

Aerial Photograph Interpretation

Interpretation of the true-color aerial photographs for THRO relied heavily on landscape position to help determine classes for vegetation polygons since many color, shape, and texture signatures were similar. Also, signatures were influenced by timing of photography, as aerial photographs were acquired in two different seasons; most of the Park during early July, and the eastern environs in late August. The difference in overflight dates created more photographic signatures to interpret because of moist, early summer conditions versus dry, late summer conditions and the corresponding phenology of dominant plant species. A brief description of each map class (plant association, alliance, or complex), topographic position, and photo signature characteristics is presented below (note, the number in parentheses indicates the map class number):

Prairie Dog Town Complex (1).

Location: This sparse vegetation class occupies plains, broad drainages, swales, terraces, and gentle slopes within the project region. Often, other vegetation types occur within the boundaries of individual towns.

Photo signature: Small, white stipples (burrow holes), usually somewhat interconnected by narrow trails and lying within dull white, tan, gray-green, and medium green background colors. The class is delineated to the edge of the obviously grazed zone (hazy/cloudy appearance) per Plumb (1997).

Figure: 4-1a

Badlands Sparse Vegetation Complex (2).

Location: This geologic feature and sparse vegetation class provides much of the Park's aesthetic focus and consists of barren to sparsely vegetated hills, cliffs, bluffs, pinnacles, mounds, table lands, escarpments, erosion fans, alkaline flats, overflows, and drainages.

Photo signature: For siltstone, claystone, sandstone, and sediments include a dull white to tan to yellowish color signature, sometimes with shadowing appearing as black. Pinkish-red rocks are delineated/mapped as Class 3 and layers of bentonite over the whitish sediments creates a dark gray signature that is delineated/mapped as Class 4.

Figure: 4-1b

Scoria Sparse Vegetation Complex (3).

Location: This map unit provides additional aesthetic focus and consists of barren to sparsely vegetated outcrops, hilltops, and ridgelines.

Photo Signature: Focuses on reddish- to pink-colored scoria that contrasts with dull white to tan badlands outcrops as the predominant interpretive feature.

Figure: 4-1c

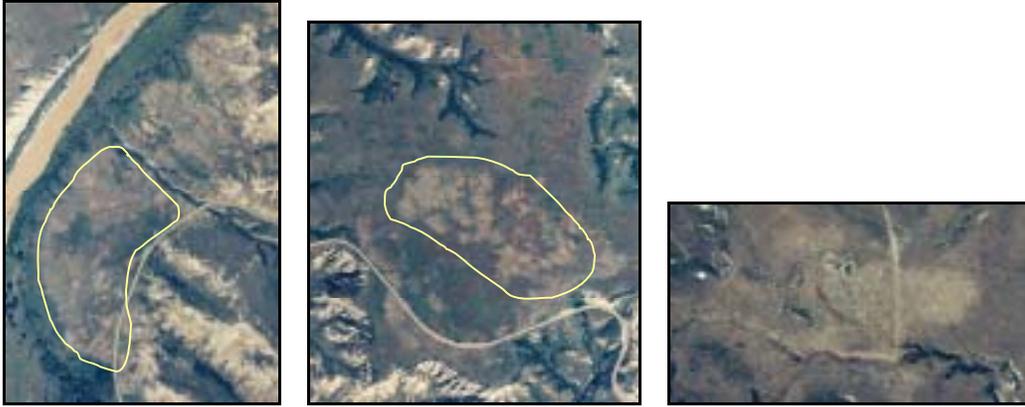
Long-leaved Sagebrush Sparse Vegetation Alliance (4).

Location: This geologic feature and sparse vegetation class provides minor aesthetic focus and consists of barren to sparsely vegetated outcrops or tongues of bentonite clay.

Photo Signature: Focuses on bluish-gray to creamy-colored exposures along a consistent horizontal gradient.

Figure: 4-1d

a. Prairie Dog Town Complex (1).



b. Badlands Sparse Vegetation Complex (2).



c. Scoria Sparse Vegetation Complex (3).



d. Long-leaved Sagebrush S.V.A. (4)



Figure 4-1 – Classes 1, 2, 3, & 4 Representative Photo Signatures.

Leafy Spurge Herbaceous Alliance (10).

Location: This exotic forb has invaded most habitats in the South Unit's west side and along many of the perennial waterways. It is the dominant plant in many moist drainages and floodplain sites, but exists as an understory species in shrub and tree stands.

Photo Signature: Focuses on the dull yellow to olive green color, located in South Unit and adjacent environs habitats and the texture is smooth.

Figure: 4-2a

Canada Thistle Herbaceous Alliance (11).

Location: This exotic forb occurs in small patches on moist sites and is mapped on an as-observed basis. One large patch occurs in a prairie dog town on the east side of the South Unit.

Photo Signature: A dark green to black patch of vegetation against the gray-green, stippled prairie dog town signature.

Figure: 4-2b

Prairie Sandreed Grass Herbaceous Alliance (12).

Location: Occurs in relatively pure patches along plateau rims, on hilltops, and slopes with sandy soil. Present on Petrified Forest Plateau along the rim and draw heads between flats dominated by needle-and-thread grass and draws occupied by green ash woodlands.

Photo Signature: Medium green color and circular growth pattern with smooth edges; when on scoria hills and ridges, also has the circular growth pattern but the color is dark gray.

Figure: 4-2c

Prairie Cordgrass Temporarily-Flooded Herbaceous Alliance (13).

Location: This tall wetland grass occurs in wet depressions, possibly old oxbows in the floodplain of the Little Missouri River. Best examples are in the North Unit: one stand occurs in the longhorn cattle pasture near the entry station.

Photo signature: Medium green to dark green in color, regular stand margins, and a smooth texture typically surrounded by silver sagebrush shrubs or green ash / eastern cottonwood trees.

Figure: 4-2d

a. Leafy Spurge Herbaceous Alliance (10).



b. Canada Thistle H.A. (11)



c. Prairie Sandreed Grass H.A. (12).



d. Prairie Cordgrass T-F H.A. (13).



e. Emergent Wetland (14).



Figure 4-2 – Classes 10, 11, 12, 13, and 14 Representative Photo Signatures.

Emergent Wetland (14).

Location: Occurs on saturated and inundated soils, where water depths do not exceed one meter. Wetland vegetation is found on seeps and springs and along drainages inside the Park, and on seeps and springs, in drainages, swales, closed basins, and around dugouts, ponds, and reservoirs within the environs. All wetlands are delineated for this study, if observed, whether or not they meet the MMU. Linear wetlands of swales are delineated in a line coverage.

Photo Signature: Ranges from light green to black, smooth texture, and rounded polygon margins for clonal species like bulrush and cattail. Small pockets of open water are often present, usually brown or black in color.

Figure: 4-2e (previous page)

Little Bluestem - Sideoats Grama Herbaceous Alliance (15).

Location: This class occurs on north-facing, gravelly hillsides and ridges, often as very small patches or intermixed with shrubs of other vegetation classes.

Photo Signature: Ranges from a stippled pattern of white dots on slopes and ridges in the Achenbach Hills area to a solid, dark green to black color at other sites.

Figure: 4-3a

Western Wheatgrass Herbaceous Alliance (16).

Location: Occupies floodplains, drainages, swales, depressions, and gradual slopes. (Typical habitat: Little Missouri River floodplain and its valley slopes).

Photo Signature: Typically smooth gray-green to dark green color which may be hidden by yellow if leafy spurge or yellow sweetclover are abundant in the habitat.

Figure: 4-3b

Introduced Grassland Herbaceous Alliance (17).

Location: This class occurs along roadways, on historic agricultural fields, or in pastures where exotic species have escaped or been interseeded. Notable examples occur along the Park loop roads and the eastern flats of the South Unit, from the bison corrals to the Painted Canyon Overlook.

Photo Signatures: Smooth brome is dark gray to black and circular (“splotchy”) when undisturbed, but medium green to dark gray and smooth-textured when burned, mown, or grazed; Kentucky bluegrass is light gray to green-gray; and crested wheatgrass is yellowish green to gray-green.

Figure: 4-3c

a. Little Bluestem – Sideoats Grama
Herbaceous Alliance (15).



b. Western Wheatgrass H.A. (16).



c. Introduced Grassland Herbaceous Alliance (17).



d. Needle-and-Thread Herbaceous Alliance (18).

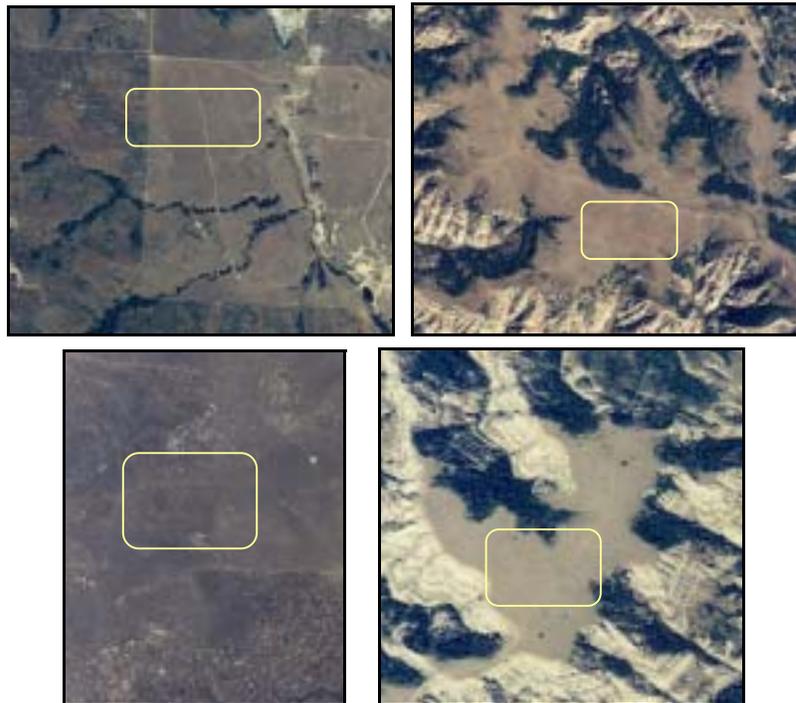


Figure 4-3 – Classes 15, 16, 17, & 18 Representative Photo Signatures.

Needle-and-Thread Herbaceous Alliance (18).

- Location:** This class is a common upland grassland throughout the region, occupying plateaus, buttes, hilltops, slopes, and ridges.
- Photo Signatures:** Tan, light gray-green, and greenish-gray (depending on early July or late August photography). This type always has a smooth texture, and some small, circular barren spots are occasionally present (bison wallows).
- Figure:** 4-3d (previous page)

Horizontal Juniper Dwarf Shrub Alliance (30).

- Location:* Primarily occupies steep, north-facing slopes, and occasional east- and west-facing exposures. More common in the vicinity of scoria outcrops and often intermixes with Classes 35, 36, and 15 on these mesic sites.
- Photo signatures:* A medium green to black, solid color on north-facing slopes to gray-green with medium green flecks on E and W exposures; the texture is smooth.
- Figure:* 4-4a

Silver Sagebrush / Western Wheatgrass Shrubland (31).

- Location:* Broad drainages, creek beds, gentle slopes, and river. Typical habitat is the oxbow bends of the Little Missouri River and meandering creeks. It often intermixes with buckbrush (Class 37), pure stands of western wheatgrass (Class 16), and is sometimes invaded by leafy spurge (Class 10) in the South Unit.
- Photo signatures:* Vary, ranging from gray dots against a gray-green to medium green background, to dark green or black dots against a green background on well-vegetated drainages. Leafy spurge can influence the color from a yellowish-green to an olive green and obscure the roughness of the signature. The texture may appear smooth or rough.
- Figure:* 4-4b

Rabbitbrush Shrubland Alliance (33).

- Location:* This shrub class was observed on slumping slopes and disturbed slopes. Stands occur near the North Unit access road off SH 85, the slump below Painted Canyon Overlook, and I-94 near the South Unit/Medora exit.
- Photo signatures:* Include a grayish, clouding effect and very small individual bumps that are gray in color.
- Figure:* 4-4c

a. Horizontal Juniper Dwarf Shrub Alliance (30).



b. Silver Sagebrush – Western Wheatgrass Shrubland (31).



c. Rabbitbrush Shrubland Alliance (33).



d. Three-leaved Sumac Shrubland Alliance (35).



Figure 4-4 – Classes 30, 31, 33, and 35 Representative Photo Signatures.

Three-leaved Sumac Shrubland Alliance (35).

Location: Occupies the tops of low ridges and hills of scoria and more mesic zones on badlands formations. It intermingles with horizontal juniper dwarf S.A. (Class 30), little bluestem - sideoats grama H.A.(Class 15), and Rocky Mountain juniper woodland alliance (Class 47).

Photo signatures: Regular distribution of rounded shrubs that are dark green to black in color; often including small exposures of reddish scoria.

Figure: 4-4d (previous page)

Silver Buffaloberry Shrubland Alliance (36).

Location: This shrub class occurs as small patches on heads of draws, around badland formations, and along several drainages and creeks. The patches often occur below the MMU.

Photo signatures: Large, pebbly texture; a gray-green to black color, associated with a medium green to dark green background.

Figure: 4-5a

Wolfberry Temporarily-Flooded Shrubland Alliance (37).

Location: This shrub class is distributed throughout the project area in swales, depressions, drainages, and moist slopes, but occurs as larger patches in the floodplain of the Little Missouri River. It commonly intermixes with Class 31 shrubland and Class 45 woodland.

Photo signatures: Medium green to dark green or black in color; sometimes a dull gray-green was noted; the margins are rounded and individual clones are oval.

Figure: 4-5c

Sandbar Willow Temporarily-Flooded Shrubland Alliance (38).

Location: This wetland shrub class is common on Little Missouri River islands and point bars and some smaller drainages/creekbanks.

Photo signatures: Include a smooth to brushy texture and a medium green color; sometimes against the tan background of sediment deposits.

Figure: 4-5b

Greasewood Shrub Herbaceous Vegetation (39).

Location: This sparse vegetation class is rare, observed only at two locations near the South Unit Loop Road. A few small greasewood shrubs grow with other shrubs on badlands formations and are delineated as part of badlands sparse vegetation complex (Class 2).

Photo signatures: Dark green dots over a gray-green to medium green background color.

Figure: 4-5d

Cottonwood / Peachleaf Willow Floodplain Woodland (41).

Location: In mature condition, this class grows primarily along Sully's Creek and similar perennial drainages, outside Park boundaries. Within the Park, eastern cottonwood and peachleaf willow are represented by very young stands in close proximity to the Little Missouri River channel and are easily confused with sandbar willow temporarily-flooded shrubland alliance (Class 38) with which they intermix.

Photo signatures: Include large-crowned trees (pebbly texture) to brushy, thick stands of young trees, with occasional larger crowns, that are medium green to dark green, sometimes black in color.

Figure: 4-5e

Cottonwood - Rocky Mountain Juniper Floodplain Woodland (42).

Location: Found along the Little Missouri River and represents decadent stands of eastern cottonwood growing on dry floodplain sites. It intermixes with mature cottonwood temporarily-flooded woodland alliance (Class 43) and green ash - American elm temporarily-flooded woodland alliance (Class 45).

Photo signatures: Large, rounded canopies that are often evenly spaced from one another, with gray to white, dead branches apparent. Colors range from medium green to dark green or black.

Figure: 4-5f

a. Silver Buffaloberry S.A. (36).



b. Sandbar Willow T-F Shrubland Alliance (38).



c. Wolfberry T-F Shrubland Alliance (37).



d. Greasewood Shrub
Herbaceous Veg (39)



e. Cottonwood / Peachleaf Willow
Floodplain Woodland (41).



f. Cottonwood / Rocky Mt.
Juniper Floodplain
Woodland (42).



Figure 4-5 – Classes 36, 37, 38, 39, and 41 and 42 Representative Photo Signatures.

Cottonwood Temporarily-Flooded Woodland Alliance (43).

- Location:** This woodland class occurs in river and large creek floodplains and represents mature, medium-aged, and dense young stands of trees. It intermixes with green ash - American elm T-F woodland alliance (Class 45) and with decadent stands of cottonwood / Rcky Mt. Juniper floodplain woodland (Class 42).
- Photo signatures:** Large, rounded canopies ranging from medium green to dark green or black in color, creating an oblong or crescent-shaped polygon.
- Figure:** 4-6a

Green Ash - American Elm Woodland Alliance - Draws (44).

- Location:** Occupies mesic draws and drainages, sometimes spreading into moist areas of grassland at the heads of draws. It tends to intermix with Rocky Mountain juniper woodland alliance (Class 47) as draws become drier and with quaking aspen woodland alliance (Class 46) at heads of draws off some large plateaus.
- Photo signatures:** Dense rounded to brushy tree canopy; medium- to dark green or black in color.
- Figure :** 4-6b

Green Ash - American Elm Temporarily-Flooded Woodland Alliance (45).

- Location:* Occupies mesic oxbows, drainages, and depressions on the outer edges of river floodplains. It is shorter-statured with a more dense crown cover than eastern cottonwood mature stands, and it tends to intermix with mature and/or decadent cottonwood stands (Classes 42 & 43).
- Photo signatures:* Small, dense, rounded tree canopies; appear dark green to black in color.
- Figure:* 4-6c

Quaking Aspen Woodland Alliance (46).

- Location:* Occurs only on the margins of large plateaus at the heads of draws and in one area of large boulders on a slope. It quickly intergrades into Class 44 as the woodland proceeds downslope or into a drainage.
- Photo signatures:* Medium-green color, rounded shape, and soft, brushy texture
- Figure:* 4-6d

Rocky Mountain Juniper Woodland Alliance (47).

Location: Widely distributed and occupies drier draws, north-facing juniper slopes, ridge and hill tops, and slumps on side-slopes. It often intermixes with Class 44 and is the understory canopy for Classes 48 and 42.

Photo signatures: Dull, dusty-gray or gray-green to dark green or black color, and tight, pebbly- to solid-textured canopy

Figure: 4-6e

Ponderosa Pine Woodland Alliance (48).

Location: This woodland class is distributed outside but near the South Unit, just east of Medora, ND and south of I-94. It occupies ridges, draws, and hilltops adjacent to the interstate.

Photo signatures: Include extremely large canopied trees, pebbly in texture, and dark green to medium-green in color.

Figure: 4-6f

Transportation, Communications, and Utilities (51).

Description: This land-use class represents major roads and highways, disturbed powerline rights-of-way and substations, sewage lagoons, and railroad rights-of-way. These are interpreted between the right-of-way or facility fences where they are disturbed by human activities.

Photo signatures: Typically a linear, square, or rectangular dull to bright white color for unvegetated surfaces and gray-green to dark green for adjacent vegetation.

Figure: 4-7a

Mixed Urban or Built-up Land (52).

Description: This land use class represents small towns, park facilities, and other developed land.

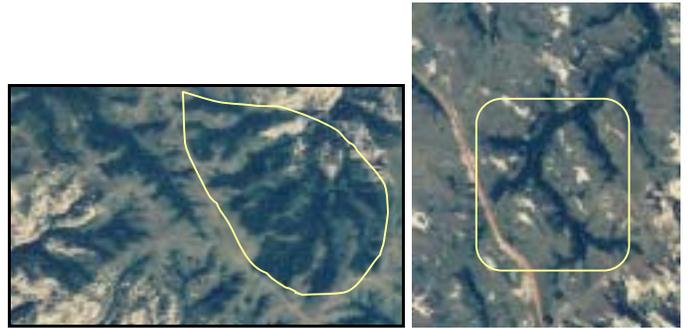
Photo signature: Ranges from white or gray on non-vegetated surfaces to green or black for lawns and tree and shrub plantings. This class generally has a very rough texture because of the various land uses and plantings.

Figure: 4-7a

a. Cottonwood T-F Woodland Alliance (43).



b. Green Ash /Am. Elm Woodland Alliance (44).



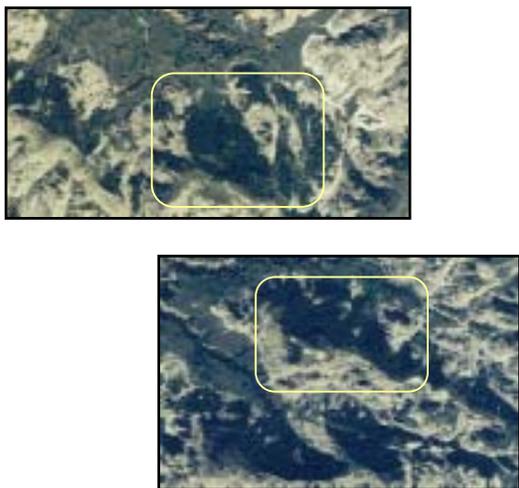
c. Green Ash – Am. Elm T-F Woodland Alliance (45).



d. Quaking Aspen Woodland Alliance (46).



e. Rocky Mt. Juniper Woodland Alliance (47).



f. Ponderosa Pine Woodland (48).



Figure 4-6 – Classes 43, 44, 45, 46, 47, and 48 Representative Photo Signatures.

Croplands and Pasture (53).

Description: This land use class includes dry-farmed and possibly a few irrigated fields, introduced pastures, and intensively used winter pastures.

Photo signatures: A striped or tilled pattern ranging from dull white to gray to gray-green, to bright cream for fallow or recently cropped land and bright green for actively growing crops. The texture for this class is smooth, often showing mowing lines, windrows of mown hay, hay bales, etc.

Figure: 4-7b

Seeded Mixed Grass Prairie (54).

Description: This land-use class represents agricultural fields placed under the CRP. To comply with program goals, restoration of these fields is typically undertaken using mid- to tall grass species and alfalfa.

Photo signature: A smooth-textured, dull, dark gray; sometimes mowing is allowed and it appears as Class 53.

Figure: 4-7c

Other Agricultural Land (55).

Description: Includes farmsteads, ranch headquarters, corrals, equipment storage areas, windbreak and shelterbelt plantings, and more remote windmill structures.

Photo signatures: Range from white for barren ground to greens and/or black depending on the vegetation present.

Figure: 4-7d

Streams and Canals (56).

Location: This class includes the Little Missouri River and small- to medium-sized drainages that flow periodically and are scattered throughout the region. These drainages meander forming large oxbow bends and support stands of scattered trees or patches of shrubs.

Photo Signature: Reflect dull white to tan, unless they are carrying water, which is typically brown or black depending on depth and clarity/turbidity.

Figure: 4-8a

a. Transportation and Utilities (51) and Mixed Urban / Built-Up Land (52).



b. Croplands and Pastures (53).



c. Seed Mixed Grass Prairie (54).



d. Other Agricultural Land (55).



Figure 4-7 – Land-Use Classes 51, 52, 53, 54, and 55 Representative Photo Signatures.

Reservoirs and Open Water (57).

Description: This land use class ranges in size from small holes dug into the ground water table (dugouts), to large ponds and small lakes stored behind earth-fill dams. Wetlands (14) may be associated with reservoir margins and often grow into the shallower waters.

Photo signatures: Range from white when sunlight is reflected, brown for sediment-laden water, and black for deeper, clear water.

Figure: 4-8b (also 4.2d)

Beaches and Sandy Areas Other Than Beaches (58).

Description: This class represents point bars and islands along and within perennial drainage channels, mostly the Little Missouri River.

Photo Signatures: These mostly unvegetated soils reflect dull to pure white or tan on aerial photos and are interpreted using their landscape position.

Figure: 4-8c

Strip Mines, Quarries, and Gravel Pits (59).

Description: This land-use class represents soil and geologic materials removed or disturbed by heavy equipment; also includes reservoir dams.

Photo signature: Dull to bright white (sand and clay) or light to medium pink (scoria), with a corresponding haul road; piles or mounds of material are often present.

Figure: 4-8d

Oil and Gas Well Drill Pads and Access Roads (60).

Description: This land-use class represents disturbed surface soils usually replaced with a new surface material (scoria gravel). An area of reseeding (interpreted as class 17) is often present in a horseshoe shape around the otherwise barren site. The pads are connected by roads, ranging from trails to corridors as wide as county roads.

Photo signature: Typically a rectangular shape that is dull white to pinkish-red, with the corresponding access road of the same color.

Figure: 4-8e

a. Streams and Canals (56).



b. Reservoirs and Open Water (57).



c. Beaches and Sandy Areas (58)



d. Strip Mines, Quarries, and Gravel Pits. (59).



e. Oil and Gas Well Drill Pads and Access Roads (60).



Figure 4-8 – Classes 56, 57, 58, 59, and 60 Representative Photo Signatures.