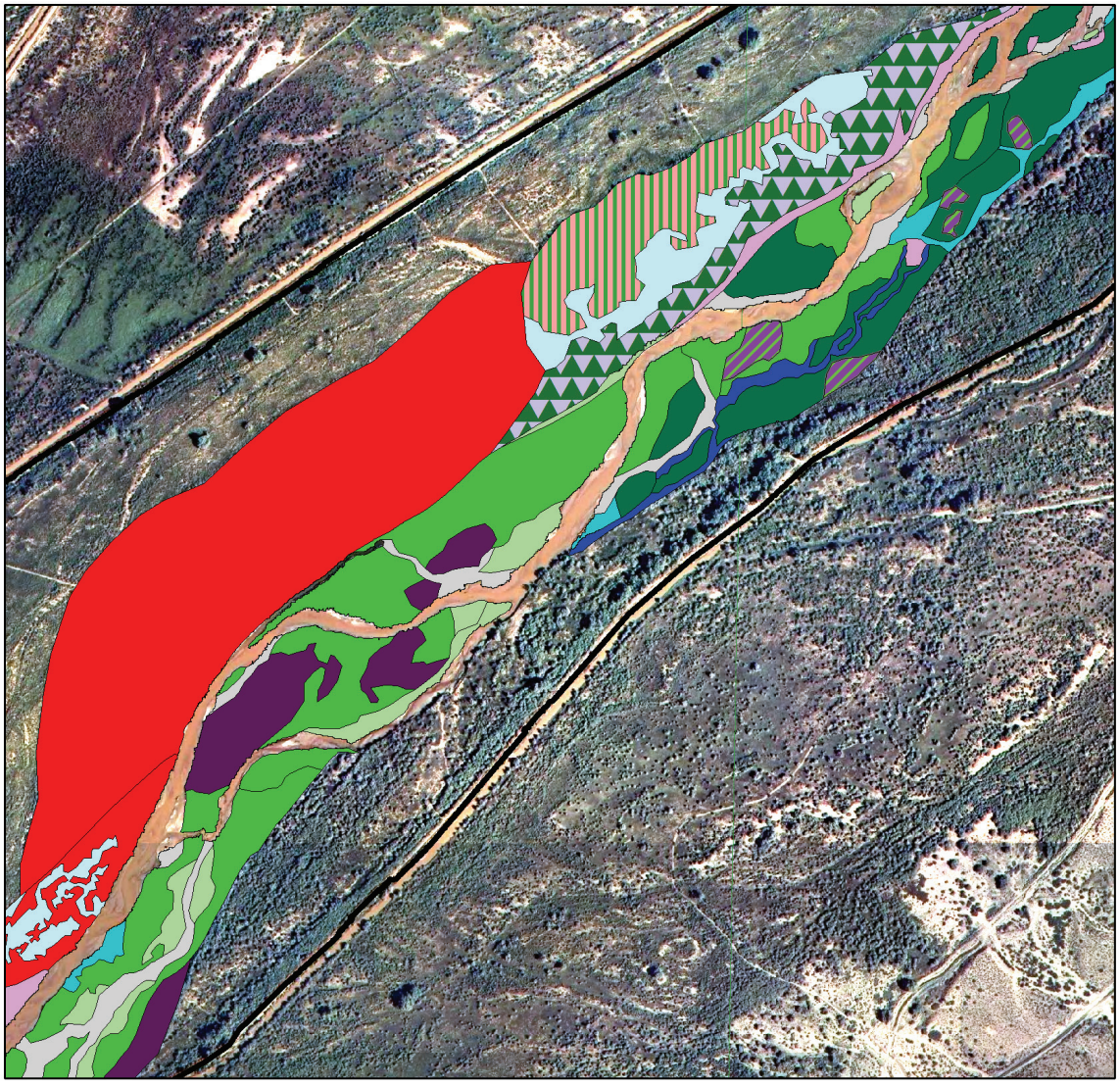
Middle Rio Grande River Bar Vegetation Map III

Belen to San Acacia



Final Report

2008

Natural Heritage New Mexico Publ. No. – 08-GTR-334

The University of New Mexico

U.S. FISH & WILDLIFE SERVICE

NATURAL HERITAGE NEW MEXICO

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Introduction

In support of riparian ecosystem management and restoration per the guidelines of the Bosque Biological Management Plan (Crawford et al. 1993), we have completed a project to map the vegetation composition of island and side bars of the Middle Rio Grande. Of particular interest are the plan's recommendations 16 and 17 on enhancing existing and creating new native cottonwood communities along the river while containing the expansion of exotic trees and shrubs. River bars are nurseries for native trees and shrubs, thus key elements in the restoration effort. River bars also provide habitat for wetland herbaceous species, have greater overall biological diversity than established terrace forests (see Milford and Muldavin 2004), and contribute to habitat heterogeneity within the river corridor, thus providing unique and important habitat for wildlife.

Given the importance of vegetated river bars with respect to biodiversity and function in the bosque ecosystem, we felt that the first step in integrating the bars into the restoration planning process was to construct a map of their distribution and composition. Furthermore, with a base map of the current river bars, future dynamics of the system can be evaluated in a quantitative spatial framework. For example, the stability of the bars through time with respect to location, shape, and composition as a function of flow regulation and channel manipulations could be assessed.

Initially, we mapped the Albuquerque reach between Alameda and the I-25 bridge (Bernalillo County) using digital aerial photography and generated digital layers within a geographic information system (GIS) along with paper maps (Milford et al. 2003). The maps were based on aerial-photo interpretation and extensive ground surveys. In 2004-05 we mapped from Alameda to Bernalillo, and from the I-25 bridge to Belen (Sandoval and Valencia Counties, respectively) (Milford et al. 2005). In 2005-08 we proceeded with the third, and final, stage of the mapping from Belen to San Acacia (Valencia and Socorro Counties), provided in this report. We present the maps from this segment (referred to in this report as the 2005 Map) of the river along with an annotated map legend and a preliminary map analysis of vegetation composition and extent. The map units focus on vegetation structure and density, dominant species composition, and level of exotic encroachment. They are based on vegetation work from our previous bar studies, direct ground sampling along the reach, and the wetland/riparian

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[1] Work submitted in partial fulfillment of FWS Contract No. 201813G920 between the University of New Mexico and the U.S. Fish and Wildlife Service as part of the Bosque Improvement Group, Middle Rio Grande Bosque Initiative. Suggested citation: Milford, E., E. Muldavin, and T. Neville. 2008. Middle Rio Grande river bar vegetation map III Belen to San Acacia. Natural Heritage New Mexico Publ. No. 08-GTR-334. Natural Heritage New Mexico, University of New Mexico, Albuquerque, NM 23 p. + Appendices.

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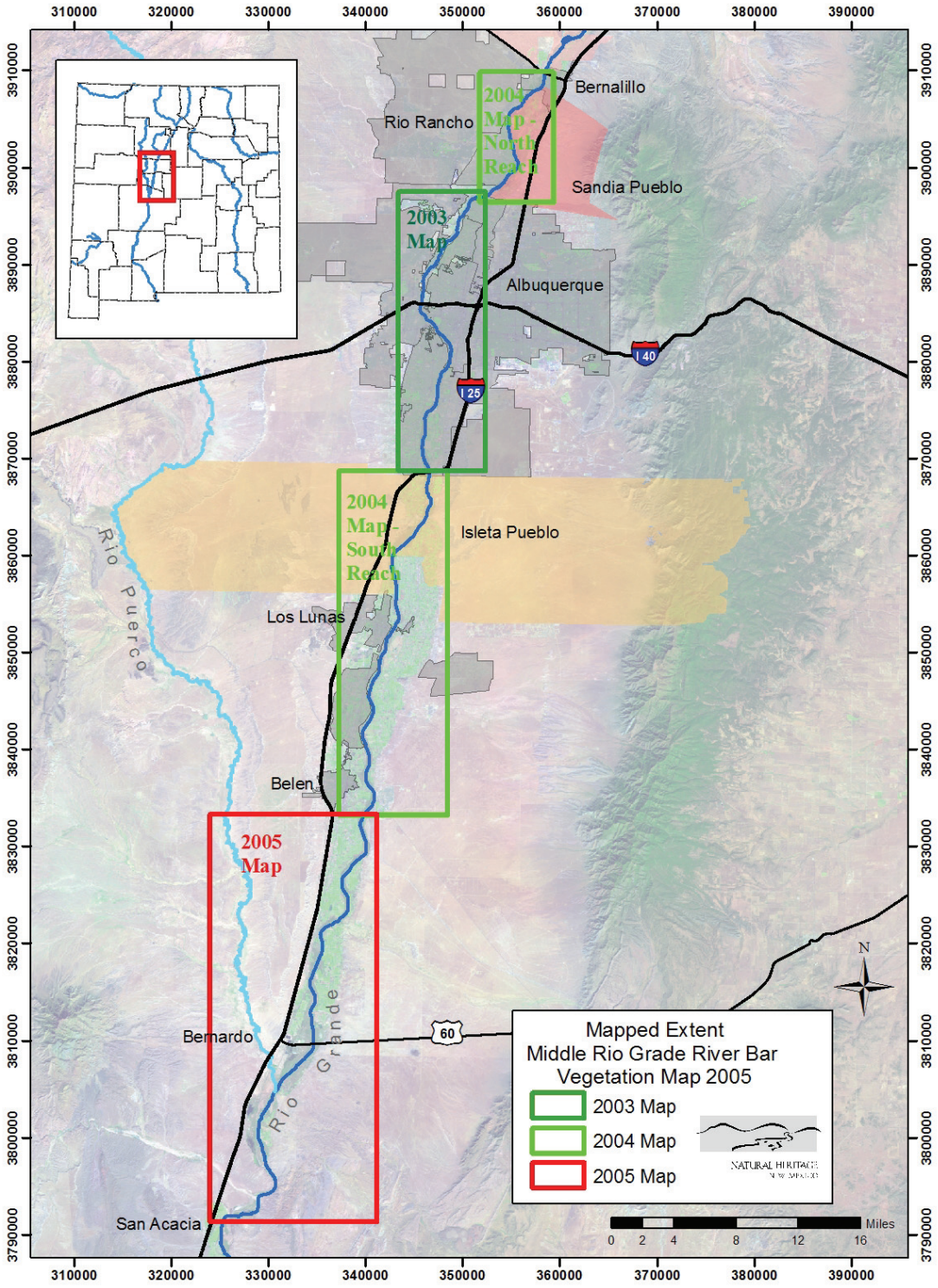

Figure 1. Overview of the mapped area. The Belen to San Acacia reach was mapped for the Middle Rio Grande River Bar Vegetation Map III. The Albuquerque reach was mapped in 2003 (Milford et al. 2003). The Bernalillo to Alameda reach, and the Isleta to Belen reaches were mapped in 2004 (Milford et al. 2005).

classification of Muldavin et al. (2000). Paper versions of the map with a generalized legend were produced at a 1:6,000 scale. In addition, the GIS layers are available in an ESRI personal geodatabase (ArcGIS 9.x) and printable maps in Adobe Acrobat (.pdf) format.

Methods

Field Work

Field data collection was conducted on foot. Field sampling was guided by a combination of randomly selected sites and predefined areas determined after examining color infrared (CIR) digital orthophotography from 2002 (see Image Processing below). Field map sheets made from the CIR orthophotography were used in the field throughout the summer of 2005. The field maps were marked to circumscribe areas that represent mapping units as described by Milford et al. (2004) as well as extents of the newly acquired plot data.

A total of 86 ground control plots were established with locations determined to within 10 m using field values from a Garmin GPS 12 unit. For each plot, site characteristics such as location relative to the bank, the degree of bare ground, and substrate texture were noted. Percent aerial cover of the dominant plant species by height strata was recorded. We define plant height stratum as trees (>3 m), shrubs (0.5-3 m), sub-shrubs (<0.5 m), and herbaceous layers. In addition to the ground control plots, we acquired brief, qualitative plant community descriptions and locations from an additional 12 sites. Surrounding vegetation was also charted on the field maps throughout the reach. Although mapping all of the mature terraces was outside the project scope, terrace forests (bosque) were evaluated opportunistically in the field and mapped. Plant voucher specimens were collected as necessary, identified by a Natural Heritage New Mexico (NHNM) botanist, and deposited at the University of New Mexico Herbarium.

Image Processing

Early in the project we used CIR orthophotography from 2002 (see Milford et al. 2005) to select initial field sample sites. However, by 2006 we obtained both CIR and natural color digital orthophotography flown in 2005 having one-meter spatial resolution (Bohannan-Huston, Inc. 2005). The imagery is publicly available and downloadable from the New Mexico Resource Geographic Information System Program (RGIS) webpage (http://rgis.unm.edu).

We created raster catalogs of the orthophotography and used additional ancillary data such as roads, topographic maps, and satellite imagery previously developed by NHNM for other river bar studies and mapping. The ancillary layers provide contextual environment and infrastructure information helpful in aerial photo interpretation. We completed a preliminary photo interpretation of the CIR orthophotography to: (1) identify sites to visit in the field, (2) identify potential problem areas due to radiometric inconsistencies inherent in the photography, and (3) develop field maps as a background, overlaid with a Universal Transverse Mercator (UTM) coordinate grid to assist orientation in the field. These preliminary photo interpretations were based on the 2002 imagery we had used to construct the 2004 river bar map (Milford et al. 2005), as the 2005 orthophotography was not yet available when we were preparing for the 2005 field

work. The field maps from 2005, along with the plot data points, field photographs and other information gathered during the 2005 field season were used along with the 2005 CIR and natural color imagery to create the final vegetation map.

Vegetation Classification and Mapping

Data from the 2005 plots in conjunction with long-term NHNM river bar monitoring plots were used to build a vegetation classification, develop map units and build on the previous map unit legend for the Albuquerque Reach report (Milford et al. 2003) and the Bernalillo to Alameda and Isleta to Belen Reach report (Milford et al. 2005). More than 19 diagnostic indicators were used to create map units within the study area. A hierarchical approach is used that begins with the predominant plant strata for a patch of area and its representative dominant species. The level of exotic invasion is then used to further split the patches into sub-groups. Appendix A provides a detailed outline and explanation of all diagnostic classes and class modifiers used in the classification process. For example, flooding potential is one hydrological diagnostic indicator that contains four modifiers: saturated, mesic, dry, and unknown. The final legend and canopy class modifiers are outlined in Tables 1 and 2.

Using on-screen aerial photo interpretation methods and digitizing in a GIS, we delineated stands of similar vegetation and assigned them to their respective map units based on the ground control plots. The CIR orthophotography was particularly useful in distinguishing among vegetation types (plants strongly reflect the near-infrared wavelength) such as saltcedar from native vegetation. The natural color orthophotography was useful in distinguishing Russian olive from cottonwood, as both can look similar in the near infrared. Polygons were digitized for all areas considered river bars and portions of the terrace. Areas were calculated in hectares and acres for each polygon. Final map sheets were developed at 1:6,000 scale and structured to fit within 11 x 17 inch foldout sheets (Appendix B).

Results

River bar distribution

There were 7,581 acres (3,068 ha) of total floodplain (levee to levee) in the Belen to San Acacia reach mapped in 2005. The reach comprised approximately 31 river miles. River bars accounted for 29% (2205 acres; 892 ha) of the floodplain, while upper terraces comprised 63% (4774 acres; 1931 ha), and active channel 8% (602 acres; 244 ha). The majority of the bars (94%) were sidebars lying between the active channel and the upper terraces; the remaining were islands. In part, the high percentage of sidebars was due to the small active channel in the reach south of Belen during summer low flows. The percentage of active channel to floodplain in the Belen to San Acacia reach was 38% less than that of the Isleta to Belen reach to the immediate north (Milford et al. 2005). Many of the sidebars in the Belen to San Acacia reach were very low, and somewhat ephemeral, having been either islands, or flooded during the high flows

Table 1. Middle Rio Grande River Bar vegetation map units.

Map Unit Code	Map Unit Name	Scientific Name
Mature Cottonwood Woodlands		
Cw/N	Cottonwood/Native	*Populus deltoides* /Native
Cw/M	Cottonwood/Mixed	*Populus deltoides* /Mixed
Cw/Sc	Cottonwood/Saltcedar	*Populus deltoides* /*Tamarix ramosissima*
Siberian Elm Woodlands		
Em/M	Siberian Elm/Mixed	*Ulmus pumila* /Mixed
Em/Ro	Siberian Elm/Russian Olive	*Ulmus pumila* /*Elaeagnus angustifolia*
Imature Cottonwood Shrubland		
Cw/Sg	Cottonwood/Goodding's Willow	*Populus deltoides/Salix gooddingii*
Coyote Willow Shrublands		
Wi/Cw	Coyote Willow/Cottonwood	*Salix exigua* /*Populus deltoides*
Wi/N	Coyote Willow/Native	*Salix exigua* /Native
Wi/Ro	Coyote Willow/Russian Olive	*Salix exigua* /*Elaeagnus angustifolia*
Wi/Sc	Coyote Willow/Saltcedar	*Salix exigua* /*Tamarix ramosissima*
Russian Olive Shrublands		
Ro/Cw	Russian Olive/Cottonwood	*Elaeagnus angustifolia/Populus deltoides*
Ro/Wi	Russian Olive/Coyote Willow	*Elaeagnus angustifolia* /*Salix exigua*
Ro/E	Russian Olive/Exotic	*Elaeagnus angustifolia* /Exotic
Saltcedar Shrublands		
Sc/Wi	Saltcedar/Coyote Willow	*Tamarix ramosissima* /*Salix exigua*
Sc/M	Saltcedar/Mixed	*Tamarix ramosissima* /Mixed
Sc/Treat	Saltcedar/Treatment	*Tamarix ramosissima/* Treatment
Sc/Sg/HW	Saltcedar/Goodding's Willow/ Herbaceous Wetland	*Tamarix ramosissima* /*Salix gooddingii* / Herbaceous Wetland
Herbaceous types		
Sc/HM	Saltcedar/Herbaceous Mesic	*Tamarix ramosissima* /Herbaceous Mesic
HW	Herbaceous Wetland	Herbaceous Wetland
HM	Herbaceous Mesic	Herbaceous Mesic
HU	Herbaceous Upland	Herbaceous Upland
HC	Herbaceous - Common Reed	Herbaceous - *Phragmites australis*
Other types		
Ot	Other	Other
Br	Bare	Bare

Table 2. Middle Rio Grande River Bar vegetation map unit cover class modifiers.

Cover Map Unit Code	Cover Map Unit Name	Overstory Cover	Understory Cover
Woodlands and Shrublands			
h/h	high/high	high	high
h/m	high/moderate	high	moderate
h/s	high/sparse	high	sparse
m/h	moderate/high	moderate	high
m/m	moderate/moderate	moderate	moderate
m/s	moderate/sparse	moderate	sparse
s/h	sparse/high	sparse	high
s/m	sparse/moderate	sparse	moderate
s/s	sparse/sparse	sparse	sparse
Herbaceous types			
h	high	high	N/A
m	moderate	moderate	N/A
s	sparse	sparse	N/A
Barren			
b	bare	bare	bare

earlier in the summer of 2005. However, once the water went down to lower summer flows these bars were connected to other sidebars or the terrace by a mixture of bare sand and sparsely vegetated dry back channels. A classification rule was used to determine which of these bars were deemed sidebars, versus those classified as islands. Any bar connected to the terrace edge by continuous vegetation, or very narrow bare sand back channels (<20 m) was classified as a sidebar. Islands were classified as bars surrounded by active channel with flowing water, or as vegetated islands surrounded by bare sand greater than 20 m in width, that was presumably part of the active channel during spring high flows.

River bar vegetation composition

There were 24 primary map units defined across all the reaches mapped from Bernalillo to San Acacia, and these fall into four major structural groups: Woodlands, Shrublands, Herbaceous, and Other miscellaneous types (Table 1). While 22 of the map units were described previously for the Bernalillo to Belen reaches (Milford et al. 2003; Milford et al. 2004), two new map units were identified in 2005, they are: 1) Russian Olive/Cottonwood, and 2) Saltcedar/Treatment. Only 20 of the 24 reach-wide map units were present on bars within the Belen to San Acacia reach (Table 3). Siberian elm was mostly absent south of Belen, and never a dominant, so neither Siberian elm map unit (Siberian Elm/Russian Olive and Siberian Elm/Mixed) was observed. Common reed was also not present as a dominant south of Belen. The mature Cottonwood/Native map unit was present on terraces south of Belen, but not on the bars. Instead of mature Cottonwood/Native woodlands, on the bars south of Belen shrublands dominated by immature cottonwood native units (Cottonwood/Goodding's Willow and Coyote Willow/Cottonwood) were well represented.

The woodlands are represented by units where mature trees are at least 10% in cover, but the understory layers can be considerably higher or lower. Out of five woodland types described for the Middle Rio Grande, only two occurred on bars in the Belen to San Acacia reach, but represent a significant portion (20%) of the area mapped (Table 3). Both are defined by the presence of mature, overstory cottonwoods (*Populus deltoides* var. *wislezenii*) with various understory compositions (Cottonwood/Mixed, and Cottonwood/Saltcedar), and they occurred only on high sidebars.

Shrublands are the most prevalent vegetation on the established bars, but they are also common on the ephemeral bars. Shrublands are represented by 12 map units grouped by native versus exotic shrub components. Native shrublands are usually dominated by coyote willow (*Salix exigua*) and represented by the Coyote Willow/Cottonwood, Coyote Willow/Native, Coyote Willow/Russian Olive and Coyote Willow/Saltcedar units. There is also the Cottonwood/Goodding's Willow map unit, which is dominated by regenerating young cottonwoods and Goodding's willow (*Salix gooddingii*) rather than coyote willow. Although these types may contain exotic species, native species are clearly dominant and always account for more than 50% of the total woody cover.

Table 3. Map unit distribution in the Belen to San Acacia reach. Area per map unit is given for island and sidebars along with total area and percentage for both bar types combined.

Map Unit	Island Bars Acres (Ha)	Sidebars Acres (Ha)	Total Bars Acres (Ha)	%
Woodlands				
Cottonwood/Native				0%
Cottonwood/Mixed		282.7 (114.4)	282.7 (114.4)	12.8%
Cottonwood/Saltcedar		165.3 (66.9)	165.3 (66.9)	7.5%
Siberian Elm/Russian Olive				0.0%
Siberian Elm/Mixed				0.0%
Sub-total Woodlands		**448.0 (181.3)**	**448.0 (181.3)**	**20.3%**
Shrublands				
Cottonwood/Goodding's Willow	50.2 (20.3)	162.0 (65.6)	212.2 (85.9)	9.6%
Coyote Willow/Cottonwood	40.2 (16.3)	121.1 (49.0)	161.2 (65.3)	7.3%
Coyote Willow/Native	30.9 (12.5)	73.5 (29.7)	104.4 (42.2)	4.7%
Coyote Willow/Russian Olive	8.9 (3.6)	25.8 (10.4)	34.7 (14.1)	1.6%
Coyote Willow/Saltcedar	13.9 (5.6)	56.7 (22.9)	70.6 (28.6)	3.2%
Russian Olive/Cottonwood	8.9 (3.6)	45.7 (18.5)	54.7 (22.1)	2.5%
Russian Olive/Coyote Willow	3.9 (1.6)	83.4 (33.8)	87.3 (35.3)	4.0%
Russian Olive/Exotic	10.5 (4.2)	101.2 (41.0)	111.7 (45.2)	5.1%
Saltcedar/Coyote Willow	4.6 (1.9)	83.3 (33.7)	87.9 (35.6)	4.0%
Saltcedar/Mixed	1.4 (0.6)	273.0 (110.5)	274.4 (111.0)	12.4%
Saltcedar/Treatment		53.9 (21.8)	53.9 (21.8)	2.4%
Saltcedar/Goodding's Willow/Herbaceous Wetland	12.9 (5.2)	4.1 (1.7)	17.0 (6.9)	0.8%
Sub-total Shrublands	**186.3 (75.4)**	**1083.7 (438.1)**	**1270.1 (513.5)**	**57.6%**
Herbaceous				
Herbaceous Wetland	0.8 (0.3)	23.8 (9.6)	24.6 (10.0)	1.1%
Herbaceous Mesic	16.9 (6.9)	106.4 (43.1)	123.4 (49.9)	5.6%
Herbaceous Upland		29.0 (11.8)	29.0 (11.8)	1.3%
Herbaceous-Common Reed				0.0%
Saltcedar/Herbaceous Mesic	23.7 (9.6)	11.4 (4.6)	35.0 (14.2)	1.6%
Sub-total Herbaceous	**41.4 (16.8)**	**170.6 (69.1)**	**212.0 (85.8)**	**9.6%**
Other				
Other		15.5 (6.3)	15.5 (6.3)	0.7%
Bare	20.1 (8.1)	239.7 (97.0)	259.8 (105.1)	11.8%
Total All Types	**247.8 (100.3)**	**1957.5 (792.3)**	**2205.3 (892.6)**	**100.0%**

In contrast, there are four exotic shrubland units defined by the dominance of either Russian olive (*Elaeagnus angustifolia*) or saltcedar *(Tamarisk ramosissima*), these are: 1) Russian Olive/Coyote Willow, 2) Russian Olive/Exotic, 3) Saltcedar/Coyote Willow, and 4) Saltcedar/Mixed. While these types often contain native species, exotic species are clearly dominant with more than 50% of the total woody cover.

There are two map units where native and exotic species typically co-dominate in nearly equal proportions. The Russian Olive/Cottonwood unit has a near equal mixture of mature Russian olive and regeneration cottonwood, and the Saltcedar/Goodding's Willow/Herbaceous Wetland with an equal mix of young saltcedar and young cottonwood or Goodding's willow, with an understory of herbaceous wetland species (this was referred to as herbaceous with shrubs in other reach maps). A third unique unit is Saltcedar/Treatment, which comprises former Saltcedar/Mixed stands that were treated by herbicide, and thus mostly consisted of standing deadwood at the time of mapping in 2005.

Over the Belen-San Acacia reach, the area of native-dominated and exotic-dominated shrublands mapped are nearly equal, with native-dominated accounting for 583 acres (236 ha) or 46% of the shrublands, while exotics prevail over 561 acres (227 ha) or 44%, and the remaining 10% of shrublands are of a mixed dominance type (126 acres; 51 ha). In general the native-dominated shrublands tended to occur on low to ephemeral bars within the active channel of the river while exotic-dominated types were more prevalent on the higher sidebars and low terraces outside of the active river channel.

Herbaceous vegetation was the least common cover type and was mapped into four classes: 1) Herbaceous Wetland, 2) Herbaceous Mesic, 3) Herbaceous Upland, and 4) Saltcedar/Herbaceous Mesic. With the exception of Saltcedar/Herbaceous Mesic, these are broadly characterized by species complexes rather than by single dominants and may contain a number of species both native and exotic.

There are two miscellaneous map units: "Bare," which includes all polygons that have less than 10% total vegetative cover, and "Other," polygons dominated by upland species or exotics that are only incidental within the riparian corridor.

Map Unit Descriptions

Rio Grande Cottonwood (Populus deltoides var. *wislezenii) Woodlands:*

Cottonwood/Native

Woodlands dominated by mature and/or advanced regeneration cottonwoods without major exotic invasion (Figure 2). The woody understory, when present, is dominated by natives such as coyote willow and New Mexico olive (*Forestiera pubescens*). Exotic woody species may be present, but are clearly not dominant or sub-dominant (comprising less than 25% of the total woody cover). This unit includes dense (>50% woody cover) to sparse (10-25% woody cover) forest cover types and occurs either on high sidebars or terraces that are seldom flooded. Depending on moisture regime and soil type, the herbaceous understory can vary from sparse upland grasses and forbs to lush riparian grasses.

Figure 2. A Cottonwood/Native woodland located north of the Alameda bridge in the Corrales Bosque.

Cottonwood/Mixed

Woodlands dominated by mature and/or advanced regeneration cottonwoods with significant exotic woody species invasion in the sub-canopy and shrub layer (Figure 3). The understory is either dominated or co-dominated by exotic Russian olive, Siberian elm, or saltcedar, but may still include significant amounts of native understory species such as coyote willow and New Mexico olive. Although the understory is exotic dominated, 50% to 75% of the overall woody cover can be comprised of native species. This unit includes dense (>50% woody cover) to sparse (10-25% woody cover) forest types and occurs on high sidebars and terraces. The herbaceous understory in this type is usually sparse.

Figure 3. A Cottonwood/Mixed woodland located south of Belen.

Cottonwood/Saltcedar

Woodlands dominated by mature cottonwoods in the overstory and saltcedar in the sub-canopy and shrub layer (Figure 4). Saltcedar often comprises more than 50% of the total woody cover. Other exotic woody species such as Russian olive and Siberian elm may also be common to abundant. Cottonwoods tend to be remnant older individuals. Occasionally these stands are a mixture of sparse advanced regeneration cottonwoods and sparse saltcedar. Most of these stands are dense (>50% woody cover) forest types that occur on terraces and high sidebars. The herbaceous cover is sparse or absent.

Figure 4. A Cottonwood/Saltcedar woodland south of the Rio Bravo bridge in Albuquerque, where saltcedar is prevalent in the understory.

Rio Grande Cottonwood (Populus deltoides var. *wislezenii) Shrublands:*

Cottonwood/Goodding's Willow

Shrublands dominated by young regeneration cottonwoods and/or Goodding's willow (Figure 5). Often these young trees create a near mono-culture, but some stands have significant amounts of coyote willow and mesic herbaceous vegetation. Native species comprise at least 75% of the woody cover, but exotic species, particularly saltcedar, may be present in low amounts. Stands tend to be dense (>50% woody cover) and usually occur on low or ephemeral sandy islands and sidebars with a thin clay layer at the surface. This type most often occurs south of the Isleta diversion dam, on islands and sidebars within the active channel.

Figure 5. A Cottonwood/Goodding's Willow stand near the Jarales gas pipelines south of Belen, dominated by regenerating cottonwood with scattered Goodding's willow.

Siberian Elm (Ulmus pumila) Woodlands

Siberian Elm/Mixed

Woodlands dominated by Siberian elm with native woody species such as coyote willow or young cottonwoods as co-dominants or sub-dominants (25-50% of total woody cover). Other exotic woody species may be present, but are neither co-dominant nor sub-dominant. Stands tend to be dense (>50% woody cover) to moderately dense (25-50% woody cover) and usually occur on high sidebars north of Belen. The herbaceous understory in these stands is usually sparse (Figure 6).

Figure 6. An example of the Siberian Elm/Mixed map unit north of the Alameda bridge and just south of Sandia Pueblo.

Siberian Elm/Russian Olive

Woodlands dominated by Siberian elm with Russian olive as a co-dominant or sub-dominant (Figure 7). Native woody species may be present, but usually comprise less than 25% of total woody cover. Other exotic woody species, particularly white mulberry, may also be present. The herbaceous understory is usually luxuriant and graminoid dominated, and can include both exotic species such as bermudagrass (*Cynodon dactylon*) and natives like Emory's sedge (*Carex emoryi*). Stands tend to be dense (>50% woody cover) and usually occur on high sidebars and islands north of Belen.

Figure 7. A dense Siberian Elm/Russian Olive stand south of the I-25 bridge on Isleta Pueblo.

Coyote Willow (Salix exigua) Shrublands:

Coyote Willow/Cottonwood

Shrublands dominated by coyote willow with young cottonwoods and/or Goodding's willow as a significant sub-dominant (Figure 8). Native species comprise at least 75% of the woody cover, but exotic species may be present in low numbers. Stands tend to be dense but often patchy. They usually occur on sandy bars with moderately dense graminoid-dominated to sparse forb-dominated herbaceous understories. Graminoid understories are commonly dominated by exotic species such as tall fescue (*Festuca arundinaceae*)) while forb understories include native species such as hoary tansyaster (*Machaeranthera canescens*). This type occurs on low to high islands and sidebars. Stands modified by restoration work with pole planted cottonwoods are included in this type.

Figure 8. Example of the Coyote Willow/ Cottonwood map unit near La Joya, with young cottonwoods scattered among dense coyote willows.

Coyote Willow/Native

Shrublands dominated by coyote willow (>75% total woody cover). Exotic species may be present but make up less than 25% of the total woody cover (Figure 9). Unlike Willow/Cottonwood, young cottonwoods are not a significant component. South of Bernardo native seepwillow may be a co-dominant with coyote willow. Stands can be dense or sparse, depending on moisture availability. The herbaceous understory also varies with soil moisture, from luxuriant graminoid- and mesic forb-dominated to sparse, weedy forb-dominated. Western goldenrod (*Euthamia occidentalis*) is often a dominant member of the understory in more mesic stands. Common graminoids include both natives species such as Canada wildrye (*Elymus canadensis*) and exotics like redtop (*Agrostis gigantea*) and tall fescue. This type occurs on low to high islands and sidebars.

Figure 9. A dense Coyote Willow/Native stand near the Albuquerque waste water outflow.

Coyote Willow/Russian Olive

Shrublands dominated by coyote willow with Russian olive sub-dominant. Willows comprise 50% to 75% of the total woody cover, while Russian olive and other exotic woody species account for 25% to 50%. Russian olive is the most significant exotic woody component, but saltcedar, Siberian elm, white mulberry, and southern catalpa may be present. These sites often have a luxuriant grassy understory, similar in composition to the understories of mesic Coyote Willow/Native stands, particularly on low islands. A sparser variant occurs on high sidebars and islands with a correspondingly sparse herbaceous understory (Figure 10).

Figure 10. Example of the Coyote Willow/Russian Olive map unit south of the Rio Bravo bridge in Albuquerque.

Coyote Willow/Saltcedar

Shrublands dominated by coyote willow with saltcedar sub-dominant. Willows comprise 50% to 75% of the total woody cover, with saltcedar and other exotic woody species accounting for 25% to 50% of woody cover (Figure 11). Saltcedar is the most significant exotic component, but other exotic woody species, particularly Siberian elm, in the Bernalillo to Isleta portion of the reach, may be present. South of Bernardo native seepwillow may be a co-dominant with coyote willow. These stands tend to be on high islands and sidebars and are usually moderately dense (25-50% woody cover) to sparse (10-25% woody cover). The herbaceous understory varies from dense (>50%) to moderately dense (25-50%) grass and forb cover, and is often dominated by exotic annual grasses such as Japanese brome (*Bromus japonicus*).

Figure 11. A dense Coyote Willow/Saltcedar stand south of the Rio Bravo bridge in Albuquerque.

Russian Olive (Elaeagnus angustifolia) Shrublands:

Russian Olive/Cottonwood

Shrublands, bordering on woodlands, co-dominated by Russian olive and regeneration cottonwood. Either Russian olive or cottonwood can be dominant, but both will be well represented and have 25-50% cover (Figure 12). Native Goodding's willow, coyote willow, or seepwillow, and exotic saltcedar may all be a component of the stand, but Russian olive and cottonwood are the obvious dominants. This type is distinguished from the Cottonwood/Mixed type in that the cottonwoods present are either saplings or young regeneration trees under 25' in height. The herbaceous understory is usually sparse to well represented, with a wide variety of grass and forb species both native and exotic. These stands generally occur on high, but still mesic, patches within young cottonwood-dominated sidebars. Stands tend to be very dense (>50% woody cover).

Figure 12. Example of the Russian Olive/Cottonwood map unit underneath the Jarales gas pipeline south of Belen.

Russian Olive/Coyote Willow

Shrublands dominated by Russian olive with coyote willow a sub-dominant at 25% to 50% of the woody cover (Figure 13). Cottonwoods, either mature or regeneration, are not a significant presence within these stands. The herbaceous understory is often abundant to luxuriant and graminoid dominated. Both native species like alkali muhly (*Muhlenbergia asperifolia*) and indiangrass (Sorghastrum nutans) and exotic species like tall fescue can be common. These stands are generally mesic and occur on low to high islands and sidebars. Stands tend to be dense (>50% woody cover), though there is also a sparse variant that occurs on high dry sidebars.

Figure 13. Example of the Russian Olive/Coyote Willow map unit near the Montano bridge in Albuquerque.

Russian Olive/Exotic

Shrublands dominated by Russian olive or Russian olive and a mixture of other exotic woody species, particularly saltcedar (Figure 14). Together, exotic species comprise more than 75% of the total woody cover. Native woody species may be present but are clearly subordinate. The herbaceous understory can vary from luxuriant and graminoid dominated to very sparse. The dominant graminoid species are often native alkali sacaton (*Sporobolus airoides*), alkali muhly or vine mesquite (*Panicum obtusum*) mixed with exotic bermudagrass. Sites range from low islands and sidebars to terraces. Generally, the denser stands occur on more mesic low islands and sidebars, while sparse stands are found on drier high sidebars and terraces.

Figure 14. A closed Russian Olive/Exotic stand on an upper bar south of the Belen bridge.

Saltcedar (Tamarix ramosissima) Shrublands:

Saltcedar/Coyote Willow

Shrublands dominated by young to moderate aged saltcedar (<3.5m tall) with coyote willow as a sub-dominant (Figure 15). South of Bernardo native seepwillow may be sub-dominant instead of, or alongside, coyote willow. Natives, either coyote willow or coyote willow and seepwillow, comprise 25% to 50% of the woody cover. In the Bernalillo to Isleta portion of the reach Siberian elm is often present, particularly on higher islands and sidebars. The herbaceous understory varies from dense graminoids to very sparse forbs, depending on the site's soil moisture regime. While stands occur on all types of bars, from ephemeral to high sidebars, the denser stands tend to occur on lower, more moist bars.

Figure 15. An example of the Saltcedar/Coyote Willow map unit near the San Acacia dam.

Saltcedar/Mixed

Shrublands dominated either by saltcedar exclusively or by saltcedar with an admixture of exotic and native woody sub-dominants (usually Russian olive or cottonwood, and occasionally other species) (Figure 16). These stands are usually composed of young to moderate aged saltcedars and tend to be dense or occasionally patchy. Exotics comprise over 50% of the woody cover. The herbaceous understory is usually sparse and forb-dominated and often includes perennial pepperweed (*Lepidium latifolium*), a New Mexico Class A state noxious weed. Stands occur on a variety of bar types.

Figure 16. A young Saltcedar/Mixed stand near Abeytas, south of Belen.

Saltcedar/Treatment

Former Saltacedar/Mixed shrublands that have been treated with herbicide and are currently dominated by standing dead wood and ruderal (weedy) herbaceous species, including many annuals (Figure 17). This type is dependant on vegetation management practices, and was only observed between La Joya and San Acacia. It is considered a transient herbaceous type that will likely succeed to shrublands or other perennial herbaceous vegetation depending on management practices at a given site.

Figure 17. Saltcedar/Treatment near San Acacia dam. Untreated Saltcedar/Mixed vegetation is in the foreground and to the right of the treated patch.

Saltcedar/Goodding's Willow/Herbaceous Wetland

These are stands of herbaceous vegetation dominated by cattails with a significant component of young regeneration saltcedar and/or Goodding's willow (Figure 18). In the more mature stands, young saltcedar Goodding's willow (or cottonwood on occasion) form a clear overstory above the cattails and other mesic herbaceous species. Besides cattail, the most common herbaceous species are the natives western goldenrod (*Euthamia occidentalis*) and Canadian horseweed (*Conyza canadensis*), or the exotic perennial pepperweed. Stands tend to be on the higher ephemeral sandy islands and sidebars. During the 2004 drought and associated die-off, stands varied greatly in density. In the reach south of Belen, the herbaceous layer tended to be sparse (<20% cover) and the young tree/shrub cover, while also sparse (<25% cover), usually dominated, thus this was changed from an herbaceous to a shrubland map unit.

Figure 18. Saltcedar/Goodding's Willow/Herbaceous Wetland south of Los Lunas.

Herbaceous Types:

Saltcedar/Herbaceous Mesic Vegetation

Herbaceous vegetation dominated by mesic weedy herbaceous facultative or obligate wetland species and co-dominated by saltcedar seedlings or very young regeneration saltcedar under 4' in height (Figure 19). Herbaceous species include natives such as Canadian horseweed, rough cocklebur, and witchgrass (*Panicum capillare*), and exotics such as perennial pepperweed and bearded sprangletop (*Leptochloa fascicularis*). Commonly, only one or two herbaceous species dominate along with young saltcedars. Stands tend to be patchy, with areas of dense cover interspersed with bare sand. They most often occur on low ephemeral islands and sidebars that were part of the active river channel at higher flows, but have been exposed due low flows.

Figure 19. Saltcedar/Herbaceous Mesic vegetation south of Los Lunas.

Herbaceous Wetland

Herbaceous vegetation dominated by obligate wetland herbaceous species such as spikerushes, sedges, cattails, and bulrushes (Figure 20). Seedling trees and shrubs, both native and exotic, are common components but do not dominate. Herbaceous species diversity can be high. Stands are typically found on ephemeral islands and sidebars, in back channels through bars, or occasionally on higher sites adjacent to perennial water sources. They tend to be small dense patches, or scattered and patchy over larger polygons.

Figure 20. Herbaceous Wetland dominated by cattails and sedges north of the Alameda bridge.

Herbaceous Mesic Vegetation

Herbaceous vegetation dominated by mesic, often weedy herbaceous facultative or obligate wetland species, such as Canadian horseweed, rough cocklebur and alfalfa. Scattered seedlings and young trees and shrubs are often present. Species diversity is lower in these stands than in Herbaceous Wetlands, and is mostly limited to opportunistic annual forbs and grasses that establish on the wet soil of the newly emerged bar in the early summer. Stands are usually found on low or ephemeral islands and sidebars. Ground cover can increase significantly after inundation (late spring to early summer) then become sparse in the late fall and winter as water levels drop and annuals senesce (Figure 21).

Figure 21. Herbaceous Mesic sidebar dominated by Canadian horseweed at the I-40 bridge in Albuquerque.

Herbaceous Uplands

Stands dominated by upland herbaceous species, either forbs or graminoids (Figure 22). Species in these stands tend to be perennials and may include upland or facultative wetland species, but rarely obligate wetland species. Native dropseed grasses (*Sporobolus* sp.) are common graminoids along with vine mesquite, alkali muhly and inland saltgrass (*Distichlis spicata*). Native or exotic woody species may be present in low numbers (<10% woody cover). Sites tend to occur on higher, more stable islands and bars as well as terraces. Stands can be either dense or sparse in cover, depending on moisture regime.

Figure 22. Herbaceous Upland dominated by dropseed grasses and asters North of the I-25 bridge in Albuquerque.

Herbaceous - Common Reed Wetland

These are stands dominated by common reed without any significant woody species (Figure 23). Typically these are very dense patches with a sparse grassy understory. This type is found near the edges of sidebars and on low to moderately low islands.

Figure 23. A stand of Herbaceous - Common Reed located on an island north of the I-25 bridge in Albuquerque.

Other Types:

Other

Stands dominated by upland species or exotics that are only incidental within the riparian corridor. Examples include sand sagebrush, and ravennagrass in the Albuquerque reach, and screwbean mesquite in the San Acacia reach.

Barren

These are polygons that have less than 10% total vegetative cover. These are typically low, semi-stable, sandy sidebars or islands, or sandy areas within higher sidebars or islands such as abandoned channels. An effort was made to exclude ephemeral sandy shoals, which are considered part of the active channel. However, due to major river channel changes related to variations in flow, it was not always possible to clearly distinguish the two. When in doubt the error was made on the side of mapping barren sandy areas rather than excluding them.

Discussion

This map is the third and final in a series of maps delineating river bar vegetation in the Middle Rio Grande from the Bernalillo bridge to San Acacia diversion dam. With its completion, a picture has emerged of shifting bar composition and distribution from north to south. The northern portion of the reach (Bernalillo to Isleta diversion dam) is characterized by high, established, and largely non-dynamic sidebars and islands dominated by mature shrublands and young woodlands. On these bars there is little regeneration of native vegetation; exotics, once they are established, eventually take over as natives senesce. Below Isleta diversion dam ephemeral islands and sidebars become much more common within the active channel. Between Isleta and Belen these ephemeral bars are largely herbaceous dominated with a mixture of exotic and native species. They tend to be very dynamic, and rarely support more permanent vegetation like shrublands. Just north of Belen, however, the character of these bars inside the active river channel changes; they become more permanent, and mostly dominated by shrublands. These in-channel shrubland bars are dominated by communities of young native trees and shrubs as frequently as they are by exotics, and represent one of the few places within the Bernalillo to San Acacia reach where native tree species are reproducing naturally. This change in bar and vegetation types to the south suggest a shifting dynamic in terms of sediment inputs, channel incision, and stability moving down stream from Cochiti Reservoir.

Although islands and sidebars occupy between 19 and 29% of the total river floodplain, these areas provide crucial wetland habitat for plants and animals that is not available elsewhere in the river corridor. For example, plant species diversity is higher on the bars than in the adjacent mature cottonwood bosque. In our data from 1998 to 2002, native-dominated bars had a total of 110 plants species, while 67 species were observed on exotic-dominated bars and only 39 species were found in the mature cottonwood bosque (Milford and Muldavin 2004). Many of these species were unique to the bar habitat. Native-dominated bars also had the highest number of wetland indicator species. The higher plant species diversity on bars is echoed by a higher diversity of ground-active beetles on bars as compared with the mature bosque (Milford and Muldavin 2004). In addition, the bars are typically the only area in the river's floodplain where natural reproduction of native woody species occurs. This all points to the bars' role as an essential ingredient in both wildlife habitat and the overall health of the Middle Rio Grande ecosystem. It is also evident that this area needs to be carefully considered during restoration and conservation planning.

Given recent accelerated efforts in forest and bar restoration in the Middle Rio Grande, a map of the current vegetation is needed for targeting and prioritizing restoration sites. In addition, current-condition maps will provide a benchmark for measuring change as restoration proceeds. A challenge for future management of the river is to maintain the reproduction of native species on the bars and discourage establishment of exotic species. Since bars are key in native species reproduction, knowledge about their current extent, distribution, and species composition is a crucial first step to managing exotics and encouraging native species. We hope this map will provide knowledge that can be used to manage the river and aid restoration efforts for greater success of native species into the future.

Acknowledgements

This work was funded by the Middle Rio Grande Bosque Initiative – U.S. Fish and Wildlife Service through grant 201813G920. We thank the Middle Rio Grande Conservancy District for allowing us access to the bosque lands under their jurisdiction and for granting us permission to map the river bars therein. We thank the following for their contributions both in the field and to the overall project: Katie Mann, Jake Cammack, Yvonne Chauvin, Amanda Kennedy, and Rebecca Keeshen.

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Appendix A – Bar Map Classification Table

The following are field names and definitions for the GIS attribute table of the river bars of the Middle Rio Grande, from Belen to San Acacia. This appendix lists all the fields in the attribute table with their definitions. It also provides lists of the discrete value codes and their definitions for applicable fields. Boldface type indicates field titles present in the table. Boldface type in parenthesis indicates codes used in the table for discrete variables.

1. **PolyNum** – Unique identifier for each polygon

2. **GenLoc** – Descriptive general location of polygon along river

3. **Barlocname** – More specific descriptive location of bar on which polygon is located

4. **BarNum** – Unique identifier for each sidebar or island

5. **BarLoc** – General landform type for the polygon:
    A. Terrace (**Tr**)
    B. Sidebar (**Sb**) (Alternate bar) adjacent to active channel
    C. Island (**Is**)

6. **BarType** – More specific landform type:
    A. Terrace (**tr**) well above the channel (>4’), probably not inundated even at extreme high flows
    B. High Sidebar (**hs**) well above the channel (2-4’), inundated never or only at extreme high flows
    C. Low Sidebar (**ls**) above the usual channel height (1-2’), possibly inundated at high flows
    D. High Island (**hi**) well above the channel (>2’), inundated never or only at extreme high flows
    E. Low Island (**li**) above the usual channel height (1-2’), possibly inundated at high flows
    F. Ephemeral (**ep**) island or sidebar that is barely above the active channel – this class does not include shoals, only more stable low sandbars that are often vegetated but easily inundated at moderate to high flows
    G. Bar Channel (**bc**) occasionally or previously active channel through island or sidebar
    H. Terrace Channel (**tc**) old channel through terrace –not active or only active at extreme high flows
    I. Outside Levee (**ol**) obvious wetland areas that are outside but alongside the river levees

7. **Hydrotype** – Hydrological type or flooding potential of polygon:
    A. Saturated (**1**) Frequently flooded with ground water near the surface
    B. Mesic (**2**) Potential for flooding during high river flows; ground water estimated between 0.5 and 1.5 m of the surface
    C. Dry (**3**) No flooding potential under current river management conditions; ground water estimated at greater than 1.5 m below the surface
    D. Unknown (**9**)

8. **DomVegClass** – Dominant vegetation strata class:
    A. Woodland/Forest (**F**) = trees over > 5m make up > 10% canopy cover
    B. Shrubland (**S**) = shrubs (< 5m) dominate with at least 10% cover
    C. Herbaceous (**H**) = other classes not present or less than 10% total cover
    D. Bare (**B**) = less than 10% total cover

9. **DomVegCov** – Dominant vegetation cover:
    A. High (**h**) > 50% total cover
    B. Moderate (**m**) = 25-50% cover
    C. Sparse (**s**) = 10-25% cover
    D. Bare (**b**) < 10% cover

10. **PerExotic** – (Percent Exotic) percent of woody layer dominated by exotic species:
    A. 0-24% - Native (**N**)
    B. 25-49% - Mixed, Native dominated (**Mn**)
    C. 50-74% - Mixed, Exotic dominated (**Me**)
    D. 75-100% - Exotic (**E**)

11. **DomSpecies** – Dominant species or species complex:
    A. Cottonwood (**Cw**) - *Populus deltoides* var. wislezenii
    B. Goodding's Willow (**Sg**) – *Salix gooddingii*
    C. Coyote Willow (**Wi**) - *Salix exigua*
    D. Seepwillow (**Bc**) – *Baccharis salicina*
    E. Screwbean mesquite (**Pp**) – *Prosopis pubescens*
    F. Russian olive (**Ro**) - *Elaeagnus angustifolia*
    G. Saltcedar (**Sc**) - *Tamarix ramosissima*
    H. Siberian Elm (**Em**) - *Ulmus pumila*
    I. Herbaceous Wetland (**HW**) – obligate wetland herbaceous species
    J. Herbaceous Mesic (**HM**) – mesic, lush annual grasses or forbs
    K. Herbaceous Upland (**HU**) – dry, sparse upland grasses and forbs, annuals or perennials
    L. Common Reed (**Pr**) – herbaceous areas dominated by dense *Phragmites australis*
    M. Bare (**BR**) – total vegetation cover less than 10%
    N. Other (**Ot**) – incidental dominants

12. **DomCert** – Dominant species certainty:
    A. Field Checked (physically visited) (**A**)
    B. Field Observed (observed from distance in field) (**B**)
    C. High photo interpretation confidence (not field checked: imagery good and typical for vegetation type) (**C**)
    D. Poor photo interpretation confidence (not field checked: imagery confusing, not typical for type) (**D**)
    E. Unclear class (not field checked: imagery very poor and/or extremely atypical) (**F**)

13. **SubDomSp1** – (Sub-dominant Species 1) most common woody sub-dominant species:
    Same codes as DomSpecies with the additions of:
    A. New Mexico olive (**No**) – *Forestiera pubescens* var. *pubescens*

14. **SubDomSp2** - Second most common woody sub-dominant species:
    Same codes as DomSpecies and SubDomSp1

15. **OtherSigSp – Other significant woody species present in the stand:**
    Same codes as above

16. **SubDomCert** – Sub-dominant species certainty:
    Same codes as DomCert applied to sub-dominant species identification

17. **UnderHerb** – Understory herbaceous cover class for woodland and shrubland types:
    A. Abundant to luxurious cover (>50%), typically obligate or facultative wetland grasses and forbs (**gm**)
    B. Abundant to moderately sparse cover (20-50%), typically upland grasses and forbs (**gf**)
    C. Sparse, poorly-represented (<20%) or no herbaceous cover (**vs**)

18. **Comments** – Brief description and comments about the polygon

19. **Inclusions** - Significant, but unmappable inclusions at 1:6,000 scale; typically types that make up less than 10% of a polygon

20. **Cwrepro** – (Cottonwood reproduction) presence and type of cottonwood reproduction:
    A. A number of young trees or saplings (>0.5 m tall) present (**+ct**)
    B. A number of seedlings (<0.5 m tall) present (**+cs**)
    C. Little or no cottonwood reproduction observed (**-c**)

21. **MapDate** – Date on which polygon was last edited

22. **AreaMeters** – Area of polygon in meters

23. **PerimeterM** – Perimeter of the polygon in meters

24. **Acres** – Area of polygon in acres

25. **Hectares** – Area of polygon in hectares

26. **LegDomSpC** – (Legend Dominant Species Code) dominant species code for map unit (See Domspecies):

27. **LegDomSpN** – (Legend Dominant Species Name) dominant species for map unit type:
    Common names from LegDomSpC above rather than the codes

28. **LegCTcode** – (Legend Community Type Code) Map Unit code:
    A. Cottonwood/Native (**Cw/N**) - *Populus deltoides*/Native
    B. Cottonwood/Mixed (**Cw/M**) - *Populus deltoides*/Mixed
    C. Cottonwood/Saltcedar (**Cw/Sc**) - *Populus deltoides*/*Tamarix ramosissima*
    D. Siberian Elm/Mixed (**Em/M**) - *Ulmus pumila*/Mixed
    E. Siberian Elm/Russian Olive (**Em/Ro**) - *Ulmus pumila*/*Elaeagnus angustifolia*
    F. Cottonwood/Goodding's Willow (**Cw/Sg**) – *Populus deltoides/Salix gooddingii*
    G. Coyote Willow/Cottonwood (**Wi/Cw**) - *Salix exigua*/*Populus deltoides*
    H. Coyote Willow/Native (**Wi/N**) - *Salix exigua*/Native

I. Coyote Willow/Russian Olive (**Wi/Ro**) - *Salix exigua*/*Elaeagnus angustifolia*
J. Coyote Willow/Saltcedar (**Wi/Sc**) - *Salix exigua*/*Tamarix ramosissima*
K. Russian Olive/Cottonwood (**Ro/Cw**) – *Elaeagnus angustifolia/Populus deltoides*
L. Russian Olive/Coyote Willow (**Ro/Wi**) - *Elaeagnus angustifolia*/*Salix exigua*
M. Russian olive/Exotic (**Ro/E**) - *Elaeagnus angustifolia*/Exotic
N. Saltcedar/Coyote Willow (**Sc/Wi**) - *Tamarix ramosissima*/*Salix exigua*
O. Saltcedar/Mixed (**Sc/M**) - *Tamarix ramosissima*/Mixed
P. Saltcedar/Treatment (**Sc/Treat**) – *Tamarix ramosissima*/Treatment
Q. Saltcedar/Goodding's Willow/Herbaceous Wetland (**Sc/Sg/HW**) - *Tamarix ramosissima/Salix gooddingii*/Herbaceous Wetland
R. Saltcedar/Herbaceous Mesic (**Sc/HM**) - *Tamarix ramosissima*/Herbaceous Mesic
S. Herbaceous Wetland (**HW**) - Herbaceous Wetland
T. Herbaceous Mesic (**HM**) - Herbaceous Mesic
U. Herbaceous Upland (**HU**) - Herbaceous Upland
V. Herbaceous - Common Reed (**HC**) - Herbaceous - *Phragmites australis*
W. Other (**Ot**) - Other
X. Bare (**Br**) - Bare

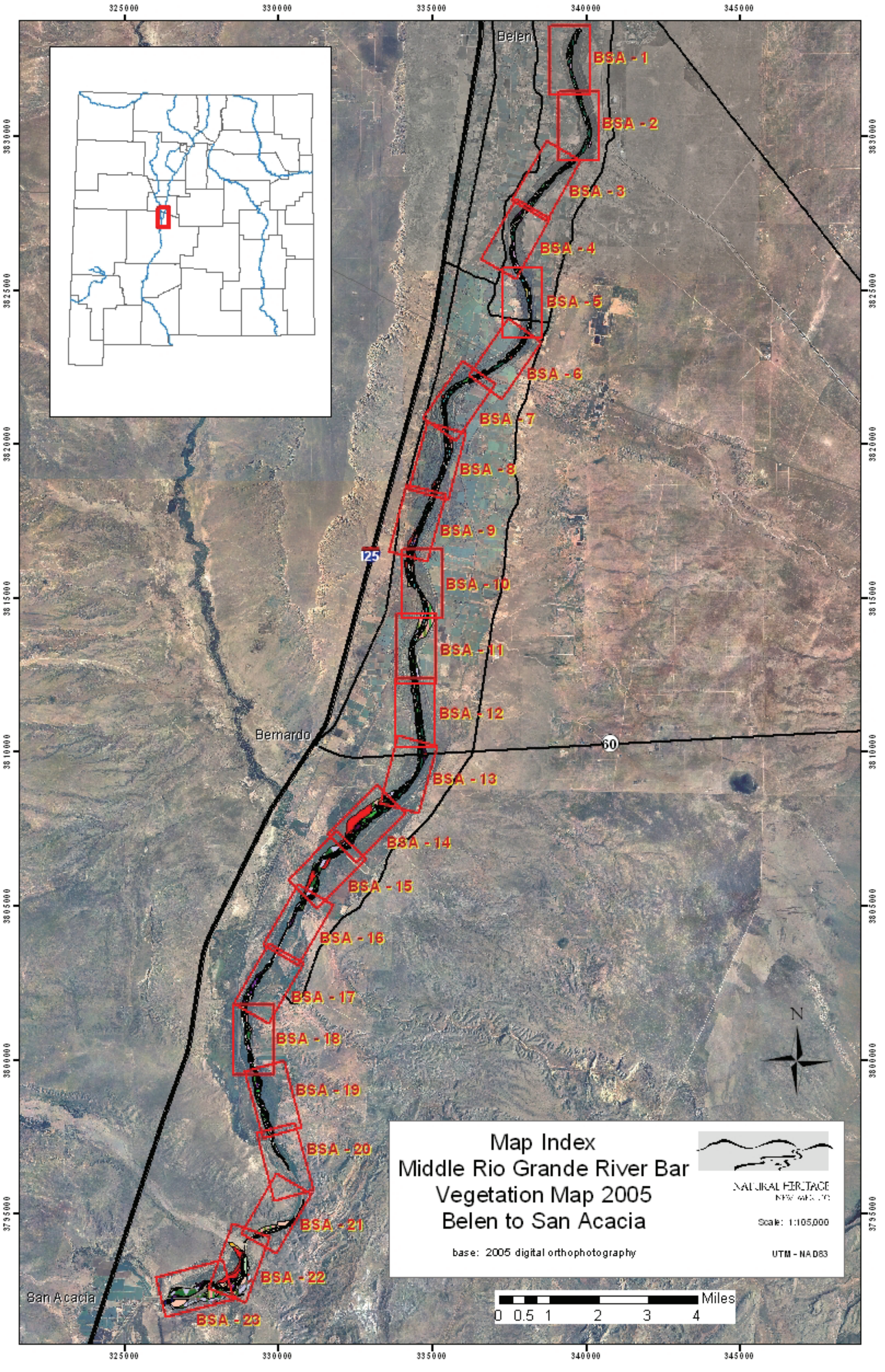
29. **LegCtname** – (Legend Community Type Name) Map Unit name:
Names from LegCTcode above

30. **LegCovCode** – (Legend Cover Code) Cover Map Unit code:
A. High/high (**h/h**) - overstory cover high, understory cover high
B. High/moderate (**h/m**) - overstory cover high, understory cover moderate
C. High/sparse (**h/s**) - overstory cover high, understory cover sparse
D. Moderate/high (**m/h**) - overstory cover moderate, understory cover high
E. Moderate/moderate (**m/m**) - overstory cover moderate, understory cover moderate
F. Moderate/sparse (**m/s**) - overstory cover moderate, understory cover sparse
G. Sparse/high (**s/h**) - overstory cover sparse, understory cover high
H. Sparse/moderate (**s/m**) - overstory cover sparse, understory cover moderate
I. Sparse/sparse (**s/s**) - overstory cover sparse, understory cover sparse
J. Bare (**b**) - overstory cover bare, understory cover bare
K. High (**h**) - overstory cover high, understory cover N/A
L. Moderate (**m**) - overstory cover moderate, understory cover N/A
M. Sparse (**s**) - overstory cover sparse, understory cover N/A

31. **LegCovName** – (Legend Cover Name) Cover Map Unit name:
Names from LegCovCode above

Appendix B – 2005 Middle Rio Grande River Bar Vegetation Map Sheets

This appendix consists of an index map and 23 bar vegetation map sheets for the Belen to San Acacia reach of the Middle Rio Grande mapped in 2005. The map sheets are arranged from north to south, and start with the first map sheet just south of the Belen railroad bridge, BSA-1, and end with the last sheet just above the San Acacia dam, BSA-23. The maps are at a 1:6,000 scale and overlay CIR digital orthophotography (see Methods). Polygons are color coded according to their map unit, and labeled by cover type (see the map legend and Tables 1 & 2).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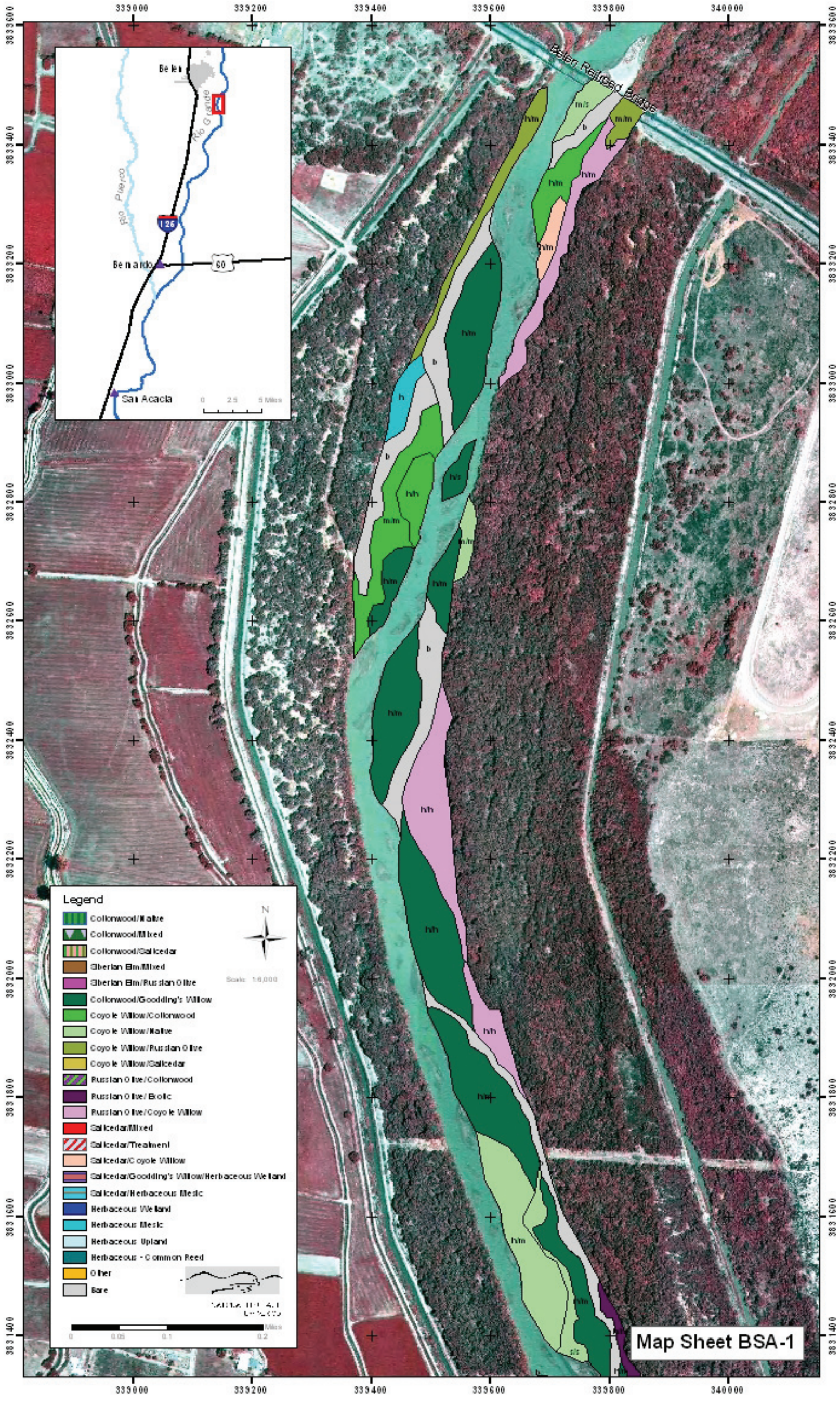
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Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
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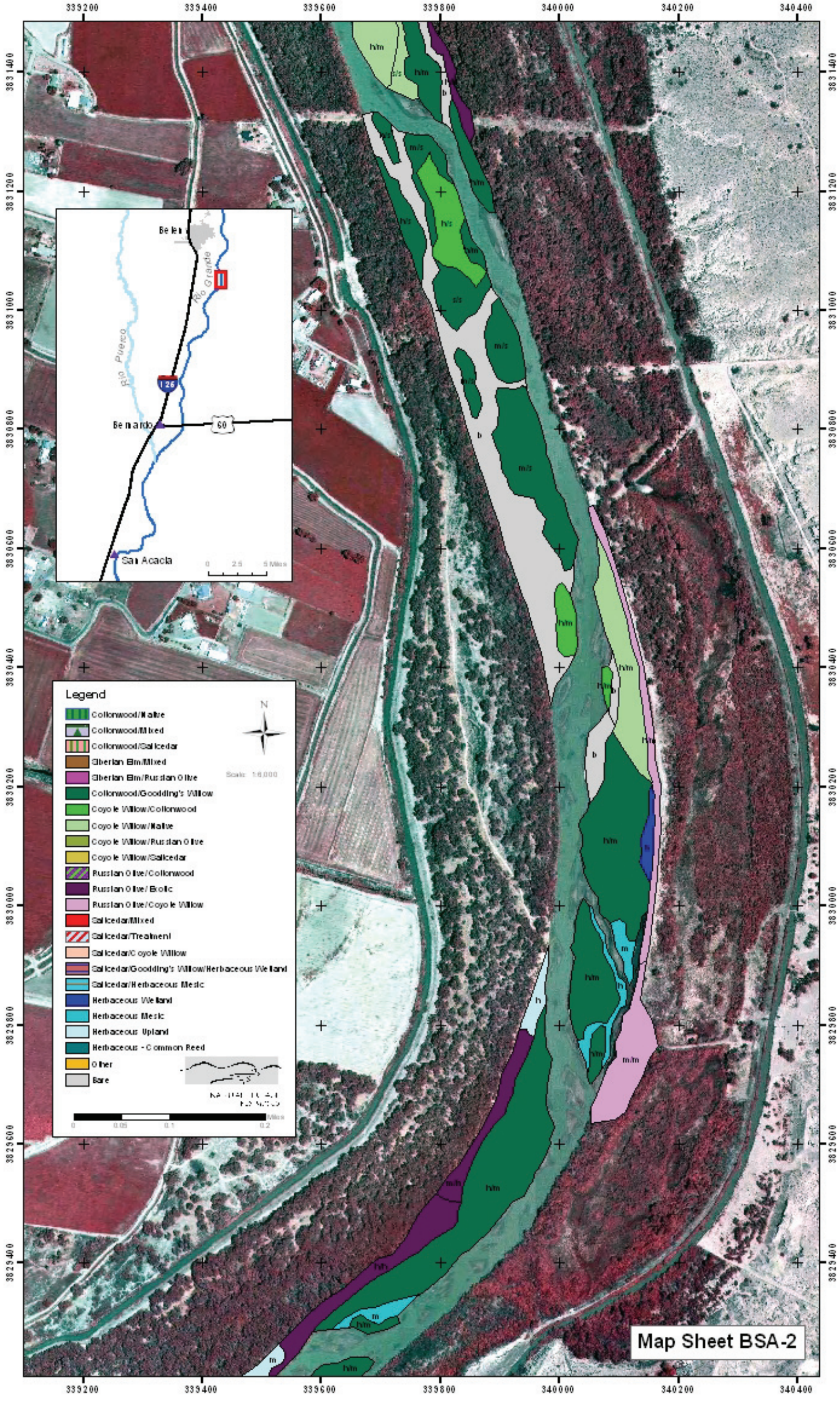
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Cottonwood/Goodding's Willow
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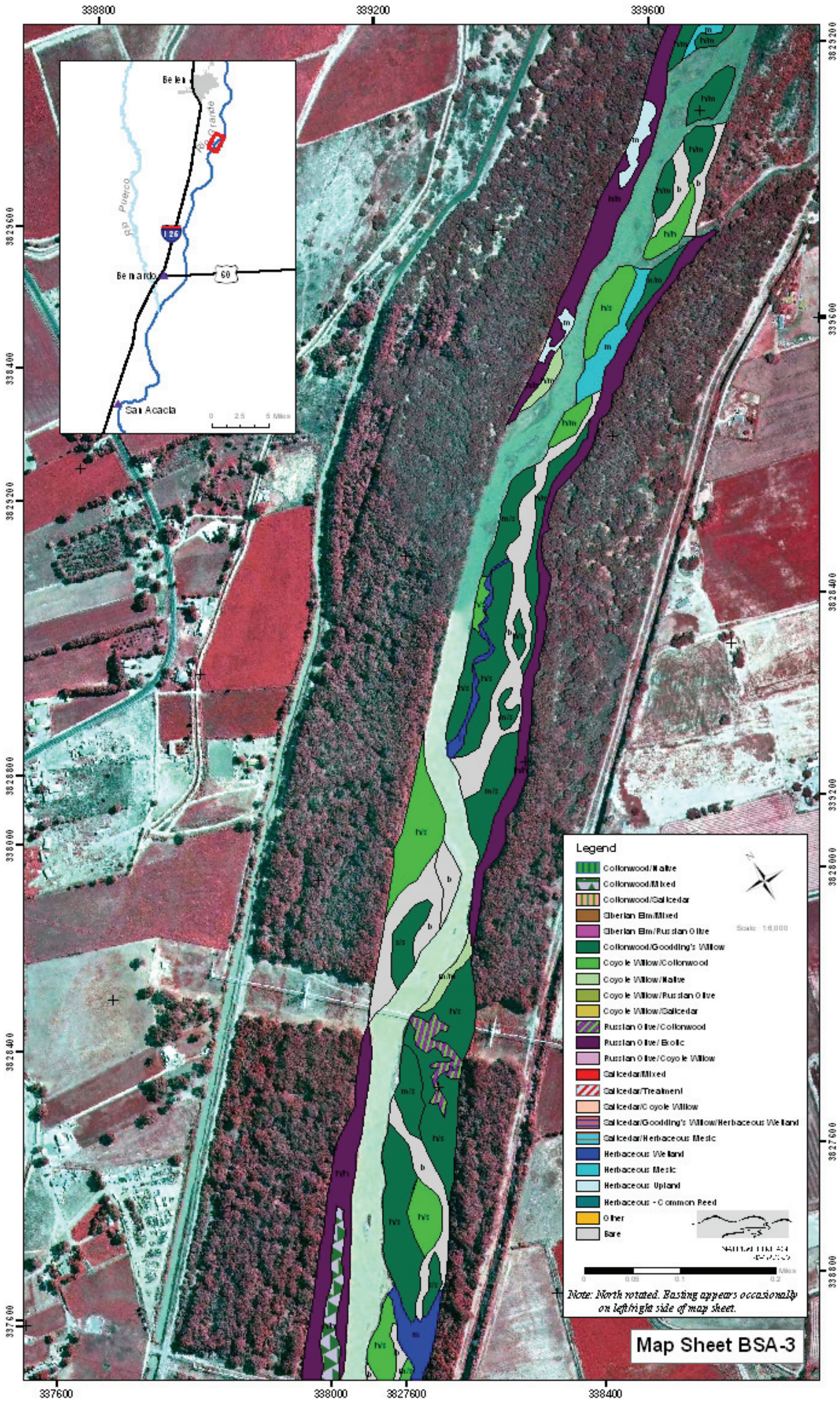
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
0 0.05 0.1 0.2 Miles
h/m
m/h
m/s
b
h
m
Map Sheet BSA-2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339200
339600
3829200
3829600
338400
3828800
338000
3828400
3827600
337600
Belen
Rio Grande
Rio Puerco
I-25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-3
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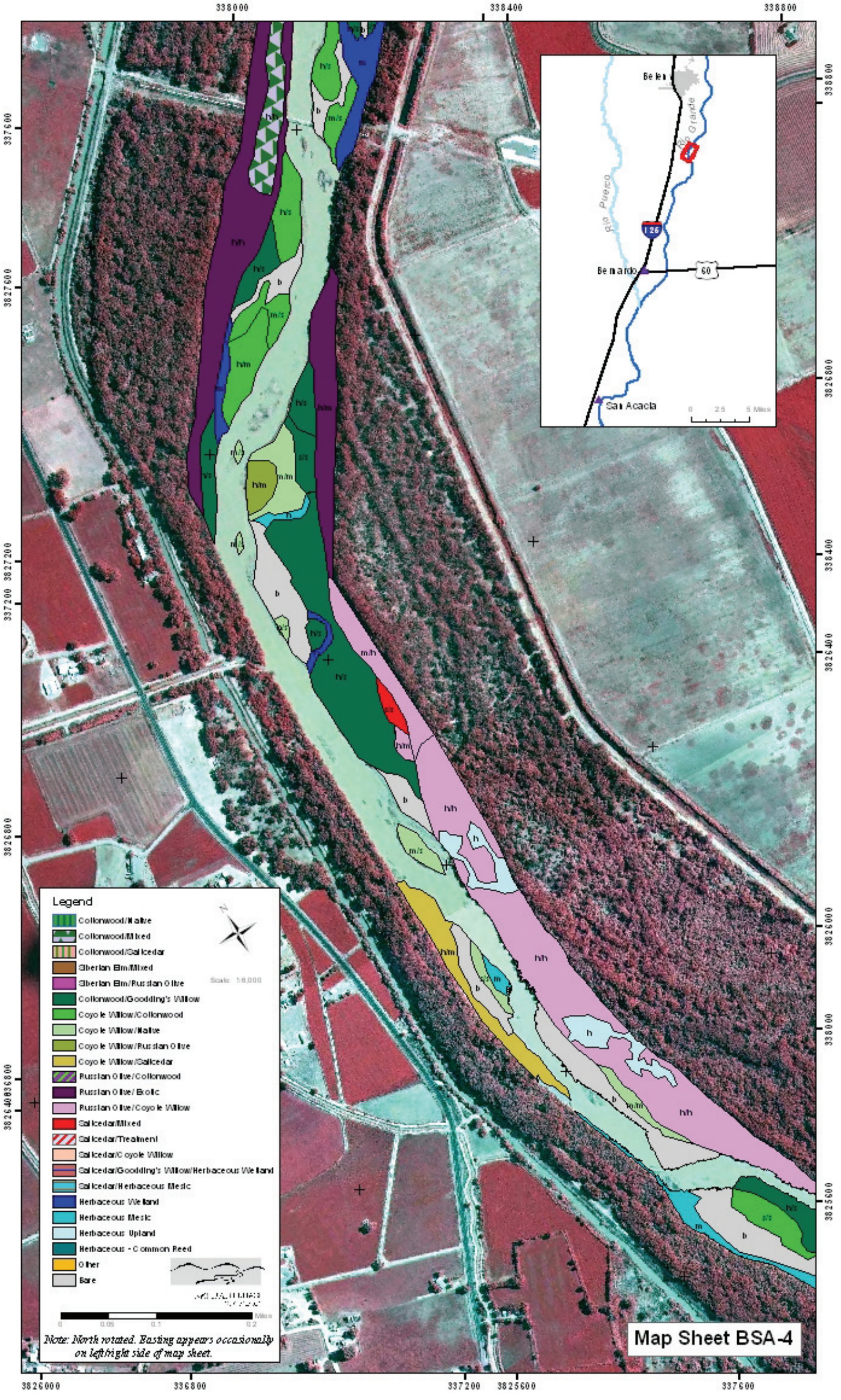
338000
3827600
338400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3827200
3826800
3826400
3826000
3825600
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
Miles
0 0.05 0.1 0.2
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-4
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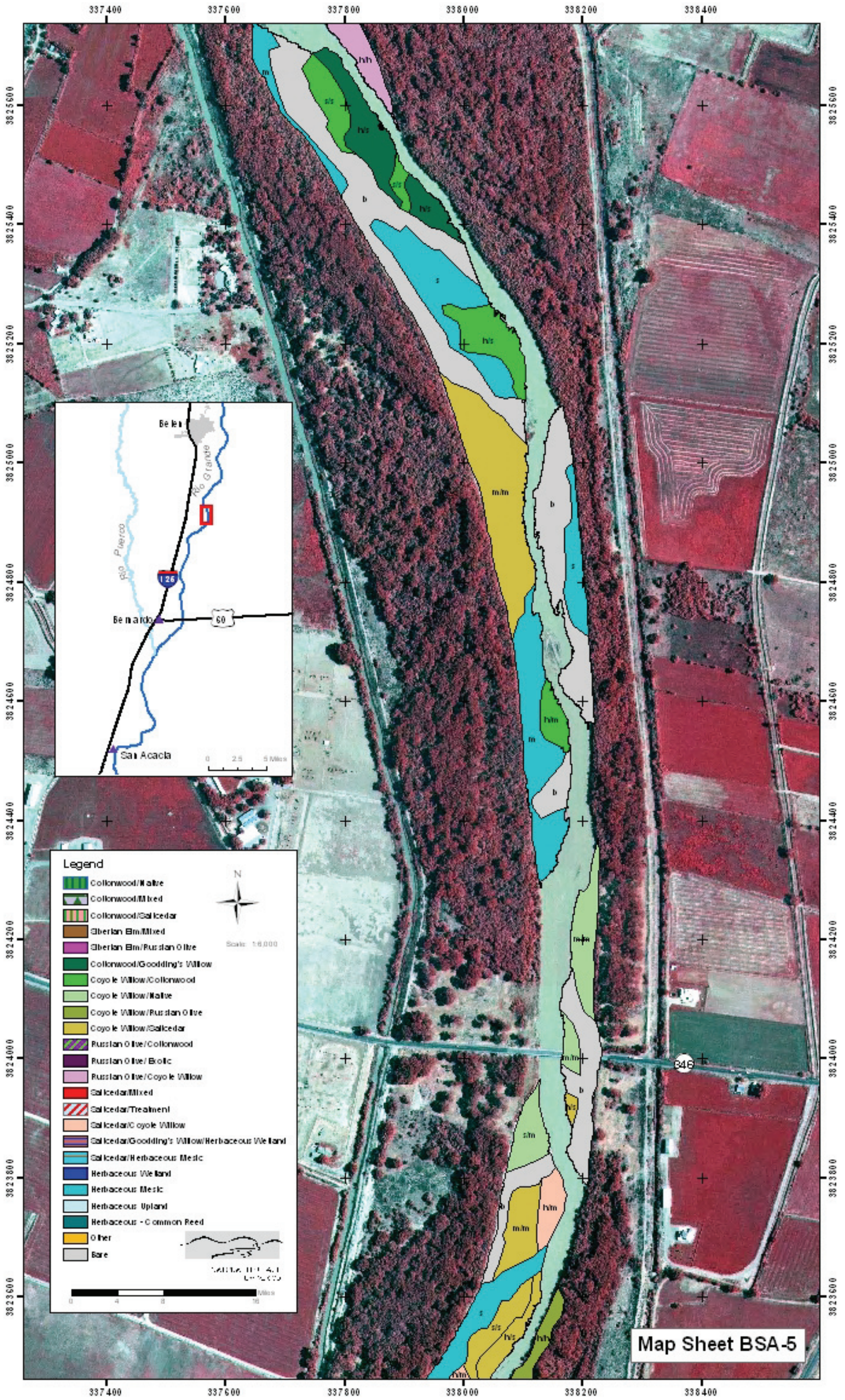
336800
337200
3825600
337600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337800
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338400
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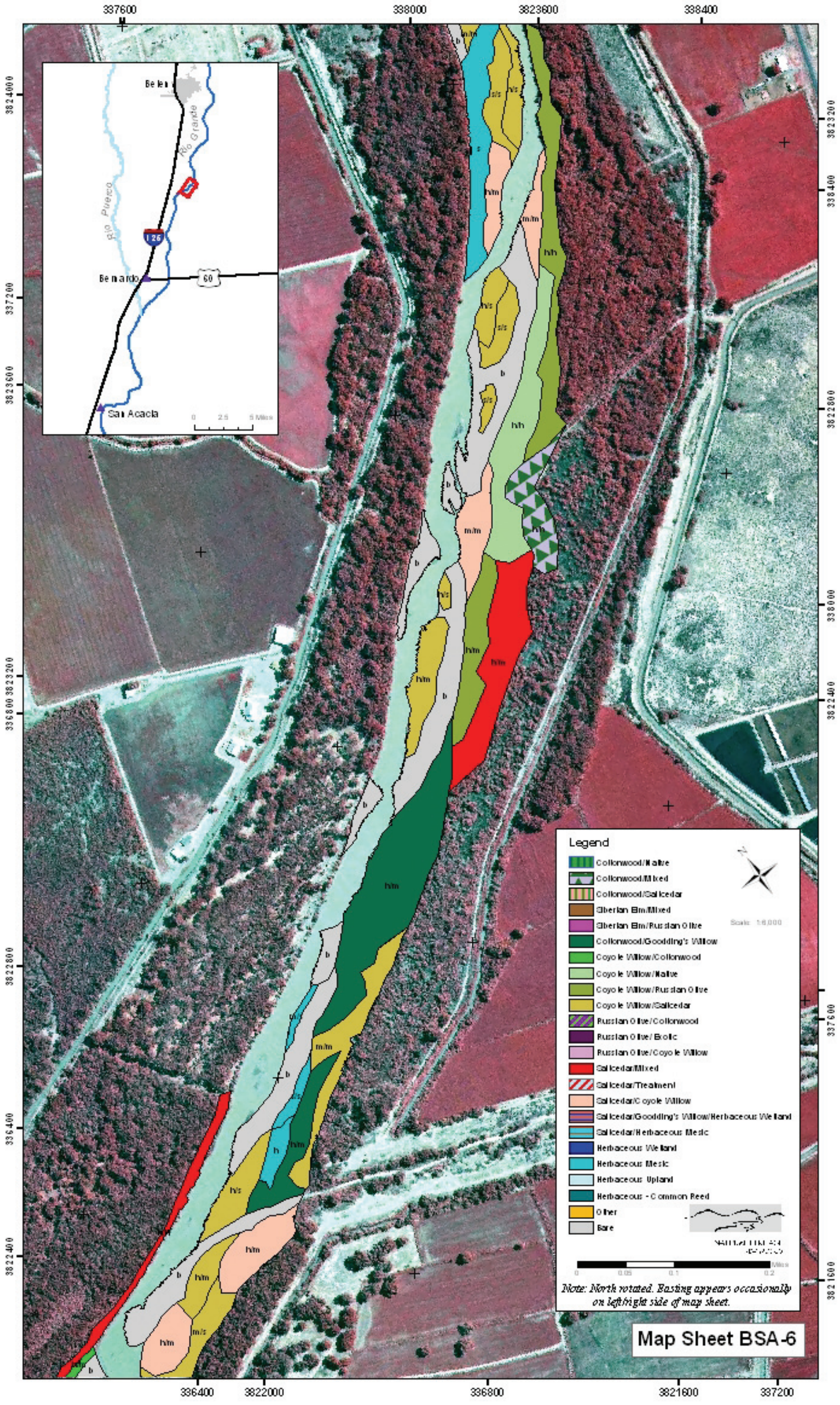
3825000
3824800
3824600
3824400
3824200
3824000
3823800
3823600
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
N
Scale: 1:6,000
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
0 4 8 16 Miles
346
Map Sheet BSA-5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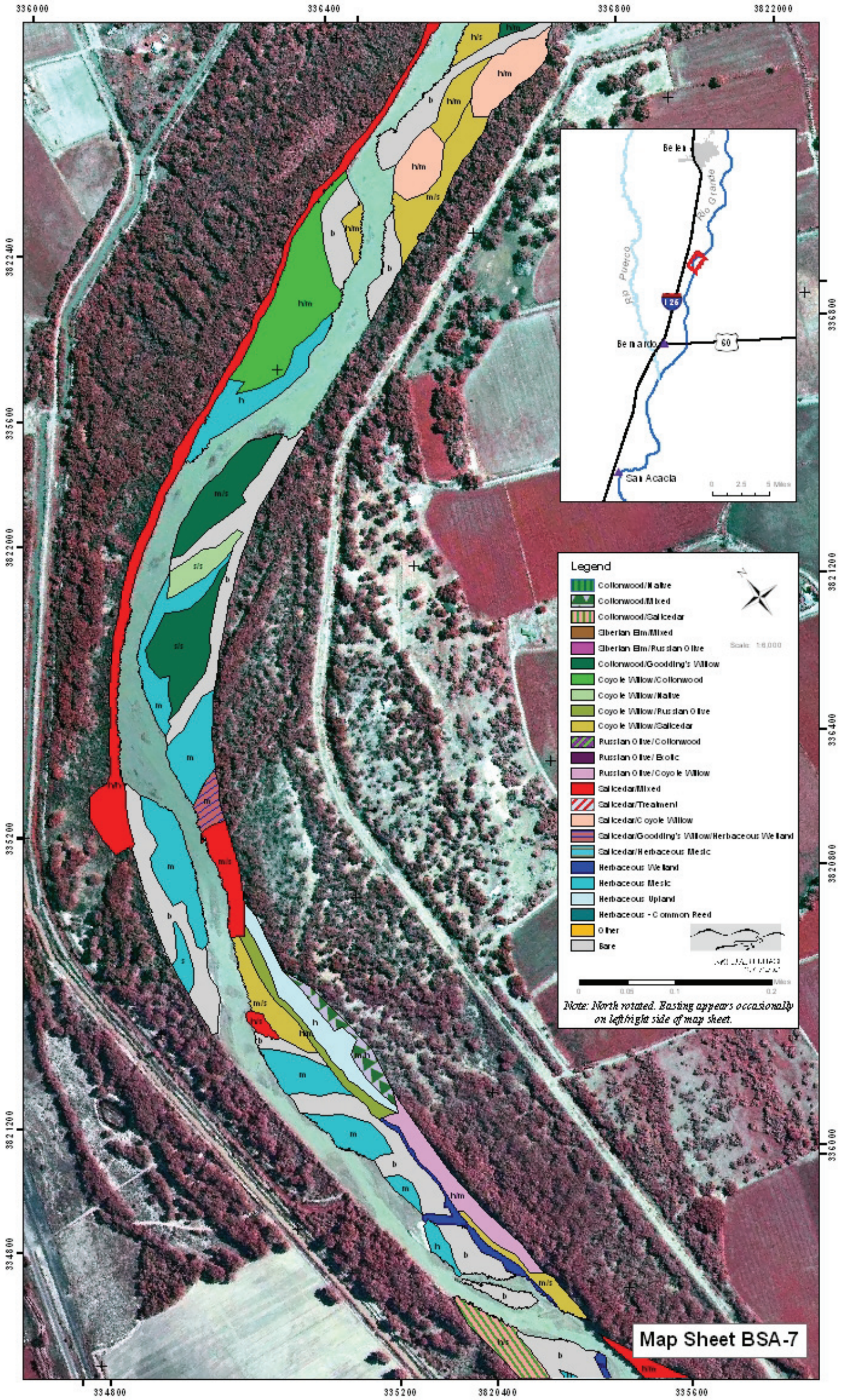
3822400
338400
338000
3822400
3821600
337600
336400
3822000
336800
3821600
337200
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
b
m/m
s/s
h/s
h/m
h/h
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-6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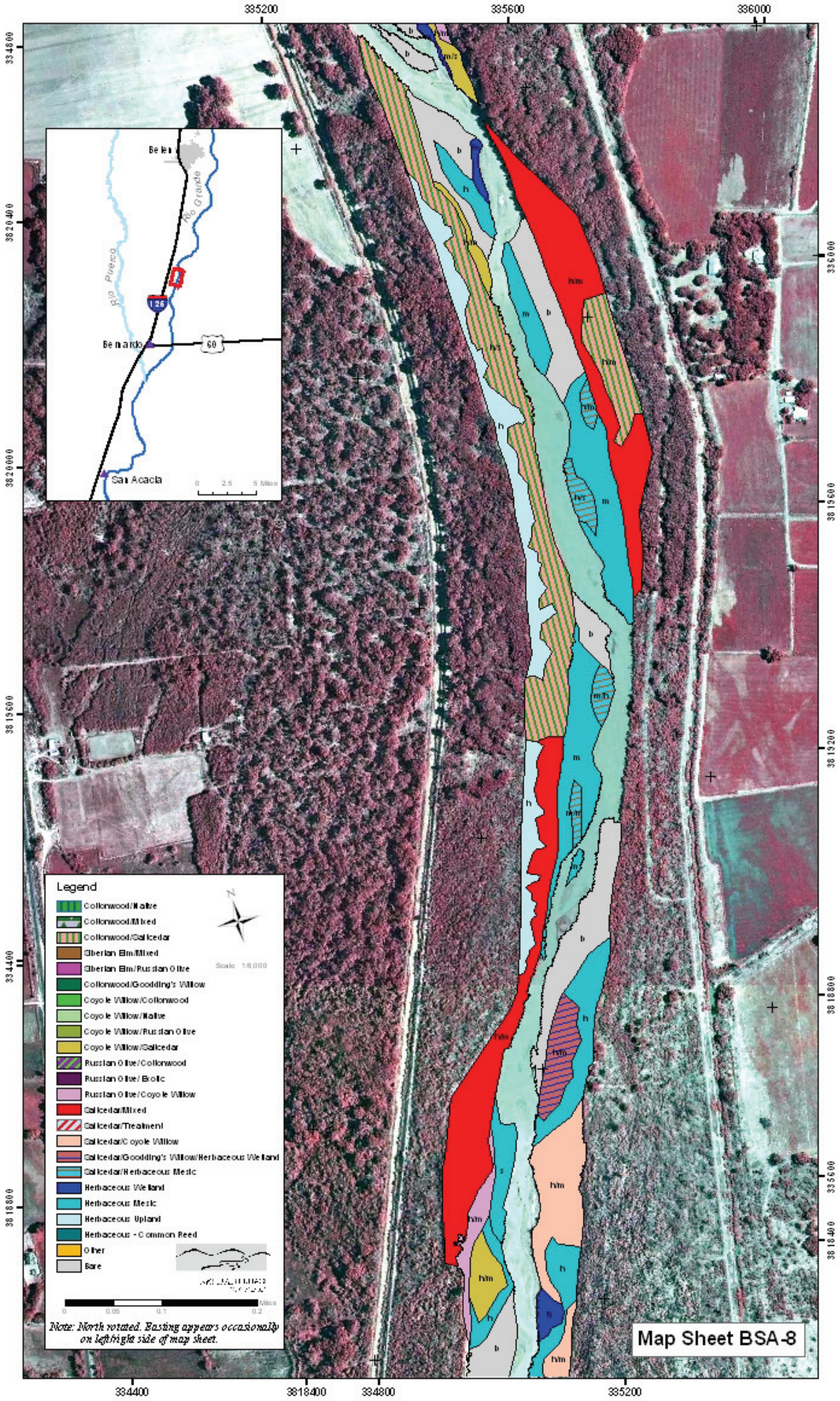
3822000
335200
3821200
336400
3820800
3821200
336000
334800
335200
3820400
335600
Belen
Rio Grande
NM Rivers
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-7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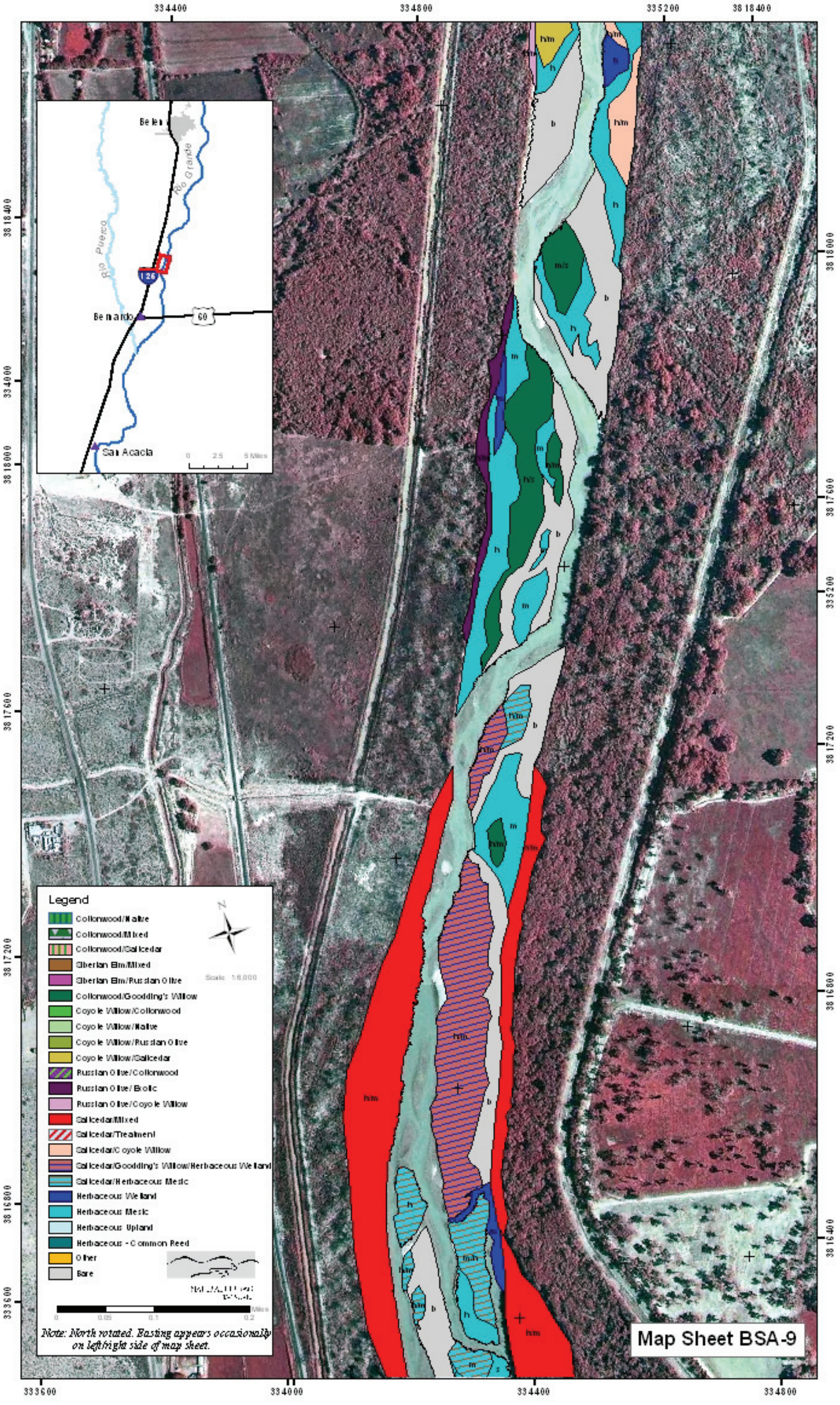
336000
3348000
3820400
3820000
3819600
3334400
3819200
3818800
3356000
3818400
334400
3818400
334800
335200
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-8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334800
335200
3818400
3818000
3817600
3817200
3816800
3816400
Belen
Rio Grande
Rio Puerco
I-25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-9
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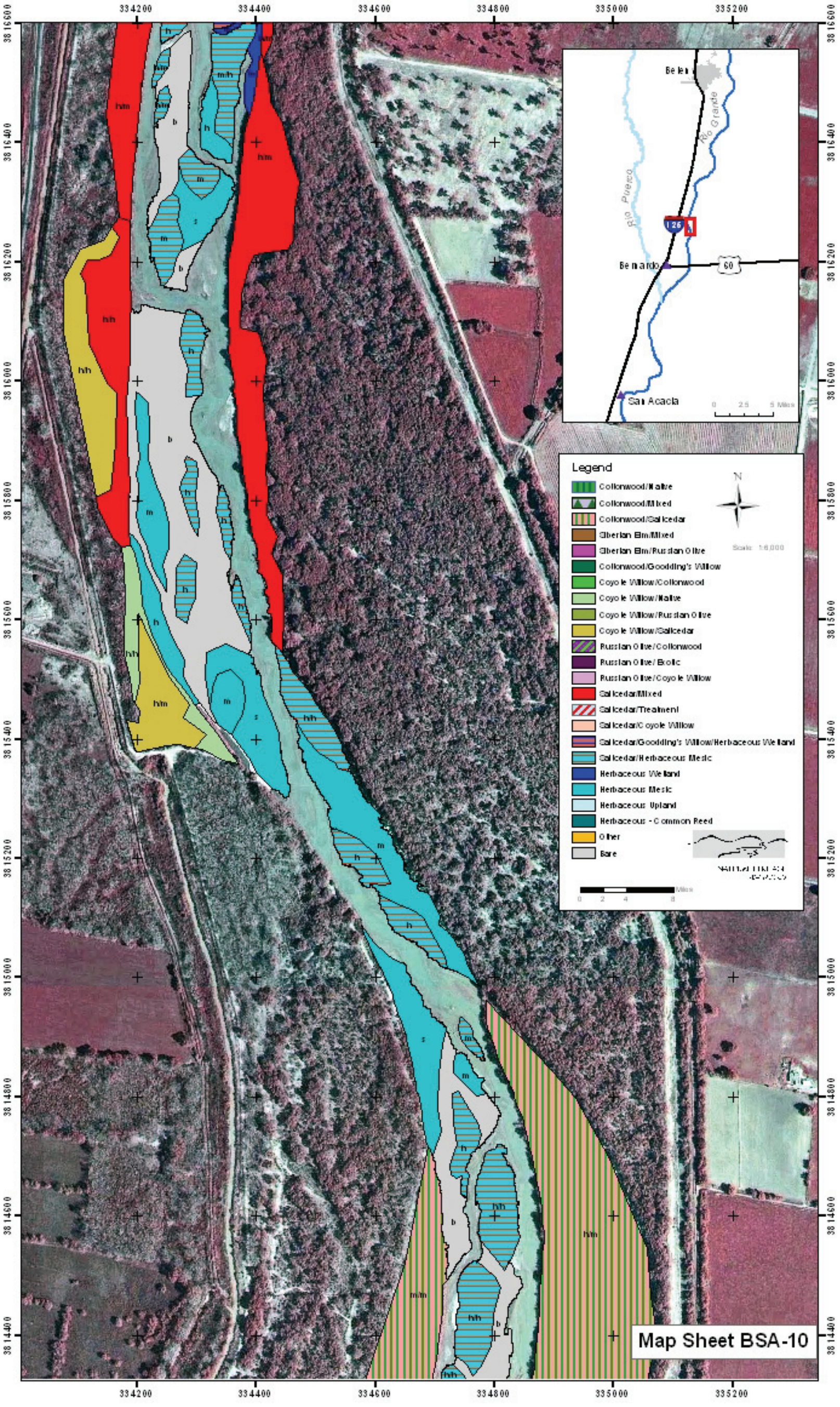
3340000
3344000
3348000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334600
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335200
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3816200
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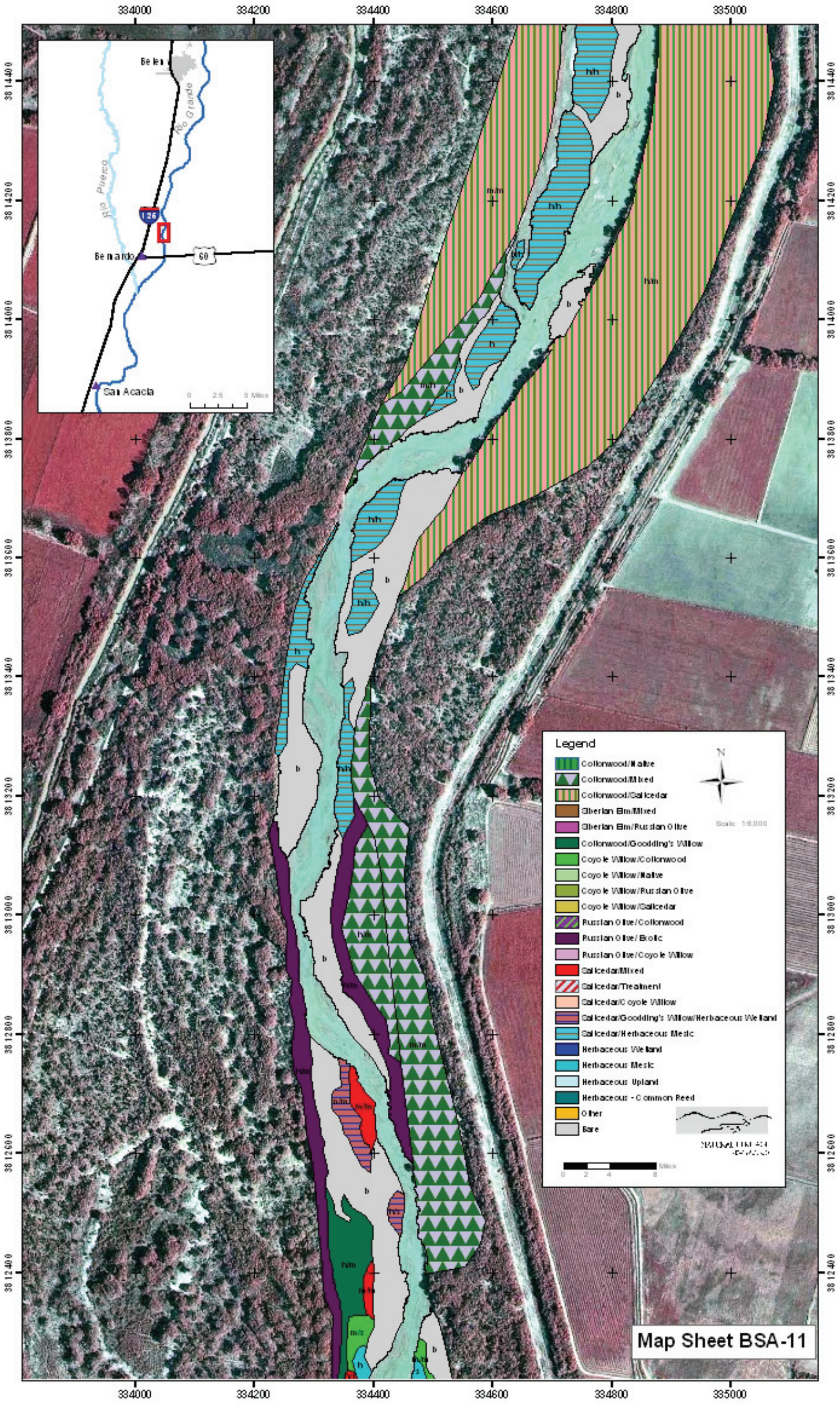
3815800
3815600
3815400
3815200
3815000
3814800
3814600
3814400
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
N
Scale: 1:8,000
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
0 2 4 8 Miles
Map Sheet BSA-10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334600
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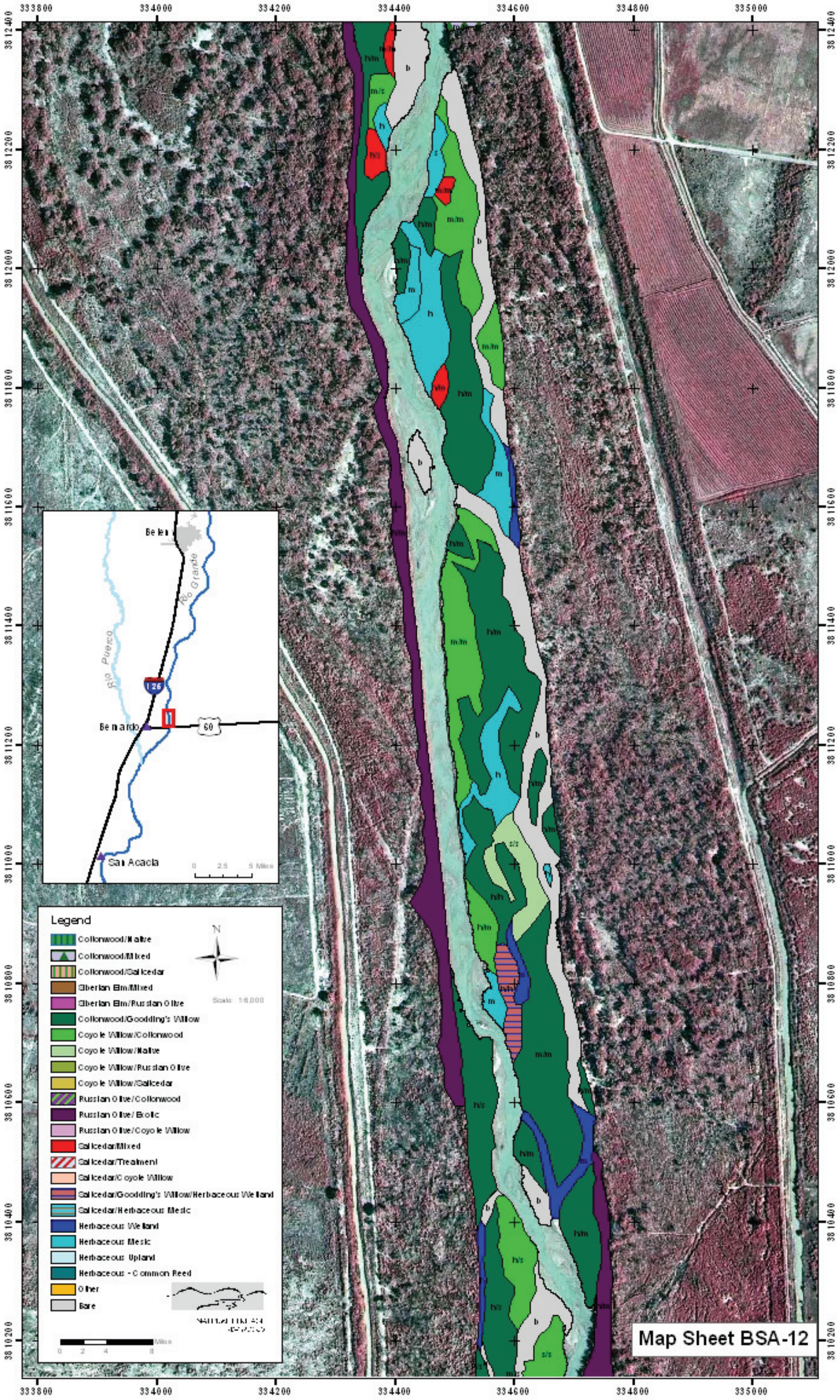
38 14200
38 14000
38 13800
38 13600
38 13400
38 13200
38 13000
38 12800
38 12600
38 12400
Belen
Rio Grande
Rio Puerco
I-25
Bernardo
60
San Acacia
0 2.5 5 Miles
hh
b
m/m
h
m/h
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/ Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
N
Scale: 1:6,000
0 2 4 8 Miles
Map Sheet BSA-11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334800
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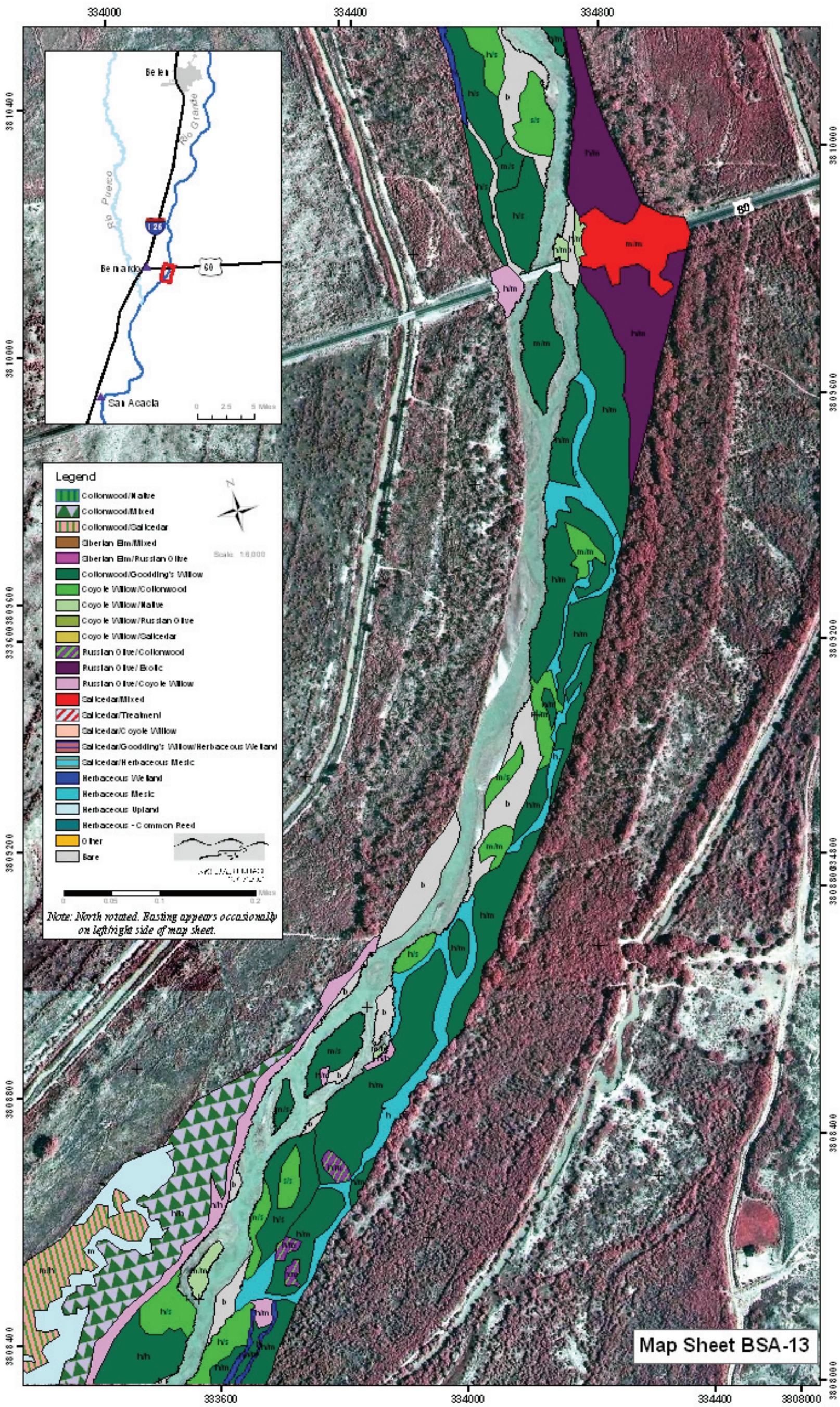
3811200
3811000
3810800
3810600
3810400
3810200
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/ Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
N
Scale: 1:6,000
0 2 4 8
Map Sheet BSA-12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3336003809600
Belen
Bernardo
San Acacia
Rio Grande
Rio Puerco
126
60
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-13
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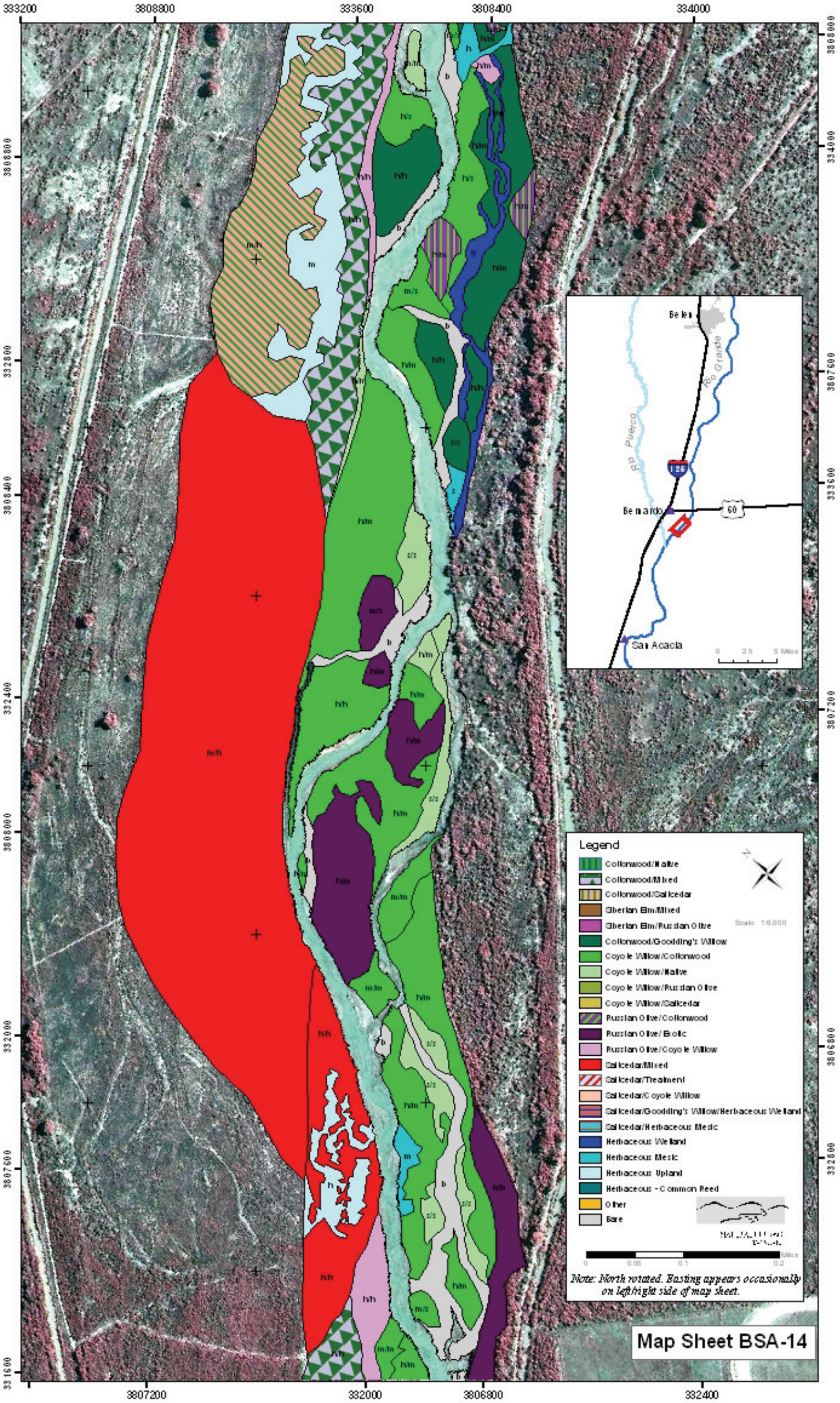
334400
3808000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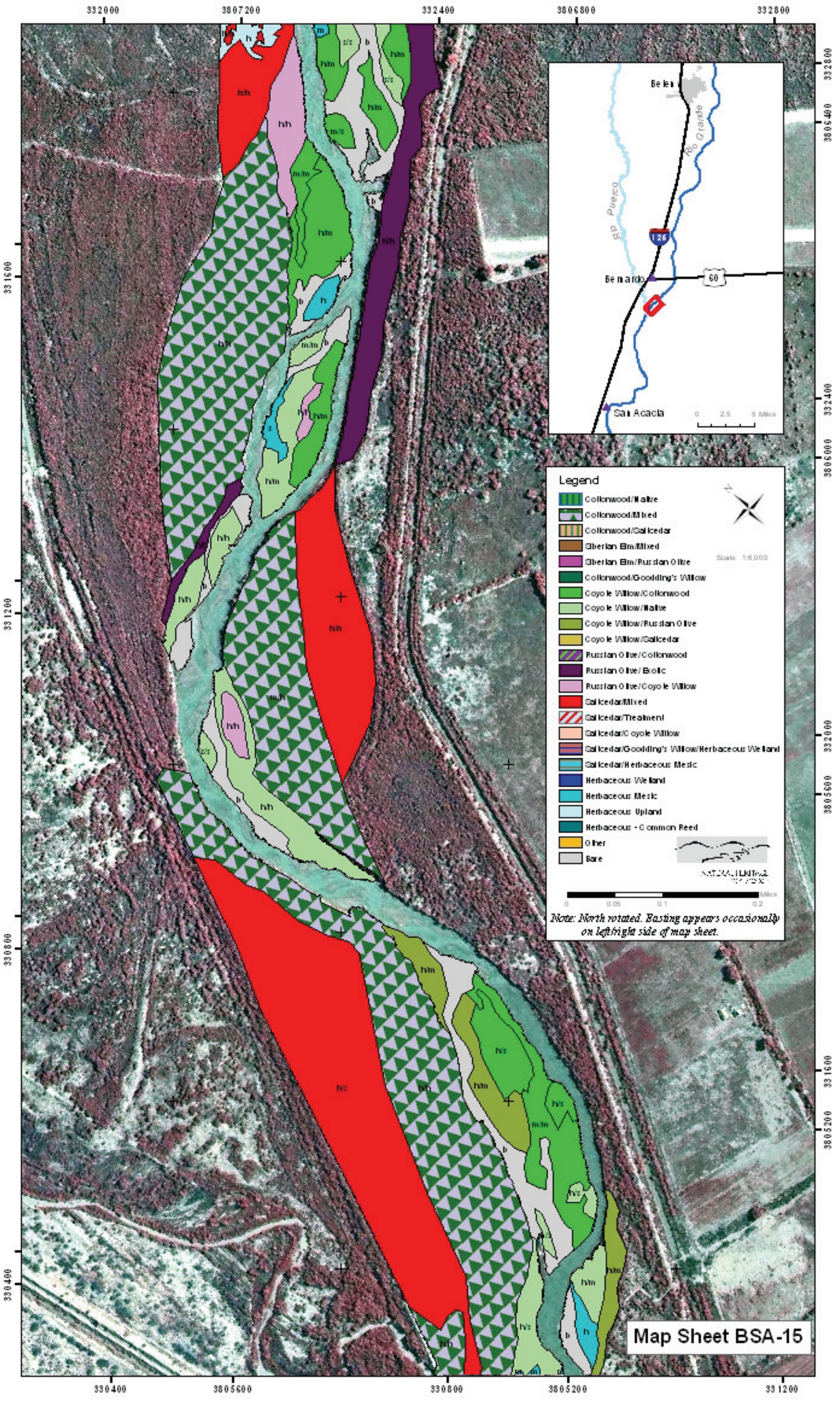
3808000
332000
3806800
3807600
332800
3807200
332000
3806800
332400
Belen
Rio Grande
R.P. Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Biotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-14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3806000
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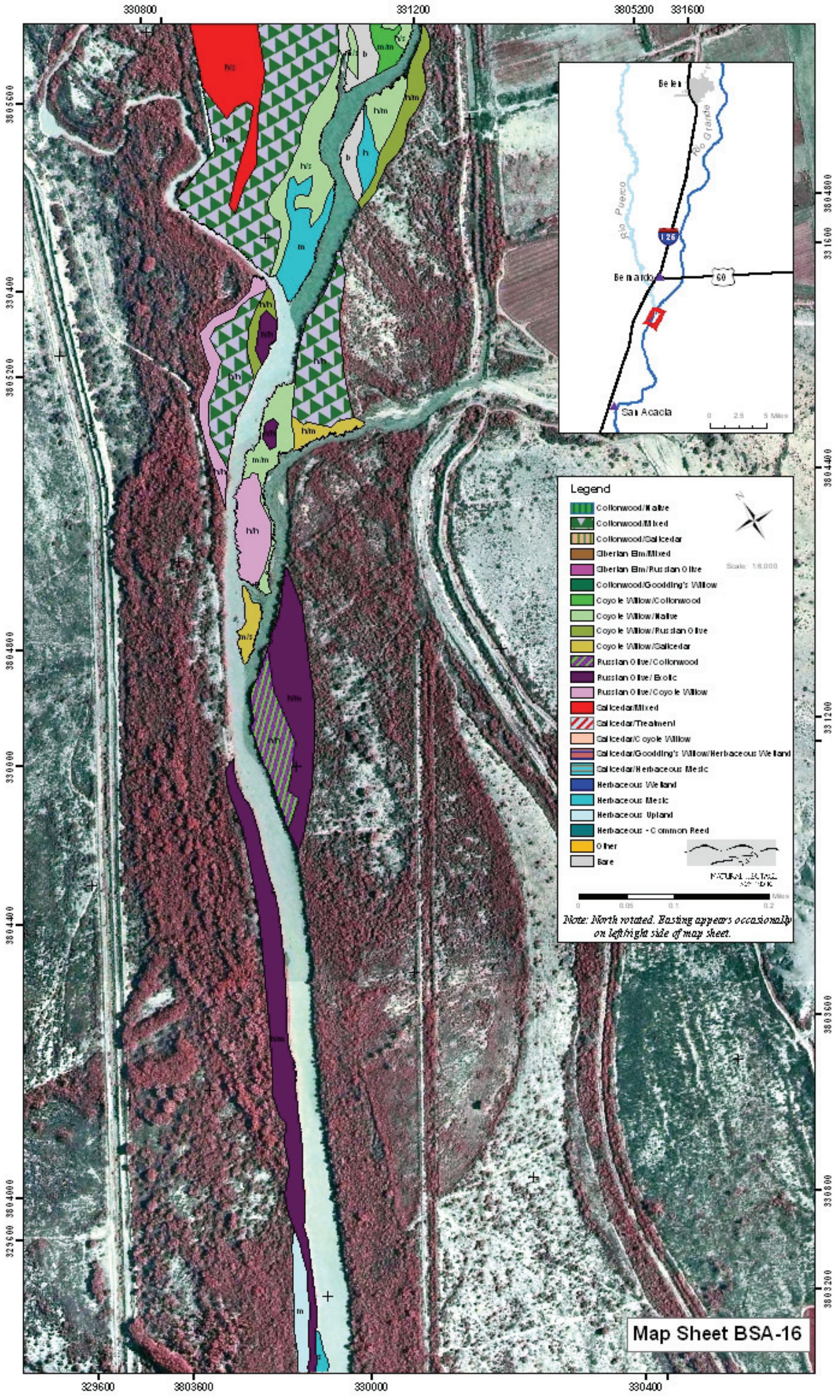
330400
3805600
330800
3805200
331200
Belen
Rio Grande
RP Pueco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-15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380 4800
331600
380 4400
330000
331200
380 4800
380 4400
329600
380 4000
380 3600
330800
380 3200
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Salicedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Salicedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Salicedar/Mixed
Salicedar/Treatment
Salicedar/Coyote Willow
Salicedar/Goodding's Willow/Herbaceous Wetland
Salicedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
Miles
0 0.05 0.1 0.2
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-16
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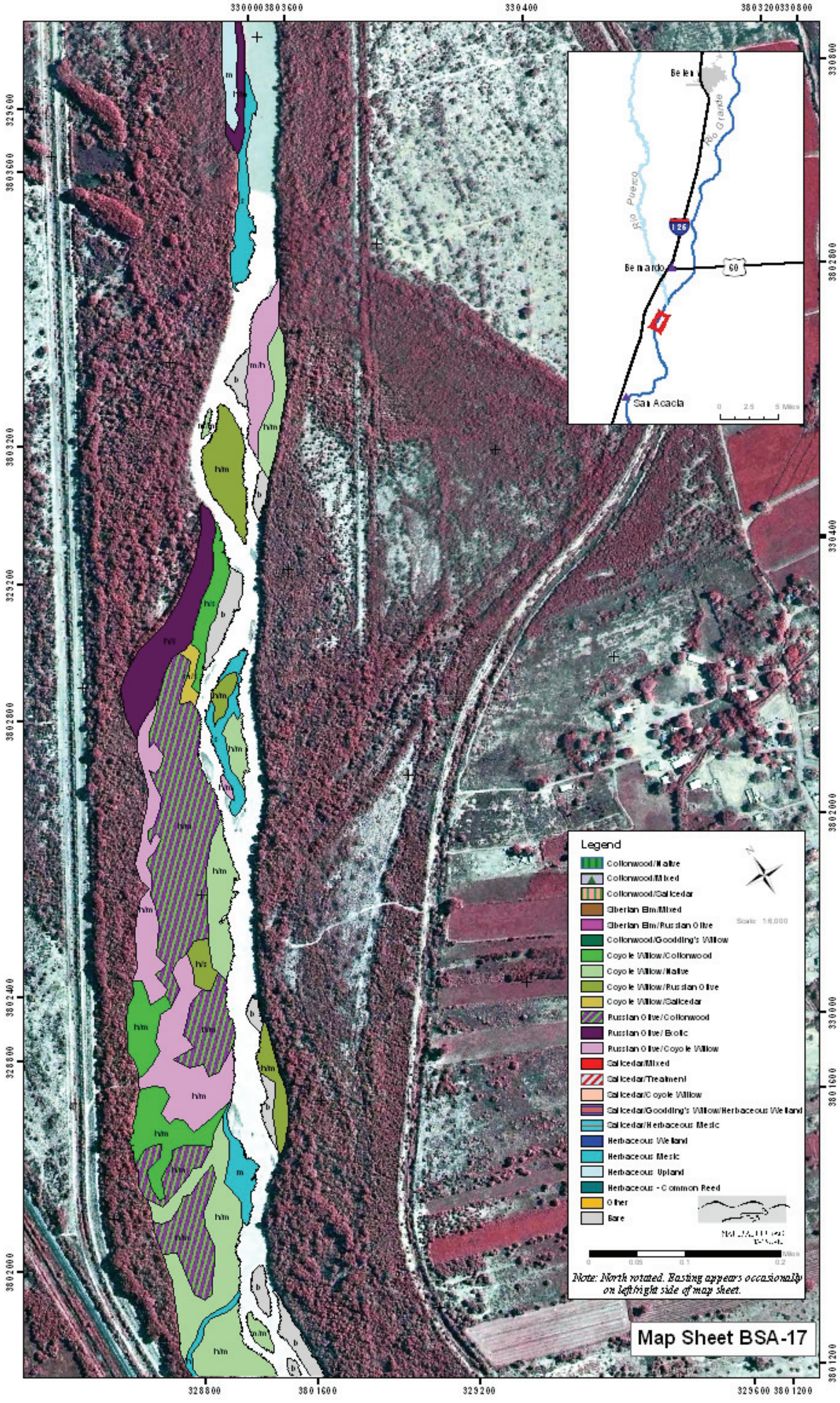
3803600
330000
330400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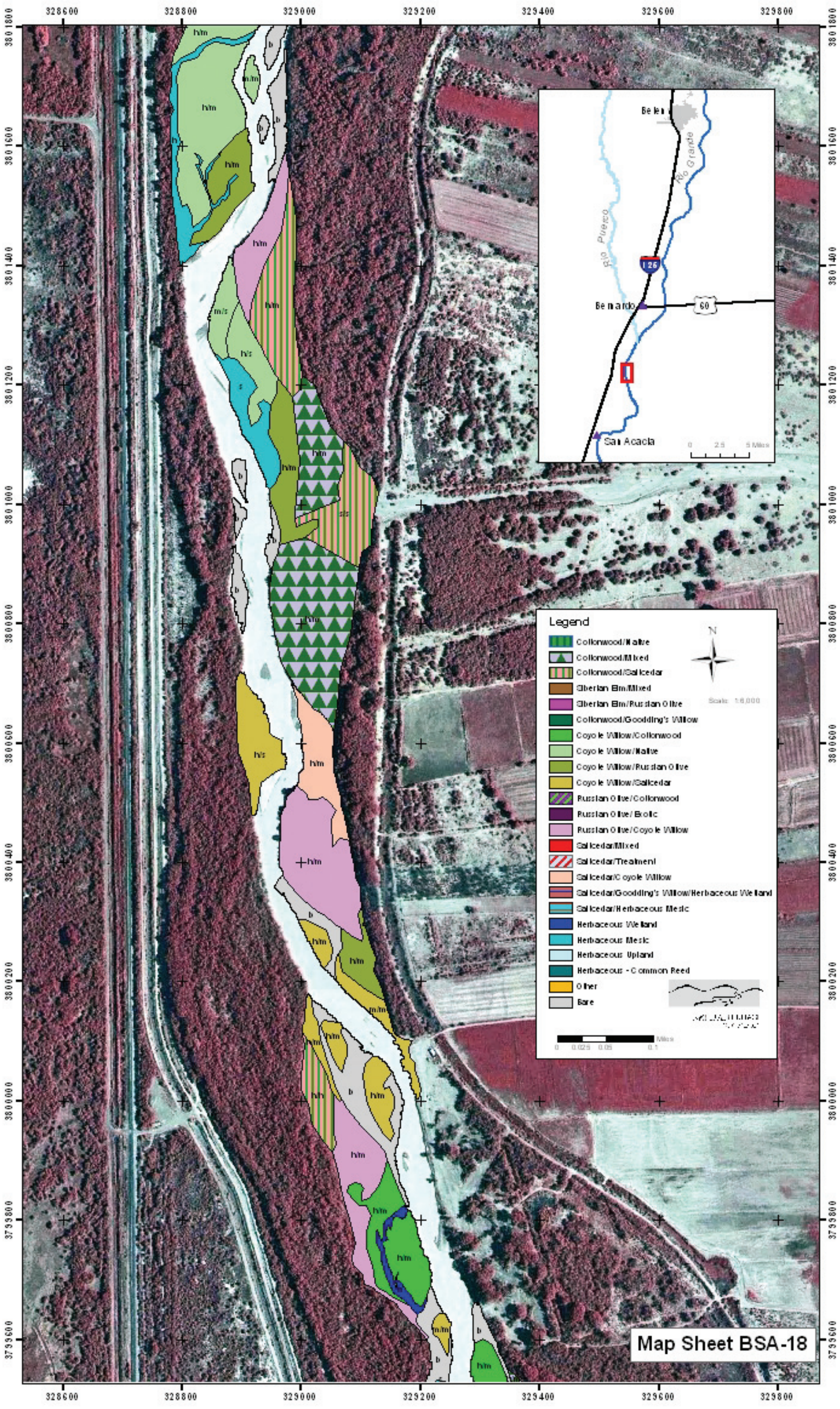
3802800
330000
3801600
3801200
328800
3801600
329200
329600 3801200
Bellen
Río Grande
Río Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
m
m/h
h
h/m
h/s
b
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale 1:6,000
0 0.05 0.1 0.2
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-17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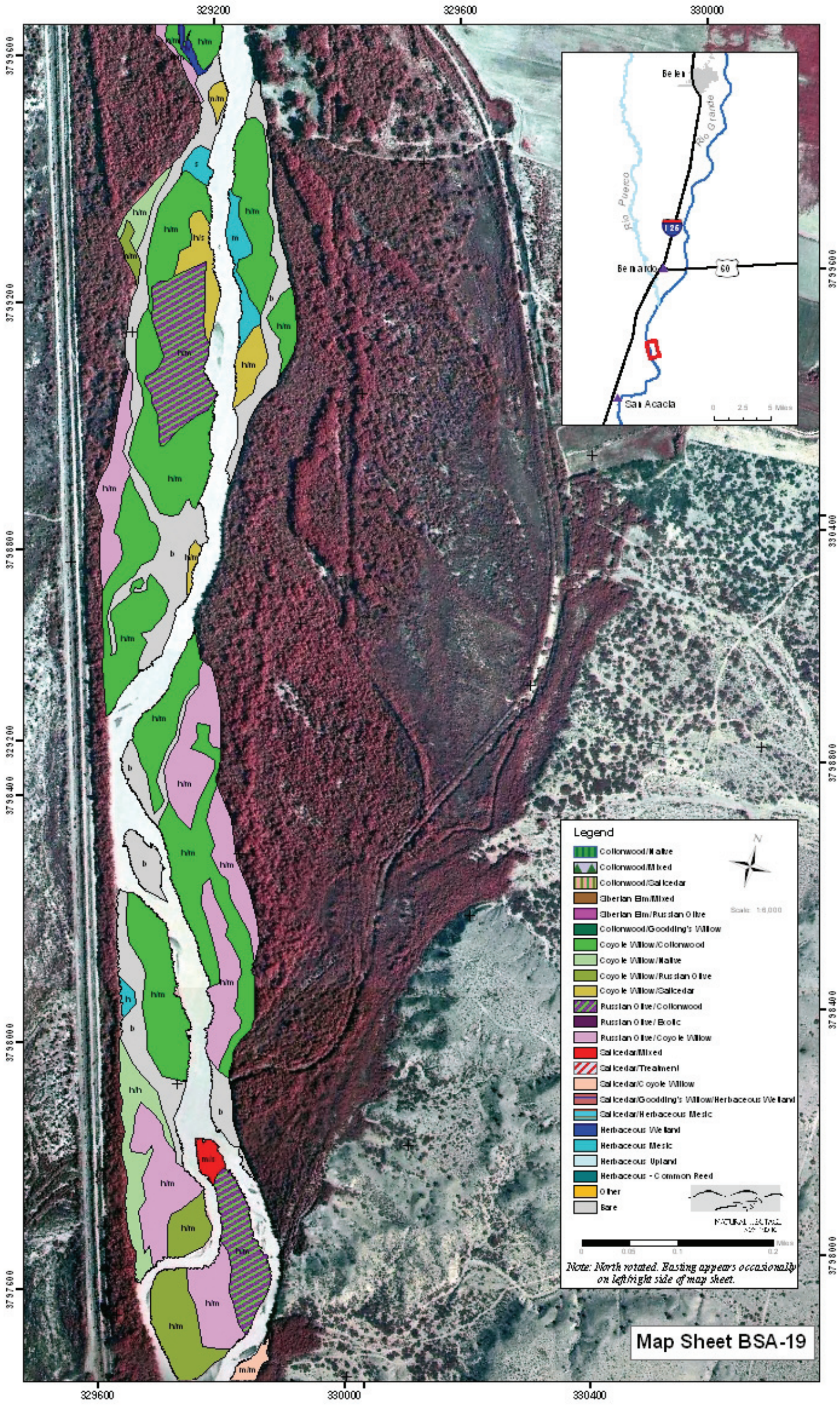
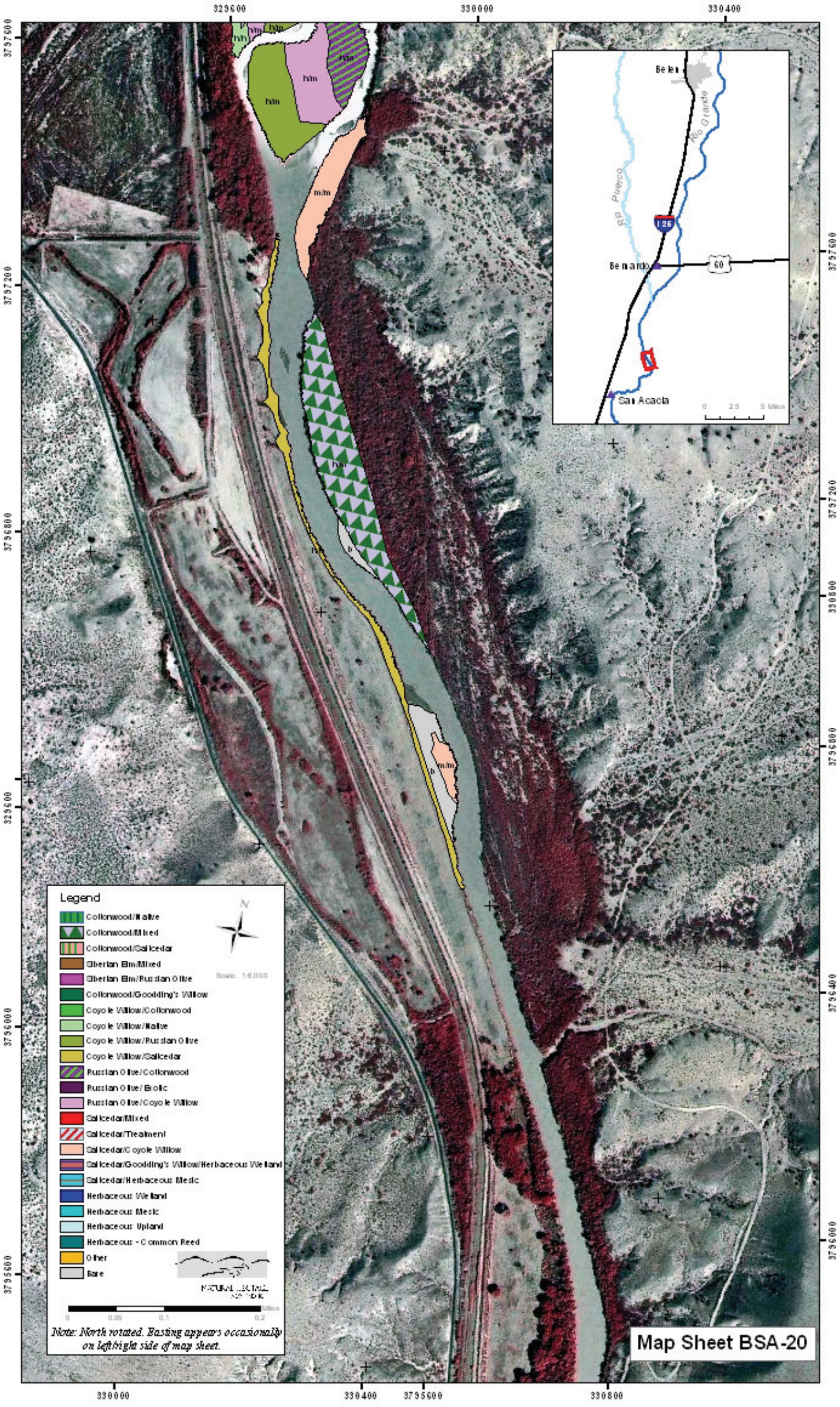
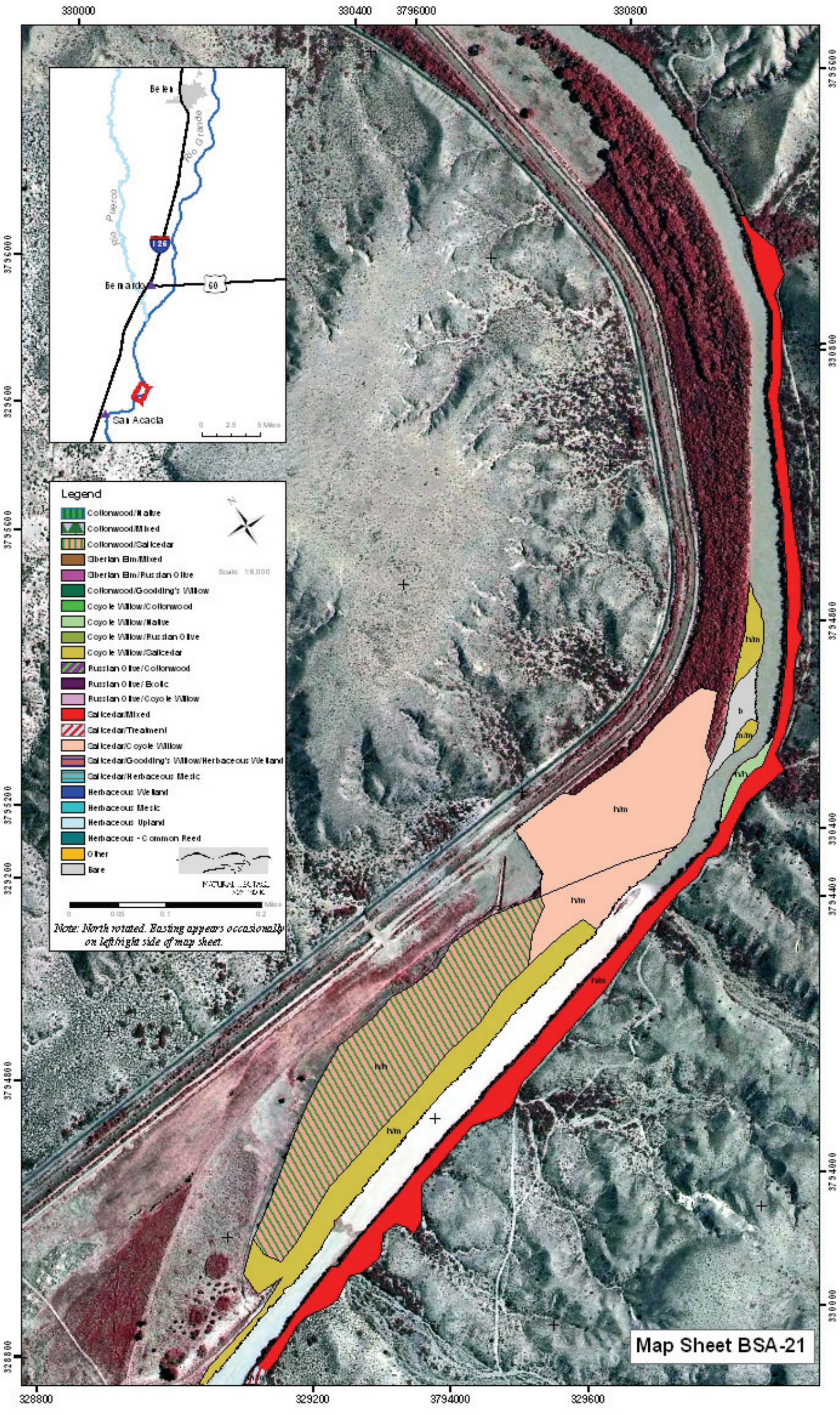
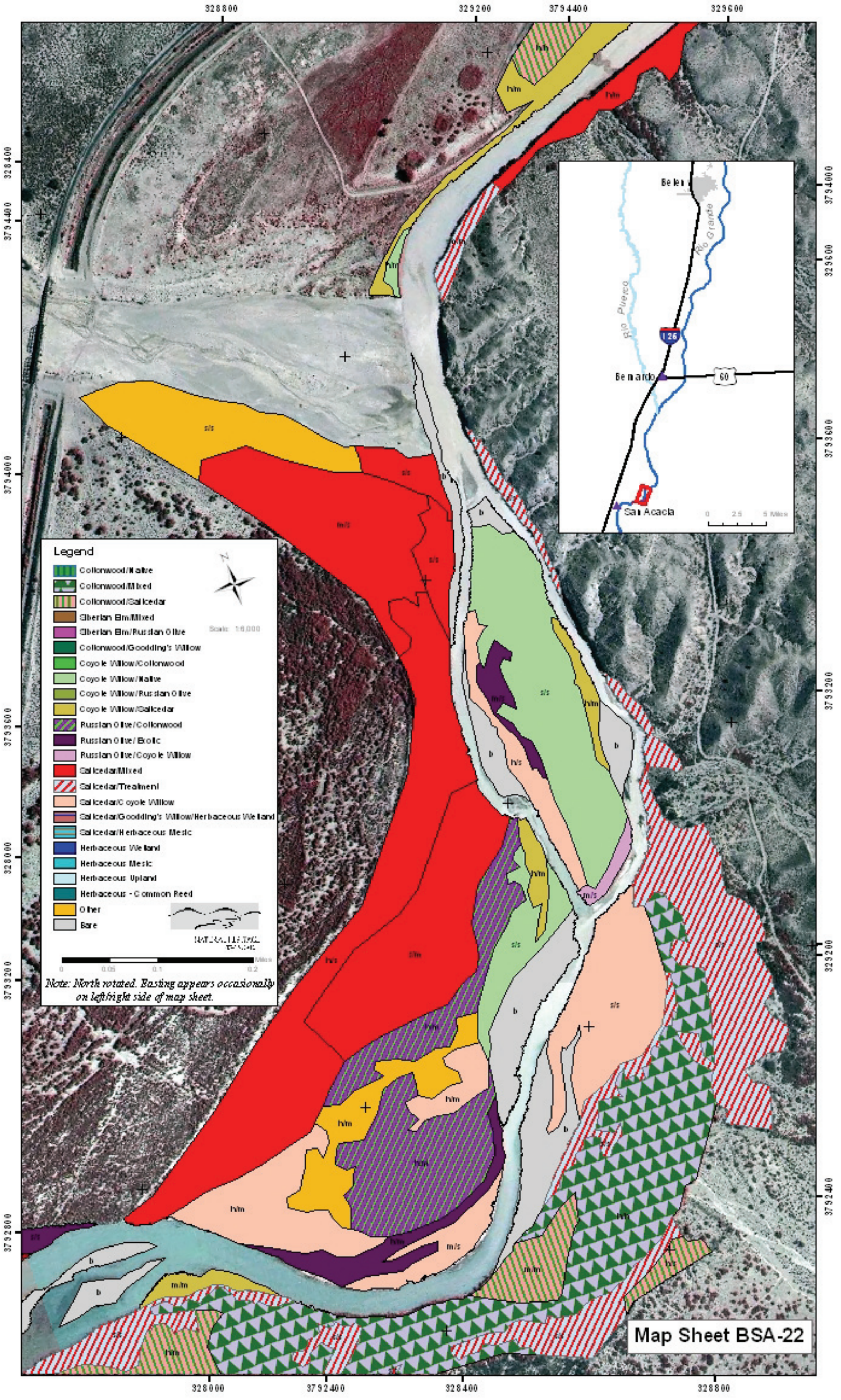
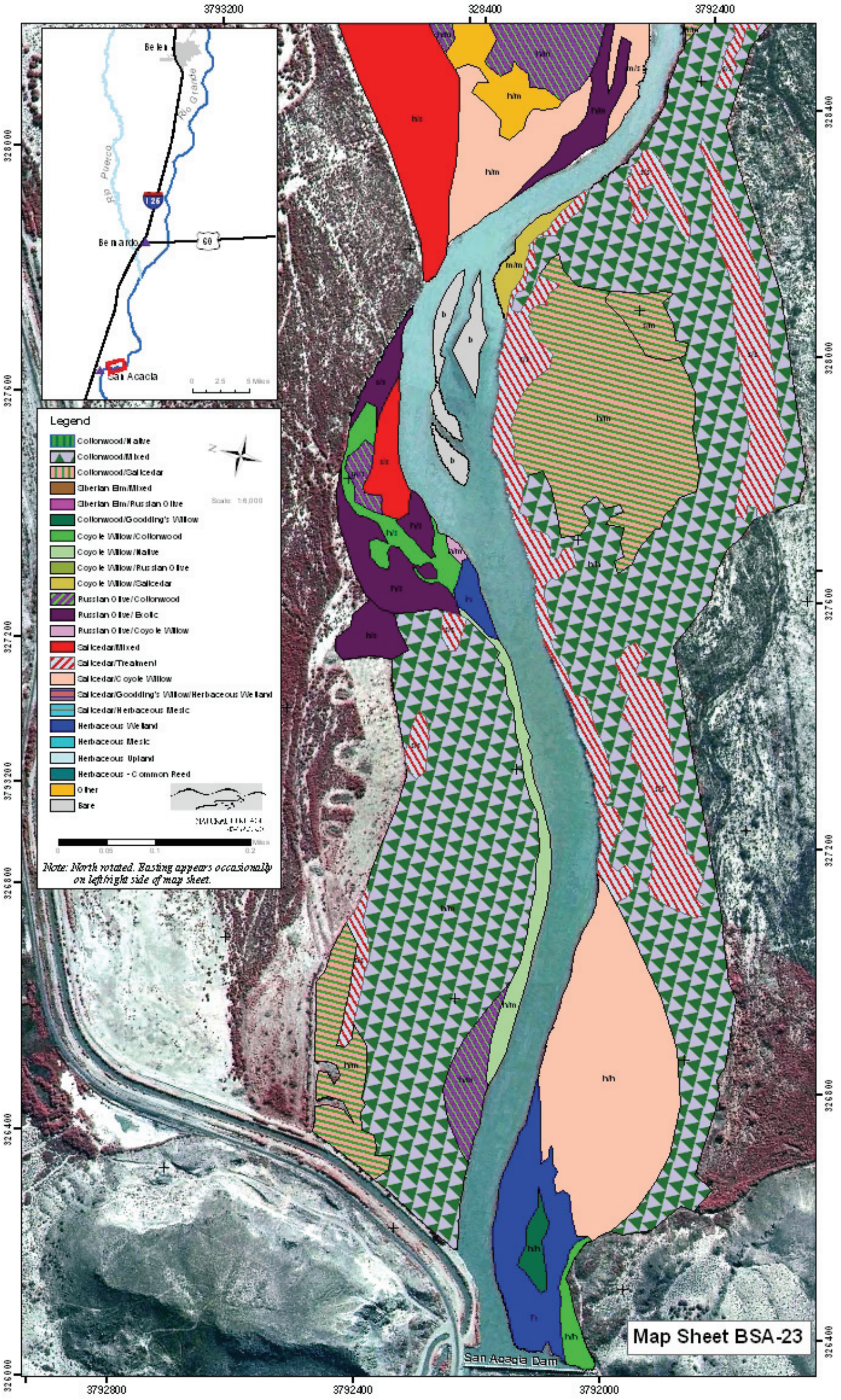
3800600
3800400
3800200
3800000
3799800
3799600
h/m
m/m
h/s
b
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
N
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
0 0.025 0.05 0.1 Miles
Map Sheet BSA-18


329200
329600
330000
330400
3799600
3799200
3798800
3798400
3798000
3797600
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
h/m
m/m
m
b
h
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Salicedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Salicedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Salicedar/Mixed
Salicedar/Treatment
Salicedar/Coyote Willow
Salicedar/Goodding's Willow/Herbaceous Wetland
Salicedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
N
Scale 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-19


329600
330000
330400
3797600
3797200
3796800
3796400
3796000
3795600
h/m
m/m
b
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
N
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Map Sheet BSA-20


330000
330400
3796000
330800
3795600
3796000
329600
329200
3795200
3794800
328800
Belen
Rio Grande
Rio Puerco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
h/m
b
m/m
Map Sheet BSA-21
3795600
3796000
3795200
3794800
3794400
3794000
330800
330400
330000
328800
329200
3794000
329600


328800
329200
3794400
329600
328400
3794400
3794000
3793600
3793200
328000
3792800
3792400
328400
328800
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Exotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
Scale: 1:6,000
Miles
0
0.05
0.1
0.2
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
Belen
Rio Grande
Rio Puerco
I-25
Bernardo
60
San Acacia
0
2.5
5 Miles
Map Sheet BSA-22


3793200
328400
3792400
328000
327600
327200
326800
326400
Belen
Rio Grande
RP Pueco
I 25
Bernardo
60
San Acacia
0 2.5 5 Miles
Legend
Cottonwood/Native
Cottonwood/Mixed
Cottonwood/Saltcedar
Siberian Elm/Mixed
Siberian Elm/Russian Olive
Cottonwood/Goodding's Willow
Coyote Willow/Cottonwood
Coyote Willow/Native
Coyote Willow/Russian Olive
Coyote Willow/Saltcedar
Russian Olive/Cottonwood
Russian Olive/Biotic
Russian Olive/Coyote Willow
Saltcedar/Mixed
Saltcedar/Treatment
Saltcedar/Coyote Willow
Saltcedar/Goodding's Willow/Herbaceous Wetland
Saltcedar/Herbaceous Mesic
Herbaceous Wetland
Herbaceous Mesic
Herbaceous Upland
Herbaceous - Common Reed
Other
Bare
0 0.05 0.1 0.2 Miles
Note: North rotated. Easting appears occasionally on left/right side of map sheet.
San Acacia Dam
Map Sheet BSA-23
3792800
3792400
3792000