FREEZE CREEK PROPERTY
NATURAL RESOURCE ASSESSMENT AND FORESTRY ACTIVITY PLAN

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General Property Description

The Freeze Creek property owned by the Leick family consists of 40-acres in northcentral Utah, situated within the incorporated Emigration Canyon Metro Township. The property can be reached by foot or mountain bike travel via a 1.0-mile single-track trail originating at a parking lot administered by the Emigration Improvement District along Pine Creek Canyon Road. The property is zoned by Salt Lake County as *Recreation, Vacant Lot – Residential*, and occupies a wooded, mountainous setting.

The property legal description is as follows: SE ¼ of SE ¼ Section 20, Township 1N Range 2E, Salt Lake Meridian, Salt Lake County. The latitude and longitude of the middle of the property is (40.79986, -111.74258). The elevation at the middle of the property is 6,580 feet above sea level (ASL).

Freeze Creek, a perennial stream, originates on the property from springs. It is recognized as a tributary of Emigration Creek, a classified *Waters of the State*.

The property exists within the Upper Emigration Creek Sub-Basin located along the western flank of the central Wasatch Mountain Range in the Middle Rocky Mountain physiographic province.

The nearest weather station to the property records a January minimum average temperature of 34.2 degrees F., and an average July daily maximum temperature of 88.7 degrees F. The mean annual temperature is between 44 to 46 degrees F. The frost-free growing season ranges between 80 and 100 days. The mean annual precipitation amount is between 20 and 30 inches.

The Wasatch Range is home to a wide variety of plants and animal species. The topographic relief of the mountain hillsides and creek accommodates diverse vegetation communities on the property. Forest and woodland tree species include white fir (*Abies concolor*), quaking aspen (*Populus tremuloides*), Rocky Mountain juniper (*Juniperus scopulorum*), bigtooth maple (*Acer grandidentatum*), Gambel oak (*Quercus gambelii*), Douglas hawthorn (*Crateagus douglasii*), water birch (*Betula occidentalis*), and narrowleaf cottonwood (*Populus angustifolia*).

Forest management on the property is affected by the Salt Lake County - *Foothills and Canyon Overlay Zone* (Title 19, Chapter 19.72). Intent to alter living trees on the property must comply with processes described in the ordinance.

The property is categorized as high value spring and fall-season habitat for mule deer, elk, moose cougar and black bear. A fishery is not associated with Freeze Creek.

The Upper Emigration Creek Sub-Basin has been historically used for ranching, limited farming, quarrying, and summer retreats. In the last forty years, year-round urban residential development has increased within the sub-basin.

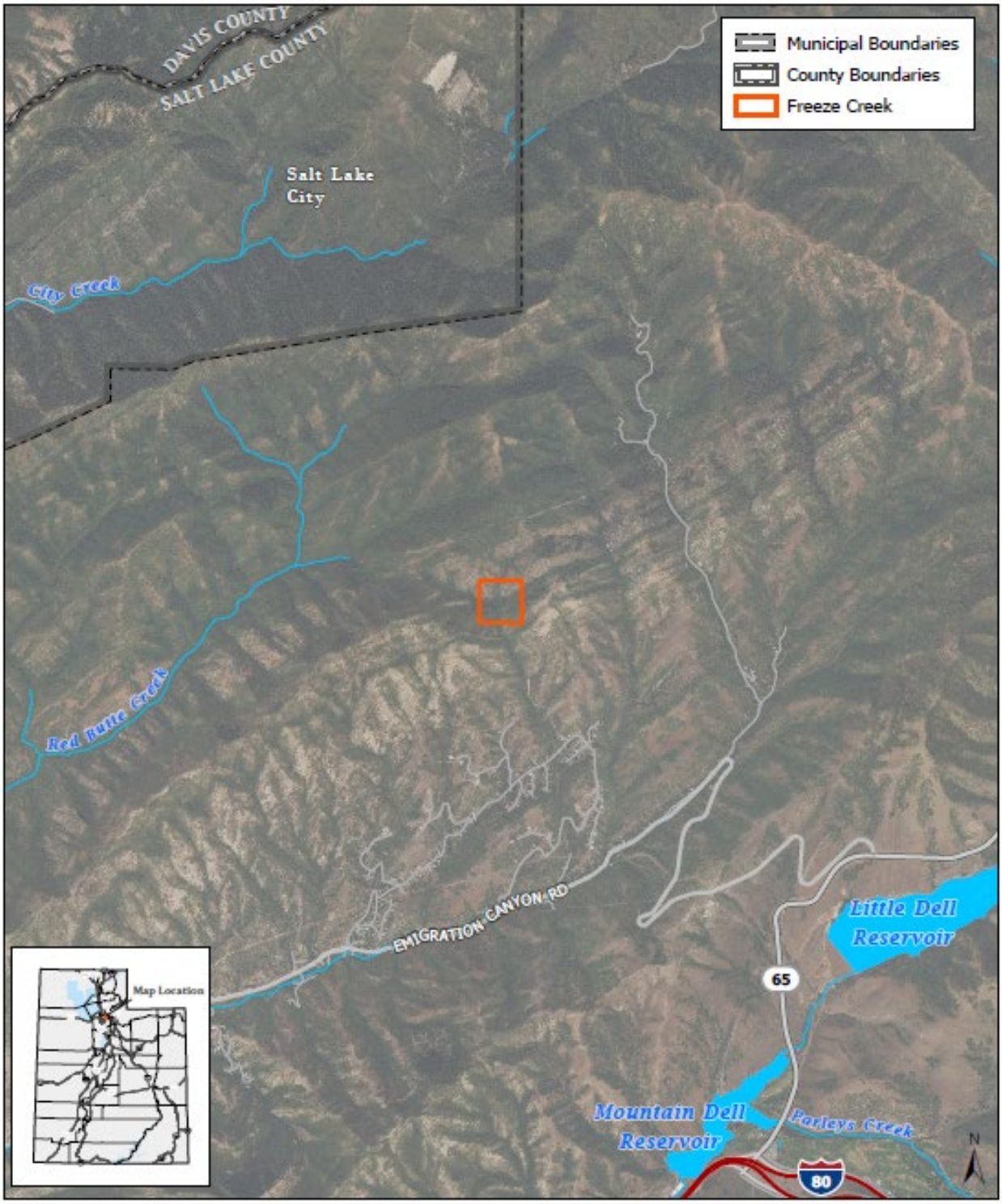
Wildland fire response, preparation, and prevention is provided by the Unified Fire Authority, through its tax collection authority. The agency maintains Fire Station #119 at 5025 Emigration Canyon Road.

Adjacent federal land holdings are managed and administered by the USDA Forest Service, Uinta-Wasatch-Cache National Forest, Salt Lake Ranger District. As well, land administered by Salt Lake City Public Utilities is situated east and south of the ownership. The Emigration Improvement District holds land northeast of the ownership.

Historical vegetation management is not evident on the private land ownership or adjacent public lands, aside from livestock grazing which is no longer a permitted use.

The following table summarizes the vegetative cover classifications for the Freeze Creek property.

Resource Component	Total Acres
Forested Acres	**6.5**
Woodland Acres	**2.5**
Rangeland Acres	**31**
Total Acres	**40**



Freeze Creek Property Overview

Scale: 1:50,000

0 0.5 1 1.5 2

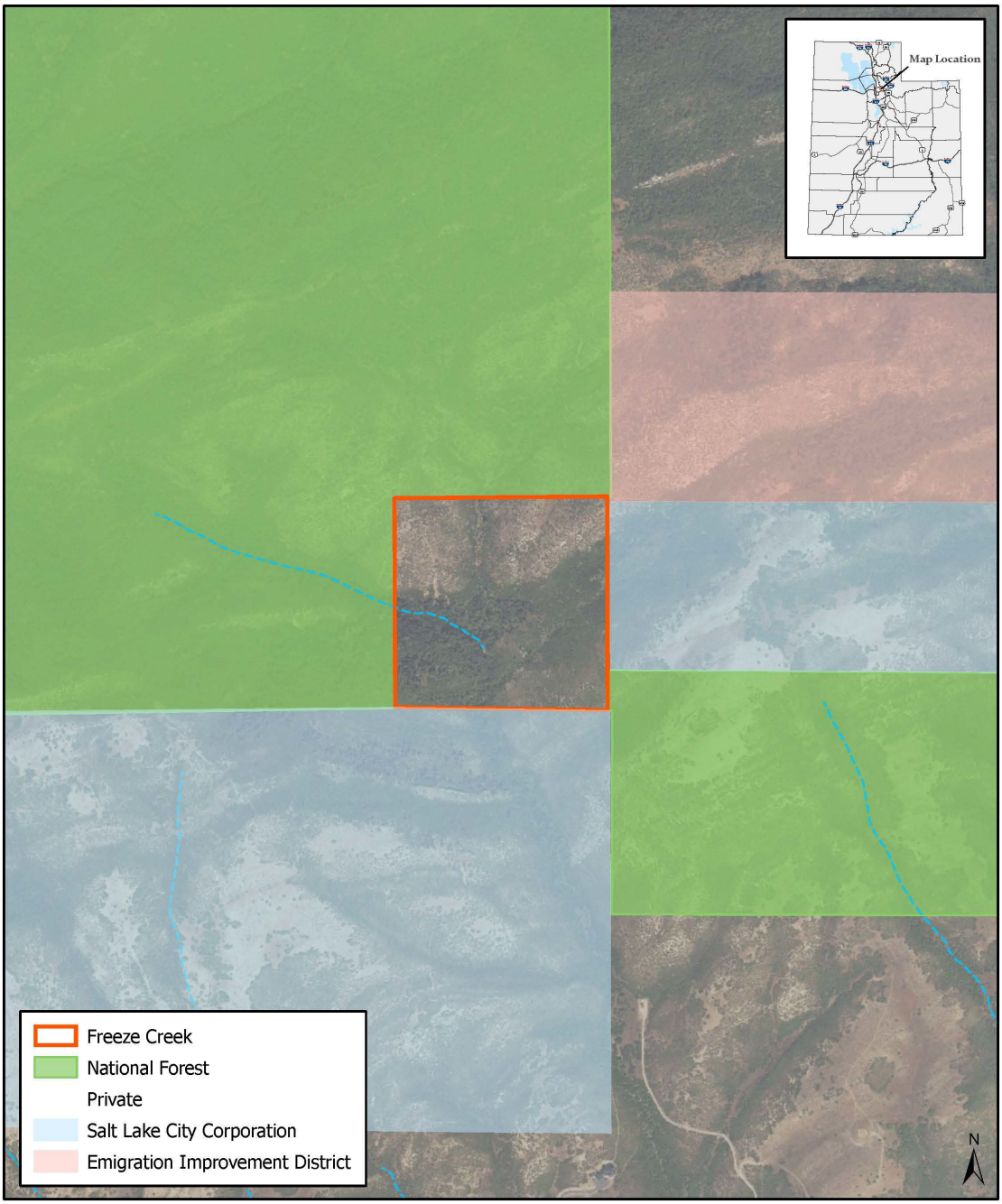
Miles

Freeze Creek Detailed

Scale: 1:3,000

0 250 500 1,000

Feet



Freeze Creek Land Ownership

Scale: 1:10,000

0 500 1,000 1,500 2,000

Feet

Landowner Objectives/Desired Future Condition

"I purchased this property as a retreat for family recreation. But as a researcher from a long line of farmers, my curiosity naturally desires to explore the role of silviculture in watershed conservation while validating the economic incentives of sustainable agroforestry. I believe nurturing proper soil ecology for biological diversity and the cultivation of drought-resistant species can replenish aquifers while supporting organic permaculture. I hope to facilitate research on silviculture practices managed specifically to minimize evapotranspiration and preserve snowpack later in the season." – Ryan Leick, Landowner - 2021.

This *Forestry Activity Plan* documents natural resource management activities for the property, over the next 10-year period ending in 2032.

Division Purpose

The purpose of the Division of Forestry, Fire and State Lands' (DFFSL) Forest Stewardship Program is to encourage long-term stewardship of non-industrial private forestlands, by providing technical assistance to private landowners toward their active management of forest and natural resources. The recommended management activities, during the next 10-year planning period, may sustain forestland conditions and move toward the landowner-defined *Desired Future Condition*.

The Division received funding to write this plan through the USDA Forest Service - State and Private Forestry Program, a federal activity re-authorized by Congress within the *Agriculture Improvement Act of 2018*.

Landowner participation in the Forest Stewardship Program is voluntary and withdrawal can be requested at any time.

Planning technical assistance offered through the Forest Stewardship Program may enhance access to federal and state cost-share programming, including USDA – Natural Resources Conservation Service (NRCS) assistance.

This plan supports the goals and objectives outlined in the *Utah Forest Action Plan 2020*. The land base and is located in the *Wasatch Front Priority Area* defined by the DFFSL.

Plan Elements- Description and Assessment

Soil and Water

Soils

Soil information was collected from the USDA-NRCS *Web Soil Survey*. Two soil units were identified within the boundaries of the property.

The *Brad very rocky loamy sand* soil type covers approximately 10 acres, situated in the northern quarter of the ownership. The *Emigration very cobbly loam* covers the middle and southern 30 acres of the property.
Both soils are exhibiting a well-drained character resulting from weathered sandstone and limestone. Both soils are shallow loams 12 to 20 inches thick above an unweathered bedrock layer.

According to the *Web Soil Survey*, the soil types suggest the prominence of two primary ecological cover types – sagebrush and curl-leaf mountain mahogany. It may be that current status of white fir forest on the property is a reflection of wildfire suppression since the settlement era.

Water

The property is assigned to Hydrologic Unit Code (HUC8) UT16020204. Water in creeks, springs and underground flow are recharged primarily from winter snow accumulation. Rainfall also adds to water resources.

Three springs exist on the property. Within the current drought cycle, two are not producing water, while one is rendering surface flow in the spring and summer season.

Freeze Creek collects and transports water which flows to Emigration Creek.
Waters descend to the Jordan River and eventually deposit into the Great Salt Lake.

Records suggest that underground water diversions and surface wells may be associated with the property. (*Emigration Creek TMDL*, Utah Division of Water Quality, 2011)

Water rights are not yet assigned to Freeze Creek property ownership.

Hydrologic processes (as relates to forest resources) on the property is influenced by species compositions, canopy structure and tree distribution patterns over time.

The on-site hydrologic processes are a result of water interception, infiltration into the soil, evapotranspiration, soil moisture storage and hillside erosion. A shallow bedrock layer exists on the property and throughout the Upper Emigration Creek Sub-Basin. The *Emigration Creek TMDL*

identifies the potential for three or four overlapping soil constraints on the property which affect watershed values.

Utah's Forest Water Quality Guidelines - A User's Guide for Landowners, Loggers and Resource Manager's – are voluntary measures that can be implemented to better protect the state's water quality where qualifying forest practices are being implemented. The *Guidelines* booklet is included in the Appendix of this plan.

Waterbodies (lakes, ponds, reservoirs)

No open water habitats exist on the property.

Biological Diversity

The property exhibits a biological diversity as reflected in the plant, animal and insect species compositions comprising five (5) terrestrial *Key Habitats* acknowledged by the UDWR. The key habitats that exist on the ownership are described in the **Fish and Wildlife** section of this plan. The **Resource Management Recommendations** identified in this plan supports the continuation of native species richness and genetic variability currently existing on the property.

Intriguing studies have been performed in the canyon setting north of Freeze Creek – Red Butte Canyon. Much can be learned and assessed by examining the *Red Butte Canyon Research Natural Area* website; https://redbuttecanyon.net

Published researched, referenced on the website, indicate ecological drivers and life form expression that may have correlation with the Freeze Creek property.

Range

Range resources are abundant and persist on south, west and southwest facing slopes on the property. Sagebrush (*Artemisia spp.*), bitterbrush (*Purshia tridentata*), rabbitbrush (*Chrysothamnus* spp.), mountain snowberry (*Symphoricarpos oreophilus*), diminutive Gambel oak scrub (*Quercus gambelii*), Utah serviceberry (*Amalanchier utahensis*), curl-leaf mahogany (*Cercocarpus ledifolius*), snowbrush ceanothus (*Ceanothus velutinus*), bunchgrasses and associated forbs (wildflowers) in varying combinations are plant species that comprise the rangeland cover type. The rangeland type includes elements of the *Mountain Shrub Key Habitat.*

Rangeland plants generally tolerate harsh growing conditions influenced by soil characteristics, full sun exposure, competition between drought-tolerant species, precipitation timing and

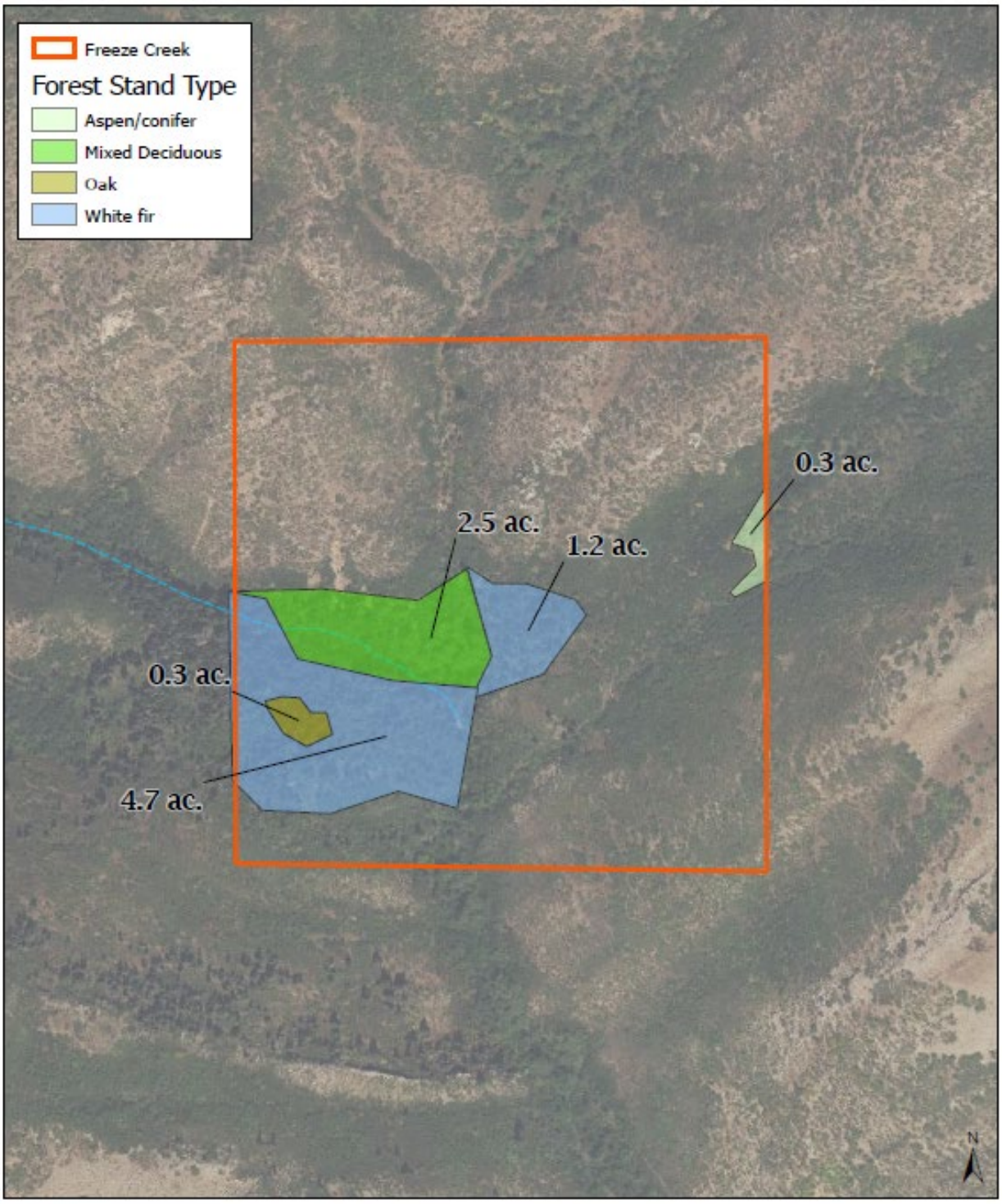
retention, and humidity. Disturbance agents, both biotic and abiotic, can also direct rangeland plant trends. Wildfire and its relation to Gambel oak and bigtooth maple regeneration and stature are observed on the property, as influenced by the 1988 *Emigration Wildfire*.

Browsing wildlife, especially Shiras moose may utilize rangelands year-round. Spring and fall-season forage is rendered for mule deer and elk on south and west-facing slopes that offer diminished snowpack. Gamble oak yield acorn crops on favorable years to black bear in the autumn season. Several shrub plants provide fleshy fruit to wildlife and birds. Access to springs and nearby flowing water provides important habitat for pollinators and wildlife dependent on the range resources.

Rangelands can be negatively impacted by establishment and expansion of non-native, invasive plant species.

Assessments and recommendations for rangelands that serve as wildlife habitat can be obtained by the UDWR, Central Region Office, 1115 N. Main Street, Springville, UT 84663 (801) 491-5678.

Additionally, advice concerning rangeland resources management can be gained through the USDA Natural Resource Conservation Service (NRCS) – Tooele Field Office, 185 N. Main Street, Tooele UT 84074, (435) 882-3018.



Freeze Creek Forest Stands

Scale: 1:4,000

0 500 1,000

Feet

Forest Resources

Trees and associated understory plants comprise forest vegetation resources. Varying combinations of forest plants are determined by sunlight intensity, available soil moisture capacity, inter-plant competition, age-related tree vigor, and an array of tree health drivers – in some part, or directly influenced by terrain features, soil chemistry and physical attributes, invasive species, climate, human manipulation and regenerative processes.

Forest and woodland resources on the property express structural, species and age-class diversity and richness.

Native shrubs and wildflowers (forbs) abundance across the property suggest that pollinators have effectively contributed to fruit and seed production which has enabled plant migration.

The most impactful recent occurrence on the property was the September 1988 *Emigration Wildfire*. That natural disturbance driver influenced aspen regeneration, oak-maple regeneration and mature and juvenile conifer tree mortality (likely dozens) on the eastern half of the property. The resulting vegetative responses to wildfire, expressed on the ownership, is in accordance with researched and published regional forest ecology.

There are two white fir dominated stands on the property. An aspen stand is situated on the eastern edge of the property. There is a diverse riparian zone associated with Freeze Creek which connects with a deciduous tree-dominated wetland forest type in proximity to water spring sources. A small but structurally unique grove of Gamble oak resides on the ownership.

A modified quick plot stand examination was conducted in May 2021. Botanical composition and structural attributes were noted.

White Fir Stand 1

This 1.2-acre stand is located east of a gully in the middle third of the property. It occupies a west-facing aspect with a mid and low slope position expressing thirty-two (32) to sixty-five (65) percent slopes at approximately 6,500 feet ASL. It's comprised of scattered, mature white fir trees with varying combinations of forb and grass understory plants including heartleaf arnica, mountain sweetroot, Utah sweetpea and waterleaf. Understory shrubs are significant and include snowberry, Oregon grape, kinnikinnick, bigtooth maple, Saskatoon serviceberry, and chokecherry. Fruit bearing shrubs are being sustained by native pollinators. The stand expressed an "open" character, allowing sunlight to reach the forest floor as shadows migrate underneath the white fir crowns. Fifty (50) to seventy (70) percent of open blue sky is observable in the daylight hours through the conifer tree canopy. Occasional remnant live mature aspen trunks are present, but have been in regression for some time due to lack of significant widespread disturbance and progressive sunlight filtering. The estimated basal area of mature white fir trees is around 70 square foot per acre. Estimated average trunk diameter at breast height (DBH) is 15 inches. The stand has been experiencing white fir tree blowdown for some time based on the scattered tree trunks deposited

across the stand. Remnant white fir lower trunks and root crowns of toppled trees demonstrate wood decay fungus tissue disease.
Many standing mature white fir exhibit previous damage from fir engraver beetle as tree tops are forked in structure. The largest tree encountered in the stand was a 35-inch DBH white fir with one-half of its crown blown down by wind at the junction of codominant leaders where included bark created a weak union. White fir tree seedlings and saplings are minimal within the stand. Available filtered sunlight is rendering advantage for grasses, forbs and shrubs on the forest floor, perhaps due to the sites "drier" quality. Evidence of historic fire is present on the uphill margin of the stand – likely the 1988 *Emigration Wildfire*. Charring within the stand is not widespread, but perhaps indicative of an isolated single tree lightning strike or a small spot fires. Game trails are evident within the stand. Previous tree harvest is not apparent.

White Fir Stand 2

This 4.7-acre stand is influenced by its east-facing aspect, which likely invites persistent spring snowpack guarded against the late afternoon sunlight. Twenty-five (25) to forty (40) percent of open blue sky is observable in the daylight hours through the conifer tree canopy. This mature white fir stand exists on a mid to low slope between nine (9) and forty-eight (48) percent value at an elevation of 6,575 feet ASL. The basal area of the stand is around 150 square foot per acre. Compared to White Fir Stand 1, this site contains many more small to mid-diameter class trees that boost its basal area value substantially. Average DBH is 12 inches. All dominant and co-dominant trees within the stand are white fir, which is the climax plant community tree type. The largest tree encountered has a DBH of 23 inches and a height of 80-feet. The understory is comprised of Fendler meadowrue, common yarrow, Utah sweetpea, and shade-tolerant grasses. Kinnikinnick, Oregon grape, bigtooth maple, Saskatoon serviceberry, snowberry, Wood's rose, and chokecherry shrubs also occupy. An occasional aspen stem or trunk can be observed in the stand, though the species is demonstrating a significant regression. Very few white fir saplings and no seedlings were noticed at observation points. Previous tree harvest is not apparent.

Freeze Creek Forested Wetland and Riparian Zone

In proximity to two water springs situated at the toe of three slopes, eroded deposited soils and modest ground angles have enabled the presence of mature narrowleaf cottonwood, abundant river birch, snake grass Equisetum, riparian grass-like plants and forbs to combine in what appears to be a small wetland forest approximately 2.5-acres in size. Wetland delineation by a qualified ecologist has not yet occurred. The site is depicted on the *Forest Stands Map* as *Mixed Deciduous*.

The opposing hillsides and mature white fir trees render late-morning and late-afternoon shade to the site, potentially conserving soil moisture. The cottonwoods appear overmatured and exhibit scaffold branch failure, likely attributed to wood decay and reduced tree vigor. Terrain influenced wind may play a role in branch break as well. Cottonwood tree regeneration is limited.

At the lower end of the wetland forest, water erosion appears evident. It is not known if water erosion is an ongoing process or a periodic reoccurring event during high water years. Localized creek headcutting has also occurred downslope in the Freeze Creek riparian channel as well.

The Freeze Creek Trail runs along the creek corridor taking advantage of the cool, shaded setting. In close proximity to the flowing water channel - narrowleaf cottonwood, river birch, Douglas hawthorn, boxelder, red-osier dogwood, shrub willow, and Wood's rose stabilize the creek banks at the southern boundary of the ownership. The riparian zone is rather narrow by way of riparian species reach from the water's edge. However, the adjacent upland slopes are also densely occupied with bigtooth maple, Gambel oak, currant, blue elderberry, snowberry, Saskatoon serviceberry, chokecherry, ninebark, and occasional Rocky Mountain juniper, aspen and white fir trees. Increased humidity near Freeze Creek has maintained plant vigor during the dry summer season compared to more sun-exposed upland sites. The riparian forest and creek corridor appear stabile and well stocked with vegetation. The shallowness of the soil above bedrock may be a compounding factor of observed headcutting erosion.

Aspen Stand 1

This stand is situated on the east boundary of the ownership at 6,750-foot ASL elevation. It's comprised of aspen trees regenerating from root masses as a result of the 1988 Emigration Fire. Large remnant aspen trunks are not present on the forest floor suggesting that the wildfire consumed most of the previous large woody material. The aspen on this site are the dominant tree species. The tallest heights of trees are around 30-feet. The average DBH of the stems is between two (2) and three (3) inches. The tree canopy blocks around 60% of available blue sky. Grasses, Fendler meadowrue, Utah sweetpea, Saskatoon serviceberry, chokecherry and bigtooth maple comprise the understory and stand margins.

Natural thinning is occurring within the stand, driven by competition for sunlight, and perhaps soil moisture. Some aspen are declining and dying as a result of being neglected from direct sunlight by companion stems. Aspen trunk canker disease is observed throughout the stand as well. The bigtooth maple may become an impactful competitor in the future if severe drought persists – as observed within other mixed deciduous stands in northern Utah. The stand's west- southwest aspect exposes the aspen to warm updraft summer winds which may favor the more drought-tolerant bigtooth maple.

Elk scat and beds were observed in the stand during the spring season. The stand extends onto the adjacent public land (Salt Lake City Public Utilities) to the east. A water spring is situated downhill and south of the aspen stand. The spring may have previously discharged water more abundantly and sponsored a small landslide some years after the wildfire. The localized spring exhibits other sapling species of trees related to aspen – narrowleaf cottonwood and willow shrub.

Matured Oak Grove

This 0.3-acre grove is situated in the middle of the White Fir Stand 2. Very mature Gamble oak with unique physical structures provide aesthetic contributions to the property. Several trunks and scaffold branches exhibit wind or snow load breakage. The understory is occupied by forbs, grasses and shrubs. Also within the understory are seedling and sapling white fir. To sustain the presence or Gambel oak, it is recommended that cleaning-weeding work be done to kill all encroaching white fir within the grove to maintain adequate long-term sunlight interception for the oak. The cleaning-weeding will likely take but one work day to accomplish, if residual material is cut and scattered on the ground. If conducted in the winter, removed trees might be considered as exportable Christmas tree stock as well.

Agroforestry

The landowner has expressed interest in collecting/cultivating Saskatoon serviceberry fruit, chokecherry fruit, blue elderberry fruit, and edible mushrooms within and adjacent to forest and woodland overstory trees. Late winter sap collection from maple trees is being examined for syrup production. Honeybee hives have been placed on the property for honey and wax production. Onsite processing of biochar soil amendments from woody plant residue is being investigated. The property owner has expressed potential for designing and implementing a multi-story food forest garden which may include non-native, introduced vegetables, vines, stone fruit trees, forbs and greens. All of these might be considered specialty crops and products. Space to conduct these activities may be sited and expanded through understory woody plant removal (cleaning-weeding) and residue management. Existing forest and woodland overstory may be physically manipulated to foster multi-story cropping system(s). White Fir Stand 2 and Rangeland are being considered candidate sites. Persistent observation and monitoring for the effects of introduced, non-native plants should accompany the experimentation of food forest gardening. Plants should be considered and selected to avoid invasive, weed plant potentials and escapes, including seed sources and purity.

As well, seedling trees may be planted to someday modify sunlight intensity (shadowing) and snow deposition through tree crown development - to benefit understory agricultural crops and soils. This endeavor may be employed on favorable habitat microsites on the southeast quarter of the property, where the 1988 *Emigration Wildfire* occurred.

The proposed agroforestry endeavors are novel and adaptive management will likely be employed to optimize the results.

The USDA Natural Resource Conservation Service is assisting the landowner through a Conservation Activity Plan which further explores the agricultural commodity potential(s) and activities. Assistance in these agricultural endeavors may be formulated through *NRCS conservation practice standards and supporting documents.* Landowner enrollment and direct implementation of practices are expected.

Aesthetic Quality and Desired Timber Species

The forest and woodland resources on the property offer diversity to the majority rangelands. Mature large trees may be an outcome of fire suppression that has likely occurred since the settlement era. The large trees offer shade and physical presence which increases its value as habitat and recreational potentials. Views are limited due to the creek-canyon landform, but on-site and visiting wildlife and insect resources are abundant and diverse. The properties Freeze Creek resource and water springs add to its value as a destination setting. The plant expression on the property appears adequate to the potential of the Emigration Canyon area. Invasive plants species remain an ongoing nearby threat to aesthetic and ecological resources.

Commercial timbering is not feasible due to the lack of roadway access and needed heavy equipment to conduct operations. The white fir stands are relatively small and volumes are not sufficient for third-party commercial interests in wood fiber. Wood decay diseases may persist indefinitely and expose large standing trees to windthrow potential. Wood decay diseases affecting white fir may diminish the volume and percentages of bole wood suited for processing into dimensional lumber.

White fir is adaptable as evident on the sites it occupies. White fir as the expected climax forest tree type is fulfilling its ecological trajectory. There may be potential to introduce (artificial regeneration) Douglas-fir *(Pseudotsuga menziesii var. glauca)* and ponderosa pine *(Pinus ponderosa)* to some sites, but experience and strategies will need to be developed to support the endeavors. Because no native ponderosa pine forests exist nearby, seed/genetic sources will have to originate from alternative locations. Some Douglas-fir seed/genetics may be introduced from stands elsewhere in Salt Lake County. Protecting transplanted trees from browse damage and persistent drought mortality will need to factor into management schemes.

Recreation

For some time, visitors to the forestland have in mostly been motivated by recreational pursuits – hiking in a natural setting, winter snowshoeing or skiing, wildlife and botanical viewing, and/or hunting of game animals. The primary trail on and leading to the property have likely been improved voluntarily by people residing in the Emigration Canyon community. The property and its resources are not well known or published. The owners are enjoying the property as a recreational destination that involves camping, observing nature and outdoors play. On-property work, in some forms, are valued as “recreational escape” enabling quality family time together as well.

The single, established on-property trail may gain some improvements. New trails may be established to facilitate fire breaks, emergency responder access, recreation and property management work. Recreation may impact riparian resources negatively, so actions should be assessed for unintended outcomes.

Recreation may increase or develop more broadly as the owners and guests become connected to the land. Amenities such as equipment storage caches and non-permanent tents/yurts may enable increased recreation and longer-duration stays.

Wood and Fiber Production

Woody forest plants are accumulating mass at varying rates, influenced by soil water quantities and temperatures/humidity regimes affecting spring-season terminal leader and lateral branch growth and ring wood diameter. Wood tissue accumulation is directly correlated with leaf photosynthesis and cellular respiration. Net-positive energy conversion and storage enables productive accumulation of chemicals that comprise plant tissues and tree specimen survival.
Wood decay diseases are abundant, affecting tree longevity and structural capacity to remain standing. Wood decay diseases reduce lumber quality and durability.

White fir wood fiber will begin to be utilized on the property for constructing small structures and amenities.

Deciduous (oak) wood may be used as feedstock (fungal inoculation sites) for cultivating edible mushrooms.

Wood may be collected and use as heating and cooking fuel.

Limited equipment access to the property will prolong the processing timelines and movement distance of wood as a local product. Most processing will be conducted by hand using small, portable tools to which personal injury potential must always be mitigated.

Fish and Wildlife

Wildlife occurring in Utah is a public resource of the state. To that end, the UDWR is charged with the management of wildlife and also aids and partnerships with private landowners and public land administrators where wildlife and habitat is a concern. Wildlife resources occurring in Salt Lake County are administered by the Northern Regional Office of the UDWR located at 515 E. 5300 S. Ogden, UT 84405, (801) 476-2740.

Fostering and sustaining wildlife populations is a function of managing natural resources on the property.

The UDWR has identified within the *Utah Wildlife Action Plan 2015-2025*, *Key Habitats* observed on the property. They include; 1) *Aspen-Conifer Forest*, 2) *Gambel Oak*, 3) *Aquatic – Forested*, 4) *Aquatic – Scrub/Shrub*, and 5) *Mountain Shrub.* A summary for each habitat and potential threats are included in the Appendix.

There are many species of wildlife that utilize the different habitat types on this property. Some are seasonal visitors while others remain year-round. Mule deer, elk, moose, foxes, gophers, cougars, black bear, mice, porcupines, coyotes, bobcats, rabbits, bats, skunks, squirrels, marmots, woodrats, raccoons, marten, fishers, mink, weasels and voles are common across the property. Beavers don't appear to be present. Snakes, salamanders, frogs and lizards are likely present. Songbirds, game birds and raptor birds are observed across the property.

Aspen-Conifer Forest Habitat

These *Key Habitat* sub-types occupy the property and are designated as:

Inter-Mountain Basins Aspen – Mixed Conifer Forest and Woodland - Low Elevation
Rocky Mountain Aspen Forest and Woodland

Large ungulate game species, predators, game bird species, raptors, songbirds and small mammals utilize this habitat for food and cover. Forest successional status and tree, shrub and forb stratum vary across the ownership.

Gambel Oak

These *Key Habitat* sub-types occupy the property and are designated as:

Rocky Mountain Gambel Oak-Mixed Montane Shrubland – Continuous
Rocky Mountain Gambel Oak-Mixed Montane Shrubland – Patchy

Larger continuous patches of Gambel oak as well as smaller populations intermixed on drier sites. Gambel oak habitats are observed to include companion bigtooth maple trees. Brushy growth forms of Gambel oak are utilized by big game and provide habitat for birds and rodents. Young oak pole stands provide sites for foliage-nesting birds. Mature growth forms provide acorn yields for squirrels, wild turkey, elk, deer and black bear. New, tender sprouts of Gambel oak are a major forage species for moose, deer and elk.

Aquatic-Forested

This *Key Habitat* is characterized by woody vegetation greater than 6-meters in height, commonly found around the margins springs and creeks. Narrowleaf cottonwood and water birch (Mixed Deciduous stand) is present on the property and contribute to this habitat type. This key habitat appears to be proximate to emergent wetland understory plants that tolerate long periods of soil saturation. Browsing ungulates, rodents, raptors and songbirds will utilize the vegetation as important food and cover. Riparian zones are comprised tall woody vegetation as well. Companion shrub species also provide shading to maintain cool creek temperatures and water oxygen content.

Aquatic-Scrub/Shrub

This *Key Habitat* is characterized by woody vegetation less than 6-meters in height, and can include those areas near flowing-water resources. Habitat sites include both intermittent and perennially flooded areas. Riparian zones are comprised of Aquatic – scrub/shrub habitats. Moose will utilize the willows and dogwood. River birch, thinleaf alder, Wood's rose and red-osier

dogwood also gain use by birds and mammals on the property. These shrub species also provide soil bank stabilization along the creek.

Mountain Shrub
These *Key Habitat* sub-types occupy the property and are designated as:

Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland
Rocky Mountain Bigtooth Maple Ravine Woodland
Rocky Mountain Lower Montane-Foothill Shrubland – No True Mountain Mahogany
Rocky Mountain Lower Montane-Foothill Shrubland – True Mountain Mahogany

Moose, elk and mule deer may use this zone for food and cover especially in the spring and fall seasons. Curl-leaf mahogany, chokecherry, snowbrush ceanothus, serviceberry (Utah and Saskatoon), snowberry, ninebark, blue elderberry and bigtooth maple are the dominant shrub species in this zone. Many songbirds and grouse frequent these areas at different times of the year to eat the berries produced by the shrubs. Black bears utilize mountain brush habitats for forage and cover. The floral habits of the mountain shrub plants are beneficial to native insects seeking pollen and nectar.

Threatened and Endangered Species

No known federally listed threatened or endangered species exist on the property. In the vicinity of the ownership, the following *Utah Species of Greatest Conservation Need* (SGCN) have potential for existence based on mapping published by the UDWR, Utah Conservation Data Center program.

Species	Listing Agency	Status
Utah Ambersnail, *Succinea rustincana*	State	SGCN
Flammulated Owl, *Psiloscops flammeolus*	State	SGCN
Northern Goshawk, *Accipiter gentilis*	State	SGCN
Western Toad, *Anaxyrus boreas*	State	SGCN
June Sucker, *Chasmist horus*	State	SGCN
Northern Leopard Frog, *Lithobates pipiens*	State	SGCN
Bald Eagle, *Halaeets leucocephalus*	State	SGCN
Cross Snaggletooth, *Gastrocoptera quadridens*	State	SGCN
Kit Fox, *Vulpes macrotis*	State	SGCN
Black Swift, *Cypseloides niger*	State	SGCN
Columbia Spotted Frog, *Rana luteiventris*	State	SGCN
Mitered Vertigo, *Vertigo modesta concinnula*	State	SGCN
Coarse Rams-horn, *Planobella binneyi*	State	SGCN
Ferruginous Hawk, *Buteo regalis*	State	SGCN
Western Pearlshell, *Margaritifera falcata*	State	SGCN
Lewis's Woodpecker, *Melanerpes lewis*	State	SGCN
Bonneville Cutthroat Trout, *Oncorhynchus clarkii Utah*	State	SGCN
Mountain Marshsnail, *Stagnicola montanensis*	State	SGCN
Least Chub, *Lotishthys phlegethontis*	State	SGCN

If threatened or endangered species are found during the course of implementing this plan, management activities should be reviewed to insure they do not harm the species, or destroy the habitat they occupy. The landowner is advised to contact the UDWR for direction.

Forest Health and Invasive Species

Tree health can be affected by plant tolerances and intolerances to growing conditions, the effects of destructive insect pests and diseases of woody plants, weather phenomena and the manipulation of vegetation through management and activities that occur in the forest. Forest health involves trees, but also companion plant forms and communities that reside on shared ground.

Drought has and will continue to be a significant agent of forest succession and health in the long-term. Drought is a re-occurring phenomena that has influenced plant communities in northern Utah for millennia. A severe drought is underway in the region and will likely affect perennial woody plants negatively by reducing vigor or defense mechanisms or by causing damage to water-conducting vascular system tissues – including rapid hydraulic collapse.

Variable climate patterns, especially affected by opposing eastern Pacific Ocean La Nina and El Nino, influence the gain of precipitation on the land and temperature averages. Unfortunately, years that either of these climate patterns dominate, the potential outcome is drier conditions than normal. Additionally, the property is situated against the eastern reach of the Great Basin and Range geophysical province where air masses derived from the distant Pacific Ocean can gain influence – elevated air temperatures and single-digit relative humidity can increase plant stress in the short term and elevate evaporative demand over many weeks.

Trees can also be negatively impacted by high-velocity, terrain-driven winds and snow avalanches that can damage or destabilize them. Human disruption or alteration of tree root functions by soil grade changes, trenching and/or root removal can predispose plants to growing condition stressors and subsequent attacks by insect pests and root decay diseases.

Regular, periodic surveys of forest stands on the property will help determine location, extend and potential management response needs to address forest health issues. Forest management action thresholds will be optimized by ongoing forest health monitoring and mapping work.

Forest pathology examines the role of diseases and wood tissue decays affecting trees. Forest entomology examines the role that insects play, especially ones that in disrupt tree tissues and plant survival. Diseases and insects can be secondary agents of drought-induced moisture stress, physical damage to trees and the effects of extreme temperature variations. The following table summarized common, potential forest insect pests and diseases which might impact tree health on the property.

Table: Potential and Active Forest Tree Insect and Disease Pests

Tree Species	Tree Pest(s)	Where to Examine	What to Look For
white fir, *Abies concolor*	Insects; fir engraver beetle, Douglas-fir tussock moth, western spruce budworm, balsam woolly adelgid, white fir needleminer, cutworms	Trunk, branches, buds, leaves	Needle drop, branch and tree top growth reduction and death, seedling mortality.
white fir, *Abies concolor*	Diseases; fir dwarf mistletoe, white fir mistletoe, Annosus root rot, yellowcap fungus, Indian paint fungus, white pocket rot	Trunk, roots, branches	Witches brooms on branches, tree top death, shortened terminal growth
aspen, *Populus tremuloides*	Insects; poplar/aspen borer, clearwing moths	entire tree trunk, branches and leaves	holes emitting sap, woodpecker mining, tree trunk color changes, leaf necrosis, early fall leave drop
aspen, *Populus tremuloides*	Diseases; black leaf spot fungus, trunk decay disease, root and butt rot pathogens, stems cankers,	Trunk, branches, leaves	leaf necrosis, trunk cankers and early fall leave drop, root decay
bigtooth maple, *Acer grandidentatum*	fall cankerworm, and wood boring insects	leaves	moderate to heavy defoliation by caterpillars
Gambel oak, *Quercus gambelii*	fall cankerworm, gypsy moth and wood boring insects	leaves	moderate to heavy defoliation by caterpillars

The following describes the major forest/woodland insect and disease agents that are, or may potentially be active on the property. Additional pamphlets and fact sheets are also included in the Appendix of the plan.

Balsam Woolly Adelgid (BWA)

Adelges piceae (Ratzeburg) is a non-native, invasive insect detected in northern Utah in 2017. It may have existed in Salt Lake County several years prior however. North American fir species have hypersensitive responses to the adelgid's feeding that disrupt the trees' metabolism, damage the vascular system, and reduce radial growth, which can kill the trees (Balch, 1952, Balch et al., 1964). In western North America, BWA is causing the slow disappearance of fir (*Abies*) from some ecosystems (Ragenovich and Mitchell, 2006). BWA insects may locally reach adult life stages in the spring and fall seasons, when storms descending from the Pacific Northwest illicit strong prefrontal winds and post storm winds. These directional winds could effectively disperse

the very small, mobile adults' miles away via air masses moving across forests comprised of true firs. If not already present, BWA has strong potential to exist on the property. The piercing-sucking feeding habit of BWA offers countless feeding points on individual trees. Populations build up quickly in forests.

The property has historically demonstrated and sustained the significant, but limited, white fir conifer component. The uncertainties of the long-term effects of BWA to white fir existence and productive capacity deserve awareness and caution. The current and future growth potential of white fir seedlings and sapling trees may be subject to impacts by BWA. The current and future cone productivity and viable seed yields rendered by mature white fir trees may be subject to impacts by BWA. Invasive species, BWA included, are sometimes referred to as biological wildfire equivalents. The fidelity of the white fir forest type (reproduction and dominance) may become casualty of the BWA – perhaps reflecting unsustainability that could impact the land for many decades. Employed management actions to white fir simultaneous to undetermined but potential negative effects of BWA, could affect resilience of the tree species to persist as it has in the past.

Dwarf Mistletoe

Mistletoes (*Arceuthobium* spp.) are parasitic plants that extract water and nutrients from their host tree. Witches brooms often form on infected branches. Top kill is common. Mistletoes affect tree form. They reduce growth, wood quality, seed production, and life span of host trees. Severe infections may eventually kill trees. Infected trees can increase activity of secondary pests that often attack and kill the infected trees (Hawkworth et al. 1996). Host-specific mistletoe diseases are associated with the white fir tree species, the dominant conifer present.

Fir Engraver

Fir Engraver (*Scolytus ventralis* LeConte) is a native bark beetle affecting white fir mostly, but occasionally subalpine fir. Adults and larvae feed in phloem layer of inner bark. Often trees are top killed although whole trees can be killed if attacked by enough beetles. Attacked trees are generally 5 inches or greater in diameter. Root diseases can be a precursor for fir engraver attack.

Root and Trunk Wood Pathogens

Root diseases are decay fungi that break down cellulose and lignin that comprise wood tissues in trees – mostly roots and lower tree trunks. They can also kill the cambium of roots and the root collar, resulting in girdling of the tree. Pathogens of conifer trees are sometimes referred to as white or brown rots, referring to the appearance of the fungal mycelium or decayed wood color staining. Older trees and high-density stands are at higher risk to some root and trunk rots compared to young or open stands. Once established on a site, root disease fungi persist or may become permanent, living for decades in the root and stumps and killing new trees that seed into the site (Hagle 2010). The result of the pathogens is usually several to hundreds of trees dying or dead in patches called root disease patches, or pockets. Tree crown symptoms of root pathogens vary according to rapidity of death, involvement of bark beetles, and season of death. Root diseases can be conveyed from diseased trees to healthy trees by root grafts that occur in the soil. Small

trees which are killed rapidly by root disease may turn uniformly red without having been attacked by bark beetles. Shortened terminal growth and short leaves are often symptoms of root disease infection. These symptoms are especially apparent in seedlings and saplings a year or two before death. Armillaria root disease, laminated root rot, Schweinitzii root and butt rot, Annosus root disease and Tomentosus root rot are potential root pathogens on the property. Root diseases can lead to tree instability or resulting windthrow as well as increased attack potential by bark beetles. Fir engraver beetle and western balsam bark beetle may be attracted to respective conifer tree hosts effected by diseased weakened roots (Hagle 2010).

Other Insects and Diseases

White fir on the property are hosts to additional insects and pathogens, though they may not become mass-mortality event drivers. Other insects and diseases include white fir needleminer, cutworms, gypsy moth (nonnative invasive), Douglas-fir tussock moth, western spruce budworm, western balsam bark beetle, fall cankerworm, aspen borer, blue stain fungus of sapwood, and aspen black leaf spot fungus.

As invasive, nonnative insects are detected in the state, the Utah Department of Agriculture and Food and Utah State University Extension Services will provide advisory documents and prescribe methods to suppress or eradicate them.

Annual surveys of forests for appearances and tree symptoms associated with insect and disease agents is a best practice to identify and potentially react to threats. Site disturbances or stressors to trees caused by environmental factors can elevate the risk of insect and pathogens.

If signs and symptoms of tree stress, steady decline, or mortality are observed the DFFSL may be able to diagnose and advise further on forest health issues. Please contact the Division's Forest Health Program Coordinator, 1594 W. North Temple, Suite 3520, Salt Lake City, UT 84114, (801) 538-5555.

Invasive Species

Noxious weeds (state recognized non-native invasive plants) are considered harmful to wildlife habitat and native plant communities. Invasive plant species can have a significant impact on an array of ecological facets. Invasive plants reduce species richness, plant diversity, and plant community productivity. Wildlife forage and cover species may be degraded; soil erosion and stream sedimentation may result; soil moisture and nutrient levels may be depleted; and wildfire regimes may be altered by invasive plant species. Working with the land and activities on it will enable property owners to readily observe and react to plants that demonstrate weed-pest attributes.

On-site technical assistance to identify and potentially control invasive species plant is available from the *Salt Lake County Weed Supervisor*, Salt Lake County Health Department, 2001 S. State Street, Ste. S2-600, Salt Lake City, UT 84190, (385) 468-4035. Partnerships and suppression

projects focused on invasive plants is available through the *Bonneville Cooperative Weed Management Area* workgroup.

As well, plant identification and weed control advice might be obtained from the *Utah State University – Salt Lake County Extension Services* which maintains an office at the Salt Lake County Government Center, 2001 S. State Street, Ste. S1-300, Salt Lake City, UT 84190 (385) 468-4828.

Listed in the Appendix of this plan the *2021 State of Utah - Noxious Weed List,* published by the Utah Department of Agriculture and Food. State law requires the active suppression of certain weed species designated by the County (Salt Lake) Weed Board.

Weed seed can migrate onto the property by wildlife, sporting equipment, construction equipment, pets, footwear and clothing. Some seed transports within soil clods and mud. Preventing weed seeds from migrating onto the property and suppressing newly established weed populations are very effective at preserving the ecological integrity of the property.

Early detection and rapid response are an effective weed management model that calls for annual surveys and focused intent to keep small problems small, and quickly eradicate threats.

The following listed weeds (selected for real and potential existence on the Freeze Creek property) are designated and published as noxious for the State of Utah, as per the authority vested in the Commissioner of Agriculture and Food under Section 4-17-3:
There are designated five classes of noxious weeds in the state: Class 1A (EDRR Watch List), Class 1 (EDRR), Class 2 (Control), Class 3 (Containment), and Class 4 (Prohibited for sale or propagation).
Class 1A: Early Detection Rapid Response (EDRR) Watch List Declared noxious and invasive weeds not native to the state of Utah and not known to exist in the State that pose a serious threat to the state and should be considered as a very high priority.
Class 1B: Early Detection Rapid Response (EDRR) Declared noxious and invasive weeds not native to the State of Utah that are known to exist in the state in very limited populations and pose a serious threat to the state and should be considered as a very high priority.
Class 2: Control Declared noxious and invasive weeds not native to the state of Utah, that pose a threat to the state and should be considered a high priority for control. Weeds listed in the control list are known to exist in varying populations throughout the state. The concentration of these weeds is at a level where control or eradication may be possible.
Class 3: Containment Declared noxious and invasive weeds not native to the State of Utah that are widely spread. Weeds listed in the containment noxious weeds list are known to exist in various populations throughout the state. Weed control efforts may be directed at reducing or eliminating new or expanding weed populations. Known and established weed populations, as determined by the weed control authority, may be managed by any approved weed control methodology, as determined by the weed control authority. These weeds pose a threat to the agricultural industry and agricultural products.
Class 4: Prohibited Declared noxious and invasive weeds, not native to the state of Utah, that pose a threat to the state through the retail sale or propagation in the nursery and greenhouse industry. Prohibited noxious weeds are annual, biennial, or perennial plants that the commissioner

designates as having the potential or are known to be detrimental to human or animal health, the environment, public roads, crops, or other property.

Table 5: Detected Weed Pests

Common Name	*Scientific Name*	*Class*
Canada Thistle	*Conium maculatum*	*3*
Houndstongue	*Cynoglossum officianale*	*3*
Dalmatian Toadflax	*Linaria dalmatica*	*2*
Downy Brome	*Bromus tectorum*	*none*

Table 6: Potential Weed Pests

Common Name	*Scientific Name*	
Purple Loosestrife	*Lythrum salicaria L.*	*2*
Medusahead Rye	*Taeniatherumcaput-edusae*	*2*
Yellow Starthistle	*Centaurea solstitialis*	*2*
Vipers Bugloss	*Echium vulgare*	*1B*
Oxeye Daisy	*Leucanthemum vulgara*	*1B*
Common St. Johnswort	*Hypericum perforatum*	*1B*
Leafy Spurge	*Euphorbia esula*	*2*
Poison Hemlock	*Conium maculatum*	*3*
Ventenata	*Venteneata dubia*	*1A*
Dyers Woad	*Isatis tinctoria L.*	*2*
Spotted Knapweed	*Centaurea stoebe*	*2*
Black Henbane	*Hyoscyamus niger*	*2*
Cutleaf Vipergrass	*Scorzonera lacinata*	*1B*
Japanese Knotweed	*Polygonum cuspidatum*	*1B*
Purple Starthistle	*Centaurea calictrapa*	*1B*
Diffuse Knapweed	*Centaurea diffusa*	*2*
Myrtle Spurge	*Euporbia mysinites*	*4*
Yellow Toadflax	*Linaria vulgaris*	*2*
Jointed Goatgrass	*Aegilops cylindrica*	*3*
Garlic Mustard	*Alliaria petiolata*	*1B*
Hoary Cress	*Cardaria draba*	*3*
Scotch Thistle	*Onopordium acanthium*	*3*
Musk Thistle	*Carduus nutans*	*3*
Field Bindweed	*Convolvulus arvensis*	*3*
Bulbous Bluegrass	*Poa bulbosa*	*none*
Japanese Brome	*Bromus japonica*	*none*
White Bryony	*Bryonia alba*	*none*
Phragmites	*Phragmites australis*	*none*

Invasive species might also include new insect and aquatic species that threatened natural resources. As newly identified species are detected in the state, the Utah Department of Agriculture and Food and Utah State University Extension Services will provide advisory documents and prescribe methods to manage them.

Conservation-based Estate Planning/Legacy Planning Information

No conservation easements are currently assigned to the property. There exist several conservation easement programs and organizations active in the state of Utah. Some have been involved in

previous work in the Emigration Creek basin and are familiar with the resources and values contained in the area. Estate planning, conducted under advisement by legal professionals, may facilitate landowner long-term interests.

The DFFSL in coordination with the USDA Forest Service – State and Private Forestry Program administers a federal conservation easement program titled Forest Legacy. For information about the program, its requirements and outcomes, contact the Forest Legacy Program Coordinator (435) 210-1206.

Archaeological, Cultural and Historic Sites

Any steps to protect archaeological resources that may be found on the property are highly encouraged. If evidence of sites is discovered during the course of implementing this plan, the landowner must notify the Division of State History as required by Utah Code Title 9-8-307. If the landowner receives state or federal grant funds for project implementation, then archeological clearance is required. If, upon completion of a survey done by the Division of State History, archaeological resources are found to be present, mitigating measures may have to be addressed for protection. The landowner should consider any of all viable management alternatives if such sites are discovered on or near areas designated for management. This information is provided to assist in identifying historic properties, per the consultation procedures of the National Historic Preservation Act's Section 106 regulations (36 CFR 800).

Utah Code Section 9-8-302, Definitions, states:
(4) "Archaeological resources" means all material remains and their associations, recoverable or discoverable through excavation or survey, that provide information pertaining to the historic or prehistoric peoples of the state.
(9) "Excavate" means the recovery of archaeological resources.
(17) "Site" means any petroglyphs, pictographs, structural remains, or geographic location that is the source of archaeological deposits or specimens.
(18) "Specimen" means all man-made artifacts and remains of an archaeological or anthropological nature found on or below the surface of the earth, excluding structural remains.

Utah Code Section 9-8-307, Report of discovery on state or private lands, states:
(2) Any person who discovers any archaeological resources on privately owned lands shall promptly report the discovery to the division [of State History].
(4) Nothing in this section may be construed to authorize any person to survey or excavate for archaeological resources.

The Utah Division of State History can be contacted at 3760 S. Highland Dr., Salt Lake City, UT 84106, (801) 245-7263. https://history.utah.gov/about-us/contact-us/

Wetlands

There is potential that a jurisdictional wetland resource exists near the middle of the property at the convergence of the three major mountain slopes contributing to the existence of the mixed deciduous forest type (depicted by the green polygon on the *Forest Stands Map*, page 12). There, a water spring(s) is evident and narrowleaf cottonwood and water birch trees are present. Freeze Creek might also support jurisdictional wetlands along its conveyance. A site assessment by a qualified wetland ecologist would help determine the physical attributes and associations of prolonged water presence.

Wetlands are an important, limited resource in Utah. Several land management policies apply to wetlands. To better determine wetland classification and extent, the Utah Geological Survey would be the good resource for inquiry and advise pertaining to wetlands. The agency is located at 1594 W. North Temple, Salt Lake City, UT 84114 (801) 537-3300.
https://geology.utah.gov

Fire

A major problem when attempting any generalization about the effects of fire is the variation in fire intensity, duration, frequency, location, shape, extent, season, fuels, site and soils.

Fire creates, destroys, enhances, or degrades wildlife habitat thereby causing changes in the subsequent occurrence and abundance of animal species on, and in proximity to, a burned area.

Fires role as a natural forest ecological agent is recognized and situationally promoted by public land management agencies.

The vegetation on the property exhibits risk potentials for unintended wildfire. The annual and decades-long accumulation of woody matter, leaf litter and duff are a natural phenomenon that predisposes plant communities for a wildfire event(s). The risk of *stand-replacing fires* is real, but the outcome is not certain. Such disturbance fires are typically followed by early succession plant species taking advantage of reduced perennial plant competition, greater sunlight exposure and increased moisture interception – if soils are not sluffed off by secondary erosive forces. Stand replacing fires could alter the settings where mature plant communities now reside. The status of white fir climax forest stands may wholly, or in part, be influenced by the exclusion of natural fire for many decades. As the published soil survey suggests, the existence of forests in their current mature state may not be the long-term destination potential based on aspect, soil character, and reoccurring drought cycles for the region. Shrubs and deciduous woodlands may be the better-suited woody cover species for the site. The shrubby expression of Gamble oak is a persistent, fire adapted species that likely will, and has demonstrated favorable response to wildfire.

All soils comprising the property are highly susceptible to water erosion. Wildfire, specifically stand replacing ones, have potential to contribute to mass erosion events years after the fire. Perhaps too, a substantial rain-on-snow spring season event could sponsor landslides and erosion

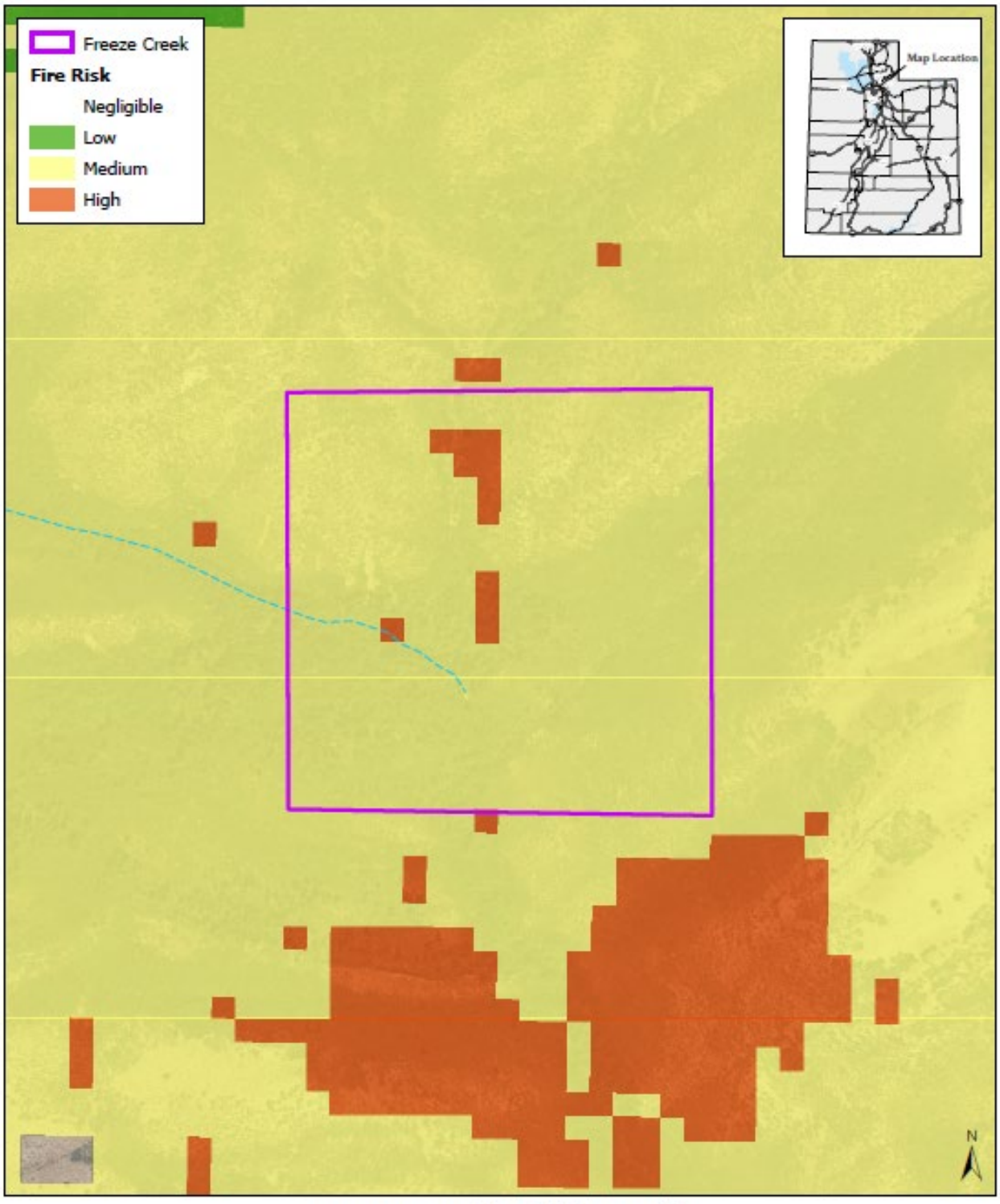
based on the shallow bedrock layers existing in Emigration Canyon. The Wasatch Range mountains do also express landslide in the absence of wildfire impacts.

Wildland fire is a re-occurring phenomenon in Salt Lake County. Over the progression of the summer season and perhaps well into the fall, the potential for wildfire can steadily increase, especially in drought years. Autumn-season wildfires along the Wasatch Mountain Range can be very erratic, fast-moving and sizeable. The September 1988 Emigration fire impacted the property and influenced the successional pathway and current conditions for rangeland, woodland and forest resources on the property. Observed outcomes from the 1988 wildfire do not suggest catastrophic long-term impact, but there may be some results and actions in the first decade that are not well-known.

Local and regional emergency responders and community representatives have participated in creating the *Emigration Canyon Wildfire Preparedness Plan.* No specific recommendations from that plan have been prescribed for the property. Whereas no permanent structures exist on the property, defensible space strategies are not applicable. Wildland fire response is a local government public service assigned to Unified Fire Authority.

In 2016, the *Utah Cooperative Wildfire System* was enacted by the Utah State Legislature. The system is based on the simple principle of risk reduction; wherein the state will pay the costs of large and extended attack wildland fire ("catastrophic fires") in exchange for local government providing initial attack and implement prevention, preparedness and mitigation actions that are proven to reduce the risk and costs of wildland fire in the long run. The local government entity eligible to participate is the Unified Fire Authority.

Technical assessments and advice to prepare for wildfire and mitigate risk can be obtained from the Unified Fire Authority, most likely from the experienced local firefighters working from Station 119, situated in the Emigration Canyon community.



Freeze Creek Wildfire Risk

Scale: 1:5,000

0 500 1,000 1,500 2,000

Feet

Carbon Sequestration and Climate Resilience

All forest plants and supportive soils have an essential relationship with the earth element carbon. Water, carbon dioxide and oxygen are both drivers and byproducts of two highly ordered and repeated biochemical processes – photosynthesis and plant cell respiration. Trees, shrubs, grasses, forbs, mosses, bacteria, fungi, viruses, insects and animals are forest life forms comprised of carbon. As plants encounter and convert sunlight energy to glucose chemical energy forms, carbon, in part, is constructed into plant tissues. As plants produce litter through leaf drop, branch drop, and root decay, a wide range of soil organisms consume cellulose (carbon containing) plant tissues for their energy. Soils, especially those comprised of high organic matter, retain and process carbon. Soils prone to organic layer loss due to slope steepness and erosive character can be reduced in their carbon storage and processing potential.

The acquisition and temporary storage of carbon from the atmosphere into plant tissues and soils is a termed coined carbon sequestration. Sequestration occurs at the single plant level and as well as a stand level. The repositioning of carbon into soils is an outcome of forest and rangeland plant tissue life and death. The forests and rangelands express carbon utilization, storage and releases at varying rates and in varying volumes across the land.

Applied forestry and rangeland management can maintain and expand opportunities to sequester atmospheric carbon while providing additional land-resource contributions, such as wildlife habitat, rainfall energy dissipation, water filtration, soil nitrogen mineralization, waterway shading, heating wood, construction lumber and some pretty great places to live, work and recreate. Forest and rangeland management work can influence plant type presence on the land, plant community competitions and relations with water and soil.

This plan is intended to identify and prioritize work and outputs in accordance to the strategies implemented in the effort of *forestry*. Fostering natural regeneration, planting new trees and maintaining future forest canopy, through targeted thinning and select mature tree removal are some of the ways to direct forest carbon gain and storage potential in the long run.

Applied forestry and rangeland management may be considered a suited action alternative to the uncertainties and challenges expressed by climate change. Variations in plants' annual growing and dormancy seasons, as affected by temperature and precipitation, can influence the highly ordered photosynthetic and cell respiration biochemical processes. Creating opportunities for genetic migration or the emergence of plant trait characteristics previously conditioned to be resilient to climate change may hasten the conservation of forest, woodland and rangeland types. Regenerating and maintaining diverse vegetation cover types (species, ages, structure, genetics, and vigor) are endeavors that may hasten resilience.

Recommendations and Implementation Schedule

This section of the plan contains potential outcomes based on practices and strategies for achieving objectives identified by the landowner as important. Recommended practices are based on current resource conditions, identified in the **Resource Description and Assessment** sections. Recommendations are limited to the acreages described in the plan, and do not reflect advise to other entities or interests.

Date	Recommend Practice(s) Description	Location	Desired Future Conditions
2022, then ongoing	Survey for invasive, noxious weeds – map locations then suppress them	Entire property	Native plant communities are conserved against the threats of noxious, invasive weeds. Small weed plant outbreaks are detected early and gains treatment. Weed seed production and transport is effectively curtailed.
Every 5 to 10 years when conditions are favorable	Prepare planting sites, procure and plant Douglas-fir tree seedlings in gully landform situated in the southeast quarter of the property affected by the 1988 Emigration wildfire. Install seedling browse protection devices and mulch barrier products. Formulate actions based on NRCS practice codes (490) and (612)	Rangeland	New trees and shrubs are established on favorable microsites to diversify species and perhaps modify surface shading and snow deposition attributes.
2022, then ongoing	Selectively fell and process intermediate diameter-class white fir trees/bole wood into dimension lumber material for use on site. Lop and scatter crown materials. Formulate actions based on NRCS practice code (666)	White fir Stand 2	Achieve a target basal area volume around 70 square feet per acre. Wood fiber is yielded for personal use on the property.
2022	Clean-weed all understory white fir saplings within the matured oak grove. Sustain sunlight availability to favor Gambel oak. Formulate actions based on NRCS practice code (666)	Matured Gamble Oak grove	Matured oak grove is maintained for overstory dominance/advantage.
Favorable water years	Enhance the forested wetland stand with native riparian tree transplants. Implement planting trials where available sunlight favors crown growth. Formulate actions based on NRCS practice codes (490) and (612)	Mixed Deciduous Stand	Riparian appropriate trees persist on the wetland site and express age-class diversity.
2022, then ongoing	Survey and document site attributes that favor specialty products that will be cultured on the property. Prepare multi-story cropping areas through understory cleaning-weeding or woody perennial plant establishment. Conduct practices after designing risk mitigations to conserve native plant community fidelity	Select areas across property	Novel specialty products and land management work is employed based on the interests of the landowner.

Appendix

Appendix A: Glossary of Terms and Definitions

Appendix B: Soil Maps, Descriptions and Ratings

Appendix C: Key Habitat Descriptions, Species Characteristics

Appendix D: Range Productivity Maps and Ratings

Appendix E: Forest Health Pamphlets; Insect, Disease, Weeds

Appendix F: Seedling Nursery Vendor List and Use Pamphlets

Appendix G: Utah Noxious Weed Control Act

Appendix H: Literature Cited