Executive Summary

The purpose of this monitoring project is to understand and quantify the current condition of upland vegetation resources within the Uncompahgre Field Office, Gunnison Gorge NCA, and UFO managed portion of the Dominguez-Escalante NCA and evaluate resource condition relative to the goals and objectives described in the respective resource management plans. Table 1 summarizes the specific vegetation monitoring goals and objectives from the resource management plans that monitoring data were evaluated against. Since the Gunnison Gorge NCA does not contain specific monitoring objectives we utilized the same goal of 80% of the landscape meeting desired conditions as the DENCA and special designations in the Uncompahgre plans. This monitoring project utilized BLM's Assessment, Inventory, and Monitoring (AIM) Strategy which provides a standardized monitoring strategy for assessing natural resource condition and trend on BLM public lands. The AIM Strategy provides quantitative data and tools to guide and justify policy actions, land uses, and adaptive management decisions. The AIM strategy uses core indicators for terrestrial monitoring that are ecologically relevant and clearly tied to the fundamentals of rangeland health. It is important to note that not only are the indicators standardized, but the methods used to collect the data are also standardized. This means that the same data are collected in the same way at each sampled site. The use of standardized methods helps ensure that AIM data are comparable.

The monitoring project leveraged a spatially balanced, stratified random sample design to make inference on approximately 871,000 BLM surface acres in the field office and NCAs. A total of 281 randomly selected plots were sampled over a five-year period from 2018 to 2022, 224 plots were sampled in the Uncompahgre FO, 38 plots in the Dominguez-Escalante NCA, and 19 plots in the Gunnison Gorge NCA (for the purpose of this report all analysis reflects the NCA boundary rather than the planning unit boundary). Every sample location was correlated to an Ecological Site Description or an Ecological Site Group to define whether any given site was within the range of natural variability or had the appropriate mix of plant functional groups or had healthy native plant communities as per the land use plans. Ecological Site Descriptions classify rangeland soils and vegetation into units with similar capabilities to respond to management and disturbance. ESD's provide an expected range of variability (benchmarks) for plant functional group cover/production, bare ground, and other ecologically relevant indicators about a distinctive Ecological Site. Ecological site groups are like ESDs however, they use quantitative approaches to generalize ecological site concepts based on unifying underlying soil, geomorphology, and climate patterns. ESGs also provide benchmarks expected within the range of natural variability of a particular ecological group for the indicators we collect in AIM.

This report focuses on four important ecological indicators to report upland vegetation conditions: bare ground, soil stability, invasive species, and plant functional group cover and composition (trees, shrubs, perennial grasses, and forbs). Additionally for these indicators, the ESDs and ESGs have established benchmarks for the expected range of natural variability. We compared the observed values of these indicators at each sample location to the expected values of the correlated ESD/ESG which then allowed us to use the sample design and a process known as weighted analysis to estimate the proportion of the landscape achieving desired conditions (benchmarks) for the indicators as well as an upper and lower confidence level for the proportional estimate (level of uncertainty).

Bare Ground

Within the Uncompahgre Field Office an estimated 66.3% (62.7 LCL, 69.9 UCL) of the public lands were within the range of natural variability for bare ground. The estimated proportion of lands in the Gunnison Gorge NCA within the range of natural variability for bare ground was 67.9% (55.5 LCL, 80.3 UCL), and for Dominguez-Escalante NCA 75.4% (66.4 LCL, 84.4). No management unit met resource management plan objectives for bare ground and however both NCA's had estimates of uncertainty which included the management objectives. Having too much bare ground may mean that the soil resource is more susceptible

Table 1: Resource Management Plan Goals and Objectives for Vegetation Resources

Uncompahgre Field Office
Objective: *Maximize native vegetation and natural processes by ensuring upland vegetation communities are within the range of natural variability, with an appropriate mix of plant functional groups, cover, and diversity, according to best available science on greater than 80 percent of vegetation communities in ACECs, WSAs, suitable WSR segments, and lands managed to minimize impacts on wilderness characteristics and on greater than 70 percent of vegetation communities on the remaining BLM-administered lands, over 10 years with 80 percent confidence.* *Manage for soil stability and productivity to maintain overall watershed health. Manage erosion to minimize downstream impacts from soil-related issues (e.g., sediment runoff, selenium, and salinity).*
Dominguez-Escalante National Conservation Area
PSV-DSS-OBJ-01: *Improve the plant composition of the D-E NCA's desert shrub/saltbush vegetation type to achieve public land health standards and move toward the following management targets:* • *80% (or more) of sampled acres contain adequate mixtures of warm and cold season grasses, shrubs and forbs* • *80% (or more) of sampled acres exhibit an acceptable composition of understory invasive plant species (<10% relative cover)* **PSV-PJW-OBJ-01:** *Manage for public land health standards in the D-E NCA's pinyon-juniper woodlands and move toward the following conditions in the D-E NCA's pinyon-juniper woodlands:* • *95% (or more) of sampled acres contain adequate mixtures of warm and cold season grasses, shrubs, forbs and trees* **PSV-SGS-OBJ-01:** *Improve the plant composition of the D-E NCA's sagebrush shrublands vegetation type to achieve public land health standards and move toward the following management targets:* • *80% (or more) of sampled acres contain adequate mixtures of warm and cold season grasses, shrubs and forbs* • *95% (or more) of sampled acres exhibit an acceptable composition of understory invasive plant species (<10% relative cover)* • *95% (or more) of sampled acres have acceptable levels (less than 50% relative understory cover) of crested wheatgrass* • *80% (or more) of sampled acres have moderate cover of sagebrush (10-30% cover)*
Gunnison Gorge National Conservation Area
***VEG-C-1** Public lands will be managed in accordance with Interpreting Indicators of Rangeland Health (Pellant et al. 2000).* ***VEG-C-2** Current vegetation studies will be continued, and new studies will be initiated.* ***VEG-C-3** Monitoring and studies will be carried out to help achieve sustainable populations of native plant species, with healthy native plant communities dominating the landscape.*

to wind and water erosion. Less bare ground than expected at a site may mean that there are other ecological issues including excessive litter generated from invasive species such as cheatgrass.

Soil Stability

Soil aggregate stability is another measure of soil erosion potential as well as an indicator of soil health, and presence of biological crusts. Soil aggregates are formed by natural processes including alternate wetting and drying and from the accumulation of organic substances derived from root exudates, roots, mycorrhizal fungi, soil microbes and their byproducts which act to cement soil particles into aggregates. Limited herbaceous understory plants, such as grasses and forbs, can contribute to lower soil stability values. Drought can also result in lower aggregate soil stability due to reduced litter cycling and suppressed soil biological activity. Within the Uncompahgre FO an estimated 39.9% (36.2 LCL, 43.7 UCL) of the landscape were found to be within the range of natural variability for soil aggregate stability and the proportion of the Gunnison Gorge NCA estimated to be achieving desired conditions was 54% (39 LCL, 69.1 UCL). There was an estimated 14.7% (7.6 LCL, 21.8 UCL) of the Dominguez-Escalante NCA found to be within the range of

natural variability for soil stability. Relative to this indicator none of the management units met resource management plan goals. The entirety of the sampling did occur in a period of prolonged severe drought which likely has contributed to such low proportions of the landscape achieving desired conditions. However, low cover and composition of herbaceous plants that contribute to higher average soil stability are also a likely contributor to the low estimated observed.

Invasive Species

Of the 280 plots sampled during this monitoring project 81% of them detected non-native invasive plants present ranging from trace occurrences to dominant components of the vegetation community. This is suggestive that invasive non-native plants are now widespread in the field office. Many invasive species can disrupt ecological processes and competitively exclude more desirable vegetation. The most prevalent and widespread invasive species detected was cheatgrass occurring at 50% of the sample locations. The next most prevalent species detected was halogeten occurring at 23% of the sample locations. Halogeten was distinctly regionalized with most of the occurrences occurring in the Mancos Shale derived soils of the Uncompahgre and Gunnison River valleys. Ecological site descriptions and ecological site groups do not have invasive non-native species present in the reference state thus there are no descriptive references for the range of natural variability for invasive species. We utilized the RMPs goals and objectives to arrive at a threshold of 5% cover or less for the Uncompahgre FO and the Gunnison Gorge NCA to meet the intent of the overarching goals for vegetation relative to rangeland health.

We established <5% as our desired condition because sites with greater than 5% relative cover of invasive species have lower resistance to invasive species invasion and dominance and reduced resilience to disturbances. Utilizing the <5% benchmark for relative cover of invasive species an estimated 60.3% (LCL 56.7, UCL 63.9) of the lands managed by the Uncompahgre field office has less than 5% cover of invasive species. Again, relative to invasive species UFO managed lands do not achieve the RMP goal of 70% of the landscape meeting the objectives. In the Gunnison Gorge NCA an estimated 23.3% (LCL 10.6%, UCL 36%) of the landscape was found to have less than 5% relative cover of invasive species which is well below the desired condition of 80% of the landscape achieving desired conditions. Of the special management goals per stratum at the DENCA most objectives are being meet. Salt desert is meeting the estimate of 80% of land having less than 10% relative cover of invasives (LCL 69.9, UCL 90.1). Sagebrush was estimated as having 67% of land achieving goals (Estimate = 66.7%, LCL 31.3, UCL 100). If we assume similar goals for Pinon-Juniper on 80% of land than it is meeting objectives (estimate = 86.7%, LCL 76.6, UCL 96.7). The RMP also set a goal of 95% or greater of the DENCA landscape to be achieving this condition. Considering the overlap in the confidence intervals the DENCA is close to achieving this desired condition.

A caveat to the estimated presented here is that most of the invasive species detected are annual plants. Given the exceptional drought conditions experienced over the five-year sampling period, and the widespread nature of invasives, it is quite likely that notably less of the landscape in any of the three management units evaluated may be achieving desired conditions under more normal precipitation conditions.

Plant Functional Group Cover & Diversity

To answer the RMP questions regarding an "adequate mix of perennial grasses, forbs and shrubs" we utilized the plant functional group concept for analysis. Each correlated ESD and ESG describes an expected cover or production range of natural variability for each plant functional group i.e. trees, shrubs, grasses, and forbs. The appropriate mix of plant functional groups is perhaps the most fundamental key point for a site to be ecologically functioning, exhibiting good rangeland health, and achieving Colorado Public land health standards for healthy plant and animal communities. Lower than expected or the absence of key functional groups like perennial grasses and forbs can result in excessive bare ground and elevated erosional processes or decrease the plant community resilience to invasive species invasion and resistance to disturbances. Conversely, higher than expected values for woody species can result in similar issues and suggest that disturbance regimes such as fire may be missed resulting in a late successional condition or facilitating encroachment into less woody dominant ecological sites. A commonly observed issue in the

Uncompahgre Field Office is that sagebrush dominant ecological sites are often found to have low cover and diversity of perennial grasses and forbs and as a result the sagebrush has infilled resulting in shrub cover that far exceeds the range of natura variability for the ecological site.

For the Uncompahgre FO an estimated 34.4% (31 LCL, 37.8 UCL) of the landscape has the appropriate cover and composition of forbs, and an estimated 23% (19.9 LCL, 26.4) has the appropriate cover of perennial grasses. Neither functional group is close to achieving the goal of 70% of the landscape achieving desired conditions of being within the range of natural variability. The Uncompahgre FO has a concerning amount of the vegetation communities that lack the appropriate minimum cover of perennial grasses and forbs. No sites were deemed to be not achieving desired conditions for having too much cover of perennial grasses or forbs. An estimated 55.7% (52 LCL, 59.5 UCL) of the UFO landscape was found to have the appropriate cover of shrubs, and an estimated 53% of the landscape had the appropriate cover of trees. Most sites not achieving desired tree and shrub cover were in undisturbed sites where cover was commonly higher than expected likely attributed to late succession, while sites typically found to have lower than expected tree and shrub cover were in previously disturbed sites that have been systematically managed to remain treeless or previously burned and are in an early successional state. Again, neither functional group achieved land use plan goals of having 70% of the landscape within the range of natural variability.

The Gunnison Gorge NCA shows similar concerning issues with the herbaceous understory of its upland plant communities. None (0%) of the landscape was found to have the minimum cover of forbs relative to ecological potential, and an estimated 28.9% (15.9 LCL, 41.9 UCL) having the minimum cover of perennial grasses. The NCA also had an estimated 63% (48.8 LCL, 77.8 UCL) of the landscape with the appropriate cover of shrubs and estimated 71% (55.8 LCL, 86.4 UCL) with the appropriate cover of trees relative to ecological site potential. Tree and shrub cover was commonly lower than expected in the GGNCA due in part to drought related mortality in the low elevation saltdesert shrublands and dry site juniper woodlands that have been occurring over the last 20+ years. None of the plant functional groups in the GGNA met land use plan goals of 80% of the landscape achieving desired conditions. However, with the estimate of uncertainty the tree functional group does approach the RMP goals.

The DENCA also shows similar trends in that perennial grasses and forb cover are lower than ecological site minimums. An estimated 24.5% (14.9 LCL, 34 UCL) of the landscape had at least the minimum cover of forbs relative to site potential. For perennial grasses 35% (25.5 LCL, 44.5 UCL) of the landscape was found to be achieving desired conditions. The shrub functional group was found to be achieving desired conditions on an estimated 70.8% (62 LCL, 79.6 UCL) and the tree group was achieving desired conditions on an estimated 43.8% (31.6 LCL, 56.0 UCL). Similar drought and succession related impacts are driving tree and shrub estimates in the DENCA.

We utilized plant functional diversity as another line of evidence to help elucidate why such low estimates of the landscape are achieving plant functional group desired conditions. We found that the perennial grass functional group has the lowest diversity of the functional groups and commonly have far fewer species than what an ESD or ESG suggests could be expected. We found that highly palatable cool and warm season perennial bunchgrasses were absent or had fewer than expected species. The absence of deep-rooted perennial bunchgrasses does directly contribute to the low cover values observed above as these plants occupy a large aerial extent when present and have higher cover values than sod forming or shallow rooted bunchgrasses. The shrub functional group also exhibited low diversity, with many sites being dominated by or having near monocultures of broom snakeweed. Snakeweed was the most common plant observed in the project occurring at 72% of the sample locations and is regarded as a native invasive (noxious) species. Snakeweed exploits open niches caused by disturbances and does not compete well with other more desirable plants. The diversity of forbs was better than expected with the number and types of forbs commonly exceeding what ESDs suggested. Many forbs do not produce above ground biomass when conditions are poor and given the drought that has occurred over the sampling period forb cover may well be better the estimates made here under more normal precipitation.

Rare Species

The extensive plant species inventory conducted utilizing the AIM protocol also helped identify new occurrences of threatened species, BLM species, and rare species tracked by the Colorado Natural Heritage Program a partner agency in rare plant conservation. The project added five new occurrence records for the Colorado hookless cactus a species that was recently de-listed from the protections of the Endangered Species Act. Six new occurrences were documented for the BLM sensitive species Aromatic Indian Breadroot (*Pediomelum aromaticum*), San Rafael Milkvetch (*Astragalus rafaelensis*), Adobe desert-parsley (*Lomatium concinnum*), and Eastwood Evening Primrose (*Camissonia eastwoodiae*). The project also added the first record in the UFO for a newly proposed BLM sensitive species Paradox Valley blazingstar (*Mentzelia paradoxensis*) which will be added to the BLM sensitive species list in the coming months. These new records help inform decisions that can advance the conservation of these species and preclude their need for additional regulatory protections. Finally, the project identified 26 additional species that are tracked by the CNHP that will help to inform their records regarding rarity and distribution.

Conclusion

None of the vegetation community indicators evaluated here met land use plan goals and objectives for proportion of the landscape being within the range of natural variability. Across all three landscapes perennial grass and forb cover and diversity is low. Often well below minimum ecological site range of variability. As a result, undisturbed sites have experienced increases in shrubs including sagebrush and broom snakeweed and trees. Bare ground is often higher than expected in these types of sites with higher rates of erosion. We often observe substantial loss of the valuable topsoil resource in the interspaces of these sites which will make restoration exceptionally difficult. In previously disturbed sites we see similar conditions with fewer trees and shrubs. Invasive species are widespread in the three management units but appear to be less problematic in the Dominguez-Escalante NCA. The invasive species prevalence and dominance are a direct result of the plant functional group imbalance that the project has revealed. Invasive species exploit areas with low diversity and cover of more competitive vegetation. A diverse mix of perennial grasses and forbs within the range of variability for any given site offer the greatest competition to repel invasive species dominance. As a result, current vegetation conditions make large portions of the management units exhibit low resistance to invasive species invasion and dominance and have low resilience to disturbances such as fire and drought.

Past and current land uses combined with the cumulative impact of numerous droughts and more specifically the now 20+ yearlong mega drought have all contributed to current upland vegetation condition. The land use plan decisions for all three units need to be leveraged with other policies and regulations to effect meaningful change in upland vegetation condition and to avoid further degradation as well as maintain the valuable ecosystem services they provide. Greater emphasis should be placed on effectively reclaiming authorized disturbances, implementing, and appropriately managing restoration of degraded vegetation communities is also needed, and lastly resource allocations involving vegetation resources need to consider these changed conditions and make allocations that more closely reflect current conditions, and appropriate management decisions around persistent drought are needed to halt further resource degradation.