Camouflage
Demonstration and Evaluation

Bureau of Land Management
Wyoming State Office

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Section 1—Introduction

Federally administered public lands are experiencing unprecedented development and use pressures from environmental incentives for developing renewable energy resources and energy transmission, as well as from more traditional activities including transportation corridors, communication sites, recreation, livestock grazing, and mineral and other forms of development. Growing land-use demands have the potential to significantly modify the character of the natural landscape, placing increasing pressure on the protection of scenic values.

It is not always possible to use terrain, distance, and standard environmental coloration to reduce the visual impacts of new developments in the landscape. Camouflage is an effective choice for visual mitigation when multiple colors are applied in a specific pattern, breaking up the form of an object. The colors of the pattern repeat the colors seen in the surrounding landscape, including shadows, creating the impression that the object is part of its surroundings, both positive and negative space. These resulting patterns visually mimic textures, giving the illusion of a three-dimensional effect on the treated facility. While the new structures or facilities may not disappear entirely, they no longer become the focal point. The goal is to effectively minimize color contrast between the development and surrounding landscape.

There has been significant research in the application of camouflage and color as applied to military use, with the U.S. Department of Defense (DOD) conducting the most widespread work. However, there is little research on the application of camouflage to structures within the landscape to mitigate visual impacts to scenic values.

This project further advances the findings from previous studies for mitigating visual impacts of energy-producing facilities. The earlier color and camouflage studies developed research and quantitative analysis, including field work, on the most successful color combinations and camouflage patterns for effective visual resource mitigation on existing energy-producing facilities.

Additional data needed to be gathered and analyzed, specifically with the development and testing of new stencil technology in order to refine the patterns and application processes that were previously evaluated. This study builds on previous research to further analyze patterns, find an efficient application process, and to evaluate and document the process on a full-scale facility in the field.

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Section 2—Stencil Application and Research

A variety of sources were contacted about stencil patterns and products, including a camouflage specialist and companies that either print onto adhesive vinyl or are manufacturers of stencils to be used for painting patterns.[1]

Paint Stencils

The main objective of this research was to determine the feasibility of creating stencils that can be utilized for painting a variety of camouflage patterns onto facilities in the landscape. With the painted-on approach, the potential of having stencils laser-cut from rubberized magnetic sheet material was investigated. An alternative thin plastic or mylar material that would be durable enough for multiple use, yet could be temporarily attached to curved metal surfaces with heavy-duty magnets or temporary adhesives was also researched. It became apparent that the significant expenses had little to do with the material of choice, but more to do with the laser-cutting process. The more intricate the level of cutting, the more expensive the final product.

The limitations of using a magnetically attached stencil depend on the tank surface being of metallic material. Laser-cut stencils may also be created using lighter, paper-based material that can be adhered with temporary spray adhesive. The feasibility of temporarily adhering the mylar stencil would have to be tested, but could also be an option. However, this method could create issues if multiple color stencils are used and paint is applied over any potential adhesive residue left from previous stencils. This process also could leave behind a sticky film that would attract dirt or need to be cleaned off, requiring more time and expense.

A second factor to consider with stencils is determining a manageable size. Assuming that a given camouflage pattern will cover an area of approximately 8'x16' (based on previous designs and testing) before repeating, this pattern can be broken into smaller stencil tiles anywhere from 2' square to 4' square. Advantages of the smaller stencil size include greater flexibility across varying dimensions of surfaces as well as less expensive replacement cost per stencil in the event of damage. Because each stencil will require a small border frame, a gridded pattern could show up in the overall painted pattern.

One disadvantage of choosing a smaller stencil size is that the gridded pattern would show up more frequently. This could be mitigated by perforating the border frame with paintable openings, as well as limiting the border width to 0.5" to 1.0", effectively minimizing the appearance of lines that might stand out from the overall pattern. Regardless of size, keeping track of each stencil piece would require good organization and storage methods. Additionally, each stencil would require a clearly identifiable label for easy assembly of the matrix. Having three to four complete stencil sets on site would enable larger areas to be painted at a time.

[1] Appendix A contains a list of sources and manufacturers

It would be necessary to determine whether the visual mitigation qualities provided by a more complex, three- or four-color design would outweigh the added expenses and increase in logistics for contractors in the field. Utilizing more than two colors requires more stencils to keep track of in the field and creates more chance for error during installation. Based on previous tests that were limited to BLM standard colors, the overall appearance of the patterns tends to become muddled and tonal contrast is diminished when more colors are used. For these reasons it may be best to stick to a two- or three-color approach when working with paint stencils.

Adhesive Color Patterning

The secondary objective of this research was to see if there have been any technological updates in the printing industry that might allow the vinyl adhesive appliqué "hybrid" approach to be a viable option. With this method, a painted-on solid base color would first be applied over which a printed color appliqué would be adhered. This method is similar to the paint mask that was explored during previous research, where the openings in the appliqué pattern reveal the background color of the tank.

The idea with this revised approach would be to leave the printed (solid color) appliqué in place, which would serve as the second color while creating the illusion of a third due to the gradational screen pattern of the design. This approach would depend heavily on the latest appliqué-printing technologies to produce a durable, color-correct product for application. Research determined that the industry is capable of producing accurate colors, but the appliqué life is limited to five to seven years. Pricing would be comparable to the paint mask appliqués tested during previous research.

Other Alternatives

An additional camouflage strategy worthy of consideration is a complete-wrap technology utilizing a variety of printing methods and/or materials. This could include multi-color vinyl adhesive appliqué wraps (as previously tested, though with the improved pattern and BLM colors), printed Tyvek® panels, or magnetically attached standoff pegs with cable-suspended, printed fabric curtains to disrupt the silhouette of the structure.

See Appendix A for a list of companies that were researched to provide these services.

Section 3—Pattern Selection and Scale

During this stage of research and development a fresh analysis of six previously tested camouflage patterns was performed. This effort focused on determining an appropriate level of coarseness (scale of pattern) to be used for the next round of panel testing in the field.

In previous research, multiple comments were made by the observation team suggesting that the tested patterns should be enlarged a certain percentage (increasing coarseness) to better blend with the surroundings at various observation distances. Another comment from the previous field test suggested that as the texture of a pattern becomes denser and more colors are used, the pattern appears to be more effective when seen from closer distances but tends to blur into one homogenized color (isoluminance) from further away. From a distance, a densely textured pattern with many colors actually begins to look similar to one that was painted with a solid color (the average of the multiple colors) and the overall form of the structure tends to stand out again.

As the multi-color pattern begins to isoluminate, a cylindrical shape like a storage tank will become more visible because the hard edges of the structure's profile and smooth gradation of light across the structure are not disrupted by larger contrasting shapes of a textured pattern. It is from these greater viewing distances (beyond 200 to 400 meters) that a more coarsely textured pattern with a higher degree of contrast offers better concealment.

Comparison of Test Patterns

For this coarseness study, six patterns were analyzed which had been previously tested in November 2009. Each multi-color pattern was updated in Photoshop to match the color of the BLM paint chips as photographed in the field, under the same lighting conditions. This enabled a close simulation of how the preferred colors would perform without having to do a full-fledged panel test in the field. When converting to black and white, perfect matching of the colors was less relevant because the focus was only on pattern coarseness, contrast, and tone.

For consistency, the multi-color patterns chosen for this comparison were the same as those tested in November 2009. They included:

1. Vapor
2. Nevada
3. Corona
4. 4-Est-C-2
5. Tumbleweed A (dark stencil)
6. Tumbleweed B (light stencil)

Of the six patterns listed above, the first four multi-color patterns utilized a combination of Carlsbad Canyon (light tone), Shale Green, Juniper Green (both medium tone), and Yuma Green (dark tone). The last two patterns used a combination of two colors (ideal for stencil) based on Shale Green (medium tone) and Yuma Green (dark tone). These two patterns are identical except for a reversal of their dominant backdrop color.

Pattern Coarseness

The goal of this study was to determine how much a pattern could be enlarged to provide better concealment properties when seen from distances greater than 100 meters. The testing approach involved taking a 2' square sample of each original pattern and scaling it up in consistent increments for side-by-side comparison in Photoshop. For this test, the following were chosen: 100% (unmodified original), 150%, 200%, and 400% (see Figure 3.1).

The idea was to see if, when placed in front of a typical vegetated backdrop, there was a noticeable improvement as patterns were enlarged or if there was a threshold where it became too much. These photo simulations were then converted to black and white to better illustrate how a color or pattern performs at different scales in contrast and tone.

The 100%, 150%, 200%, and 400% sample squares

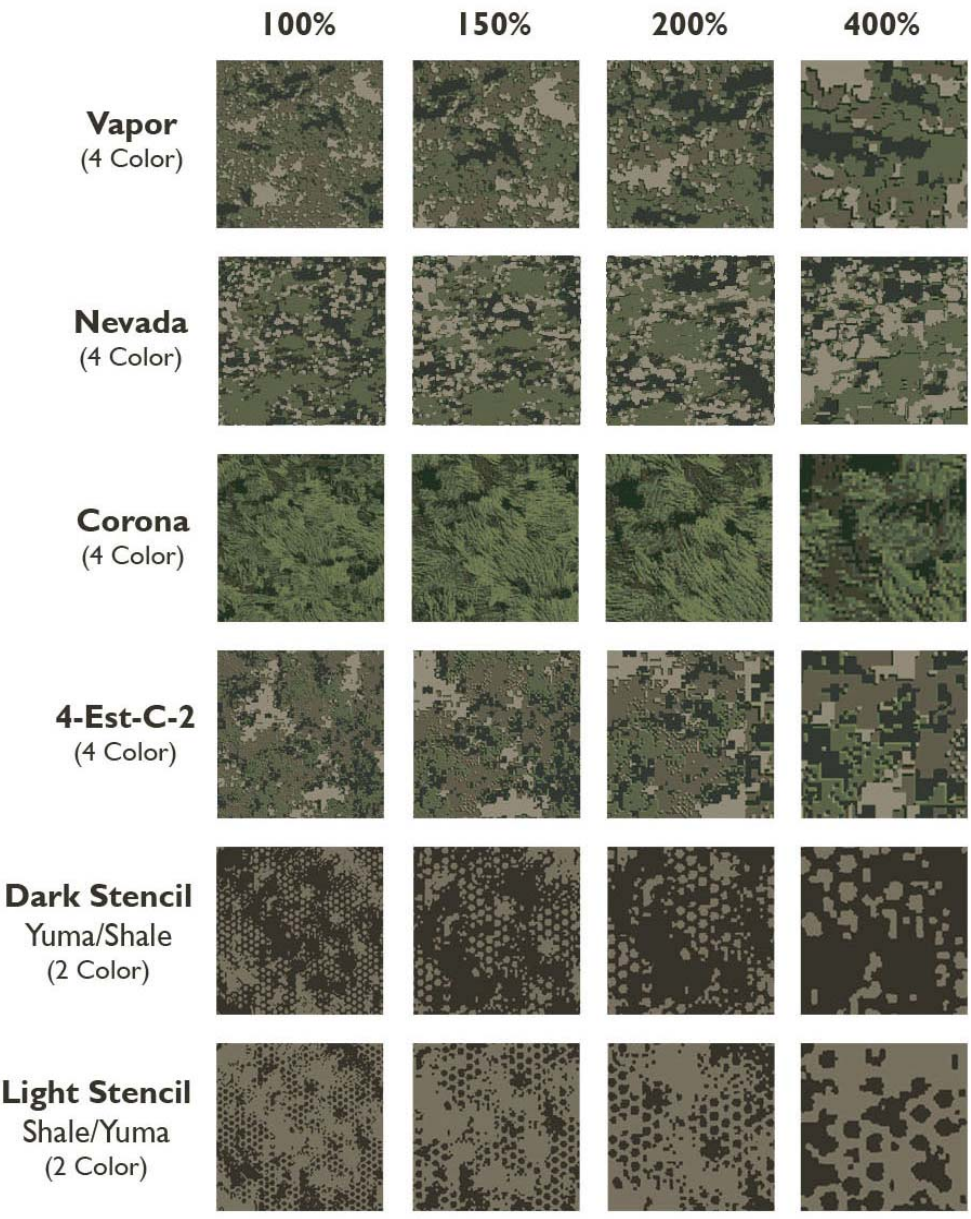

Figure 3.1

were then reduced in a consistent manner to mimic how they would appear when seen from a greater distance. This reduction was done as follows: 100% (unmodified original), 50%, 25%, 10%, and 5% (see Figure 3.2).

Figure 3.2

Conclusion

The analysis revealed a few key things. First, the original patterns could be enlarged by up to 150-200% to perform better when seen from greater distances than 200 meters. Second, it was determined that when looking at the nine standard BLM environmental colors in black and white, there are essentially three levels of tone that stand out: light, medium, and dark (see Figure 3.3). This suggested that it is important to include colors from each tone-level category in order to maintain an appropriate degree of contrast within the pattern when using a multi-color design.

Having a strong level of contrast within the pattern using only two or three colors was still effective. Using a two-color pattern with some gradational texture effects within the pattern may provide the same results, yet be simpler (and less expensive) to apply in the field when utilizing a painted-on stencil approach. When using more than two colors, a stencil-based paint pattern becomes less practical due to increased complication and higher expense. A three-or-more color pattern may be better reserved for printed vinyl appliqués where a shorter product lifespan is acceptable (appliqués are less durable than paint).

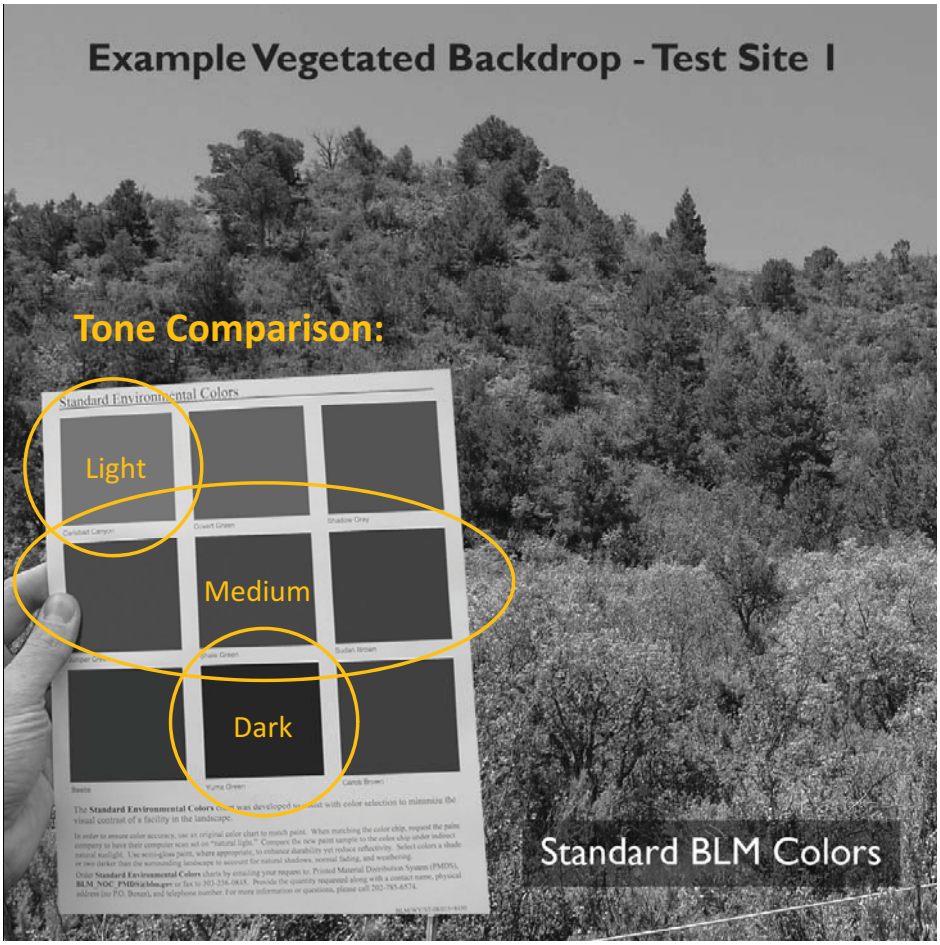

Figure 3.3

Section 4—Landscape Settings

Test Locations

A variety of appropriate test sites were identified that would cover a range of vegetation and terrain types. These sites were located between Carbondale and Grand Junction, CO, and are listed in the chart below.

Color Selection for Test Panels

The research suggests that there is not a perfect color or pattern for every site, nor is there a one-size-fits-all solution when selecting a camouflage pattern. Each site will require a qualified individual to make the determination, factoring in numerous variables at each site such as predominant soil color, vegetation color, degree of texture and color variance in the vegetation, and primary observation direction. It is straightforward to select a single color from the BLM Standard Environmental Color Chart that approximates the average color in the landscape. However, the use of additional colors and the percentage at which they are used depends on the pattern and the number of different colors the pattern it is designed for. Typically, a pattern requires a dominant mid-tone color paired with a lighter- and darker-toned color for accent and contrast within the pattern. The following table summarizes the colors that are suitable for use within a particular landscape setting:

Landscape Setting	BLM Standard Environmental Colors
Bare shale hillsides	Carlsbad Canyon, Covert Green, Shadow Gray, Shale Green, Sudan Brown, Yuma Green
Pinyon/juniper monoculture	Carlsbad Canyon, Covert Green, Juniper Green, Shale Green, Yuma Green
Pinyon/juniper grass mix	Carlsbad Canyon, Covert Green, Juniper Green, Shale Green, Yuma Green
Herbaceous rolling mountain meadow	Carlsbad Canyon, Covert Green, Juniper Green, Shale Green
Wyoming sage steppe	Carlsbad Canyon, Covert Green, Juniper Green, Shale Green, Yuma Green
Rolling hills intermittent shrubs-meadow	Carlsbad Canyon, Covert Green, Juniper Green, Shale Green, Yuma Green
Ponderosa pine, closed canopy	Carlsbad Canyon, Juniper Green, Shale Green, Yuma Green, Carob Brown
Ponderosa pine, open canopy	Carlsbad Canyon, Juniper Green, Shale Green, Yuma Green, Carob Brown
Subalpine aspen woodland	Carlsbad Canyon, Covert Green, Juniper Green, Yuma Green
Subalpine coniferous forest	Covert Green, Juniper Green, Shale Green, Beetle, Yuma Green
Short-grass prairie	Carlsbad Canyon, Covert Green, Juniper Green, Shale Green
Grassland	Carlsbad Canyon, Covert Green, Juniper Green, Shale Green

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Section 5—Test Panel Production

Figure 5.1

Figure 5.2

Camouflage Test Panels

Moving forward with the discoveries made during the previous research, five patterns were tested in the landscape utilizing larger 4'x8' test panels positioned upright in the landscape. The stencil patterns were created utilizing a bladed cutting machine. After production the stencils were sent to the BLM Sign Shop in Rawlins, WY for painting and production utilizing the standard BLM environmental colors. These panels were made from either ½" thick plywood or Alumalite® sheeting with the painted patterns applied to one side. A simple panel anchoring system was developed using stakes and guy lines.

In addition to the stencil-painted panels, a set of patterns was printed on Tyvek® material. Each pattern was mounted to a backing board with spray adhesive to be compared in the field alongside the painted patterns. Each of these printed Tyvek® patterns included either four or five colors, which were matched the BLM Standard Environmental Color chart (see Figure 5.1).

BLM Sign Shop Participation/ Feedback

During the manufacture of the test panels, the BLM Sign Shop applied the paint with rollers, with the panels placed flat and the stencils taped in place (see Figure 5.2). This method of application enabled the stencil pattern to maintain a crisp edge at the painted openings.

As multiple layers of paint began to deposit on the stencils, they appeared to become stronger and thicker due to the build-up.

Of the three stencil materials that were provided for testing, only two were considered usable. This included the Tyvek® and poly-coated paper. The third fabric stencil material curled and warped as the paint was applied and the material was quickly deemed problematic.

Because the size of the test stencils (approximately 40"x5') was smaller than the 4'x8' panels, repositioning and multiple paint steps were required—usually four positions per panel. This added a significant amount of time and labor to the process for handling and drying of wet stencils and panels, and adequate space was required to lay the stencils flat for drying. This process was ideal in a large, indoor work space but it could be challenging in outdoors.

General Test Panel Manufacturing Comments

The paint colors used for the test panels matched the BLM Standard Environmental Color chart and included: Carlsbad Canyon, Covert Green, Juniper Green, Shale Green, Carob Brown, and Yuma Green. Though not a BLM standard environmental color, black was used to increase contrast and effectiveness at greater distances. Ideally this darker color would be a mix of approximately 50% black and 50% Yuma Green but for the purposes of testing, black was used.

Before painting the test panels, 1" holes were drilled in each corner so that guy lines could be attached in the field. Sharp edges were filed or rounded off to remove cutting hazards that could injure people handling the panels, cut the guy lines, or scratch other panels during transport.

It was important that the pattern read consistently when comparing one test panel side-by-side with another panel of a different color combination. The pattern was aligned and oriented the same way, starting consistently with the stencil positioned at the upper left corner of the 4'x8' panel. Because the stencil was smaller than the 4'x8' panel, it needed to be repositioned, edges masked, and painted again with the same color to get the pattern to cover the entire panel. Paint drying time was factored into this process.

The pattern extended all the way to the edges of the panel so there would be no banding or border lines. The stencils had an identification label and orientation arrow written on the back and were placed on the panels face-up for painting.

If the stencils did not stay in place during painting, masking tape was used at the edges to hold them in place. Areas outside of the stencil were masked off to prevent overspray on the portion of the panel not covered by the stencil. The use of spray adhesive was discouraged as this could create issues with paint adhering, as well as leave residue that would collect dirt/dust in the field.

Section 6—Testing Methodology

Positioning of panels

In order to maintain consistency with the analysis, the sequential ordering of panels positioned in the landscape was performed in a similar manner for each test site to the greatest extent possible. The panels were positioned slightly relaxed from vertical, in a straight line, oriented at the same angle, and spaced consistently with a gap of approximately 2'–3' to ensure that panels were not shaded by adjacent panels (see Figure 6.1). Because setup of these large panels took some time, anticipated sun angles and viewing directions were taken into consideration when coordinating the schedule and site selection.

Figure 6.1

During the process of photographing and rating the patterns, the test panels remained in direct, consistent light. Optimal test locations were chosen which allowed the positioning of panels facing in a southeasterly direction with the camera looking northwesterly during mid-morning hours. In mid-afternoon the panels were oriented in a southwesterly direction with the camera looking in a northeasterly direction. This positioning was kept flexible, taking into consideration challenges discovered on site. In general, panel positioning was determined on site with placement as neutral as possible to minimize shadows and reflective glare.

Viewing Distance and Photo/Data Documentation

For each test site photos were captured from up to eight observation points (depending on site constraints), taken from the same direction. Photos were captured at incremental distances from the panels, measured in meters as follows: 100, 200, 300, 400 (1/4 mile), 600, and 800 (1/2 mile). Additional photos were captured from greater distances, including 1,200 meters (1/2 mile) and 1,600 meters (1 mile) if the pattern was still visible. Photo points beyond 1/2 mile were not captured if it was determined that the camouflage patterns were no longer visible or effective.

A GPS device was used to maintain consistency with distances, and a latitude/longitude coordinate was documented at each observation point. Data was manually recorded in a log. A pair of photos was taken at each observation point, one with the 4.5x optical zoom engaged, and one without the zoom. A backup camera was kept on hand to ensure adequate coverage in the event of a malfunction or other technical issue.

In the field, a performance score was assigned for each pattern (1:5–1 being low and 5 being high), taking into consideration how effectively the colors blended in with the adjacent landscape as well as an analysis of the pattern scale, contrast, and texture. The pattern with the highest combined score after analyzing each of the multiple test sites revealed which design performed best across the widest range of vegetation types. Field evaluation forms are included in Appendix D.

Section 7—Panel Testing (Phase 1 and 2)

Phase 1. Test Site Itinerary

- August 1, 2011
  Basalt, CO – Oak Scrub with Sagebrush
- August 2, 2011
  Rifle, CO – Pinyon/juniper monoculture, Bare Shale Hillside with scattered Juniper
- August 3, 2011
  Rifle and Parachute, CO – Sagebrush with scattered Juniper, Sagebrush and grass steppe
- August 4, 2011
  Four Mile Park, CO – Sub-alpine Aspen Woodland, Herbaceous Rolling Mountain Meadow
- August 5, 2011
  Four Mile Park, CO – Sub-alpine Conifer Woodland

Phase 2. Test Site Itinerary

- August 23, 2011
  South of Baggs, WY – Red soil eroded badlands backdrop
- August 23, 2011
  Robber's Gulch, Baggs, WY – Red soil backdrop with sagebrush foreground
- August 23, 2011
  South of Baggs, WY – Wyoming Sage Steppe
- August 25, 2011
  Rifle, CO – Sagebrush
- August 26, 2011
  Dry Park Road, Carbondale, CO – Red soil backdrop
- August 29, 2011
  Four Mile Park, CO – Sub-alpine Conifer Woodland

Test Patterns and Colors

Six unique patterns were tested: Vapor, Nevada, Corona, 4-Est-C-2, two-color Tumbleweed, and a new two-color stencil pattern, Reztex (B-Series below). Each pattern was scaled up to 200% from previous testing efforts, to improve coarseness and performance from greater viewing distances. Additionally, each pattern was prepared with different color combinations for comparative analysis. The goal of this exercise was to determine the optimal colors and pattern for various landscape settings.

A) Two-Color Stencil 1 (Tumbleweed):

A1 Carlsbad Canyon solid base coat, Yuma Green stencil top coat
A2 Covert Green solid base coat, Yuma Green stencil top coat
A3 Shale Green solid base coat, Yuma Green stencil top coat
A4 Carob Brown solid base coat, Carlsbad Canyon stencil top coat
A5 Covert Green solid base coat, black stencil top coat*
A6 Juniper Green solid base coat, black stencil top coat*

B) Two-Color Stencil 2 (Reztex):

B1 Carlsbad Canyon solid base coat, Yuma Green stencil top coat
B2 Covert Green solid base coat, Yuma Green stencil top coat
B3 Shale Green solid base coat, Yuma Green stencil top coat
B4 Carob Brown solid base coat, Carlsbad Canyon stencil top coat

C) Four-Color Stencil (Corona):

C1 Carlsbad Canyon solid base coat, #2 Juniper Green, #3 Shale Green, #4 black*
C2 Carob Brown solid base coat, #2 Carlsbad Canyon, #3 Carob Brown, #4 black*

These C-series stenciled patterns were composed of a solid base coat, followed by three paint layers applied in a sequence of stencil #2, followed by stencil #3, followed by stencil #4. Because pattern C2 used Carob Brown twice, it effectively became a three-color design.

D) Printed Tyvek® (4 or 5 colors):

TVK1 Corona (Carlsbad Canyon, Juniper Green, Sudan Brown, Yuma Green)
TVK1b Corona (Carlsbad Canyon, Juniper Green, Sudan Brown, black)
TVK2 4-Est (Carlsbad Canyon, Juniper Green, Sudan Brown, Yuma Green)
TVK2b 4-Est (Carlsbad Canyon, Juniper Green, Sudan Brown, black)
TVK3 Vapor (Carlsbad Canyon, Juniper Green, Sudan Brown, Yuma Green)
TVK3b Vapor (Carlsbad Canyon, Juniper Green, Sudan Brown, black)
TVK4 Nevada (Carlsbad Canyon, Juniper Green, Shale Green, Sudan Brown, Yuma)
TVK4b Nevada (Carlsbad Canyon, Juniper Green, Shale Green, Sudan Brown, black)

* Prior to Round 2 of testing (before painting the C-series pattern), the BLM Sign Shop was requested to swap out the Yuma Green for black. Two additional panels were requested to

be made using the A-series pattern (A5 and A6), utilizing black instead of Yuma Green, and introducing Juniper Green as a new base color. This is discussed further below.

Panel Testing Round 1

Test Panels

Because of production delays, not all of the proposed patterns were tested in the field as scheduled. The delayed panels were the pair of four-color painted stencil versions of the Corona pattern (C1 and C2). The team proceeded with the previously scheduled testing using the ten completed panels with the understanding that a brief second round of testing would be needed to analyze the missing panels.

While in the field, the observation team quickly determined that there was a need for a darker color than Yuma Green in the various patterns being analyzed. Because there was not enough contrast relative to the natural shadows present in the landscape, it was determined that black would be a better choice. A request was made to the BLM Sign Shop which enabled them to revise the color combination of the C1/C2 panels, introducing black into the design.

Additionally while in the field, the observation team determined the need for two additional two-color painted panels with more contrast (black), one of which would utilize Juniper Green as the solid base color. These two additional panels were called "A5" and "A6."

Panel Testing Round 2

Test Panel Status

During the week of August 22, follow-up testing was conducted for the better-performing original panels (Yuma-based) from Round One in comparison to the latest four stencil-painted panels from the BLM Sign Shop which utilized black instead of Yuma Green. Also included in the analysis were printed Tyvek® panels using black instead of Yuma Green. The newest panels that were focused on included: A5, A6, C1, C2, TVK-1b, and TVK-4b.

The first objective of this round of testing was to determine if the use of black (instead of Yuma Green) paired with the same 200% scale patterns would gain any increase in effective viewing distance beyond 400 meters. This was meant to inform the team as to whether it was necessary to enlarge the patterns prior to performing the full-scale paint test on a tank structure.

In addition, a new terrain environment with more of a red rock/soil component was analyzed. This site was used to compare the performance of patterns A4, B4, C2 (all based on the reddish Carob Brown color).

Discoveries

After the follow-up round of testing, it was determined that the various patterns were still under-performing at distances greater than 400 meters even when black was used instead of Yuma Green. Only slight improvements were seen in the +5% range, and isoluminance was still an issue. The possibility of enlarging the pattern scale to 300% was discussed, but further conversations with the supplier combined with feedback from John McCarty at the BLM suggested that the pattern should be enlarged to 400% for the full-scale test application.

It was then determined that the C2 test panel (which is based on Carob Brown) provided some unique benefits when viewed from greater distances. This panel used only three colors, and the order of the stencils was changed so that the medium-toned Carob Brown served as the base coat, the lighter-toned Carlsbad Canyon was stencil #2, and black was stencil #4. C2 clearly provided more visible contrast within the pattern from 400 meters, and there was still a minimal amount of pattern texture visible at 550 meters. This was better than anything tested to date, but still did not provide the preferred performance distances of 1/2 mile to 1 mile.

Conclusion

During the field evaluation performed during both rounds of testing it was determined that the Corona pattern used in both the C-series and Tyvek®-1 series panels consistently out-performed the others in the majority of landscape settings (see field evaluation forms in Appendix D). In response to these two discoveries the full-scale stencils were produced at 400%, and to simplify the C-series pattern (Corona) to a three-color combination. This simplification enabled the production of only two stencil sets: #2 and #4.

The next goal was to confirm the practicality of painting with flexible stencils on large, curved metal surfaces such as storage tanks with a full-scale application. The durability of the stencil material was to be analyzed, as well as the magnetic attachment methods.

Section 8—Full-Scale Application

Test Site

Various types of EnCana tank facilities were visited to determine the availability of sites with adequate viewing distances and suitable vegetative backdrops for a full-scale test application. After selecting a site, the appropriate paint colors were selected and tank dimensions were measured. Bryan Whitely with EnCana agreed to provide the installation labor and the paint was provided by the BLM.

The test tank was located on BLM land at an oil and gas production facility (K9OU Well Pad) operated by EnCana near Parachute, CO (see Figure 8.1).

Figure 8.1

The cylindrical tank selected for the application was 20' tall, approximately 14' diameter, and adjacent to two additional tanks that were also painted Shale Green (though slightly smaller at 15' height by 12' diameter). This provided the opportunity to directly compare the camouflage pattern side-by-side with a solid-color tank. The character of the surrounding landscape provided opportunity to step away from the tank in a southerly direction in increments of 100 meters up to 1,600 meters (1 mile). The well pad site was within an open sagebrush area surrounded at the clearing periphery by dense pinyon/juniper vegetation. The tank was painted Shale Green, which had been applied sometime in the last 2–3 years. The paint was showing signs of fading (compared to the BLM paint chip card) and had a noticeable chalky appearance (see Figure 8.2).

Figure 8.2

Stencil Design and Application

The camouflage pattern used for the full-scale test on the tank covered an area of approximately 10'x24' before repeating. The pattern used for the full-scale test was the same Corona pattern used during the panel testing, although it was modified to become a three-color design using only two stencils. This pattern was scaled up to 400% from the previous 200% scale used for the test panels. Because this amount of surface area would be unwieldy if a single 10'x24' stencil were used, the pattern was broken down into seven smaller pieces for easier handling. The pieces were approximately 40"x10' with the longest dimension oriented vertically.

A separate set of stencils was used for each color and paint was applied to each set separately over a solid base-coat color. The pattern was designed so the paint from the two sets of overlay stencils did not overlap.

Two different stencil materials were tested: Tyvek® and poly-coated paper, which were the same stencil materials used during the previous 4'x8' panel testing. The separate stencil pieces were tiled together in the order described in the instructions with the proper side facing out. Registration marks along the stencil edges assisted with alignment.

Figure 8.3

The stencils were positioned carefully by hand and then held in place against the metal tank with powerful magnets[2] (see Figure 8.3). The magnets were approximately 3/16" thick by 1/2" diameter, each with a holding capacity of over seven pounds. A total of 70 magnets held the seven stencils in place.

Paint Application Process

For the full-scale test, the entire surface of the 20' tall tank was first painted Juniper Green and this solid coat of paint was allowed to dry overnight (see Figure 8.4).

Figure 8.4

[2] See Appendix A

On the second day, the first stencil color of Carlsbad Canyon was applied. This lighter color was first applied to the bottom half of the northern side of the tank as a test and then to the bottom followed by the top half of the southern face of the tank (see Figures 8.5 and 8.6). This required the seven stencils in the first set to be repositioned three times. The paint was again allowed to dry overnight. This first set of stencils was made of Tyvek®.

Figure 8.5

Figure 8.6

On the third day, the black color was applied using the second stencil set, starting at the top (see Figure 8.7). Because the tank was only going to be viewed from one direction for testing, it was only painted on the south side (see Figure 8.8). The second set of stencils was made from poly-coated paper and the material did not hold up well. The stencils started tearing early in the application, with some of the panels becoming unusable by the end of the process (see Figure 8.9).

Figure 8.7

Figure 8.8

Figure 8.9

Because the stencils were so large (40”x10’ each), they were difficult to work with and required at least two people to position. With a slight breeze present and the need to climb ladders 20’ in the air, the size of the stencil was problematic. After removal from the painted tank, the partially dry stencils were temporarily placed on an adjacent tank with magnets for storage. Laying the stencils on the ground was not a good option as even the slightest breeze would blow them away or tear them.

Testing Pattern Effectiveness

The effectiveness of the full-scale stencil-painted camouflage pattern was analyzed from a wide range of distances. This range spanned from 100 to 1,200 meters (3/4 mile). With a solid-color Shale Green tank immediately adjacent to the test tank, it was easy to compare the relative pattern benefits. Because the updated Corona pattern had been simplified to three colors, enlarged to 400%, and utilized black as the darker color, significant improvements and greater effective viewing distances were noted compared to the earlier panel testing (see Figure 8.10).

Figure 8.10 (300 m zoom)

Even with these improvements it was determined that a multi-colored camouflage pattern offered minimal benefits beyond 1,200 meters (3/4 mile). At greater distances, the pattern performed as effectively as a solid color. Due to the relatively small size of the tank compared to other dominant elements in the overall landscape, it became minimal to the viewer. At this furthest distance the adjacent solid color tank performed well and within 3–5% of the performance of the multi-colored pattern (see Figure 8.11).

Figure 8.11 (1,000 m zoom)

Taking these findings into consideration, the ideal viewing distance range for a camouflage pattern to be effective is in the 400 to 1,200 meter (1/4 mile to 3/4 mile) range and the use of the three-color Corona pattern scaled at 400% was a good match for this range.

Additionally, it would be better to use a different color than black for the darkest color in the pattern. In the landscape, black appears as a foreign color and is darker than the natural shadow accents seen in the adjacent vegetation. However, earlier testing suggested that the standard Yuma Green does not provide enough dark contrast in a camouflage pattern. A recommended alternative color for ideal results is a 50/50 mix of Yuma Green and black. This color tended to match up better with the natural shadows occurring in the landscape, and would improve the effectiveness of the pattern when seen from distances closer than 800 meters (1/2 mile).

Cost Information

The following describes the various steps involved with painting the test tank and covers the known expenses. Because the knowledge of expense is based upon field testing rather than a hard and defined final approach, these numbers should be considered only as a reference.

Stencils

For the stencils used during the full-scale test, the cost included $330 for three rolls of poly-coated paper, $140 for cutting the 14 stencils, and $280 for the additional labor required to remove the

plugs from the 14 stencils at two hours each. This amounted to a total of $750 for manufacture of the two stencil sets, one for each of the two stenciled colors.[2]

In addition to the costs of manufacturing the stencil, there is a separate royalty fee to factor in, which would be 10% of the cost of the painting labor. Based on the pricing that follows for the painting and assuming that efficiencies with time can be gained with faster-drying paint, this royalty fee would be approximately $300 per tank.

It should be noted that the material tested did not appear to be durable enough to be used as a long-term, practical solution. It is recommended that the stencils be manufactured from a more durable material which would most likely increase the overall stencil expense.

Paint

For the 20' tall by 14' diameter tank facility that was painted, the total surface area was approximately 1,035 square feet. This required five gallons of paint for the Juniper Green base coat which covered the entire tank surface. At approximately $35 per gallon, the total is $175 per color, or $525 to paint the entire tank with three camouflage colors. Even though the stencils only allow 1/3 of the paint to adhere to the tank surface, the stencil is coated with the remainder.

Paint Labor

It took three days to apply the paint to the tank using two paint contractors. This totaled approximately 48 hours of labor. According to the paint contractor, they would normally charge $250/hour or $2,000 per eight-hour day for a two-man crew for this type of job, including cleanup. With a faster-drying paint the overall time required could likely be cut in half. It should be noted that the complete pattern was only applied to the southern (visible) face of the tank which was approximately 50% of the overall surface. The majority of this time was spent positioning the stencils and waiting for the paint to dry between coats. The actual painting time went quickly.

Support

Two team members[3] were present to observe the application of camouflage to the tank and were actively involved with the positioning and handling of the stencil which totaled an additional 48 hours of labor. However, it is estimated that 1/3 of the time was used only for observing and not applying the stencil. It would have been difficult to install the pattern with a two-person paint crew alone. With a refined magnetic stencil material and smaller stencil dimension, this labor time could be greatly reduced.

Because the initial cost of creating the stencils is high and they are intended to be re-used multiple times, it may be feasible for the BLM to produce multiple sets that could be kept on hand and checked out or rented to a paint contractor as the need arises.

[2, 3] See Appendix A

Section 9—Recommendations

Test Conclusions and Further Recommendations

After testing the process of applying the painted pattern to a tank structure in the field, a number of important observations were made. It is recommended that further refinements to the individual stencil dimension and material choice be made and that further testing be done prior to implementing this approach on a broad scale. The Tyvek® and poly-coated paper stencil material used is not durable enough and is too expensive for limited use.

The following is a summary of observations and recommendations. These should be carefully taken into consideration when specifying how to apply a pattern and how to manufacture a stencil:

1. Each stencil should be no larger than 40" square. Ideally, stencils would be approximately 24" to 30" square. This will make it easier to handle and store the stencils, and they will be less likely to tear in the outdoor environment.

2. Stencil material should be heavy enough to be reusable numerous times, ideally 20+ uses minimum. A Tyvek® stencil will likely only last through 4–5 uses and the poly-coated paper tested is difficult to use more than 2–3 times before tearing. The cost of cutting the stencils is generally the greatest expense and is more expensive than the paint and labor itself, so the material must be durable enough to justify the cutting expense.

3. Stencils should be flexible and durable, ideally magnetic sheet material. Rubberized magnetic sheet material would be ideal, although a heavier flexible plastic sheet could work as well with strong magnets to hold it in place.

4. Stencil borders should be kept to a maximum 1" width, and be designed to be positioned edge-to-edge with the adjacent stencil. Ideally the border would include some openings to diminish dominant gridlines appearing in the finished painted design, though these border lines tended to disappear at observation distances greater than 200 meters.

5. The stencil openings should be created with a laser or die-cutting machine. Using knife blades that must make overlapping cuts at each corner can create structural weak points and cause the stencil to prematurely tear when being handled.

6. Stencils should arrive from the manufacturer ready to use, with all cuts completely penetrating the stencil material, all plugs removed, and openings cleared away.

7. The overall stencil pattern should be limited to an area of approximately 10' square, divided into equal square tiles. An overall pattern of this size could easily be divided into 16 stencils, each 30" square, making a 4'x4' grid. This would enable the overall pattern to be mirrored, rotated 180 degrees, etc., to gain additional pattern effects without appearing repetitive. A smaller dimension (such as 24" square) would make it easier to work around obstructions or irregular protrusions on the tank surface such as pipe fittings, stairways, catwalks, etc. This smaller-sized approach would result in a matrix of 5x5 stencils, totaling 25 tiles.

8. Each stencil should have an alpha-numeric label with an orientation arrow and corner registration markings that are a part of the painted design. This would enable multiple stencil layers to be easily lined up to assist the paint contractor, simplifying installation.

9. Larger openings in the pattern (minimum 2" and maximum 3") should be held together by cutting a hexagonal mesh pattern approximately 3/8" wide in the stencil material (see Figure 9.1). The mesh structure would help strengthen the stencil while ensuring that the larger paintable openings appear as a solid color as viewing distances increase. This would also minimize the amount of cutting necessary when manufacturing the stencils.

Figure 9.1

10. The use of a faster-drying paint is recommended in response to observations in the field. A standard oil-alkyd based industrial paint was used for testing which had a long drying time. The paint required one to two hours to be "dry to touch," three to four hours before it was consider "tacky-free," and eight hours between coats. As the paint began to dry the stencils were removed, usually around 30 to 45 minutes after spraying. During stencil removal two complications tended to emerge. First, if the stencil was removed too soon the paint on the stencil was still tacky; if the stencil bent or folded in the wind it easily stuck to itself. Pulling the adhered stencil apart was a delicate process as it could easily tear. Second, if the stencil was left on the tank too long, the paint stuck to the stencil and the material could easily tear when removed from the tank. With the Tyvek® material, a thin layer of the white material peeled away in two instances, remaining stuck to the fresh paint.

11. Even though the stencil material was pinned flat against the tank surface with magnets prior to painting, the use of a paint sprayer and ambient wind in the outdoor environment tended to stretch the stencil and slightly lift it away from the tank surface. As the pressurized air nozzle delivered the paint, the stencil tended to float away from the metal tank surface slightly, allowing paint to bleed around the edges of the openings. Simultaneously, as the stencil became coated with wet paint it tended to warp and pillow, essentially floating further away from the metal tank (see Figures 9.2 and 9.3). This often eliminated any hint of the internal honeycomb pattern in the stencil, which only serves to hold the stencil openings together structurally. As the casual observer stepped away from the tank beyond 50 meters or so, this variable pattern texture

Figure 9.2

disappeared from sight and was deemed a non-issue. If anything, this side effect contributed to the pattern's performance in a positive manner because it reduced the visibility of the honeycomb pattern (see Figure 9.4).

12. The actual process of painting moved quickly once the stencils were positioned. It usually took about 15 minutes to paint a 10'x24' area which included time climbing up and moving various ladders. It is recommended that a paint contractor have at least two complete stencil sets on hand so that a larger area can be painted at once. If it is cost-effective, it may be best to have three or four sets on hand to make the painting process more time-efficient.

13. Positioning a scaffolding structure around the tank may simplify the process of applying the stencils and paint for structures taller than 10'. Painting the tanks off-site in a controlled environment before delivery would be even more efficient.

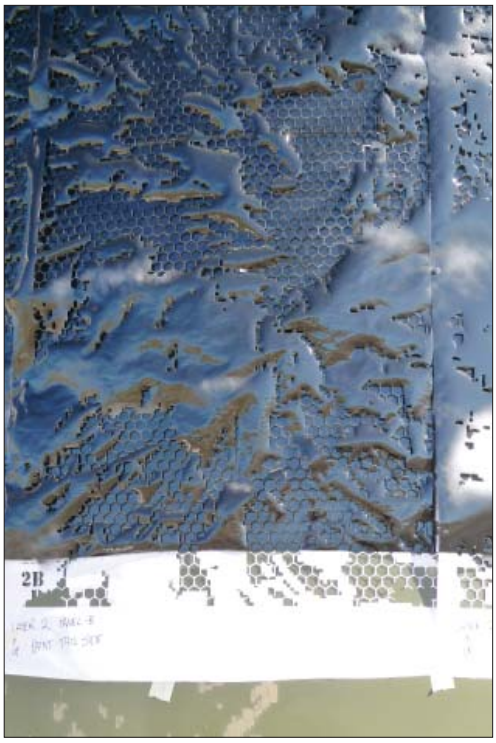

Figure 9.3

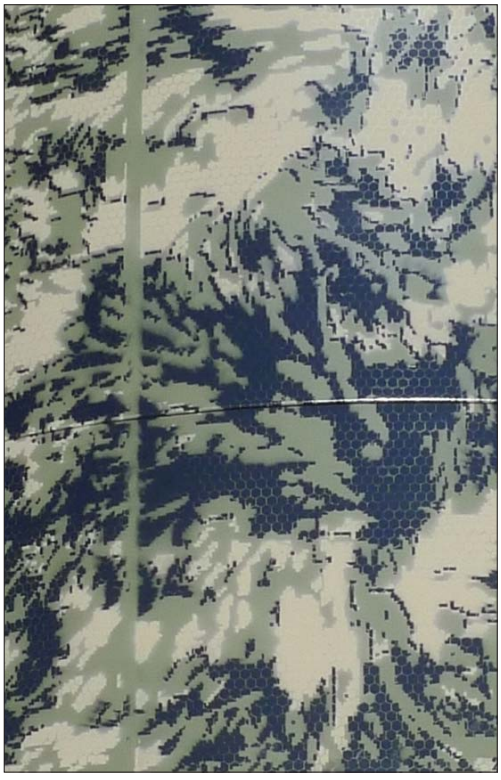

Figure 9.4

Final Analysis and Recommendations

The most effective long-term solution for applying camouflage patterns to energy production structures in the BLM landscape is via stencils and paint. When factoring in the long-term durability, ease of installation, and overall expense, the painted-on approach is superior to the alternatives. This includes printed 3M vinyl adhesive appliqués and printed Tyvek® sheets.

The greatest benefit of using a painted-on pattern is that the colors and pattern will perform in the timeframe of ten-plus years, exceeding the performance of the alternatives by a significant margin. The paint colors can be mixed easily to match the BLM Standard Environmental Colors. In comparison, a printed appliqué is only guaranteed to retain the color accuracy for five to seven years before weathering and fading. Likewise a printed Tyvek® application is only rated for three months before fading. Slowing this deterioration would require the use of an additional UV-inhibiting surface treatment which would increase reflectivity and glare. Printed Tyvek® would be an excellent short-term solution and the matte surface performed well; however, the overall negatives outweigh the positives, making this a less viable option.

Using a flexible yet durable stencil made of a thin magnetized sheet during the application can streamline the process. If a magnetized sheet is not feasible, other thin but sturdy material can be attached with heavy-duty magnets. As long as the stencils are properly labeled and they include easy-to-follow registration marks and instructions, it is simple to install a multi-colored pattern. Though manufacture of the stencils can be somewhat expensive and there is a labor component involved with stencil patterns, the long-term benefits make this the most viable option. Limiting the number of colors to two or three will minimize expense while maximizing the contrast within the pattern.

Appendix A—Vendors

The following vendors provided consultation, services, and supplies for this project:

1. Otak, Inc,
   www.otak.com
   (Contact: Kate Schwarzler, Principal). Carbondale, CO. 970-963-1971.

   Otak provided project coordination and management, research and testing, and compiled the project report.

2. Hyperstealth® Biotechnology Corporation
   www.hyperstealth.com
   (Contact: Guy Cramer, President and CEO). Maple Ridge, B.C., Canada. 604-961-7046

   Guy Cramer developed all camouflage patterns used for this research and accompanied the team during the first week of testing. Hyperstealth® provided the stencils for testing.

3. Western Slope Paint Services
   (Contact: Don Hoselton and Mark Hoselton). Grand Junction, CO. 970-245-2943

   Western Slope Paint Services provided the labor for painting the tanks during testing.

4. Sherwin Williams
   www.kjmagnetics.com
   Glenwood Springs, CO. 970-945-0707

   All paint used to create test panels and paint tanks was supplied by Sherwin Williams.

5. K&J Magnetics
   www.kjmagnetics.com
   Jamison, PA. 888-746-7556

   N35 Neodymium Rare Earth magnets (ordered online) were used to adhere the stencils to the tanks during testing.

The following vendors were contacted regarding stencil manufacture and printing on adhesive vinyl:

1. Precision Laser
   www.precision-laser.com
   (Contact: Chick Lantry). Santa Clara, CA. 408-727-3226

   Their lasers are not "engineering lasers" which are used for heavier materials such as plastic and thicker rubberized magnetic sheets. They are able to laser-cut up to 5'x10' on almost any "fabric" material. His suggestion was to utilize a silk-screening process, or contact someone who is closer to our region to make it more cost-effective. It does not appear to be cost-effective, though no mention of budget was made. Mr. Lantry did not provide a pricing estimate. (Otak's opinion is that silk-screening may not be a practical approach on vertical/curved surfaces, in the field, etc.)

2. Laser Alliance, LLC

www.laseralliance.com

(Contact: Alan Vien). Milpitas, CA. 408-262-3222

Cutting time depends on level of detail of vector-based artwork. A 4'x4' stencil with the camouflage pattern was estimated to cost $500–$700. Magnetic sheeting as well as thinner plastic can be used; material costs are small relative to cutting expense.

3. Laser Cutting Shapes

www.lasercuttingshapes.com

(Contact: Vadim Daskal), Columbus, OH. 614-848-5700

They are able to cut up to 51"x63". They can cut 2'x4' stencils for approximately $15–$30 each when the quantity is 100+. A firm quote would require the vector artwork. For example, 20 each of five unique stencils, or other various combinations to provide a grid matrix of an overall larger pattern. They do not provide stencil material and that would have to be sourced elsewhere. They can work with "clean" rubberized magnet material such as Santoprene or EPDM after performing tests. Cutting a single test sample would cost $195. Another recommended stencil material is .007" thick blue plastic sheeting starting at $.50/square foot.

4. Stencils Online

www.stencilsonline.com

(Contact: Bill McGowen), Franklin, NH. 877-863-5227

Their preliminary estimate is $110–$150 for individual stencils, with additional copies at $50–$75 each. They would need the vector-based artwork to provide an accurate quote. The price is based on a photo of a 4'x4' panel from the previous test. They cannot cut the magnetic material. Their stencils are a durable mylar material, which could be attached with magnets. Mylar is solvent-proof and its usable life can easily be extended beyond 6–10 applications by cleaning. It can be stored rolled up in a tube or flat.

5. Fine Line Signs Graphics Studio

www.finelineonestop.com

(Contact: Steve Johnson), Denver, CO. 303-293-9215

Vinyl appliqués can be effectively color matched using state-of-the-art equipment. They cannot promise more than 5–7 years longevity of product life. A 2'x2' panel would be $25–$30 and a 4'x4' panel would be $105–$120. This may be a cost-effective option for shorter lifespan applications or difficult-to-stencil surfaces like railings, pipes, and ladders, etc. The price of applying the camouflage pattern twice in a 10–15 year period would need to be considered, if that is the reliable longevity of the stencil-painted alternative.

Appendix B—Test Site Descriptions

Figure B.1 (100 meter zoom)

Site 1

Date: August 1, 2011
Location: Basalt Mountain (N 39.46207, W 107.05869)
Landscape Type: Scrub Oak background with Sagebrush foreground.
Panels Tested (L-R): A1, A2, A3, B1, B2, B3, TVK1, TVK2, TVK3, TVK4

Figure B.2 (100 meter zoom)

Site 2

Date: August 2, 2011
Location: Hubbard Wash, Rifle, CO (N 39.56816, W 107.80835)
Landscape Type: Pinyon/juniper backdrop with sagebrush foreground.
Panels Tested (L-R): A1, A2, A3, A4, B1, B2, B3, B4, TVK1, TVK2, TVK3, TVK4

Figure B.3 (100 meters)

Site 3

Date: August 2, 2011
Location: Hubbard Wash, Rifle, CO (N 39.57644, W 107.80989)
Landscape Type: Bare shale rocky hillside with scattered Juniper
Panels Tested (L-R): A1, A2, A3, A4, B1, B2, B3, B4, TVK1, TVK2, TVK3, TVK4

Figure B.4 (100 meter zoom)

Site 4

Date: August 3, 2011
Location: Hubbard Wash, Rifle, CO (N 39.56845, W 107.80811)
Landscape Type: Sagebrush and scattered Juniper
Panels Tested (L-R): A1, A2, A3, B1, B2, B3, TVK1, TVK2, TVK3, TVK4

Figure B.5 (100 meter zoom)

Site 5

Date: August 3, 2011
Location: Parachute, CO (N 39.50974, W 107.89828)
Landscape Type: Sagebrush and grass steppe
Panels Tested (L-R): A1, A2, A3, B1, B2, B3, TVK1, TVK2, TVK3, TVK4

Figure B.6 (100 meter zoom)

Site 6

Date: August 4, 2011
Location: Four Mile Park, Glenwood Springs, CO (N 39.39395, W 107.39648)
Landscape Type: Sub-alpine Aspen woodland
Panels Tested (L-R): A1, A2, A3, B1, B2, B3, TVK1, TVK2, TVK3, TVK4

Figure B.7 (100 meter zoom)

Site 7

Date: August 4, 2011
Location: Four Mile Park, Glenwood Springs, CO (N 39.39433, W 107.39358)
Landscape Type: Herbaceous rolling mountain meadow
Panels Tested (L-R): A1, A2, A3, B1, B2, B3, TVK1, TVK2, TVK3, TVK4

Figure B.8 (100 meter zoom)

Site 8

Date: August 5, 2011
Location: Four Mile Park, Glenwood Springs, CO (N 39.32701, W 107.42834)
Landscape Type: Sub-alpine conifer woodland
Panels Tested (L-R): A2, A3, B2, B3, TVK1, TVK2, TVK3, TVK4

Figure B.9 (100 meter zoom)

Site 9

Date: August 23, 2011
Location: Baggs, WY (N 41.22353, W 107.70870)
Landscape Type: Red Soil Backdrop (partial test)
Panels Tested (L-R): A5, A6, C1, C2

Figure B.10 (300 meters)

Site 10

Date: August 23, 2011
Location: Robber's Gulch, Baggs, WY (N 41.21241, W 107.79617)
Landscape Type: Red soil backdrop with Sagebrush foreground
Panels Tested (L-R): A5, A6, C1, C2

Figure B.11 (20 meters)

Site 11

Date: August 23, 2011
Location: South of Baggs, WY (no gps data collected)
Landscape Type: Sage steppe (partial test, photos only)
Panels Tested (L-R): A5, A6, C1

Figure B.12 (50 meters)

Site 12

Date: August 25, 2011
Location: Hubbard Wash, Rifle, CO (N 39.56815, W 107.80849)
Landscape Type: Pinyon/juniper backdrop with Sagebrush foreground. (partial test)
Panels Tested (L-R): A2, A5, A6, C1, TVK1, TVK1b, TVK4, TVK4b

Figure B.13 (200 meter zoom)

Site 13

Date: August 25, 2011
Location: Hubbard Wash, Rifle, CO (N 39.57493, W 107.80907)
Landscape Type: Sagebrush (partial test with updated panels)
Panels Tested (L-R): A2, A5, A6, C1, TVK1, TVK1b, TVK4, TVK4b

Figure B.14 (10 meters)

Site 14

Date: August 26, 2011
Location: Dry Park Road, Carbondale, CO (N 39.45886, W 107.30917)
Landscape Type: Red soil backdrop (partial test)
Panels Tested (L-R): A5, A4, B4, C2, C1

Figure B.15 (20–30 meters)

Site 15

Date: August 29, 2011
Location: Four Mile Park, Glenwood Springs, CO (no gps data collected)
Landscape Type: Sub-alpine conifer (partial test with updated panels)
Panels Tested (L-R): A6, TVK1b

Figure B-16. (200 meter zoom)

Encana Tank - Full Scale Painted Stencil Test Application Site

Date: September 27, 2011
Location: EnCana K9OU well pad, Parachute, CO (N 39.36240, W 108.11640)
Landscape Type: Pinyon/juniper with Sagebrush/grass foreground.
Pattern Tested: Corona 3-color, 400%, Juniper Green, Carlsbad Canyon, black

Appendix C—Pattern Color and Scale Descriptions

A1: Carlsbad Canyon solid base coat, Yuma Green stencil top coat (200%)
A2: Covert Green solid base coat, Yuma Green stencil top coat (200%)
A3: Shale Green solid base coat, Yuma Green stencil top coat (200%)
A4: Carob Brown solid base coat, Carlsbad Canyon stencil top coat (200%)
A5: Covert Green solid base coat, black stencil top coat (200%)
A6: Juniper Green solid base coat, black stencil top coat (200%)

B1: Carlsbad Canyon solid base coat, Yuma Green stencil top coat (200%)
B2: Covert Green solid base coat, Yuma Green stencil top coat (200%)
B3: Shale Green solid base coat, Yuma Green stencil top coat (200%)
B4: Carob Brown solid base coat, Carlsbad Canyon stencil top coat (200%)

C1: Carlsbad Canyon solid base coat, #2 Juniper Green, #3 Shale Green, #4 black. (200%)
C2: Carob Brown solid base coat, #2 Carlsbad Canyon, #3 Carob Brown, #4 black. (200%)
C3: Juniper Green solid base coat, #2 Carlsbad Canyon, #4 black (400%) Painted on Tank

TVK1: Corona (Carlsbad Canyon, Juniper Green, Sudan Brown, Yuma Green) (200%)
TVK1b: Corona (Carlsbad Canyon, Juniper Green, Sudan Brown, black) (200%)

TVK2: 4-Est (Carlsbad Canyon, Juniper Green, Sudan Brown, Yuma Green) (200%)
TVK2b: 4-Est (Carlsbad Canyon, Juniper Green, Sudan Brown, black) (200%)

TVK3: Vapor (Carlsbad Canyon, Juniper Green, Sudan Brown, Yuma Green) (200%)
TVK3b: Vapor (Carlsbad Canyon, Juniper Green, Sudan Brown, black) (200%)

TVK4: Nevada (Carlsbad Canyon, Juniper Green, Shale Green, Sudan Brown, Yuma) (200%)
TVK4b: Nevada (Carlsbad Canyon, Juniper Green, Shale Green, Sudan Brown, black) (200%)

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Appendix D—Field Evaluation Forms

This appendix contains data recorded in the field evaluation forms during the analysis of the camouflage pattern test panels, as discussed in Section 6. A rating form was filled out for each test site and these forms are included on the following pages.

In situations where visual access to the test panels was no longer possible due to site constraints, or where it was determined that patterns were no longer effective beyond a certain distance, we stopped capturing data. Additionally, some sites were considered follow-up test locations where we performed a partial or simplified version of the analysis for comparative analysis of revised color combinations. For example, we updated several of the panels using black instead of Yuma Green, and then did a brief side-by-side comparison at various distances to see if the use of black improved pattern effectiveness at greater distances. For these reasons, the length of the rating form varies from one to four pages per test site. The last form (Site 16) includes analysis of the Full-Scale Stencil Painted Test Application at the EnCana Tank facility.

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Camouflage Pattern Field Evaluation Form | SITE 1: Basalt Mountain, CO

Date:	**8/1/2011**	*Weather:*	**Overcast/Mixed**
Time:	**11:45 AM**	*Heading:*	**NW**
Evaluated by:	**C. Brandt, K. Schwarzler, G. Cramer, S. Roché**		
Test Site Location:	**Basalt Mountain**		
GPS Coordinates (at panels):	**N 39.46207, W 107.05869**		
Landscape Type:	**Scrub Oak, Sage, Serviceberry**		

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1	4.5	5	2	11.5	Scale is good, color selection not ideal
	A-2	4	5	3.5	12.5	
	A-3	3.5	5	3	11.5	
	A-4				0	
	B-1	2	3	2	7	These work better further away 200-300 m.
	B-2	3	3	4	10	
GPS Waypoint:	B-3	2.5	3	3	8.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.46127	C-2				0	
W 107.05815	TVK-1	5	5	5	15	
Photo #:	TVK-2	4	5	5	14	
225	TVK-3	5	5	5	15	
(zoom) 226	TVK-4	3.5	4	4	11.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1	5	5	2	12	
	A-2	5	5	3	13	
	A-3	5	5	3.5	13.5	
	A-4				0	
	B-1	4	4	2	10	
	B-2	4	4	3.5	11.5	
GPS Waypoint:	B-3	4	4	3.5	11.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.46047	C-2				0	
W 107.05766	TVK-1	5	5	5	15	
Photo #:	TVK-2	3.5	4	5	12.5	
227 - 229	TVK-3	5	5	5	15	
228 (zoom)	TVK-4	4	4	4.5	12.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1	5	4	2.5	11.5	Coarseness could go to 300% and be okay.
	A-2	4	4	3.5	11.5	
	A-3	2.5	4	3	9.5	
	A-4				0	
	B-1	3.5	4.5	2.5	10.5	
	B-2	3.5	4.5	3.5	11.5	
GPS Waypoint:	B-3	2	4.5	3	9.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.45918	C-2				0	
W 107.05672	TVK-1	4.5	5	5	14.5	
Photo #:	TVK-2	4	5	5	14	
230	TVK-3	5	5	5	15	
231 (zoom)	TVK-4	5	5	5	15	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1	4.5	3.5	2	10	
	A-2	1	3.5	3	7.5	
	A-3	1	3.5	3.5	8	
	A-4				0	
	B-1	3.5	4	3.5	11	Works better than at closer distances (contrast)
	B-2	3	4	4	11	
GPS Waypoint:	B-3	2	4	3	9	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.45914	C-2				0	
W 107.05601	TVK-1	4.5	4	5	13.5	Virtuay invisible
Photo #:	TVK-2	4	3.5	5	12.5	
232	TVK-3	5	5	5	15	
233 (zoom)	TVK-4	5	5	5	15	

Notes:

Generally a more Juniper green would be a better choice with the scrub oak. A1 has good contrast, but Carlsbad is not a good blend. Shale green with Yuma overlay - good colors but little contrast.

Juniper paired with a darker tone would be a good A series panel.

At 1/4 mile, there is a need for a darker contrast element paired with the Yuma.

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
☐ *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
☐ *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

Notes:

Not able to view panels beyond 400 meters due to site constraints.

Camouflage Pattern Field Evaluation Form | SITE 2: Hubbard Wash, Rifle, CO

Date: **8/2/2011**	*Weather:* **Clear**
Time: **9:55 AM**	*Heading:* **West**
Evaluated by:	**C. Brandt, K. Schwarzler, G. Cramer, S. Roché**
Test Site Location:	**Rifle**
GPS Coordinates (at panels):	**N 39.56816, W 107.80835**
Landscape Type:	***Juniper/Pinyon at Sage Edge***

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1	5	5	2	12	Carlsbad out of place against Juniper
	A-2	4.5	5	4.5	14	
	A-3	3.5	5	4.5	13	
	A-4	4.5	5	2	11.5	
	B-1	5	2.5	2	9.5	
	B-2	4.5	2.5	3	10	
GPS Waypoint:	B-3	3.5	3	4	10.5	
x *(Check)*	B-4	4.5	2.5	2	9	
GPS Coordinates:	C-1				0	
N 39.56860	C-2				0	
W 107.80730	TVK-1	5	5	5	15	
Photo #:	TVK-2	5	5	5	15	
238	TVK-3	5	5	5	15	
239-240 (zoom)	TVK-4	5	4.5	4.5	14	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1	5	5	2	12	
	A-2	4.5	5	4.5	14	
	A-3	4	5	5	14	
	A-4	4.5	5	3	12.5	
	B-1	5	5	2	12	
	B-2	5	5	4.5	14.5	
GPS Waypoint:	B-3	4.5	5	5	14.5	
x *(Check)*	B-4	4.5	5	3	12.5	
GPS Coordinates:	C-1				0	
N 39.56955	C-2				0	
W 107.80688	TVK-1	4.5	4	5	13.5	
Photo #:	TVK-2	4.5	4	5	13.5	
241	TVK-3	4.5	4	5	13.5	
242 (zoom)	TVK-4	5	5	5	15	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1	4.5	4	3	11.5	
	A-2	4.5	4	4	12.5	
	A-3	3.5	4	4.5	12	
	A-4	3.5	4	3.5	11	The combo red and tan matches the soil well
	B-1	4.5	4.5	3	12	
	B-2	4.5	4.5	4	13	
GPS Waypoint:	B-3	3.5	4.5	4.5	12.5	
x *(Check)*	B-4	3.5	4.5	3.5	11.5	The combo red and tan matches the soil well
GPS Coordinates:	C-1				0	
N 39.57041	C-2				0	
W 107.80643	TVK-1	3.5	3.5	5	12	
Photo #:	TVK-2	2.5	3	5	10.5	
243	TVK-3	2.5	3	5	10.5	
244 (zoom)	TVK-4	4	4.5	5	13.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1	3.5	3	2.5	9	About the limit of patterns scale
	A-2	3	3	3.5	9.5	
	A-3	2	3	4	9	
	A-4	2	3	3	8	
	B-1	4	4	3.5	11.5	
	B-2	4	4	4	12	
GPS Waypoint:	B-3	3.5	4.5	4.5	12.5	
x *(Check)*	B-4	3	3.5	3	9.5	
GPS Coordinates:	C-1				0	
N 39.57137	C-2				0	
W 107.80628	TVK-1	3	3.5	5	11.5	Virtually disappeared at this distance
Photo #:	TVK-2	3	3.5	5	11.5	Virtually disappeared at this distance
245	TVK-3	4	4	5	13	
246 (zoom)	TVK-4	4.5	5	5	14.5	

Notes:

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1	1.5	1	2	4.5	
	A-2	1	1	3	5	
	A-3	1	1	4	6	
	A-4	1	1	2.5	4.5	
	B-1	1.5	1	2	4.5	
	B-2	1	1	3	5	
GPS Waypoint:	B-3	1	1	4	6	
x *(Check)*	B-4	1	1	2.5	4.5	
	C-1				0	
N 39.57355	C-2				0	
W 107.80661	TVK-1			5	5	Scale is effective, but mainly because the
Photo #:	TVK-2			5	5	color combo is right.
247	TVK-3			5	5	Very hard to see.
248 (zoom)	TVK-4			5	5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
(Check)	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

Notes:

All the painted panels @ 600 meters perform as a single color. None of the texture within any of the patterns is visible at 600m. 400 to 500m is the threshold to where it drops out of view.

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
1200 meters (3/4 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.57816	C-2				0	
W 107.80334	TVK-1				0	
Photo #:	TVK-2				0	
249	TVK-3				0	
250 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
1600 meters (1 mile)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
(Check)	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

Notes:

All the painted panels @ 600 meters perform as a single color. None of the texture within any of the patterns is visible at 600m. 400 to 500m is the threshold to where it drops out of view.

Camouflage Pattern Field Evaluation Form | SITE 3: Hubbard Wash, Rifle, CO

Date:	**8/2/2011**	*Weather:*	**Clouds moving in**
Time:	**2:00 PM**	*Heading:*	**North**
Evaluated by:	**C. Brandt, K. Schwarzler, G. Cramer, S. Roché**		
Test Site Location:	**Rifle**		
GPS Coordinates (at panels):	**N 39.57644, W 107.80989**		
Landscape Type:	**Bare/rocky hillside with scattered Pinyon/Juniper**		

otak
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		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1	5	5	5	15	Carlsbad works well
	A-2	4	5	3.5	12.5	
	A-3	3	5	2.5	10.5	
	A-4	3.5	5	3	11.5	Too red
	B-1	5	4.5	5	14.5	
	B-2	4	4.5	4	12.5	
GPS Waypoint:	B-3	3	4.5	2.5	10	
x *(Check)*	B-4	3.5	4.5	3	11	Too red
GPS Coordinates:	C-1				0	
N 39.57565	C-2				0	
W 107.80935	TVK-1	4.5	5	4.5	14	
Photo #:	TVK-2	3	3.5	3	9.5	Too dark
251	TVK-3	3.5	3.5	3	10	Too dark
252 (zoom)	TVK-4	4	4.5	4.5	13	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1	5	5	5	15	
	A-2	4.5	5	4	13.5	
	A-3	3.5	5	2.5	11	
	A-4	4	5	3	12	
	B-1	5	4.5	5	14.5	
	B-2	5	4.5	4.5	14	
GPS Waypoint:	B-3	5	4.5	2.5	12	
x *(Check)*	B-4	5	4.5	3	12.5	
GPS Coordinates:	C-1				0	
N 39.57495	C-2				0	
W 107.80869	TVK-1	4.5	5	5	14.5	
Photo #:	TVK-2	3	3.5	3	9.5	
253	TVK-3	3	3.5	3	9.5	
254 (zoom)	TVK-4	4	4.5	4.5	13	% of Carlsbad is good

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1	4.5	4	5	13.5	
	A-2	3.5	2.5	3	9	
	A-3	2.5	2.5	2.5	7.5	
	A-4	3	2.5	2.5	8	
	B-1	5	5	5	15	
	B-2	4.5	5	4.5	14	
GPS Waypoint:	B-3	3.5	5	3.5	12	
x *(Check)*	B-4	4	5	4.5	13.5	Greatest concentration of Carlsbad helps
GPS Coordinates:	C-1				0	
N 39.57424	C-2				0	
W 107.80791	TVK-1	4	4	5	13	
Photo #:	TVK-2	3	3	3	9	Needs more Carlsbad
255	TVK-3	3	3	3.5	9.5	
256 (zoom)	TVK-4	4.5	4.5	4.5	13.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1	4	3.5	5	12.5	Contrast still visible.
	A-2	3	2	3	8	
	A-3	2	2	2	6	
	A-4	2.5	2	2.5	7	
	B-1	4.5	4.5	5	14	
	B-2	3.5	3.5	4	11	
GPS Waypoint:	B-3	3	3	3.5	9.5	
X *(Check)*	B-4	3.5	3.5	4	11	
GPS Coordinates:	C-1				0	
N 39.57289	C-2				0	
W 107.80933	TVK-1	2.5	3	3	8.5	
Photo #:	TVK-2	2	2.5	2.5	7	
259	TVK-3	3	2.5	3.5	9	
260(zoom)	TVK-4	4	4.5	4.5	13	

Notes:

Due to site navigation logistics, the 400m score was done after the 600m one.

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1	4	4	5	13	Can barely see pattern at all
	A-2	1	2	3	6	No contrast in pattern
	A-3	1	2	2.5	5.5	
	A-4	1	2	2.5	5.5	Too much red
	B-1	4.5	4	5	13.5	Near end of useful scale
	B-2	2	3	3	8	
GPS Waypoint:	B-3	2	3	2.5	7.5	
x *(Check)*	B-4	3	4	4	11	Greater amount of Carlsbad helps
GPS Coordinates:	C-1				0	
N 39.57109	C-2				0	
W 107.80946	TVK-1	1	1	3	5	
Photo #:	TVK-2	1	1	2	4	
257	TVK-3	2	2.5	3.5	8	
258 (zoom)	TVK-4	2.5	3	4	9.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	Single color
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	B1 is most effective
	B-2				0	Some detail, but barely @ this distance
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.56944	C-2				0	
W 107.80782	TVK-1				0	Single color
Photo #:	TVK-2				0	
261 262 (zoom)	TVK-3				0	
	TVK-4				0	

Notes:

Camouflage Pattern Field Evaluation Form | SITE 4: Hubbard Wash, Rifle, CO

Date: **8/3/2011**	*Weather:* **Clear**
Time: **9:30 AM**	*Heading:* **West**
Evaluated by:	**C. Brandt, K. Schwarzler, G. Cramer, S. Roché**
Test Site Location:	**Rifle**
GPS Coordinates (at panels):	**N 39.56845, W 107.80811**
Landscape Type:	**Sagebrush**

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1	5	5	3.5	13.5	
	A-2	4.5	5	4	13.5	
	A-3	3.5	5	4.5	13	
	A-4				0	
	B-1	5	4	3.5	12.5	
	B-2	5	4	4	13	
GPS Waypoint:	B-3	5	4	4.5	13.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.56930	C-2				0	
W 107.80747	TVK-1	5	4.5	3	12.5	
Photo #:	TVK-2	5	4.5	3	12.5	A bit too green; could benefit from grey against the sage
263	TVK-3	5	5	3	13	
264 (zoom)	TVK-4	5	4	3	12	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1	5	5	3.5	13.5	
	A-2	5	5	4	14	
	A-3	4.5	5	4.5	14	
	A-4				0	
	B-1	5	4	3.5	12.5	
	B-2	5	4	4	13	
GPS Waypoint:	B-3	5	4	4.5	13.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.56990	C-2				0	
W 107.80687	TVK-1	5	4	3.5	12.5	
Photo #:	TVK-2	5	4	3.5	12.5	
265	TVK-3	5	5	3.5	13.5	
266 (zoom)	TVK-4	5	5	4	14	

Viewing Distance	Pattern	Pattern Effectiveness Score (Score: 1 poor - 5 excellent) Contrast	Scale	Color	Total	Comments
300 meters	A-1	4.5	5	3	12.5	
	A-2	4.5	5	4	13.5	
	A-3	4	5	4.5	13.5	
	A-4				0	
	B-1	4.5	4.5	3	12	
	B-2	4.5	4.5	4	13	
GPS Waypoint:	B-3	4	4.5	4.5	13	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.57085	C-2				0	
W 107.80644	TVK-1	3.5	3.5	4.5	11.5	
Photo #:	TVK-2	3.5	3.5	4.5	11.5	The "green color" commented on above @ 100m is no longer a factor at this distance
267	TVK-3	5	5	5	15	
268 (zoom)	TVK-4	5	5	5	15	

Viewing Distance	Pattern	Pattern Effectiveness Score (Score: 1 poor - 5 excellent) Contrast	Scale	Color	Total	Comments
400 meters (1/4 mi.)	A-1	4.5	5	4.5	14	
	A-2	4.5	5	5	14.5	
	A-3	4	5	4	13	
	A-4				0	
	B-1	5	4.5	3.5	13	
	B-2	4.5	4.5	4.5	13.5	
GPS Waypoint:	B-3	3	4.5	4	11.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.57163	C-2				0	
W 107.80609	TVK-1	2.5	2	3.5	8	
Photo #:	TVK-2	2.5	2	3.5	8	Too fine of a texture a this distance; too dark of a color
269	TVK-3	5	5	5	15	
270 (zoom)	TVK-4	5	5	5	15	

Notes:

Photo 271 - Context photo of test site. Weather became more evenly overcast at 400m.

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1	1.5	1.5	3	6	Very subtle contrast
	A-2	1	1.5	4.5	7	
	A-3	1	1.5	4.5	7	
	A-4				0	
	B-1	3.5	3.5	3	10	Slight contrast in 1 and 2
	B-2	2.5	3.5	3.5	9.5	
GPS Waypoint:	B-3	1.5	3.5	4.5	9.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.57391	C-2				0	
W 107.80733	TVK-1				0	
Photo #:	TVK-2				0	Performing well in all categories; can't detect in the landscape
272	TVK-3				0	
273 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	A-1 can be slightly seen
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	B panels slightly discernable
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.57597	C-2				0	
W 107.80696	TVK-1				0	
Photo #:	TVK-2				0	
276	TVK-3				0	
277 (zoom)	TVK-4				0	

Notes:

Camouflage Pattern Field Evaluation Form | SITE 5: Parachute, CO

Date:	**8/3/2011**	*Weather:*	**Clouds moving in**
Time:	**2:24 PM**	*Heading:*	**East**
Evaluated by:	**K. Schwarzler, C. Brandt**		
Test Site Location:	**Parachute Sharrard Park**		
GPS Coordinates (at panels):	**N 39.50974, W 107.89828**		
Landscape Type:	**Sage steppe/scattered sage**		

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1	5	5	3	13	
	A-2	5	5	4.5	14.5	
	A-3	4.5	5	3.5	13	
	A-4				0	
	B-1	5	4	3	12	Scale is slightly too coarse
	B-2	5	4	4.5	13.5	
GPS Waypoint:	B-3	4.5	4	3.5	12	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.50949	C-2				0	
W 107.89938	TVK-1	4.5	5	4.5	14	
Photo #:	TVK-2	4.5	5	4.5	14	Color is only slightly bright green; could be good seasonaly
278	TVK-3	4	5	4.5	13.5	
279 (zoom)	TVK-4	5	5	4.5	14.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1	4.5	5	4	13.5	
	A-2	4	5	4.5	13.5	
	A-3	3.5	5	3.5	12	
	A-4				0	
	B-1				0	
	B-2				0	B panels horizontal and difficult to see here, similar to other
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.50954	C-2				0	
W 107.90058	TVK-1	3	4.5	4.5	12	Blue - greyish green might be helpful
Photo #:	TVK-2	3.5	4.5	4.5	12.5	
280	TVK-3	3	4.5	4.5	12	
281 (zoom)	TVK-4	5	5	5	15	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1	4	5	3.5	12.5	
	A-2	3.5	5	4.5	13	
	A-3	2.5	5	3.5	11	
	A-4				0	
	B-1				0	
	B-2				0	B1 color too light; can't see; contrast on top of A1
GPS Waypoint:	B-3				0	appears good; can see top of B1
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.50958	C-2				0	
W 107.90181	TVK-1				0	Performing well, blending in, hard to see
Photo #:	TVK-2				0	
282	TVK-3				0	
283 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1	3	4	3	10	Too light
	A-2	2.5	4	5	11.5	
	A-3	2	4	3.5	9.5	
	A-4				0	
	B-1	4	4.5	3	11.5	
	B-2	4	4.5	5	13.5	
GPS Waypoint:	B-3	3	4.5	3.5	11	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.50981	C-2				0	
W 107.90298	TVK-1				0	
Photo #:	TVK-2				0	
284	TVK-3				0	Colors blend; can't discern in landscape
285 (zoom)	TVK-4				0	

Notes:

Going to score similarly to other sage-based landscape

Camouflage Pattern Field Evaluation Form | SITE 6: Four Mile Park, Glenwood Springs, CO

Date:	**8/4/2011**	*Weather:*	**Clear**
Time:	**9:35 AM**	*Heading:*	**West**
Evaluated by:	**K. Schwarzler, C. Brandt, G. Cramer**		
Test Site Location:	**4 Mile Park**		
GPS Coordinates (at panels):	**N 39.39395, W 107.39648**		
Landscape Type:	**Aspen thicket at edge of grass meadow**		

otak
HanmiGlobal Partner

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1	4	5	3	12	Need a brighter green
	A-2	3.5	5	3.5	12	
	A-3	2.5	5	4	11.5	
	A-4				0	
	B-1	5	4	3	12	
	B-2	4.5	4	3.5	12	
GPS Waypoint:	B-3	3.5	4	4	11.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39414	C-2				0	
W 107.39532	TVK-1	5	5	5	15	Brighter green helps
Photo #:	TVK-2	5	5	5	15	
288	TVK-3	4.5	4.5	5	14	
289 (zoom)	TVK-4	5	5	5	15	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1	3.5	5	3	11.5	
	A-2	3	5	3.5	11.5	
	A-3	2.5	5	4	11.5	
	A-4				0	
	B-1	5	4.5	3	12.5	
	B-2	4.5	4.5	3.5	12.5	
GPS Waypoint:	B-3	3.5	4.5	4	12	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39420	C-2				0	
W 107.39419	TVK-1	3.5	4	5	12.5	Less Carlsbad would be good
Photo #:	TVK-2	4	4	5	13	
290	TVK-3	3.5	4	5	12.5	
291 (zoom)	TVK-4	5	4.5	4.5	14	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1	3.5	4.5	2	10	
	A-2	2.5	4.5	3.5	10.5	
	A-3	1	4.5	4	9.5	
	A-4				0	
	B-1	4.5	4.5	2	11	
	B-2	3.5	4.5	3.5	11.5	
GPS Waypoint:	B-3	3	4.5	4	11.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39434	C-2				0	
W 107.39301	TVK-1	3.5	3.5	4.5	11.5	
Photo #:	TVK-2	3.5	3.5	4.5	11.5	
292, 293 (zoom) - NO B3	TVK-3	4	4.5	4.5	13	
294, 295 (zoom)	TVK-4	5	5	4.5	14.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1	1.5	3	2	6.5	A's appear as a single color
	A-2	1	3	3.5	7.5	A3 is best color match
	A-3	1	3	4.5	8.5	
	A-4				0	
	B-1	2.5	4.5	2	9	B3 is best color match
	B-2	3.5	4.5	3.5	11.5	
GPS Waypoint:	B-3	4	4.5	4.5	13	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39452	C-2				0	
W 107.39214	TVK-1	2.5	2	4.5	9	
Photo #:	TVK-2	2.5	2	4.5	9	
296	TVK-3	3.5	3.5	4.5	11.5	
297 (zoom)	TVK-4	4	4.5	4.5	13	

Notes:

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1				0	Appear as single color
	A-2				0	Appear as single color
	A-3				0	Appear as single color
	A-4				0	
	B-1				0	Can barely detect pattern in B1
	B-2				0	
GPS Waypoint:	B-3				0	Appear as single color
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39398	C-2				0	
W 107.38967	TVK-1				0	
Photo #:	TVK-2				0	
298	TVK-3				0	
299 (zoom)	TVK-4				0	Slight pattern detection on TVK-4

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
(Check)	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

Notes:

Colors in general aren't bright enough.

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
1200 meters (3/4 mi.)	A-1				0	
1300 meters	A-2				0	Darker shadow would make them blend right in. Can pick out Carlsbad color.
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	No pattern is discernible on any panel
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39669	C-2				0	
W 107.38105	TVK-1				0	
Photo #:	TVK-2				0	
310	TVK-3				0	
311 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
1600 meters (1 mile)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
(Check)	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

Notes:

PHOTOS 300-309: CONTEXT PHOTOS OF PANELS. A1 and B1 are both visible from 1300m but A1 has more shadow and is broken up more. Pattern accentuated by natural shadow being cast upon panels by aspen foliage above and changing sun angles between observation points. The natural shadow tone is darker than the darkest paint used and is more effective at distance. Black 0ish>Natural Shadow 30ish>Yuma Green 60ish (via Guy Cramer's Pantone iPod app).

Camouflage Pattern Field Evaluation Form | SITE 7: Four Mile Park, Glenwood Springs, CO

Date:	**8/4/2011**	*Weather:*	**Mostly sunny, some clouds**
Time:	**11:30 AM**	*Heading:*	**Lokking N at panels**
Evaluated by:	**K. Schwarler, C. Brandt, G. Cramer**		
Test Site Location:	**Four Mile Park**		
GPS Coordinates (at panels):	**N 39.39433, W 107.39358**		
Landscape Type:	**Rolling grassland**		

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1	5	3.5	2	10.5	
	A-2	5	3.5	2.5	11	
	A-3	5	3.5	3	11.5	Needs Juniper Green
	A-4				0	
	B-1	5	3	2	10	Scale too blotchy at this distance
	B-2	5	3	2.5	10.5	
GPS Waypoint:	B-3	5	3	3	11	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39347	C-2				0	
W 107.39337	TVK-1	4	4	3.5	11.5	Too tan
Photo #:	TVK-2	5	4.5	5	14.5	
312	TVK-3	4.5	4	3.5	12	
313 (zoom)	TVK-4	3.5	3.5	3	10	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1	5	4.5	2	11.5	Needs brighter green
	A-2	5	4.5	2.5	12	
	A-3	5	4.5	3.5	13	
	A-4				0	
	B-1	5	3	2	10	
	B-2	5	3	2.5	10.5	
GPS Waypoint:	B-3	5	3	3.5	11.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39256	C-2				0	
W 107.39338	TVK-1	4	4.5	3.5	12	Carlsbad a little too noticeable here
Photo #:	TVK-2	4.5	4.5	4.5	13.5	
314	TVK-3	4	4	3	11	
315 (zoom)	TVK-4	3.5	3	2.5	9	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1	5	5	2	12	
	A-2	5	5	2.5	12.5	
	A-3	4.5	5	3.5	13	
	A-4				0	
	B-1	5	3	2	10	
	B-2	5	3	2.5	10.5	
GPS Waypoint:	B-3	4.5	3	3.5	11	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39193	C-2				0	
W 107.39391	TVK-1	3.5	4	2.5	10	Carlsbad is starting to be more noticeable
Photo #:	TVK-2	4	4.5	3	11.5	
316	TVK-3	3.5	4	2.5	10	
317 (zoom)	TVK-4	3	3.5	2	8.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1	4	5	2.5	11.5	
	A-2	4	5	3.5	12.5	
	A-3	3.5	5	4.5	13	
	A-4				0	
	B-1	5	3	2.5	10.5	
	B-2	5	3	3.5	11.5	
GPS Waypoint:	B-3	4.5	3	4.5	12	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.39104	C-2				0	
W 107.39175	TVK-1	3.5	4	3.5	11	
Photo #:	TVK-2	4.5	4.5	4.5	13.5	
318	TVK-3	3.5	4	3.5	11	
319 (zoom)	TVK-4	2.5	3.5	2	8	

Notes:

Not a lot of contrast in this landscape

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1	2	4.5	1.5	8	
	A-2	1.5	4.5	4	10	
	A-3	1	4.5	4.5	10	Almost completely blends
	A-4				0	
	B-1	4	3.5	1.5	9	
	B-2	3.5	3.5	3.5	10.5	
GPS Waypoint:	B-3	2	3.5	4.5	10	Almost completely blends
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.38960	C-2				0	
W 107.39000	TVK-1	2.5	4.5	4	11	
Photo #:	TVK-2	2.5	4.5	4.5	11.5	
320	TVK-3	3.5	5	4	12.5	
321 (zoom)	TVK-4	4	4.5	3	11.5	Too light in color

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
(Check)	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

Notes:

Texture of patterns no longer visible beyond 600m

Camouflage Pattern Field Evaluation Form | SITE 8: Four Mile Park, Glenwood Springs, CO

Date: **8/5/2011**	*Weather:* **Sunny**
Time: **9:35 AM**	*Heading:*
Evaluated by:	**K. Schwarler, C. Brandt, G. Cramer**
Test Site Location:	**4 Mile Park (beyond)**
GPS Coordinates (at panels):	**N 39.32701, W 107.42834**
Landscape Type:	**Conifer**

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1				0	
	A-2	5	4.5	2.5	12	
	A-3	4.5	4.5	3.5	12.5	
	A-4				0	
	B-1				0	
	B-2	5	3.5		8.5	
GPS Waypoint:	B-3	5	3.5		8.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.32718	C-2				0	
W 107.42721	TVK-1	5	5	3.5	13.5	
Photo #:	TVK-2	5	5	3.5	13.5	Needs more bluish-green (Beetle green); Carlsbad
322	**TVK-3**	**4.5**	**4.5**	**3.5**	**12.5**	**stands out in evergreen. Pattern is a bit too coarse at**
323 (zoom)	TVK-4	5	4	2.5	11.5	this distance

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1				0	
	A-2	5	4.5	2.5	12	
	A-3	4.5	4.5	3.5	12.5	
	A-4				0	
	B-1				0	Scale too coarse
	B-2	5	3.5	2	10.5	
GPS Waypoint:	B-3	5	3.5	3.5	12	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.32740	C-2				0	
W 107.42606	TVK-1	5	5	3.5	13.5	Carlsbad too noticeable
Photo #:	TVK-2	5	5	3.5	13.5	
324	TVK-3	4.5	4.5	3.5	12.5	
325 (zoom)	TVK-4	5	4	2.5	11.5	Scale slightly too coarse on TVK-4

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1				0	
	A-2	4.5	4	2	10.5	Starting to lose scale
	A-3	4	4	2	10	Color too light
	A-4				0	
	B-1				0	
	B-2	4.5	3.5	1.5	9.5	Scale still a little coarse but getting better
GPS Waypoint:	B-3	4.5	3.5	2	10	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.32782	C-2				0	
W 107.42502	TVK-1	3.5	4	2.5	10	Will need to be coarser beyond this point
Photo #:	TVK-2	3.5	4	2.5	10	
326	TVK-3	3	3	2.5	8.5	
327 (zoom)	TVK-4	4	4.5	2	10.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1				0	
	A-2	2.5	3.5	2	8	Still picking up some pattern, but slight
	A-3	2	3.5	2	7.5	
	A-4				0	
	B-1				0	
	B-2	3	4.5	1.5	9	
GPS Waypoint:	B-3	2.5	4.5	2	9	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.32831	C-2				0	
W 107.42400	TVK-1	2.5	3.5	2.5	8.5	
Photo #:	TVK-2	2.5	3.5	2.5	8.5	
328, 329 (zoom)	TVK-3	3	2	2.5	7.5	
330	TVK-4	4	4	2	10	

Notes:

Scale seems less important with the multi-color Tyvek patterns because the multiple colors are better. In general, the colors tested don't work in this environment. Needs to be darker, and no Carlsbad.

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1				0	
	A-2	1.5	2	2	5.5	
	A-3	1	2	2	5	
	A-4				0	
	B-1				0	
	B-2	1.5	2.5	1.5	5.5	
GPS Waypoint:	B-3	1	2.5	2	5.5	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.32951	C-2				0	
W 107.42217	TVK-1	2	2.5	2	6.5	
Photo #:	TVK-2	1.5	1.5	2	5	
331, 332 (zoom)	TVK-3	1.5	1.5	2	5	
333, 334 (zoom)	TVK-4	2.5	3.5	1.5	7.5	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	
	A-2				0	No contrast/scale visible for any at this distance; appear as single color
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.32985	C-2				0	
W 107.41949	TVK-1				0	
Photo #:	TVK-2				0	
335	TVK-3				0	
336 (zoom)	TVK-4				0	

Notes:

Camouflage Pattern Field Evaluation Form | SITE 9: Baggs, WY

Date:	**8/23/2011**	*Weather:*	**Clear**
Time:	**9:20 AM**	*Heading:*	
Evaluated by:	**C. Brandt**		
Test Site Location:	**Creston - Baggs, WY**		
GPS Coordinates (at panels):	**N 41.22353, W 107.70870**		
Landscape Type:	**Red soil badland**		

**** 4 panels documented - A5, A6, C1, C2 (photos/GPS only)***

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.22276	C-2				0	
W 107.70805	TVK-1				0	
Photo #:	TVK-2				0	
462	TVK-3				0	
463 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.22195	C-2				0	
W 107.70763	TVK-1				0	
Photo #:	TVK-2				0	
464 (bad)	TVK-3				0	
465, 466 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.22108	C-2				0	
W 107.70719	TVK-1				0	
Photo #:	TVK-2				0	
467	TVK-3				0	
468 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.22033	C-2				0	
W 107.70647	TVK-1				0	
Photo #:	TVK-2				0	
469	TVK-3				0	
470	TVK-4				0	

Notes:

At 300m C-2 was showing better contrast vs. C-1 (green based mix); 3 colors factor?

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.21862	C-2				0	
W 107.70569	TVK-1				0	
Photo #:	TVK-2				0	
471	TVK-3				0	
472 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
(Check)	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

Notes:

At 500m the pattern of C-2 was still visible; the others seemed like a monocolor. Beyond that distance, the texture disappeared.

Camouflage Pattern Field Evaluation Form | SITE 10: Robbers Gulch, Baggs, WY

Date:	**8/23/2011**	*Weather:*	**Clear**
Time:	**10:25 AM**	*Heading:*	**N**
Evaluated by:	**C. Brandt**		
Test Site Location:	**Robbers Gulch**		
GPS Coordinates (at panels):	**N 41.21241, W 107.79617**		
Landscape Type:	**Sagebrush/red soil badlands**		

otak
HanmiGlobal Partner

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1				0	(Started with 200 m. No 100 m data taken)
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
[ ] *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
[x] *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.21189	C-2				0	
W 107.79459	TVK-1				0	
Photo #:	TVK-2				0	
473	TVK-3				0	
474 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.20986	C-2				0	
W 107.79507	TVK-1				0	
	TVK-2				0	
475	TVK-3				0	
476 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.20882	C-2				0	
W 107.79541	TVK-1				0	
Photo #:	TVK-2				0	
477	TVK-3				0	
478 (zoom)	TVK-4				0	

Notes:

At 400m, minimal contrast/pattern visible on C1. C2 shows more pattern/contrast, as does A5. Pattern of A6 is less visible - looks solid dark green.

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1				0	
560 meters	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 41.20742	C-2				0	
W 107.79524	TVK-1				0	
Photo #:	TVK-2				0	
485	TVK-3				0	
486 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1				0	
	A-2				0	
	A-3				0	
	A-4				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
(Check)	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	TVK-2				0	
	TVK-3				0	
	TVK-4				0	

Notes:

C2 is only pattern really visible at 560 meter. Reds are quite harmonious w/adjacent colors, even though immediate surroundings are green.

Camouflage Pattern Field Evaluation Form | SITE 11: South of Baggs, WY

Date: **8/23/2011**	*Weather:* **Clear**
Time: **11:45 AM**	*Heading:* **N**
Evaluated by: **C. Brandt**	
Test Site Location: **South of Baggs, WY (quick stop along highway)**	
GPS Coordinates (at panels): **None recorded (partial test, Close-up and 100m photos only)**	
Landscape Type: **Wyoming Sagebrush Steppe**	

GPS Waypoint:
☐ *(Check)*
GPS Coordinates:

Photo #:

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1					No data collected other than photos taken
	A-2					
	A-3					
	A-4					
	B-1					
	B-2					
	B-3					
	B-4					
	C-1					
	C-2					
	TVK-1					
	TVK-2					
	TVK-3					
	TVK-4					

GPS Waypoint:
☐ *(Check)*
GPS Coordinates:

Photo #:

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1					
	A-2					
	A-3					
	A-4					
	B-1					
	B-2					
	B-3					
	B-4					
	C-1					
	C-2					
	TVK-1					
	TVK-2					
	TVK-3					
	TVK-4					

Camouflage Pattern Field Evaluation Form | SITE 12: Hubbard Wash, Rifle, CO

Date: **8/25/2011**	*Weather:* **Clear**
Time: **11:15 AM**	*Heading:* **West**
Evaluated by:	**K. Schwarzler, C. Brandt**
Test Site Location:	**Hubbard Mesa, Rifle**
GPS Coordinates (at panels):	**N 39.56815, W 107.80849**
Landscape Type:	**Juniper/pinyon with sage foreground**

Covert green of original panels don't match; base coat influence affects the accuracy of the color

same

(Score: 1 poor - 5 excellent)

Viewing Distance	Pattern	Contrast	Scale	Color	Total	Comments
100 meters	A-1		same		0	
	A-2		same		0	
	A-5		same		0	Black adds contrast and pop; scale is still too small,
	A-6		same		0	same as before
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.56887	C-2				0	
W 107.80777	TVK-1				0	
Photo #:	**TVK-1B**				0	
509	TVK-4				0	Better contrast (half to 1 point) by black Tyvek patterns
510 (zoom)	**TVK-4B**				0	vs. original ones

Pattern Effectiveness Score

(Score: 1 poor - 5 excellent)

Viewing Distance	Pattern	Contrast	Scale	Color	Total	Comments
200 meters	A-1				0	
	A-2				0	
Photos 511,512 are	**A-5**				0	Additional half point for performance in contrast via the
detail at 50m	**A-6**				0	black pairing
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	Looking muddy
	C-2				0	
	TVK-1				0	
Photo #:	**TVK-1B**				0	
513	TVK-4				0	
514 (zoom)	**TVK-4B**				0	4 color doesn't look as good

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1				0	
	A-2				0	
	A-5				0	Looking good contrast
	A-6				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
☐ *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	**TVK-1B**				0	
515	TVK-4				0	
516	**TVK-4B**				0	Looking very good in sage

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1				0	
	A-2				0	
	A-5				0	
	A-6				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
☐ *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #:	**TVK-1B**				0	
517	TVK-4				0	
518 (zoom)	**TVK-4B**				0	

Notes:

At 400m we are still barely seeing any texture in 2-color panels. Pairing black with the midtones of the 2 color did not increase visibility of constrasting pattern. C1 looks like solid color at 300m. Colors seem wrong, don't match Tyvek versions; paint or printing innacuracy?

Camouflage Pattern Field Evaluation Form | SITE 13: Hubbard Wash, Rifle, CO

Date:	**8/25/2011**	*Weather:*	**Clear**
Time:	**2:00 PM**	*Heading:*	**North**
Evaluated by:	**K. Schwarzler, C. Brandt**		
Test Site Location:	**Hubbards, Rifle**		
GPS Coordinates (at panels):	**N 39.57493, W 107.80907**		
Landscape Type:	**Sagebrush**		

(BLACK IS A VERY GOOD IMPROVEMENT)

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1				0	
	A-2				0	Scale still slightly too fine at 100m
	A-5				0	
	A-6				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	A little "leopardy"
N 39.57403	C-2				0	
W 107.80890	TVK-1				0	
Photo #:	**TVK-1B**				0	
519	TVK-4				0	
520 (zoom)	**TVK-4B**				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1				0	
	A-2				0	
DEAD ON!	**A-5**				0	Hard to see any of them - good
	A-6				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.57256	C-2				0	
W 107.80865	TVK-1				0	
Photo #:	**TVK-1B**				0	
521	TVK-4				0	
522 (zoom)	**TVK-4B**				0	A little black visible, otherwise hidden

Hard to see any of them at 200 - VERY good

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1				0	
	A-2				0	
	A-5				0	
	A-6				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.57135	C-2				0	
W 107.80875	TVK-1				0	
Photo #:	**TVK-1B**				0	
523	TVK-4				0	Can't see anything except the darkest spots
524 (zoom)	**TVK-4B**				0	in TVK-4B at 300m

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1				0	
	A-2				0	
	A-5				0	
	A-6				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
N 39.57045	C-2				0	
W 107.80852	TVK-1				0	
Photo #:	**TVK-1B**				0	
525	TVK-4				0	
526 (zoom)	**TVK-4B**				0	

Notes:

Camouflage Pattern Field Evaluation Form | SITE 14: Dry Park Road, Carbondale, CO

Date:	**8/25/2011**	*Weather:*	**Overcast**
Time:	**5:00 PM**	*Heading:*	**Southeast**
Evaluated by:	**C. Brandt**		
Test Site Location:	**Dry Park**		
GPS Coordinates (at panels):	**N 39.45886, W 107.30917**		
Landscape Type:	**Red soil (P-J, sage, grass), cut slope**		

Order (left to right): A5, A4, B4, C2, C1

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1				0	
	A-2				0	
	A-4	3	4.5	4.5	12	Blends well, but too much Carlsbad
	A-5	4.5	4.5	2	11	Too much green
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4	4.5	4	5	13.5	Blends well with large red areas
GPS Coordinates:	C-1	3	3.5	2	8.5	No red makes it stand out
N 39.45988	C-2	5	4	4.5	13.5	Maybe too much contrast with black
W 107.30965	TVK-1				0	Not a lot of dark shadows in this red cut bank setting
Photo #:	TVK-2				0	
566	TVK-3				0	
567 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1				0	
	A-2				0	
	A-4	3	4	4	11	A bit too much Carlsbad
	A-5	4.5	4.5	2	11	Pattern shows well; needs red
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4	4	4	4	12	Slightly too dark with much red
GPS Coordinates:	C-1	3	3	2	8	
N 39.46056	C-2	4.5	4	4.5	13	Too dark
W 107.30980	TVK-1				0	
Photo #:	TVK-2				0	
568, 569 (zoom)	TVK-3				0	
570, 571 (zoom)	TVK-4				0	
(double shots)						

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1				0	
	A-2				0	
	A-4	2.5	3	4	9.5	Too light, pale; contrast fading @300 (1st place)
	A-5	3.5	4	1.5	9	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
x *(Check)*	B-4	3	3.5	3.5	10	A bit too dark (2nd place)
GPS Coordinates:	C-1	3	2	2	7	Enlarge and no black - Yuma or 50/50
N 39.46149	C-2	3.5	3	3.5	10	Too dark
W 107.3099	TVK-1				0	
Photo #:	TVK-2				0	
572	TVK-3				0	
573 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1				0	
	A-2				0	
	A-4	1.5	2	4	7.5	
	A-5	2.5	2.5	1.5	6.5	Too green
	B-1				0	
	B-2				0	
	B-3				0	
x *(Check)*	B-4	2	3	3.5	8.5	
GPS Coordinates:	C-1	1.5	2	2	5.5	
N 39.46207	C-2	2.5	3	3.5	9	
W 107.31139	TVK-1				0	
Photo #:	TVK-2				0	
574	TVK-3				0	
575 (zoom)	TVK-4				0	

Notes:

Starting to see panels perform as solid colors at 400m. Still see a bit of contrast in A5 and C2, but A5 is too green. Too much dark tone and too small of a scale in C2. Overall A4 blends in best, second is B4. Scale up the C series for better results.

Camouflage Pattern Field Evaluation Form | SITE 15: Four Mile Park, Glenwood Springs, CO

Date:	**8/29/2011**	*Weather:*	**Clear/overcast**
Time:	**2:00 PM**	*Heading:*	**East**
Evaluated by:	**C. Brandt**		
Test Site Location:	**Four Mile Park**		
GPS Coordinates (at panels):	**Not recorded. Partial test only.**		
Landscape Type:	**Coniferous Evergreen (alpine fir, spruce)**		

*** A-6, TVK 1-B only**

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters	A-1				0	
	A-2				0	
	A-3				0	
*	**A-6**				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
☐ *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	
Photo #: *	**TVK-1B**				0	
662, 663	TVK-3				0	
664 (zoom)	TVK-4				0	

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters	A-1				0	
	A-2				0	
	A-3				0	
*	**A-6**				0	
	B-1				0	
	B-2				0	
GPS Waypoint:	B-3				0	
☐ *(Check)*	B-4				0	
GPS Coordinates:	C-1				0	
	C-2				0	
	TVK-1				0	A bit too much Carlsbad in TVK 1B giving it a slight yellowish tint; printing process issue? Blended in with dry grass in foreground well
Photo #: *	**TVK-1B**				0	
665	TVK-3				0	
666, 667 (zoom)	TVK-4				0	

Camouflage Pattern Field Evaluation Form | SITE 16: Encana K9OU well pad, Parachute, CO

Evaluated: **9/27/2011**	*Weather:* **Clear**
Time: **11:00 AM**	*Heading:* **North**
Evaluated by:	**C. Brandt, K. Schwarzler**
Test Site Location:	**Parachute (Encana K9OU well pad)**
GPS Coordinates (at panels):	**N 39.36201, W 108.11613**
Landscape Type:	**Sagebrush/grass with Pinyon/Juniper**

*** C-series pattern tested only (400% scale, Juniper Green, Carlsbad Canyon, Black)**

			Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance		**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
100 meters		A-1					
		A-2					
		A-3					
		A-4					
		B-1					
		B-2					
GPS Waypoint:		B-3					
x *(Check)*		B-4					
GPS Coordinates:		C-1					
N 39.36116	*	**C-3**	5	3	4	12	Black is a little too dark @ 100m
W 108.11568		TVK-1					slightly too extreme in terms of contrast
Photo #:		TVK-2					
113		TVK-3					
114 (zoom)		TVK-4					

			Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance		**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
200 meters		A-1					
		A-2					
		A-3					
		A-4					
		B-1					
		B-2					
GPS Waypoint:		B-3					
x *(Check)*		B-4					
GPS Coordinates:		C-1					
N 39.36039	*	**C-3**	5	3.5	4.5	13	Black still a little too dark vs. the natural
W 108.11585		TVK-1					shadows present in nearby juniper
Photo #:		TVK-2					
115		TVK-3					
116 (zoom)		TVK-4					

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
300 meters	A-1					
	A-2					
	A-3					
	A-4					
	B-1					
	B-2					
GPS Waypoint:	B-3					
x *(Check)*	B-4					
GPS Coordinates:	C-1					
N 39.35954 *	**C-3**	5	4	4.5	13.5	Black still slightly too dark.
W 108.11482	TVK-1					50/50 blend with Yuma/Black instead?
Photo #:	TVK-2					
117	TVK-3					
118 (zoom)	TVK-4					

		Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
400 meters (1/4 mi.)	A-1					
	A-2					
	A-3					
	A-4					
	B-1					
	B-2					
GPS Waypoint:	B-3					
x *(Check)*	B-4					
GPS Coordinates:	C-1					
N 39.35852 *	**C-3**	5	4	4.5	13.5	Black too dark still
W 108.11484	TVK-1					
Photo #:	TVK-2					
119	TVK-3					
120 (zoom)	TVK-4					

Notes:

At certain distances, the tank stands out where the adjacent vegetation appears to be mainly dry grass. At other vantage points, it fits in well with the juniper and sage nearby. The black appears darker than the natural shadow areas nearby. 50/50 of Yuma/Black would be better.

			Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
600 meters	A-1					
	A-2					
	A-3					
GPS Waypoint:	A-4					
x *(Check)*	B-1					
GPS Coordinates:	B-2					
N 39.35704 (e)	B-3					
W 108.11327 (e)	B-4					
N 39.35667 (w)	C-1					
W 108.11485 (w) *	**C-3**	5	4.5	4.5	14	Black is beginning to work better at this dist.
(two photo points)	TVK-1					
Photo #:	TVK-2					
(e) 121, 122 (zoom)	TVK-3					
(w) 123, 124 (zoom)	TVK-4					

			Pattern Effectiveness Score (Score: 1 poor - 5 excellent)				
Viewing Distance	**Pattern**	**Contrast**	**Scale**	**Color**	**Total**	**Comments**
800 meters (1/2 mi.)	A-1					
	A-2					
	A-3					
	A-4					
	B-1					
	B-2					
GPS Waypoint:	B-3					
x *(Check)*	B-4					
GPS Coordinates:	C-1					
N 39.35534 *	**C-3**	4.5	5	5	14.5	Black very close to working well here
W 108.11238	TVK-1					
Photo #:	TVK-2					
125	TVK-3					
126 (zoom)	TVK-4					

Notes:

At 800 m, the pattern really began to perform well. With the use of 50/50 (Yuma/Black), we would have slightly less contrast visible in the pattern and that would likely be ok. What stands out most at 800 m is the dark shadow of our painted tank casting upon the adjacent tank to the right. This distracting dark shape is separate from the tank color test and irrelevant.

Viewing Distance	Pattern	Pattern Effectiveness Score (Score: 1 poor - 5 excellent) Contrast	Scale	Color	Total	Comments
1000 m	A-1					
	A-2					
	A-3					
	A-4					
	B-1					
	B-2					
GPS Waypoint:	B-3					
x *(Check)*	B-4					
GPS Coordinates:	C-1					
N 39.35356 *	**C-3**	4	5	5	14	The Carlsbad and Juniper are fading into one,
W 108.11197	TVK-1					but the black is still reading well.
Photo #:	TVK-2					
127	TVK-3					
128 (zoom)	TVK-4					

Viewing Distance	Pattern	Pattern Effectiveness Score (Score: 1 poor - 5 excellent) Contrast	Scale	Color	Total	Comments
1200 m (3/4 mi.)	A-1					
	A-2					
	A-3					
	A-4					
	B-1					
	B-2					
GPS Waypoint:	B-3					
x *(Check)*	B-4					
GPS Coordinates:	C-1					
N 39.35197 *	**C-3**	2	5	5	12	No perception of texture on the tank, but it
W 108.11146	TVK-1					blends in better than adjacent solid color tank.
Photo #:	TVK-2					
129	TVK-3					
130 (zoom)	TVK-4					

Notes:

At 1000 m, the adjacent solid color tank is blending in well, but this also has to do with the size of the tank, relative to the overall landscape - it doesn't stand out as much. At 1200 m, the tank is virtually invisible. If the painted camo pattern is performing at 100%, the adjacent solid color tank is 95% effective. Our tested pattern scale seems appropriate as it matches the shadow/texture of the adjacent vegetation.

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