Kootenai River Habitat Restoration Project Master Plan

Appendix C – Vegetation Assessment and Supporting Information

Kootenai Tribe of Idaho
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This appendix provides supporting information related to plant community distribution and ecological processes driving plant community succession and composition for Kootenai River restoration reaches. This appendix describes the results of field assessments and observations made for areas within the Meander Reaches and Braided Reaches. The purpose of this appendix is to provide supporting information related to further describe limiting factors associated with developing riparian and floodplain revegetation restoration strategies related to various habitat actions.

Vegetation Assessment Methods

In May and September 2008, plant communities and related ecological processes were generally observed for all reaches of the Kootenai River restoration project. Vegetation assessments were completed for selected locations within Kootenai River project reaches. Sites of interest were identified by evaluating existing data sets and studies (primarily cottonwood (*Populus* species) related studies completed or in progress by Egger et al. 2007 and Jamieson and Braatne 2001), and evaluating one-meter resolution aerial photos combined with GIS data on elevation, vegetation, and pedological data. Vegetation assessments included:

- Documentation of plant community composition and relative elevation along transects extending from water's edge through developing cottonwood communities into mature riparian forests;
- Direct observation of processes either creating conditions for plant establishment or limiting establishment of native riparian and wetland plant communities; and
- Direct observation of potential human-caused influences on plant species composition.

In September 2008, plant community and ecological process data were collected along transects for two sites within the Meander Reaches (Trout Creek, Shorty's Island), and one site in the Braided Reaches (Figure C-1). Plant community and habitat types referenced below are based on those described in Hansen et al. 1995. GPS and relative elevation data were collected at points corresponding to noticeable geomorphic transitions and changes in distinct vegetation communities. Relative elevation data were tied to LiDAR imagery of the project reach to produce accurate elevation data. Additional methods and data for each transect are summarized below.

Vegetation Assessment Results

This section describes the results of vegetation assessments and other observations of vegetation patterns and associated ecological processes within the project reaches. General observations were made within all project reaches. As described above, more detailed assessments were made in

selected areas within the Meander Reaches and Braided Reaches. These locations are shown on Figure C-1.

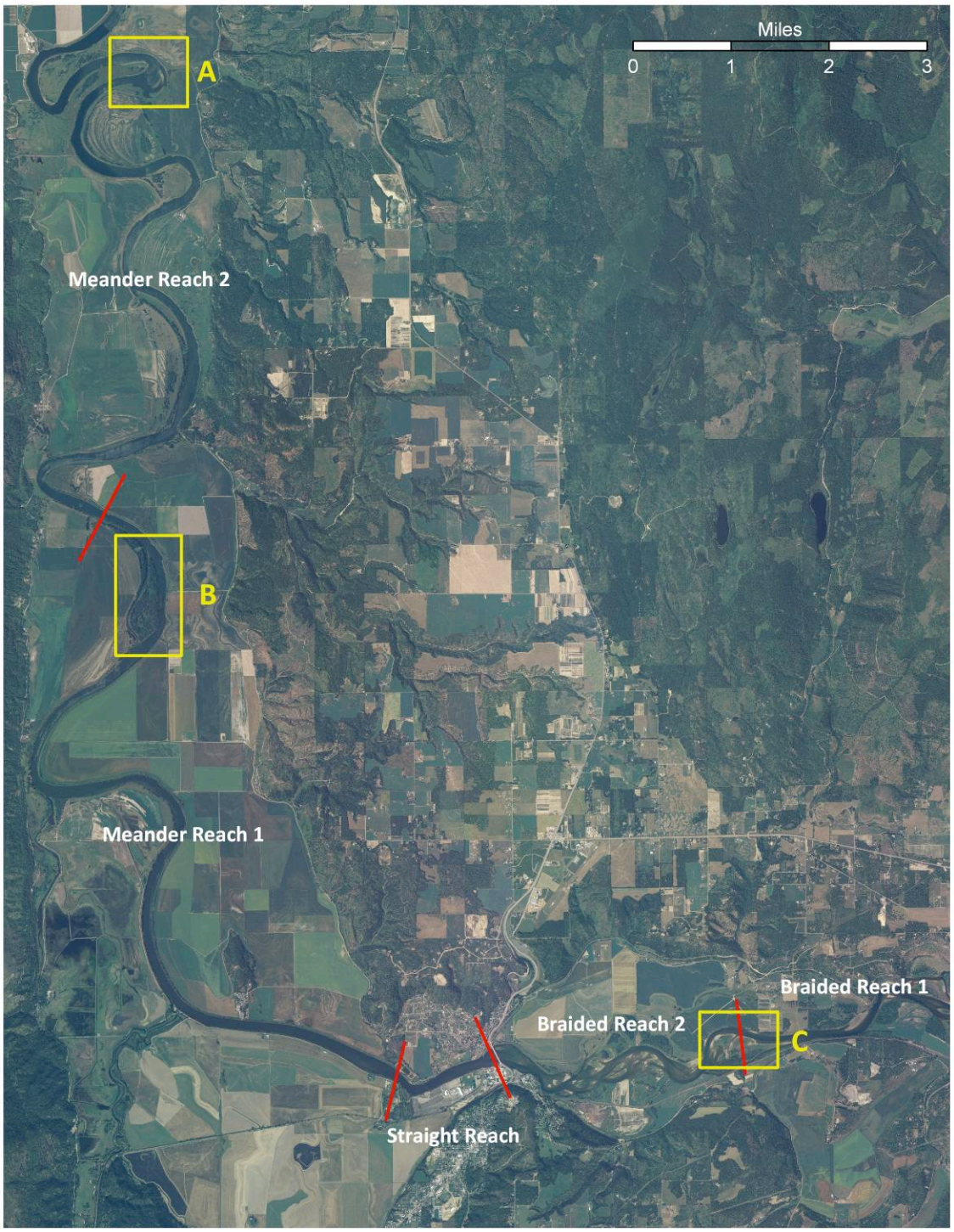

Figure C-1. Aerial photograph of the Kootenai River project area showing the location of vegetation assessment areas. Project reach breaks are shown as red lines. Areas where transect data were collected are shown as: A) Ball Creek; B) Shorty's Island; C) Braided.

Meander Reaches

Vegetation assessments were completed at two sites within the Meander Reaches. These reaches are characterized by high levees (approximately 12 to 15 feet above the 30,000 cfs stage) and agricultural floodplains. Riparian vegetation is generally restricted to constructed levees and consists primarily of linear bands of Great Plains cottonwood (*Populus deltoides*).

The Nature Conservancy Ball Creek Ranch Preserve (Ball Creek) and Adjacent Kootenai Tribe of Idaho Land

The location of this vegetation assessment area is shown in Figure C-1. This location was selected because various age classes of cottonwoods were seen to be occupying a sand bar during a boat tour of the Meander Reaches 1 and 2. This site is located on a narrow peninsula feature adjacent to the Nature Conservancy's Ball Creek Ranch Preserve (Tribal land on Trout Creek peninsula). In addition to general observations of existing plant communities and ecological processes influencing plant community development and distribution, vegetation data were collected along one transect at this site. The transect originates at the edge of water and follows a westerly course inland through a dense stand of Great Plains cottonwood and ends at what was assumed to be a constructed levee feature (Figure C-5). GPS data points were collected at obvious breaks along the transect corresponding to clear delineations in cottonwood age classes. The total transect length was 284.8 feet (86.8 meters) with a relief of 13.7 feet (4.2 meters). Results of transect data collection are illustrated in Figure C-6.

The primary observations related to natural recruitment of cottonwood seedlings and other ecological processes at this data collection site include:

- The type of bar feature where the cottonwood recruitment vegetation assessment data were collected is rare in the Meander Reaches. The feature is located at the downstream third of a very sharp meander bend and located directly across and slightly downstream from a steep, eroding streambank (Figure C-2). The bar feature reflects channel migration that has occurred here and is evident by comparing recent aerial photographs with aerial photographs from the 1930s.
- All cottonwoods observed at this site were Great Plains cottonwood. Black cottonwood (Populus trichocarpa), native to the region, are rare in the Meander Reaches; however, Great Plains cottonwood is rare in the Braided Reaches. One explanation to support this observed difference might be that that Great Plains cottonwood was planted extensively to stabilize constructed levees within the Meander Reaches. Over time, this species has become the predominant cottonwood seed source in the Meander Reaches.
- The boundaries between cottonwood age-groups and between current year seedling groups were linear (see photo call-outs in Figure C-6), suggesting seed deposition and cottonwood establishment correspond with a very specific river stage.
- Exposed sediments typically appeared unstable, with obvious erosion indicators present at various stages of flow recession.
- Current year cottonwood seedlings were present starting fourteen feet from the water's edge. Any seedlings closer to the water were typically uprooted during flow recession (Figure C-3).

- Cottonwoods were present 147 feet (45 meters) into the point bar, ranging in age from one year to approximately 3-5 yrs (10-12 feet tall) at the most inland extent.
- Older cottonwoods appeared to have been sheared off near their base prior to the 2008 growing season, making it difficult to determine the actual age of the tallest portion of the stand (Figure C-4). While some individuals appeared to be cut by beavers or other animals, the entire stand of cottonwoods had been sheared off, so it is possible that annual deep inundation, combined with sand mobilization, may be creating shear stress sufficient to break young stems.
- At 147.6 feet (45 meters) along the transect, vegetation transitions sharply from Great Plains cottonwood to a reed canarygrass (Phalaris arundinacea) habitat type.
- Further along the transect, vegetation transitions to primarily quackgrass (Agropyron repens) and other aggressive species, such as cheatgrass (Bromus tectorum), spotted knapweed (Centaurea maculosa) and crested wheatgrass (Agropyron cristatum) at the transect terminus. These species are also major components of higher elevation areas within the assessment area.
- Willows (Salix species) are present, but are only a minor component of the bar community. Sandbar willow (Salix exigua) is present in small areas on the upstream end of the bar within the Great Plains cottonwood community type. Golden willow (*Salix alba*) is also present, primarily within the reed canarygrass habitat type.

Figure C-2. Eroding streambank across the channel from Trout Creek peninsula vegetation assessment site.

Figure C-3. Current year cottonwood seedlings uprooted during flow recession at the Ball Creek assessment site.

Figure C-4. Shearing of establishing Great Plains cottonwood at Ball Creek vegetation assessment site.

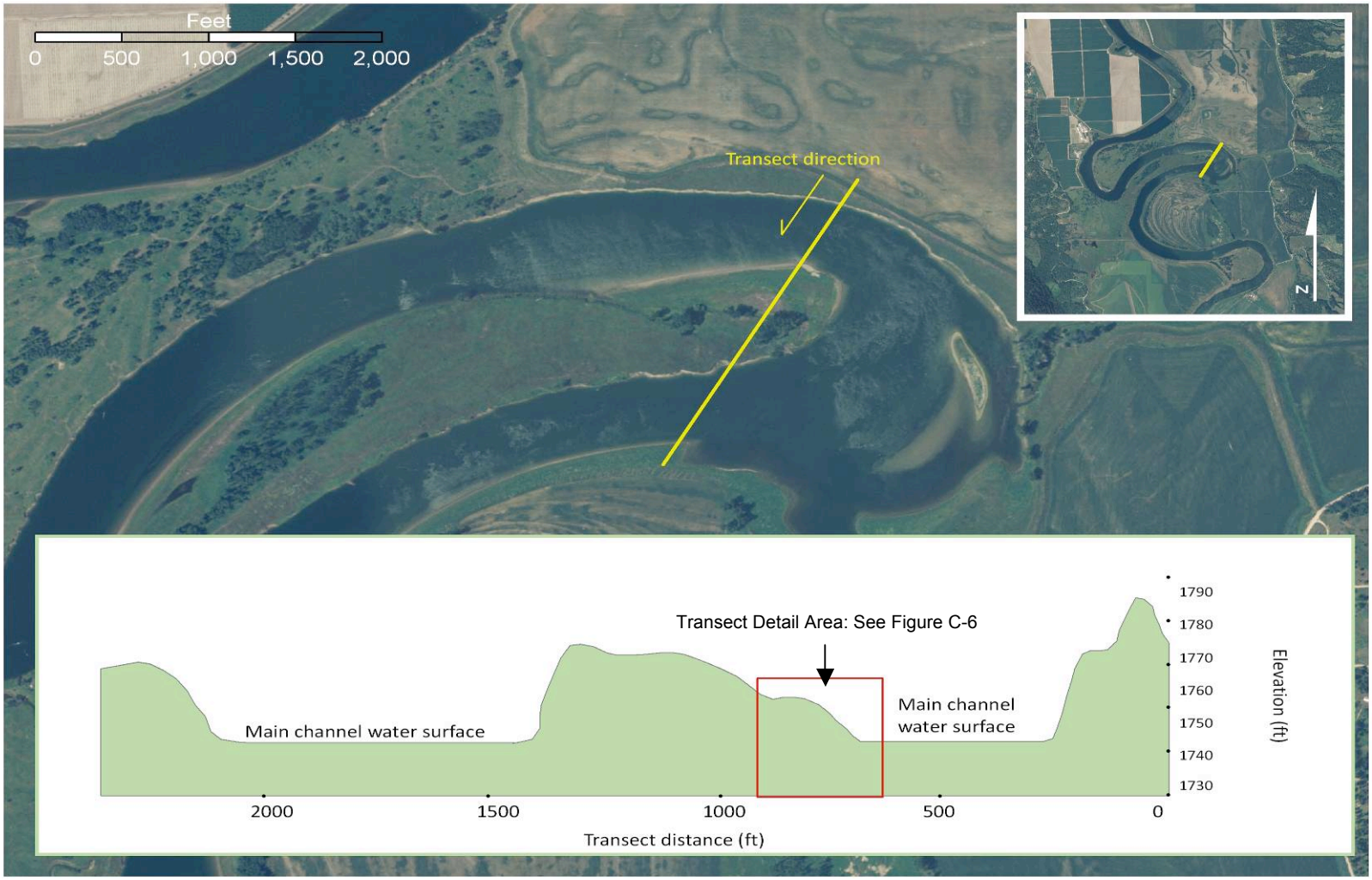

Figure C-5. Overview of Trout Creek peninsula vegetation assessment area, transect location, and transect elevations (inset transect cross section).

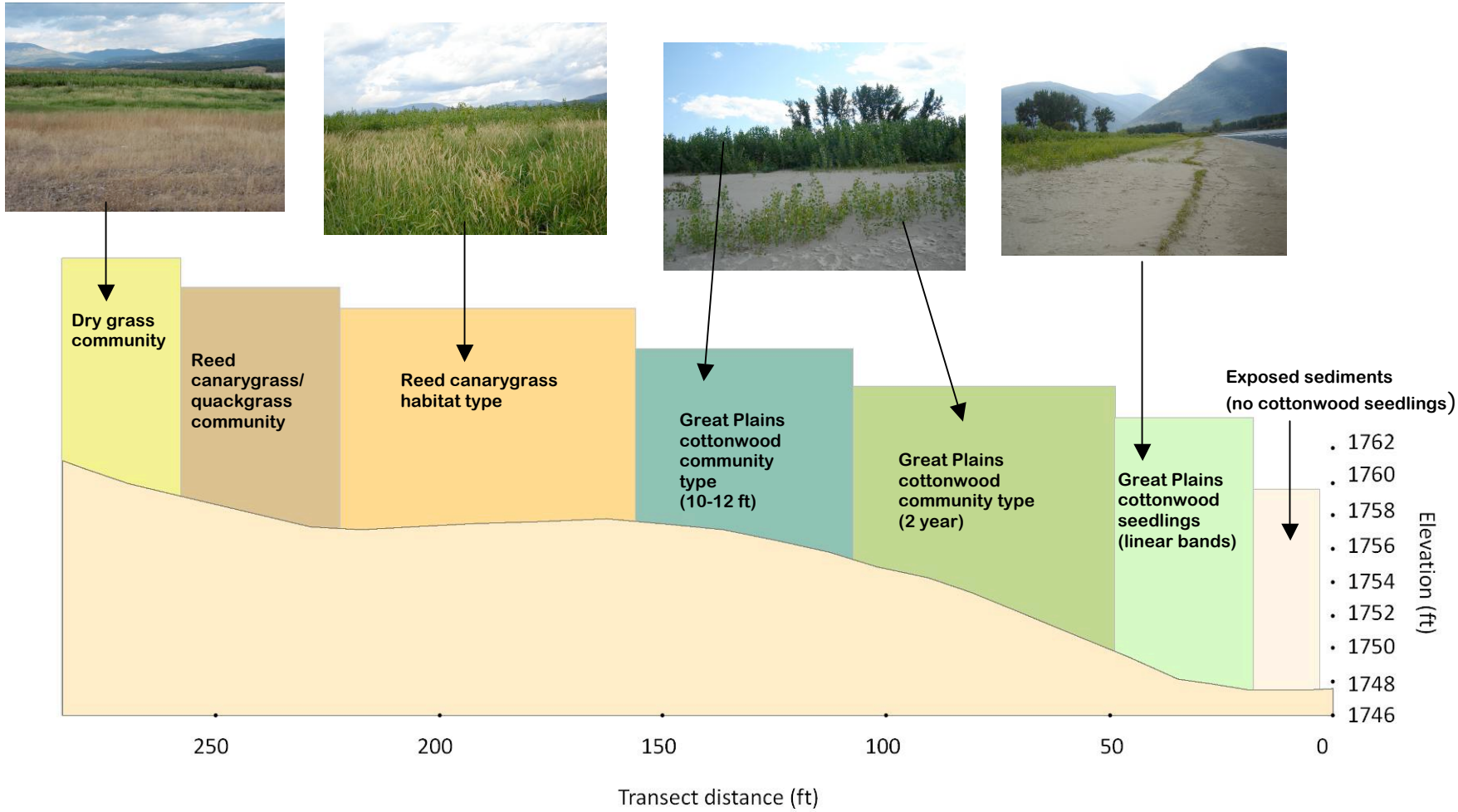

Figure C-6. Results of vegetation assessment along the Trout Creek peninsula transect.

Shorty's Island

This location was selected based on the presence of a mature cottonwood vegetation community, which is generally lacking in the Meander Reaches except in very narrow bands directly along the channel (Figure C-7). The Kootenai River in the vicinity of Shorty's Island is also considered critical habitat for KRWS. Shorty's Island is also a reference area used for the Operational Loss Assessment of the Lower Kootenai River floodplain (Egger et al 2007) and (Jamieson and Braatne 2001). Shorty's Island is defined by the mainstem Kootenai River on the east side and a smaller (approximately 196 feet or 60 meters) secondary channel on the west (Figure C-8 and Figure C-10). The island lies in the upstream portion of the Meander Reaches, just north of the Meander Reach 1 and Meander Reach 2 boundary.

Two vegetation transects were evaluated at this site. The first transect, Transect A, spanned a 492 foot (150 meter) cross section of the island (Figure C-8 and Figure C-9). The second transect, Transect B (Figure C-10 and Figure C-11), was completed to document cottonwood recruitment near the narrow downstream end of the island. This transect spanned a stretch from the eastern edge of water and extended 65.6 feet (20 meters) inland.

The primary observations related to natural recruitment of cottonwood seedlings and other ecological processes occurring at this site include:

- Cottonwood seedlings were observed at Transect B location, but not at Transect A. This is likely to due to the steep bank characterizing the eastern edge of Transect A. Although some exposed sediments and deposition were present at Transect A, it is likely that water drawdown occurs too rapidly on these steep banks for cottonwood seedlings to establish.
- Cottonwood seedlings observed at Transect B consisted primarily of Great Plains cottonwood, but black cottonwood seedlings were present in small numbers (approximately 1 black cottonwood seedling for every 100 Great Plains cottonwood seedlings).
- Cottonwood seedling densities at Transect B were present in distinct bands with the lowest densities occurring approximately 15 feet from the water's edge and highest densities occurring approximately 30 feet from the water's edge (Figure C-11).
- Data collected at Transect B indicates that reed canarygrass, a species that aggressively colonizes exposed fine sediments, may occupy similar areas as young age class cottonwoods. A sharp transition to a reed canarygrass habitat type occurred at both transect locations. Other species present in the community included common tansy (Tanacetum vulgare) and field mint (Mentha arvense).
- Along Transect B, and typical of most of the island, are steep banks (6-10 feet or 2-3 meters in height). These banks act as the primary geomorphic boundary between cottonwood seedlings near the water's edge, herbaceous plant communities on slopes and benches (primarily reed canarygrass habitat type) and the denser, mature vegetation that covers the interior of the island.
- The middle 300 feet (100 meters) of Transect A is characterized by a dense overstory of mature cottonwood. The mature cottonwoods at this site are primarily black cottonwood, which is unique within the Meander Reaches. One explanation might be that this surface is within the constructed levee system and represents the pre-dam floodplain surface.
- The shrub component of this mature cottonwood stand is limited, but consists of red-osier dogwood (Cornus stolonifera), western snowberry (Symphoricarpos occidentalis),

hawthorne (Crataegus douglasii), chokecherry (Prunus virginiana), and thimbleberry (Rubus parviflora).

- The minor shrub component and herbaceous components of this mature cottonwood stand indicates a moderate level of disturbance. Cattle signs were abundant, and it appears that cattle access the island by crossing the western side channel. Herbaceous understory species consist of: reed canarygrass, quackgrass, Oregon grape (Mahonia repens), bedstraw (Galium species), houndstongue (Cynoglossum officinale), Canada thistle (Cirsium arvense), yellow toadflax (Linaria vulgare), Canada goldenrod (Solidago canadensis), redtop (Agrostis stolonifera), field horsetail (Equisetum arvense), common mullein (Verbascum thapsus), bull thistle (Cirsium vulgare), and common tansy.
- Based on the data collected at Transect A, a black cottonwood/red-osier dogwood community type is one likely potential natural community for the Meander Reaches.

Figure C-7. Typical distribution of cottonwoods within the Meander Reaches. In general, cottonwood stands are composed of Great Plains cottonwood and only occur in very narrow bands on constructed levees.

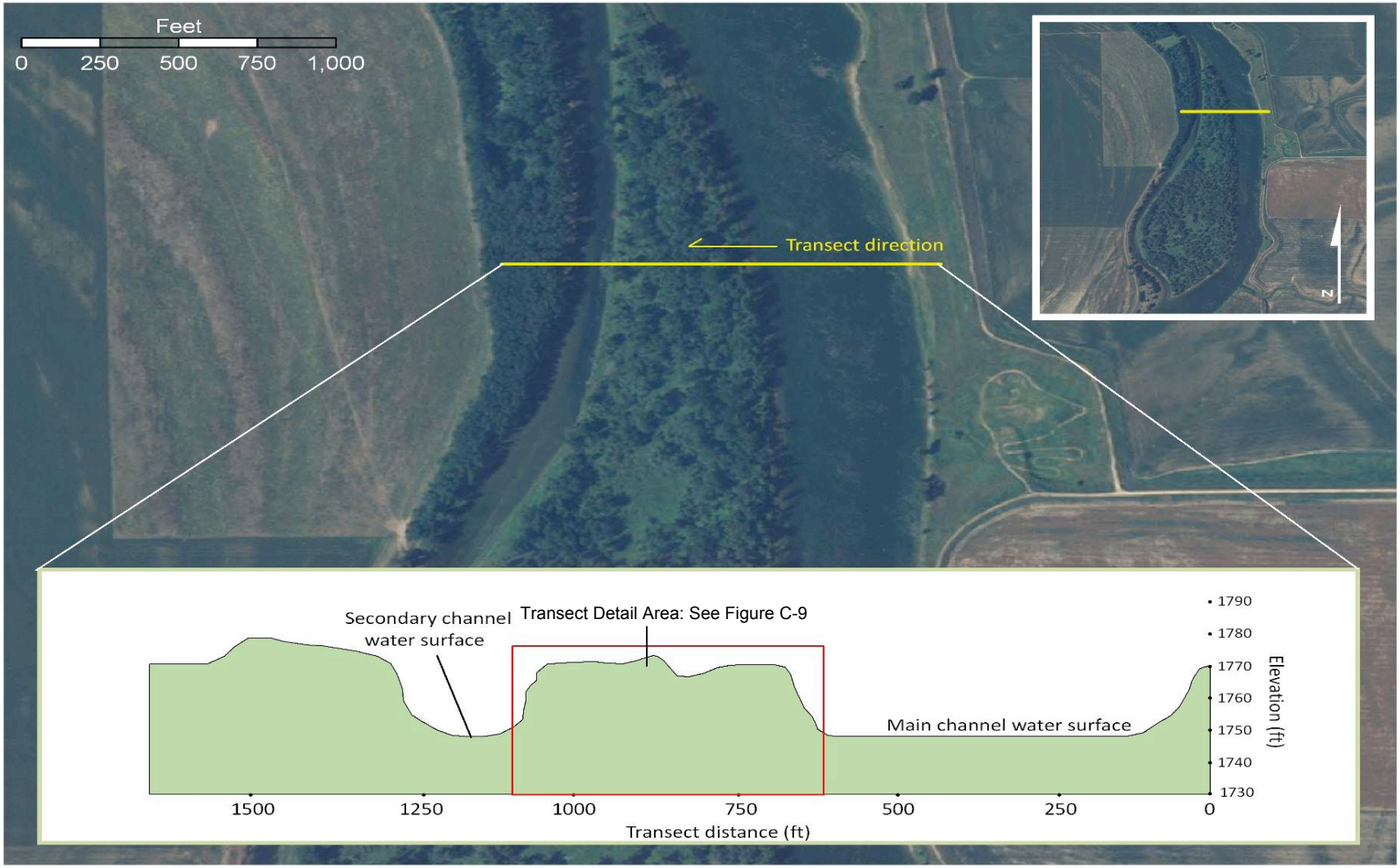

Figure C-8. Overview of Shorty's Island Transect A and elevation plan view.

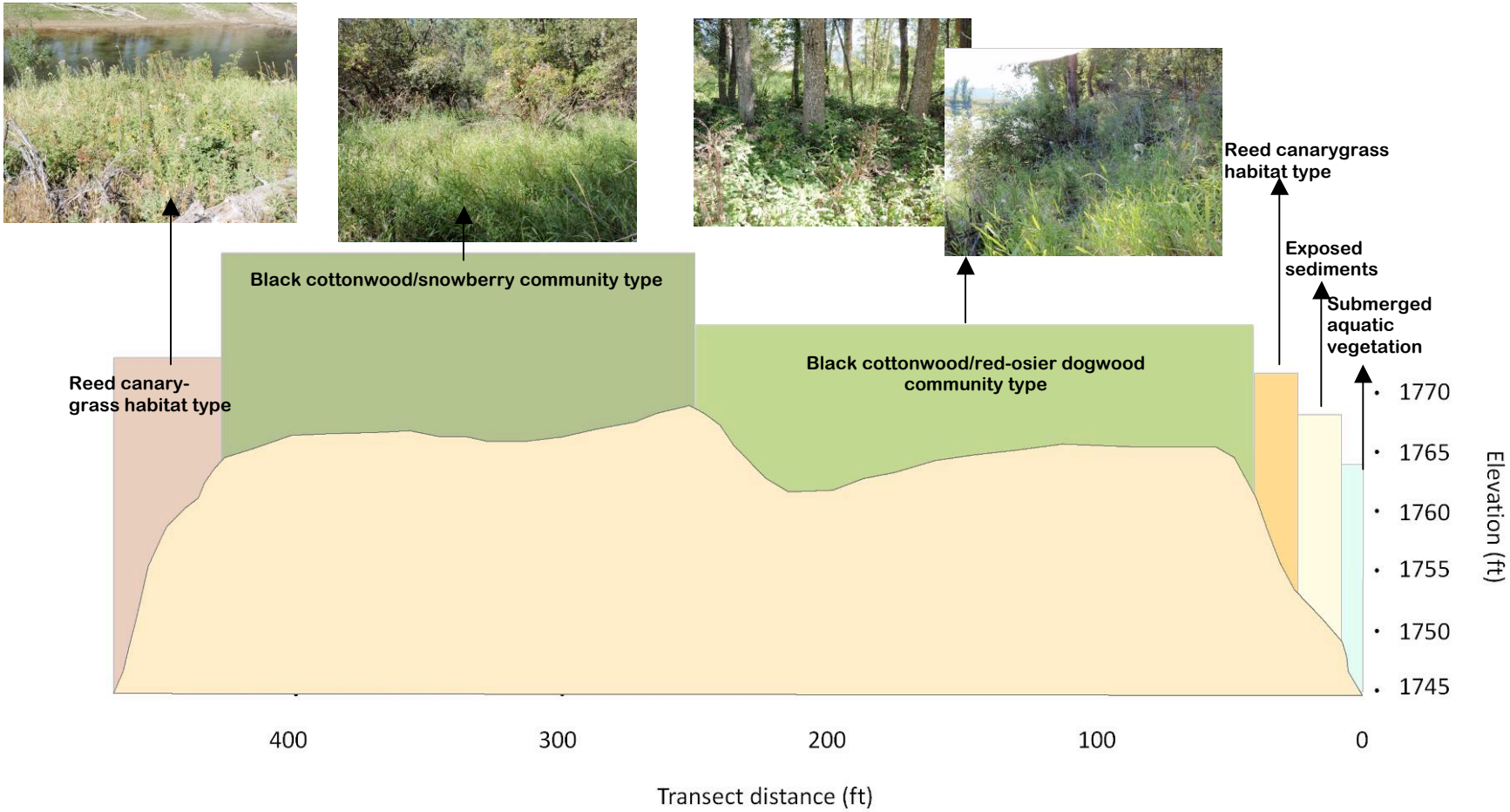

Figure C-9. Results of vegetation assessment along the Shorty's Island Transect A.

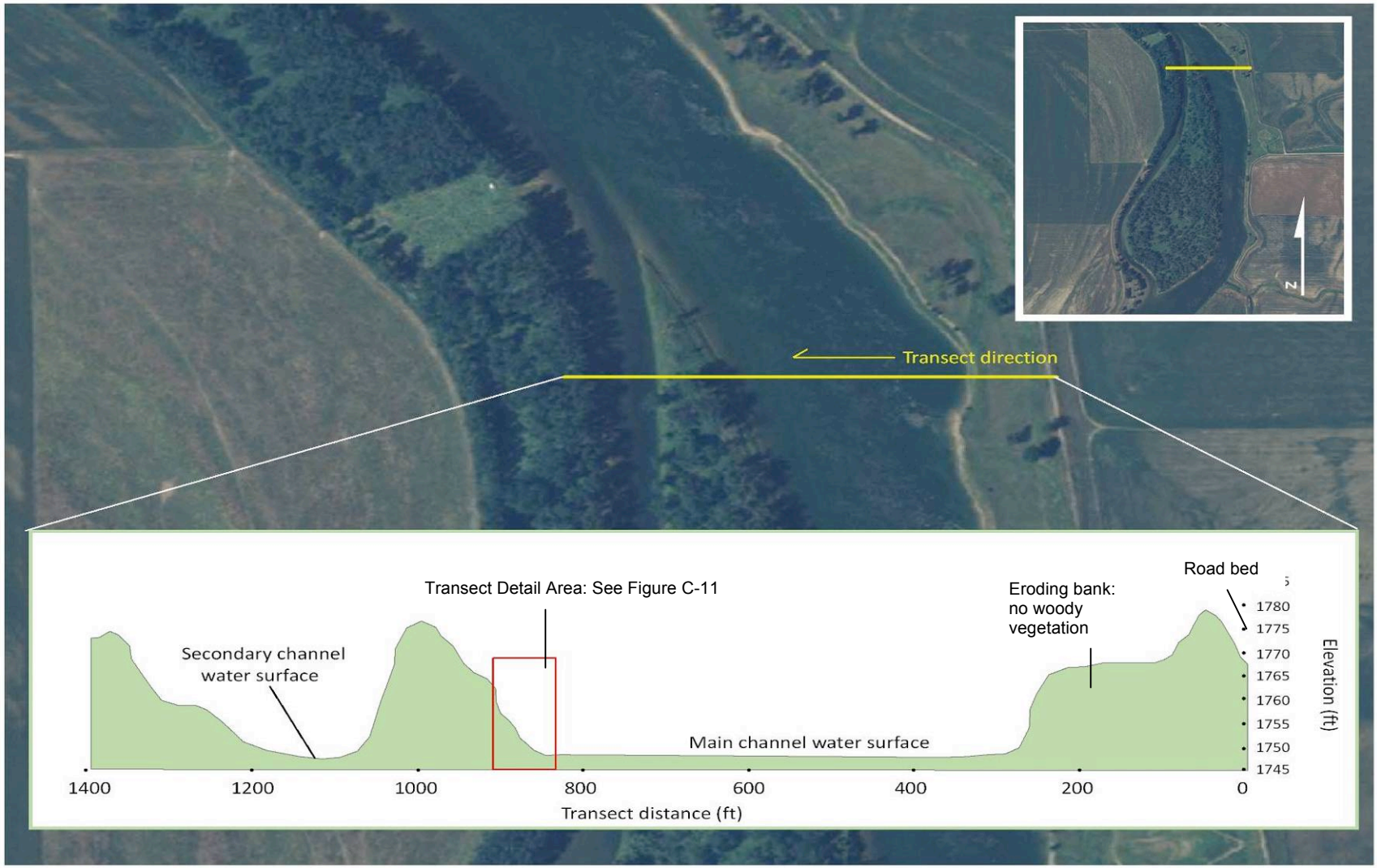

Figure C-10. Overview of Shorty's Island Transect B and elevation plan view.

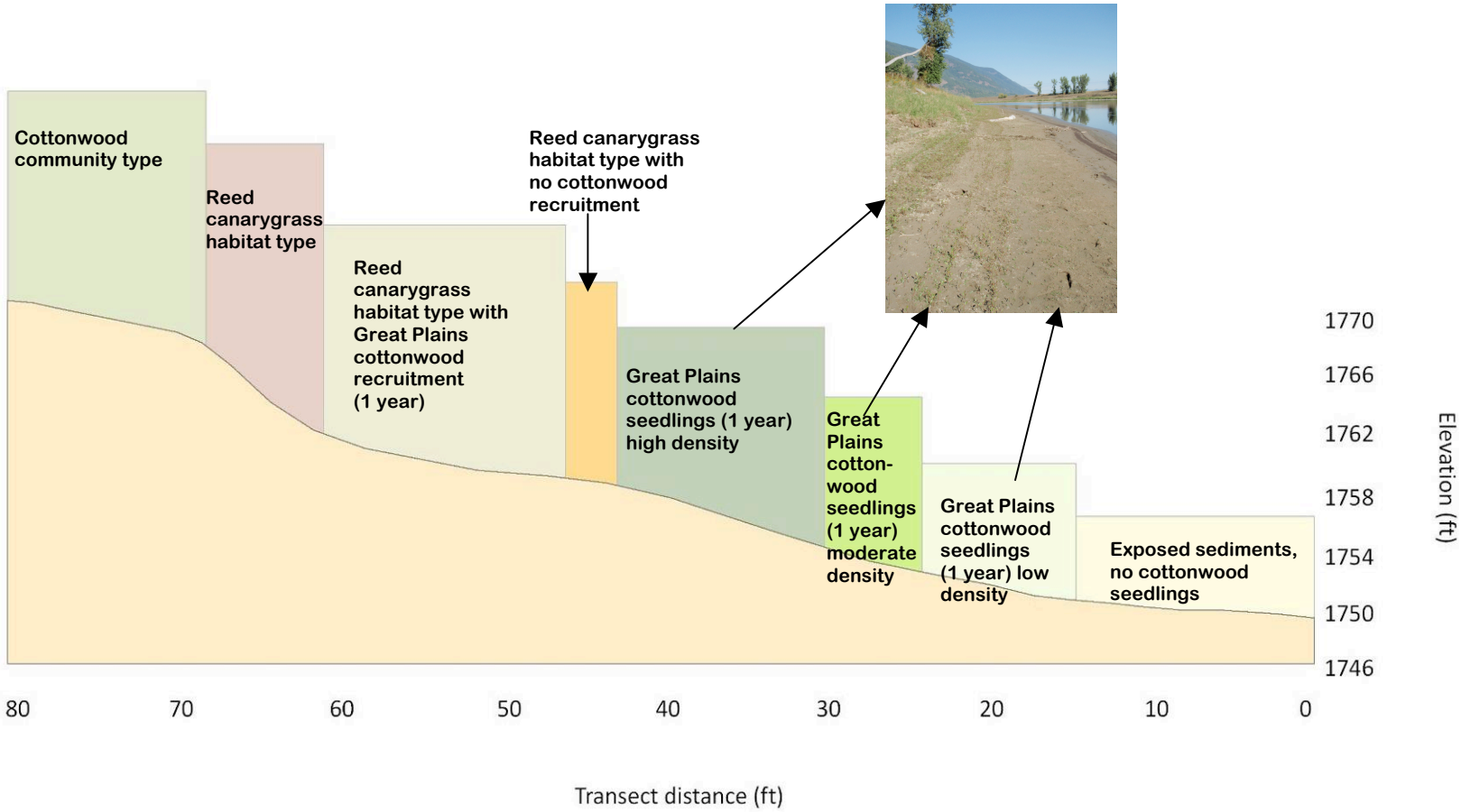

Figure C-11. Results of vegetation assessment along the Shorty's Island Transect B.

Figure C-12. Dense riparian vegetation growing on a levee in the upper portion of Meander Reach 1.

Figure C-12 shows a densely vegetated levee near the upstream end of Meander Reach 1. Levees in the Meander Reaches support a wide range of vegetation, ranging from sparse vegetation dominated by agricultural grasses or reed canarygrass to densely vegetated areas consisting of cottonwoods and diverse communities of shrubs and herbaceous species. The levee location shown in Figure C-12 supports black cottonwood, Great Plains cottonwood, sandbar willow, red-osier dogwood, Wood's rose (*Rosa woodsii*), elderberry (*Sambucus cerulean*), hawthorne, chokecherry and western snowberry. Herbaceous species at this site consist of asters (*Aster* species), field horsetail, reed canarygrass, common tansy, climbing nightshade (*Solanum dulcamara*), common mullein, quackgrass, smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), houndstongue, western salsify (*Tragapogon dubius*) and Spalding's silene (*Silene spaldingii*).

Based on observations made at vegetation assessment and other sites within the Meander Reaches, major limiting factors related to developing restoration strategies for revegetation in the Meander Reaches include:

1. Cottonwood recruitment is limited to point bar features developing within the existing levee system. These features are uncommon in the reaches. While cottonwood recruitment does occur on other exposed sediments, survival between years is not occurring. This is likely due to scour of exposed sediments from year to year. Therefore, creation of low gradient, point bar features connected to the main channel either directly or behind the existing levee system will be necessary to stimulate natural recruitment of cottonwoods and plant community succession.
2. Cottonwood establishment is not occurring on all point bar features that appear to be at appropriate elevations. Land management, particularly cattle grazing, may be limiting cottonwood establishment on some suitable surfaces. These surfaces are typically dominated by reed canarygrass plant communities. Reed canarygrass, once established, can be very aggressive and prevent establishment of other desired vegetation.
3. Diverse woody plant communities are limited within the reaches. Mature cottonwood stands lack a shrub understory. Plant community succession appears to be hindered by a number of factors including lack of seed sources and land management including grazing and extensive agricultural operations.
4. Although natural recruitment of cottonwood is occurring on other point bar features, Floodplain plant communities lack diversity and provide minimal habitat and floodplain function.

5. Invasive species are common in riparian and floodplain areas. Competition and reduced species diversity due to the introduction and spread of non-native and invasive species will limit restoration of diverse plant communities.

Braided Reaches

A vegetation assessment was completed at one site within the Braided Reaches. The reaches have dikes, but the river is able to migrate between them; therefore, the reaches are characterized by extensive areas of recent alluvial deposition. The Braided Reaches generally supports a more diverse assemblage of riparian plant communities due to a larger overall floodplain area that is still subject to annual river influences.

The location of the Braided Reach vegetation assessment area is shown in Figure C-1. The assessment area consists of a large island just upstream from Bonners Ferry, ID. This location was selected based on observing extensive areas of alluvial deposition and a wide range of tree and shrub plant communities, assumed to represent various age classes of cottonwoods. In addition to general observations of existing plant communities and ecological processes influencing plant community development and distribution, vegetation data were collected along one transect at this site. Figure C-14 and Figure C-15 show the location of this transect. The transect originated on the northern bank of the island feature. The island is separated from the southern mainland by a secondary channel approximately 40 meters wide. A large stand of cottonwoods occupies the low-lying northern portion of the island, bounded on the west by a dry secondary channel 196 feet (60 meters) – 295 feet (90 meters) across. The absence of vegetation and stranded fish indicated that this channel is activated annually. GPS data were collected at points in this dry channel, as well as along distinct age class boundaries within the cottonwood stand.

The primary observations related to natural recruitment of cottonwood seedlings and other ecological processes at this assessment site include:

- Within the 984.2 feet (300 meter) transect, a gradual transition from seedlings to mature cottonwoods (20 years) was evident in the first 196 feet (60 meters). Mature trees with moderate overstory and sparse understory persisted throughout the remainder of the transect.
- Diverse cottonwood age classes, extensive large wood deposition and bare alluvial surfaces at 361 feet (110 meters) indicated a recent flood event had occurred and deposited new materials in a portion of the floodplain.
- Both willow and cottonwood recruitment is occurring in the Braided Reach vegetation assessment area.
- Although Great Plains cottonwood is present, existing cottonwood stands and cottonwoods seedlings are predominantly black cottonwood.
- The pre-dam floodplain surface located south of the transect end point consists of a dense overstory of black cottonwood and includes a dense understory of diverse shrubs and herbaceous species. The area is grazed by cattle, but still maintains a diverse understory of shrubs. Numerous invasive weed species are also present in this plant community. This may indicate that one potential natural community for the Braided Reaches is the black cottonwood/red-osier dogwood community type.

- Similar surfaces in other areas further upstream in the Braided Reaches support western red cedar (Thuja plicata) and large stumps, assumed to be western red cedar and/or western white pine (Pinus monticola) are also present (Figure C-13).

Figure C-13. Pre-dam floodplain surface in the Braided Reach vegetation assessment area with western red cedar and western white pine.

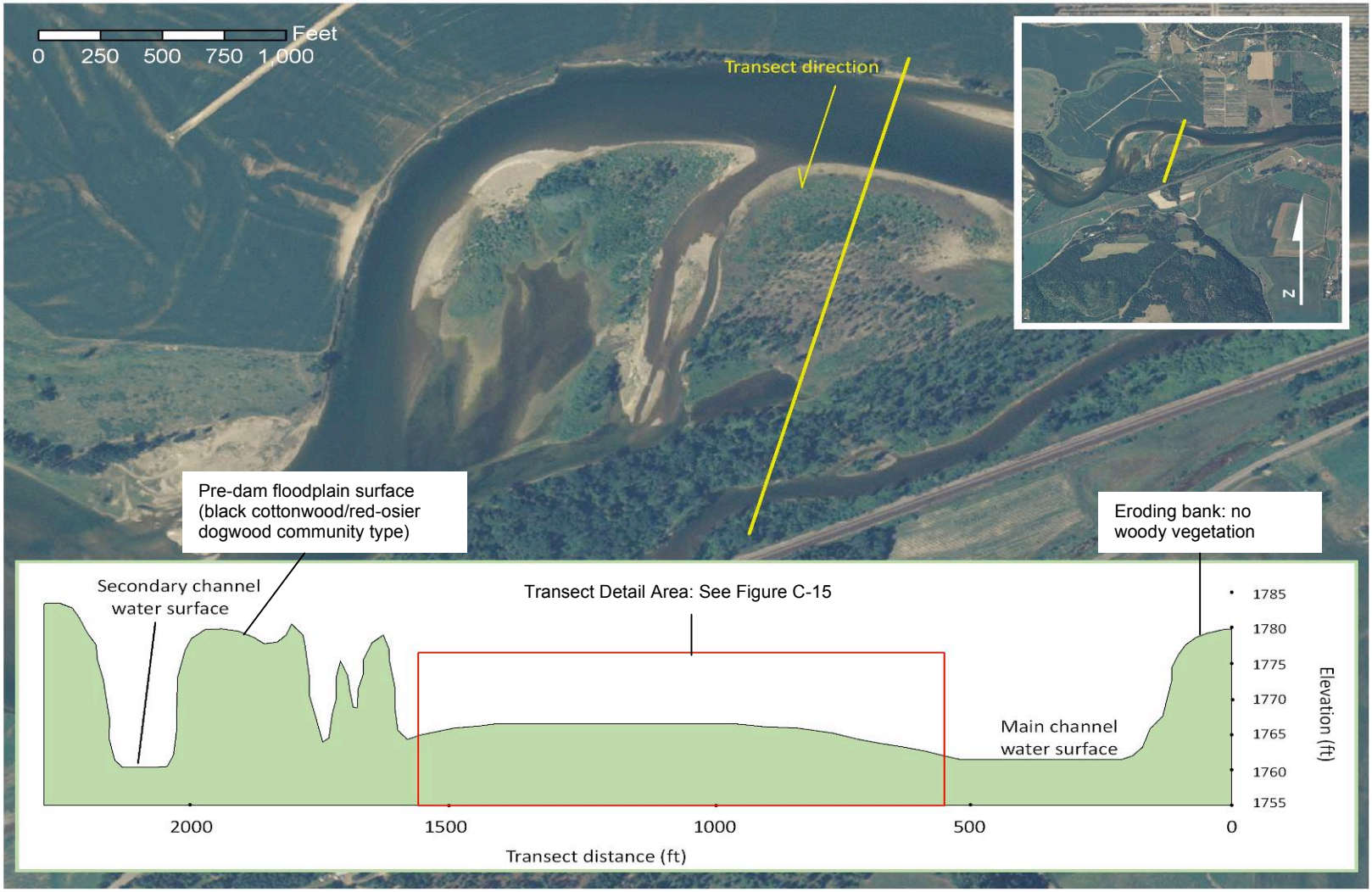

Figure C-14. Overview of the transect in the Braided Reaches and elevation plan view.

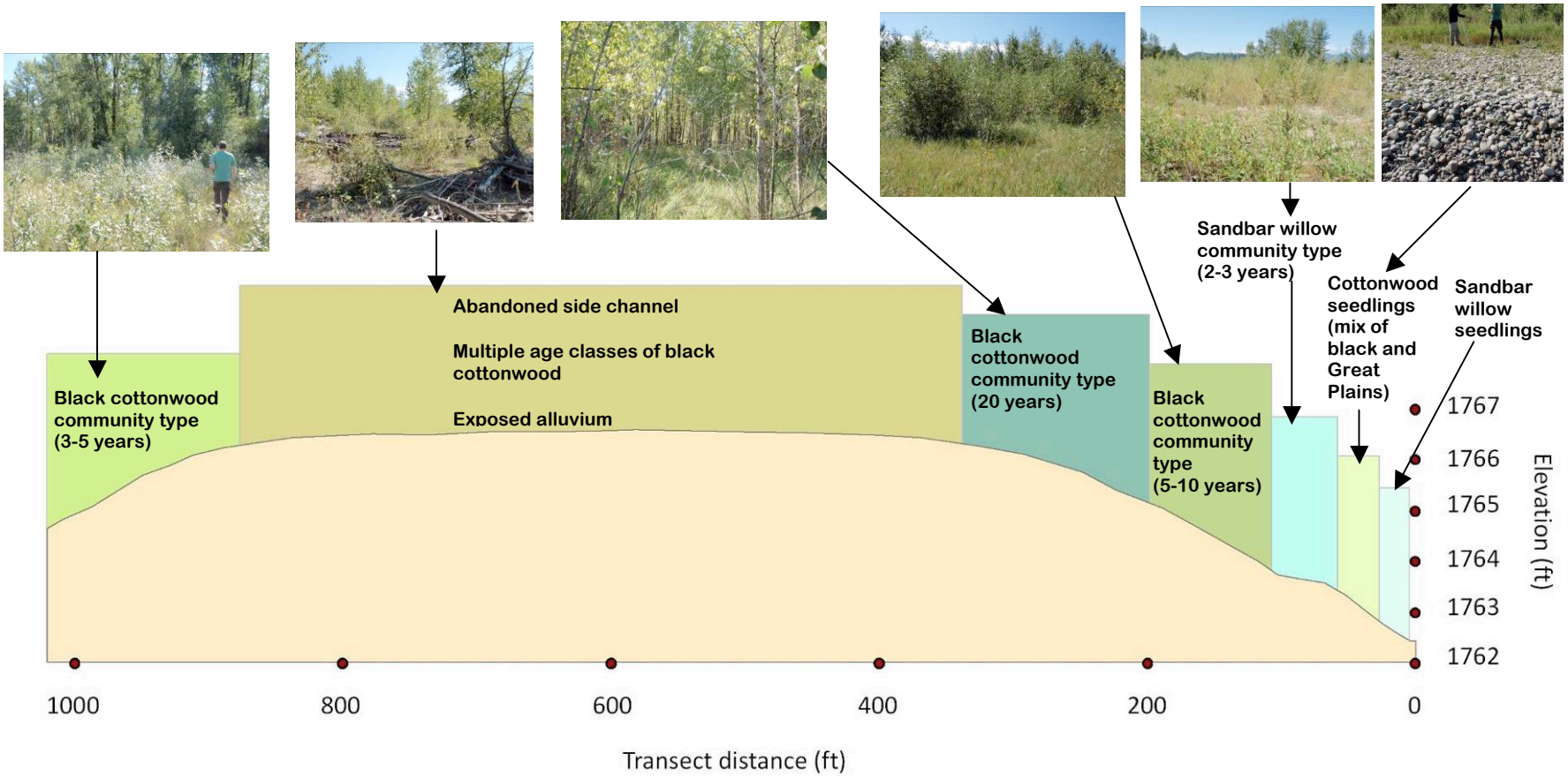

Figure C-15. Results of vegetation assessment along the transect in the Braided Reaches.

Based on observations made at the vegetation assessment area and other sites within the Braided Reaches, some limiting factors related to developing restoration strategies for revegetation in the Braided Reaches include:

- Although large areas of recent alluvial deposition characterize many areas of the reaches, these areas are re-distributed very frequently. This result is poor survival of naturally recruited cottonwoods and willows.
- Areas lacking woody vegetation are actively eroding.
- The assessment area is frequently accessed by Kootenai River flows, indicating that floodplain connectivity is not a limiting factor in the reaches. However, the plant community succession processes associated with floodplain connection seem to be limited to those areas where extensive areas of alluvial deposition have remained stable for long enough that plant community succession can occur. Other areas of the reaches are wide and shallow with no plant community succession occurring on deposited sediments. This could be a major limiting factor to riparian and floodplain revegetation restoration strategies in these reaches. This may indicate that construction of stable channel cross section may be necessary in areas to stimulate plant community succession and long-term channel stability and associated habitat features.