finalize plans, recommendations, and next steps for CCA implementation.

C APPENDIX: RECENT WILDFIRES IN BOULDER COUNTY

Boulder County has experienced several major wildfires in the last few decades. Although no one can predict if and how a fire may start, understanding causes, behavior and risks may help CCA better assess fire mitigation solutions that may be most effective.

- NCAR Fire: The NCAR Fire started on March 26, 2022 near the Bear Canyon Trail. The fire was manmade and burned approximately 190 acres[3].
- Marshall Fire: The Marshall Fire started on December 30, 2021, and swept through the City of Louisville, Town of Superior and unincorporated Boulder County. The fire spread quickly due to high winds and dry conditions, destroying, and damaging more than 1,000 homes and over 30 commercial structures. The cause of the fire is still under investigation[4].
- 2020 Cal-Wood & Lefthand Canyon Fires: The Cal-Wood fire started on October 17, 2020, and burned approximately 10,000 acres and destroyed at least 26 buildings. It was 100% contained as of November 14, 2020. The Lefthand Canyon Fire started on October 18, 2020. It burned 460 acres of brush and timber approximately one mile west of the town of Ward. It was 100% contained as of October 22, 2020. Snow and cold temperatures were instrumental in putting out much of the heat in the fire area.
- Cold Springs Fire: The Cold Springs wildfire was reported on July 9, 2016, approximately two miles northeast of Nederland, Colorado. The fire was manmade and was officially contained July 14, 2016. It burned a total of 528 acres and 8 homes were lost[5].
- Fourmile Canyon Fire: The Fourmile Canyon Fire was reported on September 6, 2010. Due to low humidity and high winds, the fire spread quickly, destroying 168 homes, and burning approximately 6,200 acres.
    - 29 homes were ignited by crown fire
    - 139 homes were ignited by surface fire[6]
- Olde Stage Fire: The first Olde Stage Fire started November 24, 1990, when a Boulder County resident threw a burning mattress out the front door of his home. 80 MPH winds swept the fire uphill into nearby homes and then down and out onto the plains. The fire burned 10 homes and approximately 3,000 acres. The second Olde Stage Fire started January 7, 2009, when wind blew down power

[3] Campbell-Hicks, Jennifer. “NCAR Fire: Investigators have ‘exhausted all leads’ in identifying suspect”. 9 News Website, Accessed August 22, 2022. https://www.9news.com/article/news/local/wildfire/ boulder-ncar-fire-human-caused/73-815e7b6d-551a-40c4-9fe0-e54b791decd7

[4] Marshall Fire Recovery. Boulder County Website, Accessed August 22, 2022. https://bouldercounty.gov/disasters/wildfires/marshall/

[5] Wasser, Leah. “An Overview of the Cold Springs Wildfire”. Earth Lab Website, Accessed August 22, 2022. https://www.earthdatascience.org/courses/use-data-open-source-python/data-stories/cold-springs-wildfire/

[6] Gabbert, Bill. “Report released on Colorado’s Fourmile Canyon fire”. Wildfire Today. October 14, 2011. https://wildfiretoday.com/2011/10/14/report-released-on-colorados-fourmile-canyon-fire/

lines in two different areas. 60 MPH winds igniting dry grasses led to approximately 3,008 acres being burned[7].

- Overland Fire: The Overland Fire started on October 29, 2003, when high winds blew a tree down into a powerline. The high wind, steep topography and the density of the forest were all contributing factors to the speed and destruction of the fire. It burned 3,500 acres and destroyed 12 homes[8].

[7] Olde Stage Fires. Boulder County Website, Accessed August 22, 2022. https://bouldercounty.gov/disasters/wildfires/olde-stage-fire/
[8] Overland Fire. Boulder County Website, Accessed August 22, 2022. https://bouldercounty.gov/disasters/wildfires/overland-fire/

D APPENDIX: MEETING MINUTES 01

form+works design group, LLC

Meeting Minutes 01

Project Name: Chautauqua Fire Mitigation Plan – Phase 1

Project Number: 22-021

Date: May 6, 2022

Time: 9:00 AM

Attendees:

Shelly Benford	Colorado Chautauqua Association (CCA) CEO	shelly.benford@chautauqua.com
Jason Hill	CCA COO	jason.hill@chautauqua.com
Pat Shanks	Board Member of Chautauqua	wcpatshanks@gmail.com
Bill Briggs	Board Member and Chair of Sustainability Committee	william.briggs@ucdenver.edu
Jeff Medanich	CAA Director of Preservation & Sustainability	jeff.medanich@chautauqua.com
Adam Gillespie	CCA Facilities Manager	adam.gillespie@chautauqua.com
Jeff Rump	CCA Horticulturalist	
Ron Anthony	Anthony & Associates	woodguy@anthony-associates.com
Natalie Lord	Form+Works Design Group	natalie@formworksdesigngroup.com

1. Introductions

2. Fire mitigation efforts to date:

    a. The team discussed efforts that CCA has undertaken utilizing grant funding for fuel mitigation. CCA has utilized volunteers as well as Reinholt Tree Specialists to complete efforts.
        i. CCA received a Colorado Forest Service Grant
    b. CCA has completed fuel reduction on the trail on the east side of the Chautauqua Historic District and has conducted some clearing on the southwest side.
        i. East Trail / Road: Chautauqua's property line terminates on the west side of the existing Trail/Road. The draw to the east of the road is owned by Boulder Open Space and Mountain Parks (OSMP). OSMP has removed dead trees and some brush that had accumulated from the 2013 flood. Additional fuel reduction in the

OSMP area, particularly immediately adjacent to the East Trail / Road was recommended by Ron Anthony. Further discussions with OSMP will be required to consider the process / feasibility of additional fuels reduction near the CCA property lines.

c. The area along the south end of the district has not been addressed and contains considerable fuel that puts the south end of CCA property at significant risk. CCA's property line terminates just south of cottage 807, but CCA noted that there is an addition ¼ mile (approximately) of additional heavy brush / vegetation area that is owned by OSMP. There is no fire break between in that area.
d. The west edge of the property was reviewed during the site walk.
    i. Mowing is maintained at northern most cottages along the west property line, however the West Trail / Road does not provide a full separation between the CCA and OSMP property. There is an area on the east side of the West Trail / Road (from cottages 35 - 20) that is owned by OSMP and CCA has inquired about periodically mowing this strip of grass to reducer fuel load. OSMP has responded that due to natural habitat constraints, this strip of grass cannot be mowed. Ron suggested that further discussions be held with OSMP as part of the CCA Fire Mitigation Plan regarding this narrow strip of land.
    ii. CCA has completed some fuel mitigation efforts at the south end of the West side of the property. These efforts were summarized by Jeff during the site walk and Ron Anthony provided feedback on the need for a prescription for additional mitigation work. CCA intends to continue these efforts utilizing the grant funds they have received.

3. CCA Firewise Coalition:
    a. The coalition was formed by CCA to engage the broader community in CCA's fire prevention efforts.
    b. Goals:
        i. Educate and communicate with stakeholders about wildfire preventions and mitigations at Chautauqua.
        ii. Solicit input and support from important stakeholders regarding wildfire prevention measures.
        iii. Create greater community engagement around sustainability issues at Chautauqua related to wildfire.
4. Prioritization of Site Assets:
    a. The Team discussed CCA's initial thoughts on the prioritization of site assets within the district.
    b. Buildings: The preliminary prioritization of the buildings is as follows:
        i. Auditorium (Including Restroom and Ticket Booths)
        ii. Dining Hall / General Store
        iii. Academic Hall
        iv. Community House
        v. Missions House
        vi. Columbine Lodge
        vii. Cottage 200
        viii. Mary H. Galey Cottage
        ix. The Rest Cottage (#401)
    c. Assets/Artifacts Inside the Buildings: Ron Anthony and Natalie Lord discussed with the group that a list and priority of non-building assets / artifacts is recommended as part of this effort to identify items that are of high priority to CCA. In a scenario where there are a few minutes to remove objects from inside

a building, having a document that identifies those items, their locations, and the place they are to be relocated / stored (somewhere off site) will be critical to communicate with occupants, staff, and first responders.

5. Fuel Removal Project Goals / Additional Considerations Discussed:
    a. Habitat protection balanced with fire protection
        i. Be discerning with fuels removal. No one wants to see clear cutting of the landscape
        ii. Protect apple trees and heritage trees
    b. Determine solutions to protect underside of decks
        i. Ron Anthony discussed the need to keep areas below deck clear, do not store firewood under decks, maintain retaining walls, etc.
        ii. The Team discussed that enclosing the underside of decks with a Hardi-plank- type product may protect the underside better from fire but will provide a barrier for water coming down through the deck. This has the potential to create a microclimate that would deteriorate the historic wood joists and create a challenge for inspecting the historic wood. Anthony and Associates and Form Works will consider what other potential solutions there may be for the open decks.
    c. Water pressure during a fire:
        i. Boulder does regular pressure checks of the hydrants on-site, however Ron Anthony noted that during a firefighting incident, the pressure will drop and may not be adequate. There is little that CCA can do about this.
    d. Forest Health: Ron Anthony discussed that considering forest health further up from the site is another way to help protect the site that could be discussed with OSMP and other partners.
    e. Alternative privacy: Are there specific plantings or other methods for providing privacy to the cottages from the Trails/Roads?
    f. Building Documentation:
        i. The community buildings have existing as-built drawings.
        ii. CCA is not 100% certain what documentation may exist for the cottages.
        iii. Lidar scanning / photogrammetry: consider methods and results for documenting the existing buildings to provide a means for reconstruction as a worst-case mitigation effort.
    g. Replacement of wood with fire rated wood
        i. CCA has utilized "Hoovered" Wood, which provides a 1-hour rating on several projects on the site (at The Mary H. Galey Cottage and the reconstruction of the building between the Dining Hall and the General Store (construction in progress)). The cost of Hoovered wood should be a consideration.
    h. Property Boundaries: CCA is undertaking a site survey to identify the property boundaries.
    i. Electrical Lines: There are areas where the electrical lines are close to or in trees. Electrical lines are scheduled to go underground in 2023.
    j. Maintenance Timeline: The existing fire mitigation grant work is anticipated to be completed over the next two years. Ron Anthony recommended removing approximately ¾ of all brush and removing limbs from trees up 6-8 feet above the ground as part of the fuels reduction strategy. At first this will appear drastic, but

in a few years there will be regrowth. Recommendations for a continued maintenance plan / guidance moving forward will be developed as part of this Fire Mitigation Project.

6. Additional Items Needed:
    a. Utility Maps:
        i. Gas and Electrical Utility Maps are available and can be provided by CCA
        ii. Hydrant Locations: CCA can mark-up where existing hydrants are located on the site.
        iii. Community Wildfire Protection Plan: Jeff Medanich provided a link on 5/9/2022

End of Meeting Minutes

Respectfully Submitted By:

Natalie Lord, RA, LEED AP BD+C

Principal, Form+Works Design Group, LLC

E APPENDIX: MEETING MINUTES 02

form + works
design group, LLC

Meeting Minutes 02

Project Name:	Chautauqua Fire Mitigation Plan – Phase 1
Project Number:	22-021
Date:	June 21, 2022
Time:	9:00 AM

Attendees:

Shelly Benford	Colorado Chautauqua Association (CCA) CEO shelly.benford@chautauqua.com
Jason Hill	CCA COO jason.hill@chautauqua.com
Bill Briggs	Board Member and Chair of Sustainability Committee william.briggs@ucdenver.edu
Jeff Medanich	CAA Director of Preservation & Sustainability jeff.medanich@chautauqua.com
Ron Anthony	Anthony & Associates woodguy@anthony-associates.com
Natalie Lord	Form+Works Design Group natalie@formworksdesigngroup.com

1. Follow-up on current / continuing fire mitigation efforts discussed at previous meetings/calls:

    a. Fuels Mitigation Work to Date, Planned and Additional Discussions:
        i. Work has continued at CCA to clear out between the Bluebell trail and the cottages as discussed at the May 6, 2022, walkthrough.
        ii. The team discussed the need to create a fuel separation barrier at the south end of the property (where CCA property and OSMP property touch). It was also discussed that CCA needs to be cognizant of the fact that clearing out 75% of the brush and trees in this area, as Ron recommends for effective fuels removal, would create the appearance of a path that would need to be controlled to prevent visitors from traveling through that area.

    b. Trees, Ladder Fuels, and Gutters:
        i. Ron discussed the idea of reducing ladder fuels on the site. Ladder fuel is a firefighting term for live or dead vegetation that allows a fire to climb up from the landscape or forest floor into the tree canopies. Once in the trees, fire can jump when trees are in close proximity to structures and/or when falling embers and/or pinecones catch and fall, landing on/near

structures. From here the biggest risk is debris in gutters catching on fire and igniting the roof. Ron discussed the idea of eliminating gutters and downspouts. Natalie discussed that this would require French drainage systems and/or regrading efforts around the buildings to mitigate water infiltration risks to the historic buildings.

1. **Natalie will research any modern roof detailing solutions that have been developed to mitigate fire risk.**
2. The goal is to keep the fire on the ground by reducing ladder fuels. This is typically done by creating a perimeter boundary. The team discussed that the challenge of this is the adjacent property management / ownership relationships and changing the visual experience of the historic district. Ron referenced the detriment to the historic experience by creating a 100-foot fire break around the property.

ii. Ash – The team discussed that there are approximately 140 ash trees on the CCA site and according to an expert arborist it was likely at least 100 of these trees would die due to emerald ash borer. The team discussed that CCA may want to consider moving ahead with preemptive removal of the ash not only as a fire mitigation effort, but also structural risk to the historic buildings / features.

iii. Highly flammable trees and plants – Ron discussed the need to locate and identify any highly flammable trees and plants and ensure that they are removed within approximately 8 feet of buildings. He mentioned that juniper was one such species that should be removed. Consideration could be given to providing "fire resistive" landscaping recommendations for replacing plants close to structures.

1. A "Landscape Design Guidelines" could be created for private cottage owners to outline these recommendations. Chautauqua uses CSU's Firewise Plant List and this has been provided to private cottage Owners.

iv. Mowing of OSMP Property- The team revisited the previously discussed need to get an agreement in place to allow mowing of OSMP land that borders Chautauqua property. OSMP has communicated with CCA that in the event of an oncoming fire their crews would then mobilize to mow these areas, but as we have learned from the recent Marshall fires, there would not be time during a similar threat to CCA. Ron suggested that communication with OSMP should delineate the understanding of habitat concerns that OSMP has for mowing, but that these need to be balanced with safety for fire fighters and to allow adequate time for people to escape the area.

c. Undergrounding of electrical: It was discussed that this project will move forward in 2023. It will be a phased project utilizing directional boring with a series of potholes. It will be a multi-year effort.

2. Site survey:
   a. CCA confirmed that they are undertaking a site survey to fully understand the exact boundaries of the property. This will be instrumental for mapping out

private ownership boundaries, OSMP, and City owned property. Once completed more formal agreements can be discussed at managing and mitigating fuels on the CCA and adjacent properties. CCA is uncertain when this project will happen as it is dependent on grant funding.

3. Meeting with Perimeter Solutions:
    a. Wes Bolsen, sales with Perimeter Solutions and Brian Oliver, Boulder Fire joined the team to review / discuss the "Fortify" product.
        i. Fortify is an uncolored spray applied product that can be applied to vegetation, power poles, etc. as a fire retardant.
        ii. Wes explained that they recommend application to utility poles, surrounding vegetation and directly on high value buildings.
        iii. The product can be utilized as a pre-treatment and/or to establish a fire line during an oncoming fire. The product consists of white phosphates, so after application there would be a faint white coating as a temporary visual impact, but allegedly a significant rain event would completely remove the product.
        iv. Wes reviewed the "lifespan" of some of the various fire-retardant solutions on the market:
            1. Foam products would likely last between 10-20 minutes so are best utilized when applied immediately before contact with a fire.
            2. Gel products can typically last between 1-2 hours, so again, are best utilized when applied nearly immediately before contact with a fire.
            3. Fortify on the other hand could last up to 3-5 months or until a significant rain event.
        v. Application success: Fortify works on cellulose structures, i.e., wood poles, vegetation and wood structures. It does not work/stick to glass, metals, or stucco.
        vi. The phosphates will burn at approximately 800°C, therefore a high heat fire (like the Marshall Fire) is going to burn through Fortify.
        vii. Wes discussed that some of his clients have retained a trained application team/company that stores the Fortify product and could be deployed in the event of an oncoming fire. The costs of this can range from $3,500 – 10,000/ day
        viii. Application and cost: Wes said that one gallon of Fortify will cover approximate 100 Square Feet of Area for a building and costs about $9 / gallon. The product is applied by spraying the top of a structure/element and letting it run down. For boundary applications, to create a 10-foot wide by one mile long boundary he said it would require about 1,000 gallons of Fortify. For vegetation they recommend two gallons per 100 square feet.
            1. In Arizona applications his clients typically apply the product in March – June and it will last to the first major snow.
            2. The product takes 1 – 1.5 hours to dry, but it is effective immediately at retarding fires. This was demonstrated in the parking lot. It is recommended that you keep pets away for at least

a day just so they do not get the product on their feet and track around. The product is allegedly safe for humans, plants, and animals.

3. Fire departments that utilize Fortify can mix it directly into the Tenders (a firefighting apparatus that transports water) utilizing the recirculation function and it would typically take about 5 minutes to mix in the tank before being able to spray.

b. The demonstration on-site was helpful in seeing the application process and resistance to fire that Fortify provided on mulch, dried grass, and paper. Post-demonstration thoughts / discussions:
   i. Ron noted that there was a sticky feel to the product on the dried grass and that the paper treated with Fortify seemed to be more brittle than the untreated paper sample. He is wondering about any structural changes to the cellulose that Fortify may have.
   ii. Ron also noted consideration should be given to the impact to fire department equipment. Can it be easily cleaned out of equipment and lines?
   iii. Rainfall is very unpredictable in Colorado. It would be difficult to determine the application time period that would be most effective, and it is possible an application would be washed away nearly immediately. wasting the investment.
   iv. Other thoughts from CCA: After review of the product, CCA believes it would be best if the fire department had a means of applying it in case of an imminent danger. With Boulder rainfall it would be difficult for CCA to time the application that would make the investment worthwhile.

4. Next Steps:
   a. Ron will meet with Boulder fire to talk to the emergency manager more in-depth and get a better sense of the County and City Protection Plan.
   b. Natalie and Ron will begin drafting the fire mitigation document for review with CCA.

End of Meeting Minutes

Respectfully Submitted By:

Natalie Lord, RA, LEED AP BD+C

Principal, Form+Works Design Group, LLC