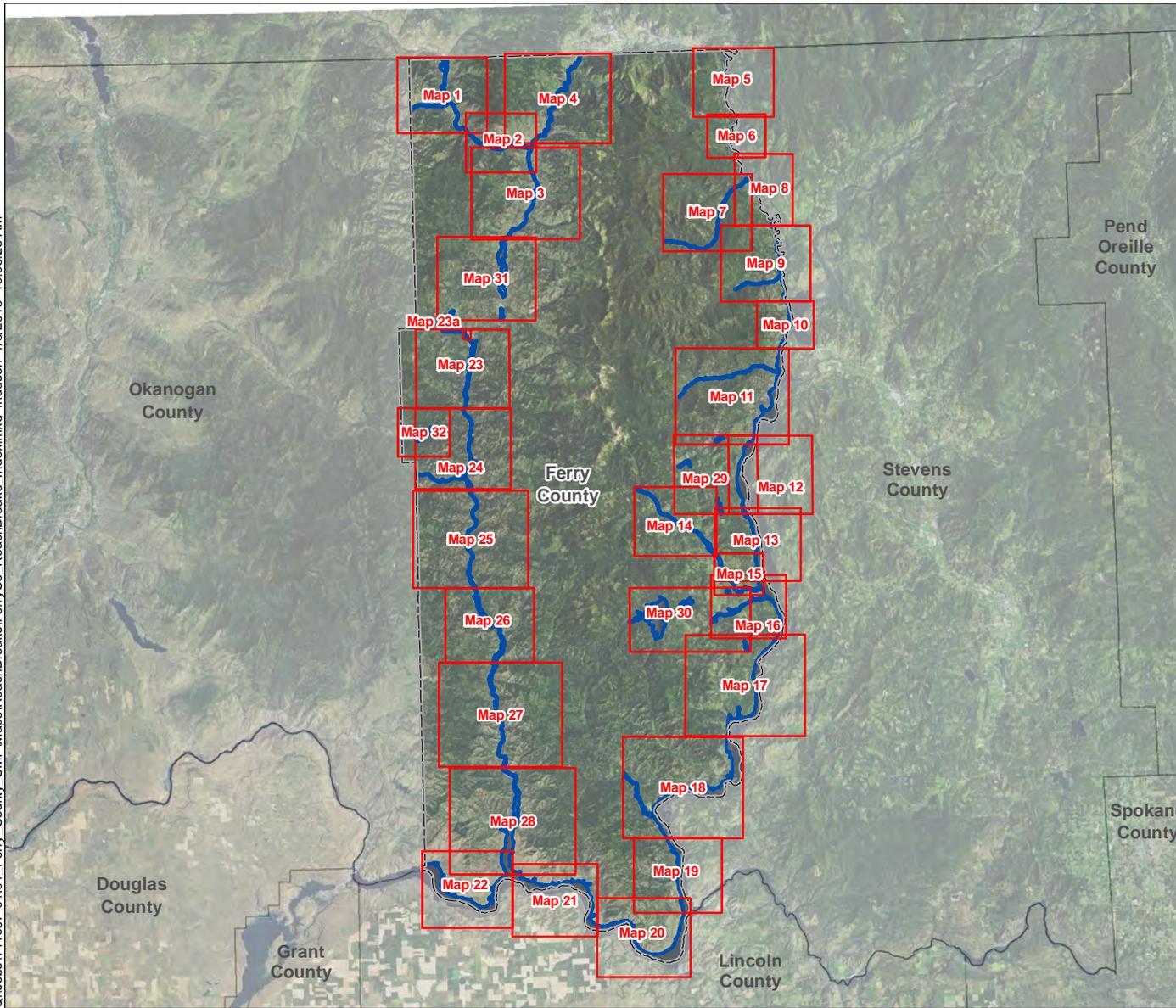


APPENDIX A
KETTLE RIVER REACH
CHARACTERIZATION TABLES AND
REACH MAPS

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LEGEND

- Ferry County Boundary
- Other County Boundaries
- SMA Jurisdiction
- Map Index

NOTES:

1. This information is to be used for planning purposes only. Data are displayed as is and without any guarantee of accuracy or completeness.
2. Aerial image courtesy of USDA NAIP (2013).
3. Ferry County's shoreline jurisdiction for Columbia River ends in the middle of the river.



Kettle River – Reach 1	Ferry County
Reach Description	
Kettle River from Canada-United States boundary to T39N R32E S2 near the mouth of Tonata Creek	
Shoreline Jurisdiction	
759 acres	
	
Source: U.S. Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP) 2013	
Subreaches (SRs); see Map 1:	
Not applicable	
Characteristics	
Ownership	
Reach 1 is mostly private with a very small amount (less than 5%) of public ownership.	
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural 	
Current Shoreline Management Program Environment Designation:	
<ul style="list-style-type: none"> • Rural and Natural 	
Existing Land Cover/Development	
Existing land cover includes forest, shrubland, and agricultural lands, and riparian vegetation. Development includes a small number of residential structures.	

Kettle River – Reach 1	Ferry County
Geomorphic Character	
<p>Description – Throughout Reach 1, the Kettle River flows within a wide, low-gradient valley with a valley bottom that consists mostly of alluvium and some local areas of continental glacial drift. Bedrock outcrops of the Sanpoil Volcanics and Klondike Mountain Formations define the valley margins. In the lower portion of the reach, the river is sinuous and consists of large river meanders. The valley width narrows upstream with valley boundary and hill slopes consisting of bedrock.</p> <p>Hardened Banks – Approximately 600 feet of artificial hardened banks exist along the shoreline and are associated with the Toroda Bridge Customs Road.</p> <p>Channel Migration Zone – The channel migration zone (CMZ) throughout the lower segments of this reach is wide. Kroupa Road, Customs Road, and Kettle River Road limit channel migration potential. In addition, the CMZ narrows upstream as the valley becomes more confined within bedrock valley boundaries.</p>	
Flooding and Geological Hazard	
<p>Flooding – Floodplains are mapped throughout the reach, and a floodway is designated near the upper end of the reach. The floodplain area is relatively wide, especially in the upper end of the reach where the river is much more sinuous compared to other portions of this reach.</p> <p>Geological Hazards – Reach 1 has soils susceptible to moderate to severe erosion. Reach 1 contains slopes that are greater than 15% and underlain by glaciolacustrine and alluvial deposits, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Reach 1.</p>	
Existing Public Access	
<p>Reach 1 is mostly privately owned and has few public access sites. Beal Park is a county park and provides picnic, fishing, water use opportunities, and an outhouse. The Kettle River is flowing mostly north to south in Reach 1. Customs Road runs along the eastern shoreline, and Kroupa Road runs down the western shoreline. Kroupa Road turns into Kettle River Road where Toroda Creek flows into the Kettle River. County Road 530 bridge crossing provides fishing access.</p>	
Identified Public Access Improvements	
<p>There are no identified public access improvements for this reach.</p>	
Public Access Opportunities	
<p>The amount of private land ownership in the reach limits the public access opportunities.</p>	
Ecological Conditions	
Water Quantity and Sediment	
<p>Reach 1 has many tributary inflows, including Catherine, Tenas Mary, Toroda, and Tonata creeks. In addition, numerous unnamed tributaries flow into this reach. Flow data are collected in the Kettle River at the upstream extent of this reach near the Canada-United States border (U.S. Geological Survey [USGS] Gage #12401500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and the winter. Runoff from local roadways and adjacent agricultural lands may contribute flow into the river</p>	

Kettle River – Reach 1	Ferry County
<p>during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible alluvial banks, soils prone to erosion, slopes prone to landslides, and surface runoff and drainages. Due to the river’s low gradient and hydrology, conditions for sediment deposition exist throughout the reach.</p>	
<p>Water Quality</p> <p>Reach 1 is not listed on Washington State Department of Ecology’s (Ecology’s) 303b list. Water quality may be impacted by wildlife and upstream agricultural, forestry, and mineral exploration activities.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Reach 1 of the Kettle River flows through a fairly wide valley, which is dominated by agricultural land uses. The Kettle River channel is sinuous and bounded by roads (State Routes 525 and 501, transitioning to State Route 530 and Kettle River Road) on either side of the valley. The river runs adjacent to these roads as it flows through Reach 1. The riparian zone generally includes a narrow forested area between the river and road or between the river and agricultural land. In some stretches, the agricultural lands are very close to the water’s edge, and no trees are present.</p> <p>This reach of the Kettle River is within the year-round range of bighorn sheep (California sub-species) and contains a known lambing area, where multiple lambs have been documented. This reach is also noted to be within the winter range for dusky grouse. For mule deer, this reach is within year-round and severe winter range, and is an extremely high priority area. White-tailed deer also occupy this reach year-round. The west Kettle River white-tailed deer population is known to migrate to this area in the winter and mix with the resident populations. In this reach, the Kettle River also supports a number of the fish species identified in the Inventory, Analysis, and Characterization (IAC) Report.</p>	
<p>Ecological Functions Analysis</p>	
<p>Level of Existing Function</p> <p>Reach 1 is designated as Partially Functioning, based on agricultural land use, upland roads, and relatively limited riparian cover.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Irrigated agriculture and limited agricultural outbuildings within jurisdiction boundary • Customs Road within shoreline jurisdiction limits channel migration • Customs Road Bridge crossing • Limited rural residential development <p>Recreational use:</p> <ul style="list-style-type: none"> • Beal Park 	

Kettle River – Reach 1	Ferry County
<p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects near agricultural fields and roads that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to increase filtration, and therefore, reduce erosion and runoff into this reach.</p> <p>Potential Protection Opportunities</p> <p>Promote alternative livestock watering areas. Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	

Kettle River – Reach 2	Ferry County
Reach Description	
Kettle River from T39N R32E S2 near the mouth of Tonata Creek to the edge of the Curlew community	
Shoreline Jurisdiction	
567 acres	
	
Source: USDA NAIP 2013	
Subreaches (SRs); see Map 2:	
<ul style="list-style-type: none"> • SR 2a – Begins at T39N R32E S2 near the mouth of Tonata Creek and extends east to the edge of residential developments • SR 2b – Extends 1.6 miles to the east to the edge of residential developments • SR 2c – Extends 2.4 miles to the east to the southwest (SW) ¼ of T39N_R33E_S10 near Hummingbird Road • SR 2d – Extends 1.7 miles to the east to the edge of the Curlew community 	
Characteristics	
Ownership	
Reach 2 is mostly private with a small amount (less than 10%) of public ownership.	

Kettle River – Reach 2	Ferry County
<p>Land Use/Current Shoreline Management Program</p> <p>Land Use Designation:</p> <ul style="list-style-type: none"> • Current land uses are private ownership, public lands, and Indian allotment trust lands • Rural and Rural Service Area <p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Rural and Natural 	
<p>Existing Land Cover/Development</p> <p>Existing land cover includes forest, shrubland, and agricultural lands and riparian vegetation. Development includes a small number of residential structures, roads, and other improvements.</p>	
<p>Geomorphic Character</p> <p>Description – The Kettle River flows within a confined to moderately confined valley throughout Reach 2. The floodplain and valley bottom consist of alluvium (SR 2a and 2b) and continental glacial drift (SR 2c and 2d). Bedrock (orthogneiss) defines the valley walls and margins throughout SR 2a and 2b. In SR 2d, the floodplain and valley widen upstream of the Curlew community.</p> <p>Hardened Banks – Approximately 9,100 feet of artificial hardened banks exist along the shoreline and are associated with Kettle River Road and Customs Road.</p> <p>Channel Migration Zone – Roadway infrastructure is present throughout Reach 2. Customs Road and Kettle River Road limit channel migration throughout the reach. In addition, bedrock channel margins exist throughout the reach. The CMZ broadens in SR 2d as the floodplain widens, and infrastructure is not located immediately adjacent to the river.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped throughout this reach, and floodways are designated in SR 2b - 2d. Floodways contain most of the floodplain area, where designated. Floodplain areas are moderate in width except for the downstream end of SR 2d, where the floodplain is relatively wide near the confluence of Curlew Creek and the Kettle River.</p> <p>Geological Hazards – Reach 2 has soils susceptible to moderate to severe erosion. Reach 2 contains slopes that are greater than 15% and underlain by glaciolacustrine and alluvial deposits, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Reach 2.</p>	
<p>Existing Public Access</p> <p>There are no formal public access sites in Reach 2. Reach 2 runs mostly east to west. Kettle River Road flanks the river on the south side. Customs Road borders the northern side of the river and runs along the entire reach.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for Reach 2.</p>	

Kettle River – Reach 2	Ferry County
Public Access Opportunities	
Public access opportunities are extremely limited due to private ownership of the reach. Much of the uplands are covered in agricultural crops, which also limits the public's use of the reach.	
Ecological Conditions	
Water Quantity and Sediment	
Reach 2 has many tributary inflows, including Henry and Cottonwood creeks. In addition, numerous unnamed tributaries flow into this reach. USGS flow data are not collected in this reach. However, flow data are collected in the Kettle River upstream in Reach 1 (USGS Gage #12401500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from local roadways and adjacent agricultural lands may contribute flow into the river during the wet season and during periods of snowmelt.	
Sediment sources throughout the reach include the erodible alluvium and continental drift banks, soils prone to erosion, and sediment transported in the local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and overall river gradient. Depositional bars exist throughout the reach.	
Water Quality	
Reach 2 is not listed on Ecology's 305b list. Water quality may be impacted by agricultural runoff along the reach.	
Habitat Characteristics and Priority Habitat Species Presence	
The Kettle River in Reach 2 supports a number of the fish species identified in the IAC Report. Subreach 2a of the Kettle River is within mule deer year-round and severe winter range, and is an extremely high priority area. White-tailed deer occupy areas along the entire subreach (SR 2a – 2d) year-round. The west Kettle River white-tailed deer population is known to migrate to this area in the winter and mix with the resident populations.	
<ul style="list-style-type: none"> • SR 2a: This subreach is relatively straight and runs through a narrow channel. At the beginning of this subreach, Kettle River Road runs along the western shoreline, and the river is bound on the opposite side by Customs Road. The valley widens somewhat, and the roads diverge from the shoreline. The land area between the shoreline and roads is in agricultural use and sparse residential development. There appears to be one public access area along the northeastern shoreline off of Customs Road in this subreach. Riparian vegetation consists of a narrow band of vegetation, including trees, shrubs, and grasses along the river's edge, typically about 20 to 50 feet in width. • SR 2b – This subreach is similar in constraints and shoreline condition to SR 2a. Land use is more residential and recreation-based than agricultural. The uplands along the southern shoreline are more steeply sloped, and the habitat on the landward side of Kettle River Road is forested and steep. • SR 2c – This subreach of the Kettle River flows through a fairly wide valley, which is dominated by agricultural land uses. The Kettle River channel is sinuous and bound by roads on either side of the valley. The river runs adjacent to these roads as it flows through SR 2c. 	

Kettle River – Reach 2	Ferry County
<p>The riparian zone generally includes a narrow forested area between the river and road or between the river and agricultural land, which are used for crops or grazing purposes. In some stretches, the agricultural lands are very close to the water’s edge and no trees are present. The upland hills above the north shoreline are unforested, and, to the south, the slopes are densely to moderately forested.</p> <ul style="list-style-type: none"> ● SR 2d – This subreach is similar in condition and function to SR 2b. There is agricultural land use on the north side of the river, and roads are located on both sides of the valley. A gravel mine is located near the end of the subreach, near Curlew. 	
Ecological Functions Analysis	
SR 2a	
<p>Level of Existing Function</p> <p>SR 2a is designated as Partially Functioning, based on confined channel from highways, agricultural, and rural residential development.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> ● Customs Road and Kettle River Road confine the channel through the northern half of this subreach ● Limited rural residential development ● Irrigated pasturelands and livestock use <p>Potential Restoration Opportunities</p> <p>Reduce riparian and water quality impacts from livestock through expanded use of best management practices (BMPs) (e.g., exclusionary fencing and rotational grazing) for livestock operations within shoreline jurisdiction, particularly within the southern half of the subreach.</p> <p>Potential Protection Opportunities</p> <p>Protect intact riparian areas adjacent to highways and pasturelands.</p>	
SR 2b	
<p>Level of Existing Function</p> <p>SR 2b is designated as Partially Functioning, based on residential development and confined channel from highway development.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> ● Residential development and signs of future development within the jurisdiction north of river in western half of this subreach ● Customs Road, and to a lesser extent Kettle River Road, confine the channel through eastern half of this subreach 	

Kettle River – Reach 2	Ferry County
<p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., riparian plantings) efforts to reduce erosion and increase filtration, particularly in undeveloped areas north of the river.</p> <p>Potential Protection Opportunities</p> <p>Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	
SR 2c	
<p>Level of Existing Function</p> <p>SR 2c is designated as Partially Functioning, based on irrigated agricultural fields, livestock grazing, a general limitation of riparian buffers, and limited highway and residential development within the shoreline jurisdiction.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Irrigated agriculture fields and pasturelands used for livestock grazing • Kettle River Road confines small segments of the channel south of the river • Limited rural residential development <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to reduce erosion and increase filtration near agricultural fields. Reduce riparian and water quality impacts from livestock through expanded use of BMPs (e.g., exclusionary fencing and rotational grazing) for livestock operations north of river.</p> <p>Potential Protection Opportunities</p> <p>Consider conservation easements to protect intact riparian and upland forests south of river.</p>	

Kettle River – Reach 2	Ferry County
SR 2d	
<p>Level of Existing Function</p> <p>SR 2d is designated as Partially Functioning, based on rural residential and industrial development, as well as livestock grazing within the shoreline jurisdiction.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Hummingbird Road and associated residential development north of the river, very limited rural residential development south of the river • Kettle River court with limited residential development. Access roads indicate a potential for future development of lots located near the eastern edge of subreach • Gravel mine operations partially cross into jurisdiction boundary at eastern end of subreach, north of the river • Livestock grazing in central portion of subreach, north of the river <p>Potential Restoration Opportunities</p> <p>Reduce riparian and water quality impacts from livestock through expanded use of BMPs (e.g., exclusionary fencing and rotational grazing) for livestock operations within shoreline jurisdiction, particularly within the north central portion of subreach. Implement riparian restoration planting projects within eastern portion of subreach near Highway 21 Bridge.</p> <p>Potential Protection Opportunities</p> <p>Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	

Kettle River – Reach 3 Ferry County	
Reach Description	Kettle River from the SW edge of the Curlew community to the northern edge of the community
Shoreline Jurisdiction	46 acres
	
Source: USDA NAIP 2013	
Subreaches (SRs); see Map 2:	Not applicable
Characteristics	
Ownership	Reach 3 is about 20% public (Ferry County) and 80% private.
Land Use/Current Shoreline Management Program	Land Use Designation: <ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural and Rural Service Area

Kettle River – Reach 3	Ferry County
<p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Rural and Natural 	
<p>Existing Land Cover/Development</p> <p>The majority of development in Curlew is private residences, with agriculture, parking, and other improvements. Existing land cover includes shrubland, forest, and riparian vegetation outside of the residential developments.</p>	
<p>Geomorphic Character</p> <p>Description – The Kettle River flows within a confined channel through Reach 3. The floodplain and valley are confined by infrastructure along both banks associated with the Curlew community. The channel and floodplain consists of continental glacial drift, and the right bank valley margin consists of dacite flows of the Sanpoil Volcanic Formation.</p> <p>Hardened Banks – Approximately 1,750 feet of artificial hardened banks occur along the Highway 21 alignment.</p> <p>Channel Migration Zone – The CMZ in Reach 3 is narrow and confined between Highway 21 and a railroad alignment.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped throughout this reach. Floodplain widths are relatively narrow, especially in the center of the reach where the Curlew Bridge is located.</p> <p>Geological Hazards – Reach 3 has soils susceptible to severe erosion. Reach 3 contains slopes that are greater than 15% and underlain by glaciolacustrine deposits, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Reach 3.</p>	
<p>Existing Public Access</p> <p>Reach 3 of the Kettle River runs through the unincorporated Town of Curlew, Washington. The river is bordered to the west by State Route 21. There are two bridges that span the river in this reach, the Kettle River Road Bridge and the historic Curlew Bridge (single lane). Curlew Bridge has an informal pull-off with a path down to the water’s edge. Ferry County Rail Corridor runs the length of the reach and provides non-motorized, motorized for Americans with Disabilities Act (ADA), and pedestrian access. Brixner Park is a county park that provides picnicking, swimming and water use access, barbecues, fire pits, interpretive signage, fishing opportunities, and a seasonal vault toilet.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for Reach 3 of the Kettle River.</p> <p>Public Access Opportunities</p> <p>Curlew is an unincorporated town; public access opportunities would depend on community need and available funds. There is potential to improve current, county-owned public access.</p>	

Kettle River – Reach 3	Ferry County
Ecological Conditions	
Water Quantity and Sediment	
<p>Reach 3 tributary inflows include Curlew Creek and Long Alec Creek. USGS flow data are not collected in this reach. However, flow data are collected upstream in Reach 1 (USGS Gage #12401500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from Highway 21 and local roadways likely contribute flow into the river during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks and soils prone to erosion. Due to the lack of depositional features within this reach, sediment is likely transport throughout this reach, with minimal deposition occurring within this reach. A stream bank restoration project is being implemented at Brixner Park to establish an angle of repose using soft bank measures for approximately 300 feet along the stream bank.</p>	
Water Quality	
<p>Reach 3 is not listed on Ecology’s 305b list. Water quality may be impacted by runoff from residential, agricultural, roadway, and rail corridor activities.</p>	
Habitat Characteristics and Priority Habitat Species Presence	
<p>White-tailed deer occupy areas along Reach 3 year-round. The west Kettle River white-tailed deer population is known to migrate to this area in the winter and mix with the resident populations.</p> <p>Reach 3 runs through the Curlew community. The riparian vegetation is limited to a thin sparsely forested area along either shoreline with a mix of large and small trees and shrubs. There are public access areas on the west shoreline, two bridges (Kettle River Road Bridge and historic Curlew Bridge), and a significant number of commercial buildings within the shoreline jurisdiction in this subreach.</p>	
Ecological Functions Analysis	
Reach 3	
Level of Existing Function	
<p>Reach 3 is designated as Impaired, based on Curlew residential development, Kettle River Road and Curlew Bridge crossings, and confinement of the western side of the river by the road.</p>	
Stressors	
<p>Upland development:</p> <ul style="list-style-type: none"> • Residential development within shoreline jurisdiction • Overhead utilities crossing river (avian) • Kettle River Road Bridge and Curlew Bridge 	
<p>Recreational use:</p> <ul style="list-style-type: none"> • Water access points at Curlew Bridge • Water access from Brixner Park 	

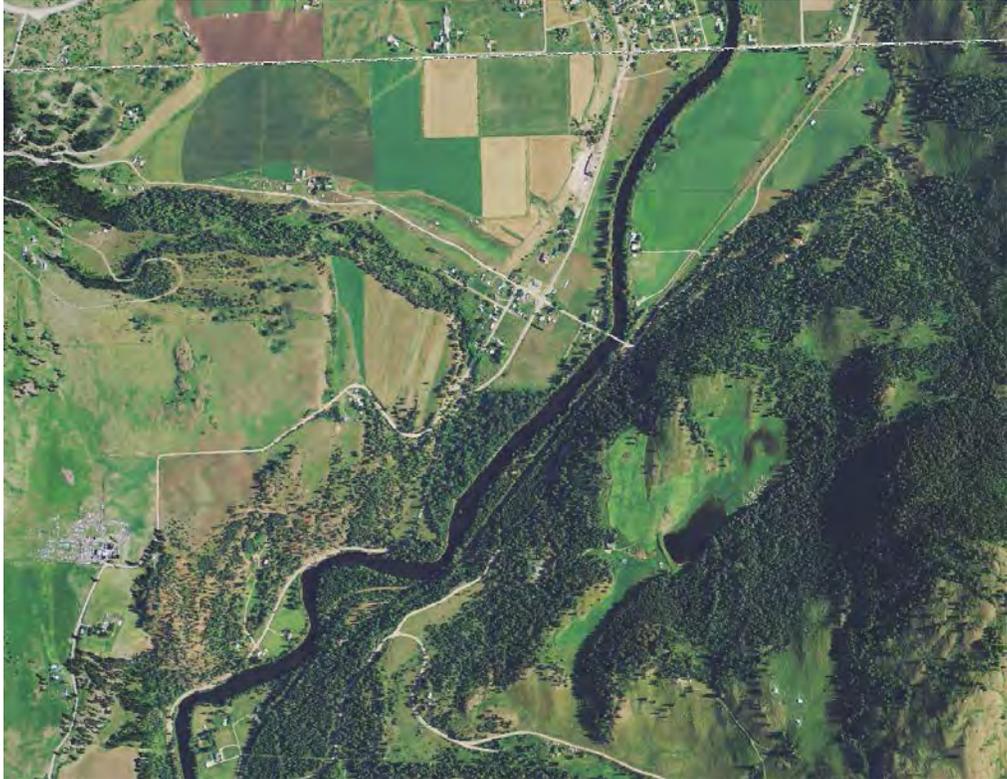
Kettle River – Reach 3	Ferry County
<p>Potential Restoration Opportunities</p> <p>Enhance and expand riparian vegetation buffer, place large woody debris (LWD) instream, and remove invasive species. Future installation of approved town sewer system.</p> <p>Potential Protection Opportunities</p> <p>Protect existing native riparian vegetation to preserve and support re-establishment of this land-cover type. Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	

Kettle River – Reach 4 Ferry County	
Reach Description	Kettle River from the northern edge of the Curlew community to SW ¼ of T40N_R34E_S09 at Lone Ranch Creek Road Bridge
Shoreline Jurisdiction	717 acres
	
Source: USDA NAIP 2013	
Subreaches (SRs); see Map 4:	Not applicable
Characteristics	
Ownership	Reach 4 is about 20% public (U.S. Bureau of Land Management, tribal, and Ferry County) and 80% private.
Land Use/Current Shoreline Management Program	Land Use Designation: <ul style="list-style-type: none"> • Current land uses are private ownership, public lands, and Indian allotment trust lands • Rural

Kettle River – Reach 4	Ferry County
<p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Rural and Natural 	
<p>Existing Land Cover/Development</p> <p>Existing land cover includes forest, shrubland, wetlands, developed areas, and agriculture. Development includes a small number of residential structures, roads, and other improvements.</p>	
<p>Geomorphic Character</p> <p>Description – Kettle River flows within a confined to moderately confined valley throughout Reach 4. Throughout most of the reach, the river is a single-thread, low-gradient channel. The floodplain and valley bottom consists of continental glacial drift. Bedrock (as intrusive dacite and metacarbonate formations) defines the valley margins and hill slopes throughout the reach.</p> <p>Hardened Banks – Approximately 4,300 feet of artificial hardened banks occur along the Highway 21 alignment.</p> <p>Hardened Banks – Approximately 4,300 feet of artificial hardened banks occur along the Highway 21 alignment.</p> <p>Channel Migration Zone – The channel migration potential in Reach 4 is mostly controlled by Highway 21, the Ferry County Rail Corridor, and the presence of bedrock.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped throughout the reach, and a floodway is designated near the center of the reach. Within the reach length that the floodway is designated, the floodway contains most of the floodplain area. The floodplain widths are relatively narrow in the upstream and downstream portions of the reach, and are moderately wide in the middle portion of the reach.</p> <p>Geological Hazards – Reach 4 has soils susceptible to moderate to severe erosion. Reach 4 contains slopes that are greater than 15% and underlain by glaciolacustrine deposits, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Reach 4.</p>	
<p>Existing Public Access</p> <p>The Ferry County Rail Corridor flanks the river on the west side through the entire reach, providing non-motorized, motorized for ADA, and pedestrian access. State Route 21 borders the river on the east. Lone Ranch Park is a county park that provides river access off State Route 21. The park’s amenities include picnic tables, fire pits, interpretative signage, seasonal outhouses, and fishing and water use access.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for Reach 4 of the Kettle River.</p> <p>Public Access Opportunities</p> <p>Public access opportunities in Reach 4 are limited to the small portion of the reach in federal ownership. There is some potential opportunity to add additional amenities to the Ferry County Rail Corridor.</p>	

Kettle River – Reach 4	Ferry County
Ecological Conditions	
Water Quantity and Sediment	
<p>Reach 4 inflows include La Fleur, Alkali, West Deer, Rincon, White, Little Goosmus, Day, Goosmus, Shasket, Skiffington, and Lone Ranch creeks. In addition, numerous unnamed tributaries flow into this reach. USGS flow data are collected in this reach. However, flow data are collected in the Kettle River upstream in Reach 1 (USGS Gage #12401500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from Highway 21 may contribute flow into the stream during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks, soils prone to erosion, and sediment transported by local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and overall river gradient. Depositional bars are visible along the reach extents. Where present, a vegetated riparian corridor helps to limit erosion and the delivery of fine sediment to the river.</p>	
Water Quality	
<p>While this reach is not listed on Ecology’s 305b list, this reach has tributary inflow (Lone Ranch Creek) at its confluence with the Kettle River at the downstream end of Reach 4, which is listed as a water of concern for bacteria and temperature on Ecology’s 305b list. Water quality may additionally be impacted by roadway and agricultural runoff.</p>	
Habitat Characteristics and Priority Habitat Species Presence	
<p>Reach 4 is noted as a medium-density use area for mule deer within their winter range. White-tailed deer occupy areas along Reach 4 year-round. The west Kettle River white-tailed deer population is known to migrate to this area in the winter and mix with the resident populations.</p> <p>The shorelines along both sides of the river near the Curlew community have been artificially hardened adjacent to the State Route 21 roadway alignment. Farther outside of the Curlew community, this reach is more sinuous. Agricultural land uses are common on the north/western floodplain land between the river and State Route 21. The south/eastern shoreline floodplain land between the river and the mountain slopes is in agricultural use when width of the floodplains and slopes allow it. The uplands in this reach are primarily steep and a mix of forested and dry steppe/grassland habitat, with a few residences associated with the farmlands where the floodplain is broader. There is a gravel mine located at the southern end of the reach that is landward of State Route 21 but within shoreline jurisdiction. Riparian vegetation is consistent with surrounding forested areas, and there are stretches of relatively undisturbed riparian buffer that may extend 100 feet or more landward from the shoreline. However, most riparian habitat is constrained by either the roadway or agricultural land use.</p>	

Kettle River – Reach 4	Ferry County
Ecological Functions Analysis	
Reach 4	
<p>Level of Existing Function</p> <p>Reach 4 is designated as Partially Functioning, based on riparian impact from limited agriculture and rural residential development, along with some segments adjacent to wide riparian and upland forests providing suitable ecological function.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Limited rural residential development • Highway 21 confines a few segments of the western river edge • Agricultural fields, though fairly limited • Gravel mine operations partially cross into jurisdiction boundary at eastern end of subreach, north of the river <p>Recreational use:</p> <ul style="list-style-type: none"> • Water access from Lone Ranch Park <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects near agricultural fields that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to reduce erosion and increase filtration.</p> <p>Potential Protection Opportunities</p> <p>Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual. Protect existing areas of continuous upland/riparian forest</p>	

Kettle River – Reach 5	Ferry County
Reach Description	
Kettle River from the Lone Ranch Creek Road Bridge to Canada-United States border	
Shoreline Jurisdiction	
184 acres	
	
Source: USDA NAIP 2013	
Subreaches (SRs); see Map 4:	
<ul style="list-style-type: none"> • SR 5a – Begins at the Lone Ranch Creek Road Bridge and extends north to the edge of Danville • SR 5b – Extends 0.9 mile to the north to the Canada-United States border 	
Characteristics	
Ownership	
Reach 5 is mostly private with a very small amount (less than 5%) of public ownership.	
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land uses are private ownership, public lands, and Indian allotment trust lands • Rural and Rural Service Area 	

Kettle River – Reach 5	Ferry County
<p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Rural 	
<p>Existing Land Cover/Development</p> <p>SR 5a consists mostly of forest, shrubland, wetlands, developed areas, and agriculture. The community of Danville in SR 5b has relatively more residential and agricultural developments.</p>	
<p>Geomorphic Character</p> <p>Description – The Kettle River flows within a confined to moderately confined valley throughout Reach 5. Throughout the reach, the river is a single-thread, low-gradient channel. The floodplain and valley bottom consist of continental glacial drift. Bedrock (as ultrabasic volcanics and metasedimentary and metavolcanic rocks) defines the valley margins and hill slopes throughout portions of the reach (SR 5a). At the downstream extent of SR 5a, the floodplain widens and includes a large wetland area.</p> <p>Hardened Banks – Approximately 1,500 feet of artificial hardened banks occur along the Highway 21 alignment.</p> <p>Channel Migration Zone – The channel migration potential in Reach 5 is mostly controlled by the Highway 21 and the BNSF Railroad alignments and the presence of bedrock. In areas where no artificial or natural controls exist, the migration zone is wider.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped for the entire reach, and floodways are delineated for most of SR 5b. In the lengths where floodways are delineated, the floodways take up a small portion of the floodplain area. Floodplain widths are relatively narrow at the upper portion of SR 5a and become wider at the lower portion of SR 5a. In SR 5b, the upper portion is relatively narrow and wide in the lower portion.</p> <p>Geological Hazards – Reach 5 has soils susceptible to severe erosion. Reach 5 contains slopes that are greater than 15% and underlain by glaciolacustrine deposits, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Reach 4.</p>	
<p>Existing Public Access</p> <p>There is minimal public access in Reach 5 of the Kettle River. Ferry County Rail Corridor runs along the eastern portion of the river and provides non-motorized, motorized for ADA, and pedestrian access. There are places people can stop on the trail and access the river; however, none of the sites have been developed. Lone Ranch Bridge and Wall Street Bridge provide public access. State Route 21 runs the length of the reach on the west side of the river.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for Reach 5 of the Kettle River.</p> <p>Public Access Opportunities</p> <p>Public access opportunities are limited for this reach due to private ownership. Improvements to the Ferry County Rail Corridor could potentially be made.</p>	

Kettle River – Reach 5	Ferry County
Ecological Conditions	
Water Quantity and Sediment	
<p>Reach 5 tributary inflows include July Creek and numerous unnamed tributaries. No flow data are collected by the USGS in this reach. However, flow data are collected upstream in Reach 1 (USGS Gage #12401500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from Highway 21 and local roadways likely contributes flow into the river during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks, soils prone to erosion, and sediment transported by local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and overall river gradient. The river’s gradient is generally low throughout this reach. Where present, a vegetated riparian corridor helps to limit erosion and the delivery of fine sediment to the river.</p>	
Water Quality	
<p>Reach 5 is not listed on Ecology’s 305b list. Water quality within the reach may be impacted by agricultural and roadway runoff.</p>	
Habitat Characteristics and Priority Habitat Species Presence:	
<p>White-tailed deer occupy areas with Reach 5 year-round. The west Kettle River white-tailed deer population is known to migrate to this area in the winter and mix with the resident populations.</p> <ul style="list-style-type: none"> • SR 5a – There are agricultural fields and rural residences scattered on both sides of the river in this subreach, along with some forested areas that appear undeveloped. Where lands have been cleared for agricultural use, riparian vegetation is limited to a small patchy strip along the shoreline if present at all. • SR 5b – This subreach runs through Danville to the border, and is almost completely bordered on both sides by large cleared lands in agricultural use, with minimal amount of riparian vegetation. 	
Ecological Functions Analysis	
SR 5a	
Level of Existing Function	
<p>SR 5a is designated as Partially Functioning, based on rural residential and highway development and areas of limited riparian cover.</p>	
Stressors	
<p>Upland development:</p> <ul style="list-style-type: none"> • Limited rural residential development • Highway 21 confines the western channel at the south edge of the subreach and a short segment within the central portion • Upland agricultural use 	

Kettle River – Reach 5	Ferry County
<p>Recreational use:</p> <ul style="list-style-type: none"> • Ferry County Rail Corridor use along the eastern side of the channel <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects near agricultural fields that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to reduce erosion and increase filtration (in central portion of subreach). Provide riparian plantings for shading and nutrient inputs adjacent to Highway 21.</p> <p>Potential Protection Opportunities</p> <p>Encourage protection of intact riparian and upland forests within federal and tribal properties.</p>	
SR 5b	
<p>Level of Existing Function</p> <p>SR 5b is designated as Partially Functioning, based on channel crossing and areas with limited riparian buffer between irrigated fields and channel.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Irrigated agriculture fields • Limited residential development within jurisdiction boundary • Wall Street Bridge crossing <p>Recreational use:</p> <ul style="list-style-type: none"> • Ferry County Rail Corridor use along the eastern side of the channel <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects near agricultural fields that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to reduce erosion and increase filtration.</p> <p>Potential Protection Opportunities</p> <p>Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	

Kettle River – Reach 6	Ferry County
Reach Description	
Kettle River from the Canada-United States border to the northwest (NW) ¼ of T40N_R36E_S14 near the edge of grazing fields	
Shoreline Jurisdiction	
196 acres	
	
<p>Source: https://fortress.wa.gov/ecy/coastalatlantlas/UICoastalAtlas/Tools/ShorePhotos.aspx</p>	
Subreaches (SRs); see Map 5:	
Not applicable	
Characteristics	
Ownership	
Reach 6 is mostly private with a small amount (less than 10%) of public ownership.	
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural 	
Current Shoreline Management Program Environment Designation:	
<ul style="list-style-type: none"> • Rural 	

Kettle River – Reach 6	Ferry County
Existing Land Cover/Development	
Reach 6 consists mostly of forest, shrubland, and agriculture. Existing developments include agriculture and grazing fields, which can be found toward the downstream end of the reach.	
Geomorphic Character	
<p>Description –Throughout Reach 6, the Kettle River flows within a wide, low-gradient valley. Throughout this reach, valley bottom consists mostly of continental glacial drift. Bedrock outcrops of orthogneiss, paragneiss, and amphibolite occur along the reach. In the upper portion of the reach, the river consists of large meanders traversing the valley. The valley width narrows downstream with valley walls and boundary consisting of bedrock.</p> <p>Hardened Banks – None identified. No artificial hardened banks were identified within Reach 6.</p> <p>Channel Migration Zone – Limited infrastructure is present along the channel and floodplain margins, which hinders channel migration. The CMZ is wide in along most of the reach extent.</p>	
Flooding and Geological Hazard	
<p>Flooding – Portions of this reach have mapped floodplains. In the areas where floodplains are mapped, floodplains widths are relatively narrow in areas where the river is less sinuous and relatively wide in areas where the river is more sinuous.</p> <p>Geological Hazards – Reach 6 has soils susceptible to severe erosion. Reach 6 contains slopes that are greater than 15% and underlain by glaciolacustrine deposits, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Reach 6.</p>	
Existing Public Access	
Reach 6 of the Kettle River is mostly privately owned, so there are minimal public access sites. The river runs mostly from north to south in this reach, and U.S. Route 395 borders the river on the west side. Kettle Falls International Railway (KFR) tracks run along the west side of the river for most of the reach. McIrvine Road Bridge provides public access.	
Identified Public Access Improvements	
There are no public access improvements identified for Reach 6.	
Public Access Opportunities	
Public access opportunities are limited due to private ownership in the reach.	
Ecological Conditions	
Water Quantity and Sediment	
Reach 6 inflows include numerous unnamed tributary inflows. Flow data are collected in the Kettle River at the upstream extent of this reach near the Canada-United States border (USGS Gage #12404500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from U.S. Route 395 local roadways and adjacent agricultural lands may contribute flow into the river during the wet season and during periods of snowmelt.	

Kettle River – Reach 6	Ferry County
<p>Sediment sources throughout the reach include the erodible continental drift banks, soils prone to erosion, and sediment transported by local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and overall river gradient. Depositional bars are present throughout the reach.</p>	
<p>Water Quality</p> <p>Reach 6 is not listed on Ecology’s 305b list. Water quality may be slightly impacted by wildlife, agricultural, and roadway runoff.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Reach 6 is within winter range for white-tailed deer, particularly for severe winter weather habitat, and supports fish species as noted in the IAC Report.</p> <p>Reach 6 is adjacent to lands in agricultural use with crops or pasture areas extending almost to the water, and several areas where livestock have direct access to the river. Mclrvn Road runs adjacent to the shoreline at the north end of the reach. No docks occur in this subreach, but there is a bridge crossing of Mclrvn Road at the north end of the reach. The riparian zone is minimal in areas under agricultural use or adjacent to roads. There is a large, 2,500-foot-long, oblong wetland area at the bend in the river within shoreline jurisdiction as Mclrvn Road diverges from the shoreline. The vegetation here includes rushes, some grasses, and shrubs spanning approximately 500 feet from the water's edge at its widest point (during summer water levels). Adjacent to this wetland area is a significant area of forested upland. Toward the end of the reach is a large area of land between U.S. Route 395 and the shoreline that appears to be used for grazing livestock with direct access to the river. The southern end of Reach 6 the shoreline slope increases, possibly due to presence of fill for U.S. Route 395, but the shoreline area (which is about 200 feet wide) between the road and water is densely vegetated with trees and shrubs, which appear similar to the species composition of upland forests.</p>	
Ecological Functions Analysis	
Reach 6	
<p>Level of Existing Function</p> <p>Reach 6 is designated as Partially Functioning, based on limited riparian coverage, grazing operations, and Mclrvn Road Bridge crossing.</p>	
<p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Livestock operations with concentrated pens near the north end of this subreach • Grazing operations • Mclrvn Road Bridge crossing • Limited rural residential development • Mclrvn Road limits channel migration at one segment in the northern half of this subreach 	

Kettle River – Reach 6	Ferry County
<p>Potential Restoration Opportunities</p> <p>Reduce riparian and water quality impacts from livestock through expanded use of BMPs (e.g., exclusionary fencing and rotational grazing) for livestock operations within shoreline jurisdiction, particularly at enclosure area within the north end of subreach and within grazing fields throughout subreach. Implement riparian restoration planting efforts near grazing fields to reduce erosion and increase filtration.</p> <p>Potential Protection Opportunities</p> <p>Protect intact riparian and upland forested areas and wetland habitat near north end of Reach 6.</p>	

Kettle River – Reach 7 Ferry County	
Reach Description	Kettle River from the NW ¼ of T40N_R36E_S14 to Rock Cut Road Bridge
Shoreline Jurisdiction	141 acres
	
Source: https://fortress.wa.gov/ecy/coastalatlantools/UICoastalAtlas/Tools/ShorePhotos.aspx	
Subreaches (SRs); see Map 5:	Not applicable
Characteristics	
Ownership	Reach 7 is about 40% public (U.S. Forest Service [USFS]) and 60% private.

Kettle River – Reach 7	Ferry County
<p>Land Use/Current Shoreline Management Program</p> <p>Land Use Designation:</p> <ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural <p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Rural 	
<p>Existing Land Cover/Development</p> <p>Existing developments in Reach 7 are primarily railroad and roads along the west side of the river. Existing land cover consists of forest and shrublands.</p>	
<p>Geomorphic Character</p> <p>Description – Throughout Reach 7, the Kettle River flows within a narrow valley with a valley bottom that consists mostly of continental glacial drift. Bedrock (as orthogneiss) defines the valley margins throughout most of this reach. The valley width narrows downstream with valley boundary and hill slopes consisting of bedrock.</p> <p>Hardened Banks – None identified. No artificial hardened banks were identified within Reach 7.</p> <p>Channel Migration Zone – U.S. Route 395 and Kettle Falls International Railway are present along the channel and floodplain margins, which hinder channel migration to the west (right bank). The CMZ to the east (left bank) is limited by the presence of bedrock along the valley margins and steep hill slope.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped in a portion of the reach, and a floodway is designated in the upper portion of the reach. Floodplains are narrow and floodways utilize most of the floodplain, where designated.</p> <p>Geological Hazards – Reach 7 has soils susceptible to moderate to severe erosion. Reach 7 contains slopes that are greater than 15% and underlain by glaciolacustrine deposits, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Reach 7.</p>	
<p>Existing Public Access</p> <p>Matney Park is located in Reach 7. It is a county park and provides picnic tables, seasonal outhouse facilities, fishing and water use access, barbecues, and interpretive signage. U.S. Route 395 and Kettle Falls International Railway tracks border the river’s west side. Rock Cut Road Bridge crosses the river.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for Reach 7 of the Kettle River.</p> <p>Public Access Opportunities</p> <p>A fairly large portion of the Reach is bordered by the Colville National Forest. There may be some public access opportunities in federal lands located in the Reach.</p>	

Kettle River – Reach 7	Ferry County
Ecological Conditions	
Water Quantity and Sediment	
<p>Reach 7 tributary inflows include Kerry and Jenny creeks and numerous unnamed tributaries. USGS flow data are not collected in this reach. However, flow data are collected upstream in Reach 6 (USGS Gage #12404500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from U.S. Route 395 and local roadways likely contributes flow into the river during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks, soils prone to erosion, and sediment transported by local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and overall river gradient. The lower extent of Reach 7 is a narrow, confined channel that is likely dominated by sediment transport. Where present, a vegetated riparian corridor helps to limit erosion and the delivery of fine sediment to the river.</p>	
Water Quality	
<p>Reach 7 is not listed on Ecology’s 305b list. Recreational use from Matney Park, wildlife, and roadway runoff may cause minor impacts to water quality.</p>	
Habitat Characteristics and Priority Habitat Species Presence	
<p>Reach 7 is within winter range for white-tailed deer, particularly for severe winter weather habitat. This reach runs through predominantly forested areas and ends at the bridge crossing of Rock Cut Road. There is minimal development in this reach, including sparsely developed residential areas. The residential developments are situated on bluffs elevated above the shoreline, and this limits the development of boat docks or other access areas along the shoreline in this reach. On the west side of the river, U.S. Route 395 and a railroad run generally parallel to the river channel at the southern end of the reach, shifting from within 100 to 800 feet from the shoreline. Riparian vegetation consists of small and large trees along the shoreline, and the riparian forested area is most often connected to larger upland forest habitat.</p>	
Ecological Functions Analysis	
Reach 7	
Level of Existing Function	
<p>Reach 7 is designated as Partially Functioning, based on residential development and transportation corridors limiting channel migration.</p>	
Stressors	
<p>Upland development:</p> <ul style="list-style-type: none"> • Residential development within jurisdiction boundary, often with view corridors carved out of riparian buffer • U.S. Route 395 near western shoreline • Railroad corridor near western shoreline 	

Kettle River – Reach 7	Ferry County
<p>Recreational use:</p> <ul style="list-style-type: none">• County park passive recreation use <p>Potential Restoration Opportunities</p> <p>Consider implementing riparian restoration planting efforts to provide shading and nutrient inputs in non-vegetated areas along U.S. Route 395.</p> <p>Potential Protection Opportunities</p> <p>Protect intact riparian and upland forested areas and existing buffers. Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	

Kettle River – Reach 8 Ferry County	
Reach Description	
Kettle River from Rock Cut Road Bridge to the edge of the community of Orient	
Shoreline Jurisdiction	
149 acres	
	
Source: https://fortress.wa.gov/ecy/coastalatlantlas/UICoastalAtlas/Tools/ShorePhotos.aspx	
Subreaches (SRs); see Map 6:	
<ul style="list-style-type: none"> • SR 8a – Begins at Rock Cut Road Bridge and extends south to the NW ¼ of T39N_R36E_S14 at the beginning of grazing fields • SR 8b – Extends 1.3 miles to the south to the edge of the community of Orient 	
Characteristics	
Ownership	
Reach 8 is entirely private.	
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land use is private ownership • Rural 	

Kettle River – Reach 8	Ferry County
<p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Rural 	
<p>Existing Land Cover/Development</p> <p>Reach 8 consists of forest, shrubland, and wetlands. Existing developments include roads and other improvements along the west side of the river.</p>	
<p>Geomorphic Character</p> <p>Description – Throughout Reach 8, the Kettle River flows mostly within a moderately wide, low-gradient valley with a valley bottom consisting mostly of continental glacial drift. Bedrock (granite, dacite flows, and quartzite) comprises portions of the valley margins.</p> <p>Hardened Banks – Approximately 800 feet of artificial hardened bank exists along Reach 8 and are associated with the BNSF Railroad alignment.</p> <p>Channel Migration Zone – The CMZ throughout Reach 8 varies in width. The migration zone is controlled by the occurrence of bedrock, valley width, and general topography. The Kettle Falls International Railway alignment limits channel migration in SR 8a. In the lower extent of SR 8a and upper extent of SR 8b, the CMZ is wider in an area of historical channels and wider floodplain. At the downstream extent of SR 8b, the migration zone narrows due to the presence of bedrock and narrowing valley width.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped throughout this reach. In SR 8a, the floodplains are relatively narrow in the upper portion and become wider toward the lower portion. In SR 8b, floodplain widths are moderate.</p> <p>Geological Hazards – Reach 8 has soils susceptible to severe erosion, and areas of severe erosion potential are dominant in SR 8a. SR 8a and 8b contain slopes that are greater than 15% and underlain by glacial continental drift, which make them designated landslide hazard areas. No mine sites or areas susceptible to erosion are located within Reach 8.</p>	
<p>Existing Public Access</p> <p>Reach 8 is entirely privately owned and public access is minimal. U.S. Route 395 and Kettle Falls International Railway train tracks border the western side of the reach; otherwise, there is no formal public access.</p> <p>Identified Public Access Improvements</p> <p>There are no identified public access improvements for Reach 8.</p> <p>Public Access Opportunities</p> <p>Because Reach 8 is entirely privately owned (except for U.S. Route 395), public access opportunities are limited.</p>	

Kettle River – Reach 8	Ferry County
Ecological Conditions	
Water Quantity and Sediment	
<p>Reach 8 tributary inflows include Little Boulder, Sand, and Martin creeks and numerous unnamed tributaries. USGS flow data are not collected in this reach. However, flow data are collected upstream in Reach 6 (USGS Gage #12404500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from U.S. Route 395, local roadways, and agriculture lands likely contribute flow into the river during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks, soils prone to erosion, and sediment transported by local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and overall river gradient. Depositional bars are present within the reach (SR 8a). The vegetated riparian corridor helps to limit erosion and the delivery of fine sediment to the river.</p>	
Water Quality	
<p>SR 8a has a tributary (Martin Creek) listed as a water of concern for bacteria on Ecology’s 305b list. Water quality in this reach may additionally be impacted by wildlife and agricultural runoff from fields in Stevens County, as well as roadway runoff.</p>	
Habitat Characteristics and Priority Habitat Species Presence	
<p>SR 8a and 8b are within winter range for white-tailed deer, particularly for severe winter weather habitat.</p> <p>SR 8a – This reach runs through predominantly forested areas along the Ferry County side. The shoreline along the other side of the river is within Stevens County and is predominantly in agricultural land use. The railroad runs generally parallel to the river channel throughout the reach, shifting from within 100 to 500 feet from the shoreline. Where it is nearest the river, the shoreline has been stabilized. Riparian vegetation is minimal where the railroad is closest to the shoreline, but elsewhere consists of a forested area of small and large trees. The riparian forested area is most often connected to larger upland forest habitat.</p> <p>SR 8b – This reach is adjacent to several large parcels of land used for livestock grazing. The riparian vegetation is less dense here and consists of patches of trees forming small habitat areas and large patches of shoreline that have small shrubs and grasses. There are two visible residences located waterward of the railroad, less than 75 feet from the shoreline. There is exposed sandy beach area along this subreach. The railroad runs adjacent to the shoreline in SR 8b in the northern end.</p>	
Ecological Functions Analysis	
SR 8a	
Level of Existing Function	
<p>SR 8a is designated as Partially Functioning, based on limited riparian coverage, particularly adjacent to agricultural uses, and confined by transportation corridors.</p>	

Kettle River – Reach 8	Ferry County
<p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Rock Cut Road Bridge crossing • Fairly limited residential development within jurisdiction boundary, often with view corridors carved out of the riparian buffer • Agricultural field with very limited riparian buffer and an access road at shoreline’s edge <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects near agricultural fields that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to reduce erosion and increase filtration.</p> <p>Potential Protection Opportunities</p> <p>Protect intact riparian and upland forested areas. Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	
SR 8b	
<p>Level of Existing Function</p> <p>SR 8b is designated as Partially Functioning, based on residential development.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Residential development within jurisdiction boundary, often with view corridors carved out of the riparian buffer • Railroad corridor west of the channel <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects near residential and agricultural development that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to increase shading and nutrient inputs.</p> <p>Potential Protection Opportunities</p> <p>Implement fencing and livestock BMPs to protect shoreline vegetation from livestock access. Protect intact riparian and upland forested areas. Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	

Kettle River – Reach 9 Ferry County	
Reach Description	Kettle River between northern and southern extents of the community of Orient near the northeast ¼ of T39N_R36E_S23
Shoreline Jurisdiction	22 acres
 <p>Source: https://fortress.wa.gov/ecy/coastalatlantools/UICoastalAtlas/Tools/ShorePhotos.aspx</p>	
Subreaches (SRs); see Map 6:	Not applicable
Characteristics	
Ownership	Reach 9 is entirely private.
Land Use/Current Shoreline Management Program	<p>Land Use Designation:</p> <ul style="list-style-type: none"> • Current land use is private ownership • Rural and Rural Service Area <p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Conservancy

Kettle River – Reach 9	Ferry County
<p>Existing Land Cover/Development</p> <p>Within the Town of Orient, the land is fairly developed with residences, agriculture, parking, and other improvements. Existing land cover includes shrubland, forest, and riparian vegetation along the river.</p>	
<p>Geomorphic Character</p> <p>Description – Throughout Reach 9, the Kettle River flows within a confined, single-thread channel. The valley bottom and floodplain consist of continental glacial drift and granite. Valley boundaries consist of bedrock (as granite and amphibolite). The floodplain is narrow throughout this reach.</p> <p>Hardened Banks – None identified. No artificial hardened banks were identified within Reach 9.</p> <p>Channel Migration Zone – Due to the confined and incised nature of the channel, the CMZ is narrow throughout this reach. The reach is a single meander bend in the river through the Town of Orient. A roadway (on bedrock) is located along the outside of the meander bend.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped throughout this reach. The floodplain width is narrow in the upper portion of the reach and becomes wider in the lower portion of the reach.</p> <p>Geological Hazards – Reach 9 does not have soils susceptible to erosion. Reach 9 contains slopes that are greater than 15% and underlain by glacial continental drift, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Reach 9.</p>	
<p>Existing Public Access</p> <p>Reach 9 of the Kettle River flows through the unincorporated Town of Orient. The reach is mostly under private ownership except for the Main Street Bridge that crosses the Kettle River on the western outskirts of the town. There is a path to the water on the County easement.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for Reach 9 of the Kettle River.</p> <p>Public Access Opportunities</p> <p>The Town of Orient is unincorporated, and most of the land is privately held, so public access opportunities are limited. There is open space along the shoreline that would make a good location for a town park if land were secured.</p>	
Ecological Conditions	
<p>Water Quantity and Sediment</p> <p>Reach 9 inflows include numerous unnamed tributary inflows. USGS flow data are not collected in this reach. However, flow data are collected upstream in Reach 6 near the Canada-United States border (USGS Gage #12404500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from local roadways and the Town of Orient may contribute flow into the river during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks and soils prone to</p>	

Kettle River – Reach 9	Ferry County
<p>erosion. Due to the lack of depositional features within this reach, sediment is likely transported throughout this reach, with minimal deposition occurring within this short reach.</p>	
<p>Water Quality</p> <p>Reach 9 is not listed on Ecology’s 305b list. Water quality may be slightly impacted by residential, wildlife, and roadway runoff.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Reach 9 is within winter range for white-tailed deer, particularly for severe winter weather habitat. This subreach runs through the Town of Orient. There are several primitive shoreline access areas along the shoreline associated with upland residential areas and one adjacent to the bridge approach. There is one bridge crossing, and some residences encroach upon the shoreline jurisdiction, but otherwise there is little development within the shoreline jurisdiction area. Riparian vegetation consists of trees and shrubs, with some areas appearing to be dominated by grasses, potentially non-native species.</p>	
Ecological Functions Analysis	
Reach 9	
<p>Level of Existing Function</p> <p>Reach 9 is designated as Partially Functioning, based on residential development and transport corridors limiting channel migration and crossing channel.</p>	
<p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Residential development associated with the Town of Orient. • Main Street Bridge crossing <p>Recreational use:</p> <ul style="list-style-type: none"> • Trail use near the Main Street Bridge 	
<p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects, particularly south of the Main Street Bridge that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to increase shading and nutrient inputs near residential development.</p>	
<p>Potential Protection Opportunities</p> <p>Protect intact riparian and upland forested areas. Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.</p>	

Kettle River – Reach 10		Ferry County
Reach Description		
Kettle River from the edge of the community of Orient to the southeast (SE) ¼ of T38N_R37E_S18		
Shoreline Jurisdiction		
202 acres		
		
Source: https://fortress.wa.gov/ecy/coastalatlantlas/UICoastalAtlas/Tools/ShorePhotos.aspx		
Subreaches (SRs); see Map 8:		
<ul style="list-style-type: none">• SR 10a – Begins at the edge of the community of Orient and extends south to the edge of agricultural fields• SR 10b – Extends 5.5 miles to the SE ¼ of T38N_R37E_S18		

Kettle River – Reach 10	Ferry County
Characteristics	
<p>Ownership</p> <p>Reach 10 is mostly private with a very small amount (less than 5%) of public ownership.</p>	
<p>Land Use/Current Shoreline Management Program</p> <p>Land Use Designation:</p> <ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural and Rural Service Area <p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Rural and Conservancy 	
<p>Existing Land Cover/Development</p> <p>In Reach 10, there is little development except roads and railroads. Existing land cover consists of shrub, forest, and wetlands.</p>	
<p>Geomorphic Character</p> <p>Description – Throughout Reach 10, the Kettle River flows within a mostly confined, single-thread channel. The valley and floodplain are generally narrow and consist of continental glacial drift. Along a portion of the reach, valley boundaries consist of bedrock (as paragneiss, metacarbonate, and metavolcanic rocks of the Rosslund Group). The U.S. Route 395 and Kettle Falls International Railway alignments are located on the western side of the valley and are located immediately adjacent to the river for a portion of the reach.</p> <p>Hardened Banks – Approximately 4,400 feet of artificial hardened banks exists along Reach 10 and are associated with the US 395 alignment.</p> <p>Channel Migration Zone – U.S. Route 395 and the Kettle Falls International Railway are present along the channel and floodplain margins and hinder channel migration to the west (right bank). The CMZ to the east (left bank) is limited by the presence of bedrock along the valley margins and steep hill slope.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped throughout the reach, and floodways are designated for most of the upstream portion of SR 10a. Floodplains are relatively narrow, and the floodway takes up most of the floodplain area where designated.</p> <p>Geological Hazards – Reach 10 has soils susceptible to moderate to severe erosion, and areas of severe erosion potential are dominant in SR 10b. SR 10a and 10b contain slopes that are greater than 15% and underlain by glacial continental drift, which make them designated landslide hazard areas. No mine sites or areas susceptible to erosion are located within Reach 10.</p>	

Kettle River – Reach 10	Ferry County
<p>Existing Public Access</p> <p>There is no formal legal public access in Reach 10. However, there are several pull-offs from U.S. Route 395 that people use to access the river for floating and rafting. Floating the river in this reach is a popular summertime activity. People park in the road right-of-way, and trespass across private ground to access the river. One land owner has posted a sign stating that people should trespass at their own risk. Kettle Falls International Railway tracks also flank the western shoreline.</p>	
<p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for Reach 10.</p>	
<p>Public Access Opportunities</p> <p>The traffic congestion and risk to public safety caused by people parking alongside U.S. Route 395 in order to float the river should be addressed. There appears to be State land located near the most congested pull-off. One opportunity may be to use State land to create safe parking and water access.</p>	
Ecological Conditions	
<p>Water Quantity and Sediment</p> <p>Reach 10 inflows include East Deer and Boulder creeks and numerous unnamed tributary inflows. USGS flow data are not collected in this reach. However, flow data are collected upstream in Reach 6 near the Canada-United States border (USGS Gage #12404500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from local roadways and U.S. Route 395 may contribute flow into the river during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks, soils prone to erosion (SR 10b), and sediment transported by local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and overall river gradient. Depositional bars are present within the reach (SR 10a). The vegetated riparian corridor helps to limit erosion and the delivery of fine sediment to the river.</p>	
<p>Water Quality</p> <p>SR 10b has a tributary (Deer Creek) that requires total maximum daily loads (TMDLs) for dissolved oxygen. Additionally, water quality may be slightly impacted by agricultural runoff in SR 10b and roadway runoff.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Reach 10 is within winter range for white-tailed deer, particularly for severe winter weather habitat. SR 10b is also noted as a heavy use wintering area for mule deer.</p> <p>SR 10a – This shoreline along this short subreach has little encroachment or disturbance within the shoreline jurisdiction. There are several outbuildings located within 60 feet of the shoreline at the end of 3rd Avenue outside of the Town of Orient, and some recreational use trails located on a large area of flat and moderately forested area between the shoreline and upland railroad. Riparian vegetation is characterized by coniferous/deciduous trees, shrubs, and grasses and is generally intact.</p>	

Kettle River – Reach 10	Ferry County
<p>SR 10b – This longer subreach is paralleled by U.S. Route 395 or railroad tracks along most of the subreach and includes areas of hardened banks. There is generally little land between the roadway or railroad berm and the water. Where there is most space, some sizable areas along the shoreline are either cleared for agricultural use, but mostly the area remains forested, with some small clearing for recreational access and residences.</p>	
Ecological Functions Analysis	
SR 10a	
<p>Level of Existing Function</p> <p>SR 10a is designated as Partially Functioning, based on limited riparian coverage near agricultural fields and limited rural residential development.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Fairly limited residential development within jurisdiction boundary • Agricultural field with private access roads near shoreline’s edge <p>Recreational use:</p> <ul style="list-style-type: none"> • Unauthorized water access points and rafting along river <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration planting efforts to reduce erosion and increase filtration near agricultural fields east of the channel. Concentrate recreational access points to specific locations.</p> <p>Potential Protection Opportunities</p> <p>Protect intact riparian and upland forested areas west of the channel.</p>	
SR 10b	
<p>Level of Existing Function</p> <p>SR 10b is designated as Partially Functioning, (borderline Functioning) based on transportation corridors limiting channel migration and limited riparian cover at the southern edge of this subreach.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Railroad corridor with a few segments in the jurisdiction boundary • U.S. Route 395 with a few segments in the jurisdiction boundary • Agricultural field with a fairly substantial riparian buffer (located to the west of the channel), also a larger field at the southern edge of subreach with less riparian coverage. <p>Recreational use:</p> <ul style="list-style-type: none"> • Informal water access points and rafting along river 	

Kettle River – Reach 10	Ferry County
Potential Restoration Opportunities Implement riparian restoration planting efforts to reduce erosion and increase filtration near agricultural field at southern edge of subreach. Concentrate recreational access points to specific locations.	
Potential Protection Opportunities Protect intact riparian and upland forested areas throughout subreach.	

Kettle River – Reach 11	Ferry County
Reach Description	
Kettle River from the SE ¼ of T38N_R37E_S18 to the SE ¼ of T38N_R37E_S20	
Shoreline Jurisdiction	
163 acres	
	
Source: https://fortress.wa.gov/ecy/coastalatlus/UICoastalAtlas/Tools/ShorePhotos.aspx	
Subreaches (SRs); see Map 8:	
Not applicable	
Characteristics	
Ownership	
Reach 11 is about 15% public (U.S. Bureau of Reclamation and Ferry County) and 85% private.	
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural 	
Current Shoreline Management Program Environment Designation:	
<ul style="list-style-type: none"> • Rural and Conservancy 	

Kettle River – Reach 11	Ferry County
<p>Existing Land Cover/Development</p> <p>Reach 11 has agricultural developments, as well as residential developments alongside of the river. Riparian vegetation, shrubland, and forest can be found between existing developments.</p>	
<p>Geomorphic Character</p> <p>Description – Through Reach 11, the Kettle River flows in a large, incised meander bend through a wide valley that consists of continental glacial drift and alluvium. Along the outside of the meander bend are glaciolacustrine deposits. A large off-channel area with multiple flowpaths is present in the floodplain just upstream of the meander bend. An outcrop of granodiorite is located along the downstream extent of the meander bend.</p> <p>Hardened Banks – None identified. No artificial hardened banks were identified within Reach 11.</p> <p>Channel Migration Zone – The CMZ is limited by the local geology and topography. The channel flowpath is entrained along the outside of the meander at the valley margin. The CMZ widens in an upstream area of active flowpaths and downstream of the meander bend in an area of historical flowpaths.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped in most of this reach, and a floodway is designated in the lower portion of the reach. The upper and lower portions of this reach have narrow floodplains, but the central portion of the reach has relatively wider floodplain areas. Where a floodway is delineated, the floodway area contains most of the floodplain.</p> <p>Geological Hazards – Reach 11 has soils susceptible to moderate to severe erosion. Reach 11 contains slopes that are greater than 15% and underlain by glacial continental drift, which make them designated landslide hazard areas. A seismic hazard area, rated moderate, to high is located in the downstream extent of Reach 11. No mine sites are located within Reach 11.</p>	
<p>Existing Public Access</p> <p>Reach 11 of the Kettle River is all privately owned and highly residential. There is no existing public access except for Barstow Bridge, which crosses the river in this reach. Floating the river throughout this reach is a popular summertime activity.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for this reach.</p> <p>Public Access Opportunities</p> <p>Because most of the land in this reach is private, public access opportunities are limited.</p>	
Ecological Conditions	
<p>Water Quantity and Sediment</p> <p>Reach 11 inflows include Toulou Creek and numerous unnamed tributary inflows. USGS flow data are not collected in this reach. However, flow data are collected upstream in Reach 6 near the Canada-United States border (USGS Gage #12404500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late</p>	

Kettle River – Reach 11	Ferry County
<p>summer, early fall, and winter. Runoff from local roadways and U.S. Route 395 may contribute flow into the river during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible alluvium and continental drift banks, soils prone to erosion, and sediment transported by local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and overall river gradient. Depositional bars are present within the reach.</p>	
<p>Water Quality</p> <p>In this reach, TMDLs are required for pH and dissolved oxygen. These requirements are based on samples collected from Ecology station #60A070, a long-term water quality station that has collected water quality data since 1960. At this station, Ecology states that overall water quality is of moderate concern (based on Water Year 2013 summaries). Water quality may be impacted by residential, wildlife, roadway, and agricultural runoff.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Reach 11 is within winter range for white-tailed deer, has medium-density use, and is also noted as a heavy-use wintering area for mule deer. The northern end of the reach is similar in condition to Reach 10. The southern end of the reach makes a turnaround an outcropping of land that has been cleared and developed for residential and small-scale agricultural use, and the shoreline has been stabilized. This area has insignificant tree cover along the shoreline and in the uplands, with some scattered trees associated with residences and some smaller trees remaining along the shoreline. The southern end of the reach includes most of a wetland complex on the offsite side of Barstow Bridge Spur Road. This area appears to be in good condition with a mix of upland, wetland, and riparian vegetation types.</p>	
Ecological Functions Analysis	
Reach 11	
<p>Level of Existing Function</p> <p>Reach 11 is designated as Impaired, based on residential development and transportation corridors limiting channel migration and significant upland clearing and crossing channel.</p>	
<p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Residential development, most concentrated in central portion of subreach, most development has carved out viewing corridors from the riparian buffer • Lower Barstow Bridge Road limits channel migration • Barstow Bridge Road crosses the channel • Agricultural field at southern edge of subreach <p>Recreational use:</p> <ul style="list-style-type: none"> • Unauthorized water access for river floating in the summertime 	

Kettle River – Reach 11	Ferry County
<p>Potential Restoration Opportunities</p> <p>Implement riparian restoration planting efforts to reduce erosion and increase filtration near agricultural field and along residential areas. Implement riparian restoration projects that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to increase shading and nutrient inputs near developed areas in central portion of subreach.</p> <p>Potential Protection Opportunities</p> <p>Protect intact wetland riparian and upland forested areas throughout subreach, particularly at the southern end.</p>	

Kettle River – Reach 12 Ferry County	
Reach Description	
Kettle River from the SE ¼ of T38N_R37E_S20 to the confluence with the Columbia River	
Shoreline Jurisdiction	
665 acres	
Source: https://fortress.wa.gov/ecy/coastalatlus/UICoastalAtlas/Tools/ShorePhotos.aspx	
Subreaches (SRs); see Map 9:	
<ul style="list-style-type: none"> • SR 12a – Begins at the SE ¼ of T38N_R37E_S20 and extends south to the from the SE ¼ of T37N_R37E_S04 near the downstream of Napoleon Road Bridge • SR 12b – Extends 1.5 miles to the south to the mouth of Deadman Creek • SR 12c – Extends 2.7 miles to the south to the confluence with the Columbia River 	
Characteristics	
Ownership	
Reach 12 is about 20% public (U.S. Bureau of Reclamation, Ferry County, and U.S. Department of the Interior) and 80% private.	

Kettle River – Reach 12	Ferry County
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural 	
Current Shoreline Management Program Environment Designation:	
<ul style="list-style-type: none"> • Rural and Conservancy 	
Existing Land Cover/Development	
Reach 12 has little development, except roads and railroads alongside the river. Shrubland, grassland, and wetlands are present in SR 12a and 12b. In SR 12c, forest becomes more dominant along steeper hillsides.	
Geomorphic Character	
Description –Through Reach 12, the Kettle River flows in a wide, low-gradient valley. Valley bottom and floodplain materials consist of continental glacial drift and alluvium. Local bedrock outcrops consist of granodiorite and marine metasedimentary rocks. Glacial outwash deposits are also present along the valley margin. Backwater effects from the Columbia River influence the river flows throughout this reach.	
Hardened Banks – Approximately 1,200 feet of artificial hardened banks are associated with the BNSF Railroad alignment as it crosses the Kettle River at the confluence with the Columbia River.	
Channel Migration Zone – The CMZ in SR 12a generally follows the margin of the valley bottom perimeter. The steep alley walls consist of bedrock to the east (left bank). The Kettle Falls International Railway and U.S. Route 395 alignments define the limit of channel migration to the west. The CMZ was not delineated for SR 12b and 12c due to the hydraulic nature (Columbia River backwater area) of the Kettle River throughout this reach because this segment of the river is generally ponded backwater from the Columbia River.	
Flooding and Geological Hazard	
Flooding – Floodplains are not mapped in this reach. SR 12b and 12c are in the backwater influence area from the Columbia River, so flooding is influenced by the Columbia River operations in these areas.	
Geological Hazards – Reach 12 has soils susceptible to moderate to severe erosion, and areas of severe erosion potential are dominant in SR 12c. SR 12a – 12c contain slopes that are greater than 15% and underlain by glacial continental drift and alluvial deposits, which make them designated landslide hazard areas. A seismic hazard area, rated moderate to high, is located in SR 12a and 12b. No mine sites are located within Reach 12.	
Existing Public Access	
Reach 12 is a mix of public and private lands. Kettle Falls campground, managed by the National Park Service, is located in this reach and provides camping, restrooms, a boat dock (no launch), fire pits, and picnic tables. U.S. Route 395 and railroad tracks run along portions of this reach’s western border. Napoleon Bridge and Barstow Bridge cross the river in this reach. The Kettle Falls International Railway	

Kettle River – Reach 12	Ferry County
<p>tracks also cross the river via a train trestle, which has created a public safety concern. People trespass on the trestle and jump off it into the water, despite numerous posted warning signs. There are several privately owned recreational vehicle parks in this reach that have water access. Floating and boating in this reach are popular summertime activities.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for this reach. Addressing public safety concerns associated with jumping off the train trestle should be addressed.</p> <p>Public Access Opportunities</p> <p>Public access opportunities may be adequate for this reach.</p>	
Ecological Conditions	
<p>Water Quantity and Sediment</p> <p>Reach 12 inflows include Hodgeson, Doyle, and Matsen creeks and numerous unnamed tributary inflows. USGS flow data are not collected in this reach. However, flow data are collected upstream in Reach 6 near the Canada-United States border (USGS Gage #12404500), including instantaneous flow data. Based on historical records, peak flows occur during the late spring, and low flows occur during the late summer, early fall, and winter. Runoff from local roadways and U.S. Route 395 may contribute flow into the river during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks, soils prone to erosion, and sediment transported by local runoff and surface drainages. Large depositional features are present throughout SR 12a, where contain large vegetated bars. In addition, sediment accumulates upstream of the river’s confluence with the Columbia River, as backwater conditions are present throughout most of the reach (SR 12b – 12c). Where present, a vegetated riparian corridor helps to limit erosion and the delivery of fine sediment to the river.</p>	
<p>Water Quality</p> <p>Reach 12 is not listed on Ecology’s 305b list. Water quality may be slightly impacted by agricultural, wildlife, and roadway runoff.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Reach 12 is a bald eagle wintering area (foraging and perching). This reach is also a migratory waterfowl concentration area during fall and winter and provides foraging sites. SR 12c is within wintering range and contains heavy-use areas for mule deer and white-tailed deer, with only medium density use noted for SR 12a and 12b.</p> <ul style="list-style-type: none"> • SR 12a – The shoreline along this subreach is relatively undeveloped. There is one crossing within this subreach at the Napoleon Road Bridge. In general, shoreline areas include a number of wetland complexes that may provide off-shore habitat areas that are occasionally inundated. Rail lines are adjacent to the shoreline in this subreach, located within less than 100 feet in some locations. Upland floodplain and riparian vegetation in this subreach is characterized by sandy grasslands, with small clusters of trees scattered along the shoreline, mixed with open sandy areas. 	

Kettle River – Reach 12	Ferry County
<ul style="list-style-type: none"> • SR 12b – The shoreline along this subreach, as the Kettle River approaches the Columbia River, shows evidence of shifting shorelines. Upland floodplain and riparian vegetation in this subreach is characterized by sandy grasslands and wetlands, with small clusters of trees scattered along the shoreline, mixed with open sandy areas. • SR 12c – The shorelines along this subreach are more steep and defined, and forested areas are present in the uplands. U.S. Route 395 runs along this subreach at the southern end. This subreach ends at the Columbia River and Kamlops Island, which has been stabilized to support the bridge and railroad crossings here. 	
Ecological Functions Analysis	
SR 12a	
<p>Level of Existing Function</p> <p>SR 12a is designated as Partially Functioning, based on limited riparian coverage areas sporadically throughout subreach, transportation crossings, and recreation infrastructure.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Boat ramp and associated parking lot within jurisdiction boundary • Napoleon Road Bridge crossing • Railroad corridor and Barstow Bridge Spur Road both limit channel migration in a few areas west of the channel <p>Recreational use:</p> <ul style="list-style-type: none"> • Gravel parking lots associated with paved boat ramp • Gravel road to boat ramp/trailhead and dirt roads outside of shoreline jurisdiction • Motorized boat use <p>Potential Restoration Opportunities</p> <p>Evaluate opportunities to incorporate aquatic habitat complexity (substrate, organic material, structural elements [e.g., LWD], and aquatic and riparian vegetation) along with soft bank stabilization techniques, particularly to support habitat substrate and water access opportunities near the recreation area in the southern portion of the subreach.</p> <p>Potential Protection Opportunities</p> <p>Protect native riparian vegetation to preserve and support re-establishment of this land-cover type.</p>	
SR 12b	
<p>Level of Existing Function</p> <p>SR 12b is designated as Partially Functioning, based on residential development and historical fill within channel.</p> <p>Stressors</p> <p>Upland development:</p>	

Kettle River – Reach 12	Ferry County
<ul style="list-style-type: none"> • Residential development at southern edge of subreach • Kettle River Road limits channel migration west of channel • Historical fill possibly associated with railroad or road infrastructure east of channel <p>Recreational use:</p> <ul style="list-style-type: none"> • Camping area with one dock • Motorized boat use <p>Potential Restoration Opportunities</p> <p>Evaluate feasibility of removing historical fill.</p> <p>Potential Protection Opportunities</p> <p>Protect native riparian vegetation to preserve and support re-establishment of this land-cover type.</p>	
SR 12c	
<p>Level of Existing Function</p> <p>SR 12c is designated as Partially Functioning, based on transportation corridors limiting channel migration, and agricultural development.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • U.S. Route 395, River Bridge Road, and railroad corridor limits channel migration • Railroad Bridge crosses channel • Overhead utilities crossing channel • Agricultural field west of channel <p>Recreational use:</p> <ul style="list-style-type: none"> • Unauthorized diving off of railroad trestle bridge • Motorized boating <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration planting efforts to reduce erosion and increase filtration near agricultural field west of channel.</p> <p>Potential Protection Opportunities</p> <p>Protect intact riparian and upland forested areas throughout subreach.</p>	

Toroda Creek Ferry County	
Reach Description	
Toroda Creek from Okanogan-Ferry County line to the confluence with the Kettle River	
Shoreline Jurisdiction	
223 acres	
	
Source: USDA NAIP 2013	
Subreaches (SRs); see Map 1:	
<ul style="list-style-type: none"> • SR 1a – Begins at Okanogan-Ferry County line and extends east to Toroda Creek Road channel crossing • SR 1b – Extends 3.2 miles to the east to the NW ¼ of T40N_R32E_S27 at the edge of the forested area • SR 1c – Extends 0.5 mile to the east to the confluence with the Kettle River 	
Characteristics	
Ownership	
Reach 1 is mostly private with a very small amount (less than 5%) of public ownership.	

Toroda Creek	Ferry County
<p>Land Use/Current Shoreline Management Program</p> <p>Land Use Designation:</p> <ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural <p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Rural 	
<p>Existing Land Cover/Development</p> <p>SR 1a and 1c include a few agricultural developments and other improvements. SR 1b has little development except roads alongside of the river. Existing land cover mostly consists of forest and shrublands.</p>	
<p>Geomorphic Character</p> <p>Toroda Creek flows within a low-gradient valley and floodplain comprised mostly of alluvium. The valley is moderately confined with wider floodplain areas occupied by wetlands and more complex channel patterns. Valley walls consist mostly of bedrock of the Klondike Mountain Formation (as rhyolite and continental sedimentary deposits).</p> <p>Description</p> <p>Hardened Banks – None identified. No artificial hardened banks appear to exist along Toroda Creek.</p> <p>Channel Migration Zone – The CMZ potential exists throughout the valley due to the presence of alluvium throughout the channel and floodplain. Channel migration is limited by the topography and bedrock channel and valley margins throughout much of its reach. Toroda Creek Road limits migration to the north along some segments.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are mapped through the entire reach. Floodplain widths are relatively moderate and do not appear to have much variation throughout the reach.</p> <p>Geological Hazards – Toroda Creek has soils susceptible to moderate to severe erosion. Toroda Creek contains slopes that are greater than 15% and underlain by alluvial deposits, which make them designated landslide hazard areas. A seismic hazard area, which is rated moderate to high, can be found in the most length of Toroda Creek. No mine sites are located within Toroda Creek.</p>	
<p>Existing Public Access</p> <p>Toroda Road runs along most of the Toroda Reach. There are several pull-offs along the road with pathways leading to the water. Toroda Creek is mostly privately owned, and there are no formal public access sites.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for Toroda Creek.</p>	

Toroda Creek	Ferry County
<p>Public Access Opportunities</p> <p>Because the land is privately owned, there are minimal public access opportunities. There is a parcel of Washington Department of Natural Resources land in the reach that could provide informal public access to Toroda Creek.</p>	
<p>Ecological Conditions</p>	
<p>Water Quantity and Sediment</p> <p>The major tributary inflows to Toroda Creek include Nicholson and Graphite creeks. Numerous unnamed tributaries flow into the stream along its alignment. No current flow data are collected for Toroda Creek or its tributaries.</p> <p>Sediment sources throughout the reach include the erodible alluvium banks, soils prone to erosion (SR 1b – 1c), slopes prone to landslides (SR 1b – 1c), and sediment transported by local runoff and surface drainages. Based on the stream’s gradient, sediment is mostly transported through SR 1b – 1c and enters Kettle River. Where present (mostly SR 1b – 1c), the vegetated riparian corridor helps to limit erosion and the delivery of fine sediment to the stream.</p>	
<p>Water Quality</p> <p>Toroda Creek is not listed on Ecology’s 305b list. Water quality in Toroda Creek may be impacted by agricultural, wildlife, and roadway runoff.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Toroda Creek is within winter range for mule deer, for both the resident population and Okanogan highlands population individuals. It is also within white-tailed deer winter range.</p> <ul style="list-style-type: none"> • SR 1a – SR 1a is adjacent to agricultural lands and pasture area, with clearing extending almost to the creek. There is a 20-foot band of vegetation of mostly larger trees immediately adjacent to the shoreline, and in some cases the creek forms marshy habitat areas around oxbows and meander areas. Toroda Creek Road crosses the creek twice and falls within shoreline jurisdiction within portions of this subreach. • SR 1b – The creek runs through a mix of agricultural lands and forested area for most of this subreach. In several stretches, the creek is not visible from aerial imagery due to the closed canopy of riparian trees. Where agricultural clearing has occurred, the riparian tree cover is limited to narrow bands on one or both sides of the creek, and the adjacent lands are used for crops or pasture areas. There are some residential parcels with large cleared areas that are located just outside of but uphill from Toroda Creek, and land-use practices here may generate runoff directed to Toroda Creek. • SR 1c – The creek in this subreach exhibits similar characteristics to SR 1b. As the creek approaches the Kettle River, more of the surrounding forested habitat has been cleared, and remaining trees are limited to those along the creek banks. The creek crosses under Toroda Creek Road prior to entering the Kettle River. 	

Toroda Creek	Ferry County
Ecological Functions Analysis	
SR 1a	
Level of Existing Function	
SR 1a is designated as Partially Functioning, based on impacts from grazing, agriculture, and transportation corridor.	
Stressors	
Upland development:	
<ul style="list-style-type: none"> • Overhead utility corridor (avian) • Agricultural and pastureland fields • Livestock operations with concentrated pens near the east end of this subreach • Toroda Creek Road crosses channel and within jurisdiction boundary throughout this subreach 	
Recreational use:	
<ul style="list-style-type: none"> • Pull-offs from Toroda Creek Road and informal trails to waterway (through private lands) 	
Potential Restoration Opportunities	
Reduce riparian and water quality impacts from livestock through expanded use of BMPs (e.g., exclusionary fencing and rotational grazing) for livestock operations within shoreline jurisdiction. Implement riparian restoration planting efforts to reduce erosion and increase filtration near agricultural fields and grazing adjacent to channel.	
Potential Protection Opportunities	
Limit recreation access within intact wetland areas. Implement or retrofit stormwater controls consistent with the Eastern Washington Stormwater Manual.	
SR 1b	
Level of Existing Function	
SR 1b is designated as Partially Functioning, based on impacts from grazing, residential development, agriculture, and transportation corridor.	
Stressors	
Upland development:	
<ul style="list-style-type: none"> • Rural residential development • Pasturelands used for livestock grazing • Informal dirt/gravel access roads • Small agriculture fields • A few short segments of Toroda Creek Road are within jurisdiction boundary 	

Toroda Creek	Ferry County
<p>Potential Restoration Opportunities</p> <p>Reduce riparian and water quality impacts from livestock through expanded use of BMPs (e.g., exclusionary fencing and rotational grazing) for livestock operations within shoreline jurisdiction.</p> <p>Potential Protection Opportunities</p> <p>Protect intact riparian and upland forested areas throughout subreach.</p>	
<p>SR 1c</p>	
<p>Level of Existing Function</p> <p>SR 1c is designated as Partially Functioning, based on impacts from grazing, and transportation corridor.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • Pasturelands used for livestock grazing and outbuildings • Informal dirt/gravel access roads • Toroda Creek Road crossing and corridor within jurisdiction boundary • Overhead utilities <p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to reduce erosion and increase filtration near grazing fields.</p> <p>Potential Protection Opportunities</p> <p>Protect intact riparian and shrub-steppe habitat areas throughout subreach.</p>	

South Fork Boulder Creek	Ferry County
Reach Description	
South Fork Boulder Creek from the SW ¼ of T38N_R35E_S27 to the confluence with North Fork Boulder Creek	
Shoreline Jurisdiction	
533 acres	
	
Source: USDA NAIP 2013	
Subreaches (SRs); see Map 7:	
Not applicable	
Characteristics	
Ownership	
Reach 1 is entirely managed by USFS.	
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land use is public lands • Rural 	
Current Shoreline Management Program Environment Designation:	
<ul style="list-style-type: none"> • Rural 	

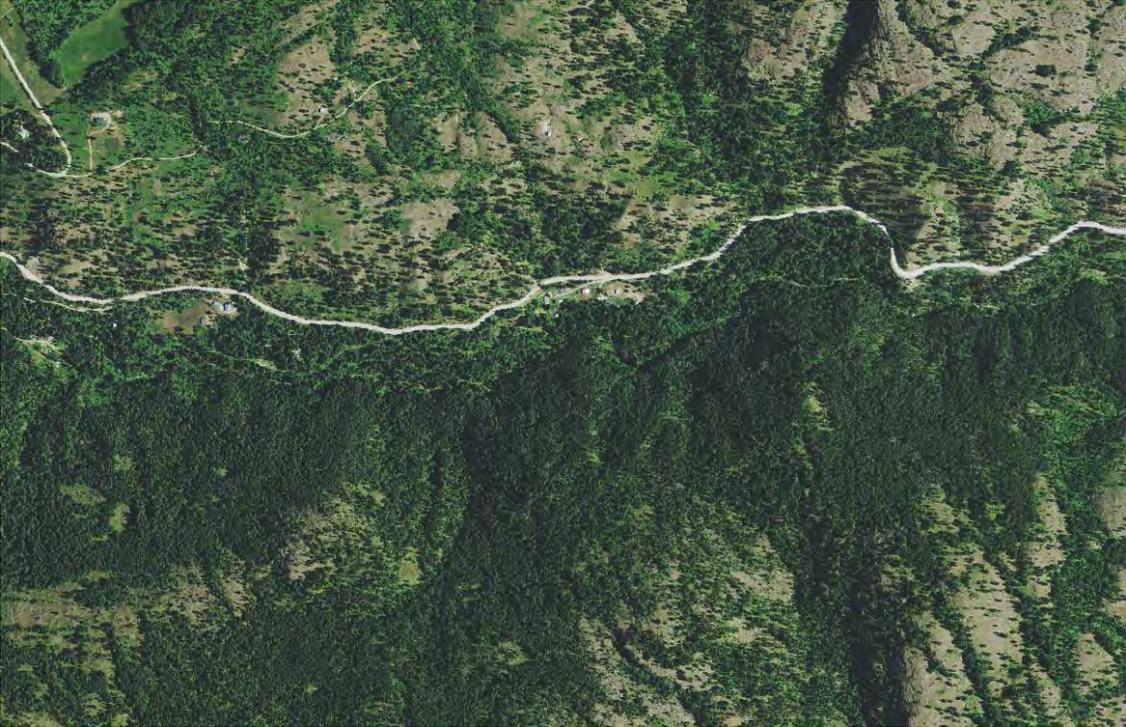
South Fork Boulder Creek	Ferry County
<p>Existing Land Cover/Development</p> <p>South Fork Boulder Creek is managed by USFS and remains in forested open space. Existing developments are very scarce, except for a few minor USFS roads.</p>	
<p>Geomorphic Character</p> <p>South Fork Boulder Creek flows within a moderately narrow, confined valley comprised mostly of continental glacial drift. Wider valley areas are occupied by wetlands and more complex channel patterns. Overall, the valley steepens and narrows upstream. Bedrock (as orthogneiss) is present along the channel and valley margins throughout most of this reach.</p> <p>Description</p> <p>Hardened Banks – None identified. No hardened banks appear to exist along South Fork Boulder Creek.</p> <p>Channel Migration Zone – Channel migration potential is limited by the narrow valley and presence of bedrock throughout. Wider valley areas comprising the glacial continental drift have a wider CMZ. Limited infrastructure is present throughout this reach to limit channel migration.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are not mapped in this reach. Floodplain widths appear to be relatively narrow due to the narrow valleys present along the reach.</p> <p>Geological Hazards – South Fork Boulder Creek has soils susceptible to severe erosion. South Fork Boulder Creek contains slopes that are greater than 15% and underlain by glacial continental drift, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within South Fork Boulder Creek.</p>	
<p>Existing Public Access</p> <p>South Fork Boulder Creek is managed entirely by USFS. USFS Road #6110 runs the length of the reach. There are several informal pull-offs along the road, but no significant public access points.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements identified for South Fork Boulder Creek.</p> <p>Public Access Opportunities</p> <p>The area is heavily wooded and steep in some areas, limiting potential opportunities for public access.</p>	
Ecological Conditions	
<p>Water Quantity and Sediment</p> <p>The major tributary inflows to South Fork Boulder Creek include Tom, Echo, Slide, M J B, Friday, Bulldog, and Trio creeks. Numerous unnamed tributaries flow into the stream along its alignment. No current flow data are collected for South Fork Boulder Creek or its tributaries.</p> <p>Sediment is likely transported through much of South Fork Boulder Creek due to its relatively steep gradient. Sediment sources throughout the reach include the erodible continental glacial drift banks, soils prone to erosion, steep slopes prone to landslides, and sediment transported by local runoff and</p>	

South Fork Boulder Creek	Ferry County
<p>surface drainages. The well-vegetated riparian corridor likely helps to limit erosion and the delivery of fine sediment to the stream.</p>	
<p>Water Quality</p> <p>The upstream extent of South Fork Boulder Creek is listed as a water of concern for dissolved oxygen on Ecology’s 305b list. Water quality is likely more affected by natural processes than anthropogenic processes due to the relatively undisturbed conditions except for ongoing erosion from bridge washout.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>This Creek has minimal developed habitat and is entirely under federal ownership. It has low levels of public access due to rugged terrain limiting access points. This area is within habitat identified for lynx, white-tailed deer, and mule deer.</p>	
Ecological Functions Analysis	
South Fork Boulder Creek	
<p>Level of Existing Function</p> <p>South Fork Boulder Creek is designated as Functioning based on lack of development and intact riparian and upland forest.</p>	
<p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • USFS access road (NF-6110); washed out bridge 	
<p>Potential Restoration Opportunities</p> <p>Rebuild bridge</p>	
<p>Potential Protection Opportunities</p> <p>Protect native riparian and upland forest habitat.</p>	

Boulder Creek	Ferry County
Reach Description	
Boulder Creek from North Fork and South Fork Boulder Creek confluence to the confluence with the Kettle River	
Shoreline Jurisdiction	
126 acres	
	
Source: USDA NAIP 2013	
Subreaches (SRs); see Map 7:	
Not applicable	
Characteristics	
Ownership	
Reach 1 is 50% public (USFS) and 50% private.	
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural 	
Current Shoreline Management Program Environment Designation:	
<ul style="list-style-type: none"> • Rural 	

Boulder Creek	Ferry County
<p>Existing Land Cover/Development</p> <p>Most of Boulder Creek remains in forested open space. Existing developments include USFS roads, U.S. Route 395, a railroad crossing, and a few residential developments.</p>	
<p>Geomorphic Character</p> <p>Boulder Creek flows within a narrow, confined valley comprised mostly of continental glacial drift. Limited floodplain areas exist. Bedrock (marble) is present along the channel and valley margins through a portion of this reach.</p> <p>Description –Hardened Banks – None identified. No hardened banks appear to exist along Boulder Creek.</p> <p>Channel Migration Zone – The CMZ throughout the valley is relatively limited due to the narrow, confined valley. The presence of bedrock along the channel and valley margin limits migration through a portion of the reach. In addition, the Deer Creek/Boulder Creek Road is located along the northern valley margin and limits migration to the north.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are not mapped for this reach. Floodplain widths appear to be relatively narrow due to the confined valley.</p> <p>Geological Hazards – Boulder Creek has soils susceptible to severe erosion. Boulder Creek contains slopes that are greater than 15% and underlain by glacial continental drift, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Boulder Creek.</p>	
<p>Existing Public Access</p> <p>More than half of Boulder Creek is privately owned. Boulder Creek Road runs the length of the reach. The other portion of Boulder Creek is managed by USFS. USFS Road #6110 starts in this reach. There is a wide pullout at the beginning of Road #6110 with informal paths down to the water.</p> <p>Identified Public Access Improvements</p> <p>There are no identified public access improvements for Boulder Creek.</p> <p>Public Access Opportunities</p> <p>There are opportunities for public access on the land managed by USFS; however, much of the area is steep and heavily wooded, reducing the number of potential access sites.</p>	
Ecological Conditions	
<p>Water Quantity and Sediment</p> <p>The major tributary inflows to Boulder Creek include North Fork Boulder Creek. Numerous unnamed tributaries flow into the stream along its alignment. No current flow data are collected for Boulder Creek or its tributaries.</p> <p>Sediment is likely transported through much of Boulder Creek, due to its relatively steep gradient. Sediment sources throughout the reach include the erodible continental drift banks, soils prone to erosion, steep slopes prone to landslides, and sediment transported by local runoff and surface</p>	

Boulder Creek	Ferry County
<p>drainages. The well-vegetated riparian corridor likely helps to limit erosion and the delivery of fine sediment to the stream.</p>	
<p>Water Quality</p> <p>Boulder Creek is listed as a water of concern for pH, bacteria, temperature, and dissolved oxygen on Ecology’s 305b list. A TMDL is in place for temperature at the downstream extent of the creek. Water quality may have been impacted from roadway, wildlife, and agricultural runoff, as well as cattle grazing and a lack of effective shade areas.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>This reach is noted for a heavy presence of mule deer and is within the winter range for white-tailed deer. The upstream third of Boulder Creek within this reach is under federal ownership. The creek is surrounded by forested area, which generally forms a closed canopy over the creek. Outside of the national forest land, there is some land cleared for agricultural development and there are residential parcels within forested areas. Boulder Creek Road is adjacent to the creek at the beginning of the reach and is often within 100 feet of the creek bank. The creek is crossed by Hodgen Lake Road, U.S. Route 395, and railroad tracks before it reaches the Kettle River.</p>	
Ecological Functions Analysis	
Boulder Creek	
<p>Level of Existing Function</p> <p>Boulder Creek is designated as Partially Functioning, based on impacts from transportation corridors, and recreation use.</p>	
<p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • U.S. Route 395 and road crossings and segments within the jurisdiction boundary • Railroad corridor crossing near the outlet • Limited rural residential development <p>Recreational use:</p> <ul style="list-style-type: none"> • Informal pullouts and water access points on USFS land 	
<p>Potential Restoration Opportunities</p> <p>Implement riparian restoration projects near privately owned lands in agricultural/grazing fields that may include passive (e.g., Conservation Reserve Expanded Program riparian buffers or protected area conservation easements) or active (e.g., plantings) efforts to reduce erosion and increase filtration.</p>	
<p>Potential Protection Opportunities</p> <p>Protect native riparian and upland forest vegetation to preserve and support re-establishment of this land-cover type.</p>	

Deadman Creek	Ferry County
Reach Description	
Deadman Creek from the NW ¼ of T37N_R36E_S23 to the confluence with the Kettle River	
Shoreline Jurisdiction	
267 acres	
	
Source: USDA NAIP 2013	
Subreaches (SRs); see Map 9:	
Not applicable	
Characteristics	
Ownership	
Reach 1 is about 15% public (USFS, U.S. Department of the Interior, and Washington Department of Natural Resources) and 85% private.	
Land Use/Current Shoreline Management Program	
Land Use Designation:	
<ul style="list-style-type: none"> • Current land uses are private ownership and public lands • Rural 	

Deadman Creek	Ferry County
<p>Current Shoreline Management Program Environment Designation:</p> <ul style="list-style-type: none"> • Unavailable – Not included in the existing Shoreline Management Plan 	
<p>Existing Land Cover/Development</p> <p>Deadman Creek mostly consists of forested, open space. Existing developments include private residential buildings, USFS roads, U.S. Route 395, and a railroad crossing.</p>	
<p>Geomorphic Character</p> <p>Deadman Creek generally flows within a moderately narrow, confined valley comprising glacial outwash. Wider valley areas exist and are occupied by floodplains and wetlands. Overall, the valley steepens and narrows upstream. Bedrock (as orthogneiss) has a limited presence throughout the reach.</p> <p>Description –Hardened Banks – None identified. No artificial hardened banks appear to exist along Deadman Creek.</p> <p>Channel Migration Zone – Channel migration potential is generally limited by the narrow valley width. Wider CMZs occur in the floodplain and wetland areas. Limited infrastructure is present throughout this reach, controlling channel migration.</p>	
<p>Flooding and Geological Hazard</p> <p>Flooding – Floodplains are not mapped in this reach. Floodplain widths appear to be relatively narrow.</p> <p>Geological Hazards – Deadman Creek has soils susceptible to severe erosion. Deadman Creek contains slopes that are greater than 15% and underlain by glacial continental drift, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Deadman Creek.</p>	
<p>Existing Public Access</p> <p>There are no formal public access sites in Deadman Creek. Deadman Creek Road runs along most of the reach, which is mostly privately owned. There is some land managed by USFS.</p> <p>Identified Public Access Improvements</p> <p>There are no public access improvements that have been identified for Deadman Creek.</p> <p>Public Access Opportunities</p> <p>There are potential public access opportunities for the portions of Deadman Creek that are managed by the USFS; however, much of it is heavily wooded and steep, limiting the potential development.</p>	
Ecological Conditions	
<p>Water Quantity and Sediment</p> <p>The major tributary inflows to Deadman Creek include Camp Creek. Numerous unnamed tributaries flow into the stream along its alignment. No current flow data are collected for Deadman Creek or its tributaries.</p>	

Deadman Creek	Ferry County
<p>Sediment is likely transported through much of Deadman Creek, due to its relatively steep gradient. Sediment sources throughout the reach include the erodible continental glacial drift banks, soils prone to erosion, steep slopes prone to landslides, and sediment transported by local runoff and surface drainages. The well-vegetated riparian corridor likely helps to limit erosion and the delivery of fine sediment to the stream.</p>	
<p>Water Quality</p> <p>The creek has a tributary listed as a water of concern list for dissolved oxygen on Ecology's 305b list. Water quality is likely more affected by natural processes than anthropogenic processes due to the relatively undisturbed conditions.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Deadman Creek is identified as a regular wintering area (foraging and perching) for bald eagles. It is a medium- to heavy-use wintering area for mule deer. There are significant migratory waterfowl concentrations around Deadman Creek during fall and winter, as the area provides foraging opportunities.</p> <p>Much of the upland habitat along Deadman Creek remains forested, and the riparian areas are generally still contiguous with the surrounding upland forest habitat. Much of the land is privately owned, and there are numerous residences along both sides of the creek through the length of the floodplain, with the exception of a small area that is under federal management. These residences are both within and outside of the shoreline jurisdiction area. The creek is near Deadman Creek Road, as well as a number of small access roads related to residences. It is crossed by Murphy Road and U.S. Route 395. At the mouth of Deadman Creek, there is a wetland complex with a small inlet that appears accessible via boats.</p>	
Ecological Functions Analysis	
Deadman Creek	
<p>Level of Existing Function</p> <p>Deadman Creek is designated as Partially Functioning, based on impacts from transportation corridors, and rural residential development. USFS lands are Functioning.</p>	
<p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • U.S. Route 395 and USFS roads throughout jurisdiction, including crossings • Railroad corridor at the eastern end of the creek • Rural residential development, mostly concentrated at the eastern end of the creek 	
<p>Potential Restoration Opportunities</p> <p>Evaluate opportunities to incorporate aquatic habitat complexity (substrate, organic material, structural elements [e.g., LWD], and aquatic and riparian vegetation) east of National Forest lands.</p>	
<p>Potential Protection Opportunities</p> <p>Protect native riparian and upland forest vegetation.</p>	

Curlew Creek	Ferry County
Existing Land Cover/Development	
Most of Curlew Creek is privately owned and includes a mix of agricultural and residential developments. Shrubland, wetland, and grassland comprise the rest of Curlew Creek.	
Geomorphic Character	
Curlew Creek flows within a broad valley that consists of continental glacial drift. Valley margins and hillsides consist of bedrock and continental glacial drift. Transportation infrastructure present throughout the valley limits the extent of the floodplain and controls channel migration. When the channel is not impeded by infrastructure, the floodplain is wider and wetlands occur throughout. Evidence of historical channels is present within select floodplain areas.	
Description	
Hardened Banks – Approximately 1,950 feet of hardened banks exist along Curlew Creek and are associated with the Ferry County Rail Corridor alignment.	
Channel Migration Zone – The CMZ along Curlew Creek is limited by the Highway 21 and Ferry County Rail Corridor alignments that parallel the creek. These two alignments result in an overall narrow CMZ throughout this reach. In areas where the stream is not limited by this infrastructure, the potential for channel migration exists and results in a wider CMZ.	
Flooding and Geological Hazards	
Flooding – Floodplains are mapped throughout this reach. Floodplain widths are relatively narrow throughout the reach.	
Geological Hazards – Curlew Creek has soils susceptible to moderate to severe erosion. Curlew Creek contains slopes that are greater than 15% and underlain by glacial continental drift, which make them designated landslide hazard areas. No mine sites or areas susceptible to seismic hazards are located within Curlew Creek.	
Existing Public Access	
The Ferry County Rail Corridor runs along most of Curlew Creek. The trail provides access to walkers, bicyclists, and horseback riders and ADA motorized use. State Route 21 runs the length of Curlew Creek.	
Identified Public Access Improvements	
There are no public access improvements identified for Curlew Creek.	
Public Access Opportunities	
Curlew Creek is entirely privately owned. The area is mostly in agriculture, thus public access opportunities are limited.	
Ecological Conditions	
Water Quantity and Sediment	
The major tributary inflows to Curlew Creek include Lambert, Saint Peter, Art, Aeneas and Tonasket creeks. Numerous unnamed tributaries flow into the stream along its alignment. No current flow data are collected for Curlew Creek or its tributaries. Runoff from Highway 21, local roadways, and	

Curlew Creek	Ferry County
<p>adjacent agricultural lands may contribute flow into the stream during the wet season and during periods of snowmelt.</p> <p>Sediment sources throughout the reach include the erodible continental drift banks, soils, and slopes prone to erosion, and sediment transported by local runoff and surface drainages. Conditions for sediment transport and deposition occur throughout this reach and depend on the local hydraulics and stream gradient. With the low gradient of Curlew Creek, depositional features are present. Areas of recent bank movement (erosion) are present along the stream's alignment.</p>	
<p>Water Quality</p> <p>Curlew Creek has two tributaries where TMDLs are required for temperature (Lambert Creek and Saint Peter Creek) and bacteria (Saint Peter Creek). Water quality may be impacted from residential, roadway, wildlife, and agricultural runoffs. A lack of effective shade and upland grazing may also impact water quality in this creek.</p>	
<p>Habitat Characteristics and Priority Habitat Species Presence</p> <p>Curlew Creek is known to support white-tailed deer year-round, with high concentrations in the winter. Important waterfowl areas are associated with the remaining wetlands of the Curlew Valley. The wetland areas have high biodiversity of species, including waterfowl, fish, frogs, and turtles. This creek is within an important waterfowl rearing area and supports great blue heron and kingfisher.</p> <p>Curlew Creek runs through a relatively wide floodplain valley, where much of the surrounding land has been cleared for agricultural land use and used for pasturing livestock or croplands. Crops or pasture extend very close to the creek, and in some locations livestock have severely reduced or eliminated riparian vegetation at highly used access points. In general, there is a minimal amount of remaining, undisturbed riparian vegetation in this reach. The creek is crossed numerous times by State Route 21 and other local access roads, and is highly constrained from migration in some areas because of the presence of railroad beds and stabilization. There are a number of residences, outbuildings, or warehouse structures within the shoreline jurisdiction boundary, as well as other structures and developed areas outside of the shoreline boundary that may be connected to the creek via upland runoff. The reach ends near where West Curlew Lake Road meets State Route 21.</p>	
Ecological Functions Analysis	
<p>Curlew Creek</p> <p>Level of Existing Function</p> <p>Curlew Creek is designated as Partially Functioning, based on impacts from transportation corridors, rural development, and agricultural fields.</p> <p>Stressors</p> <p>Upland development:</p> <ul style="list-style-type: none"> • A number of channel crossings and channel confinement barriers from Highway 21, local roads, and a railroad corridors • Irrigated agricultural fields with limited vegetated filter/riparian corridors; significant algal blooms at Curlew Lake • Rural residential development and agricultural outbuildings within jurisdiction boundary 	

Curlew Creek	Ferry County
<p>Recreational use:</p> <ul style="list-style-type: none">• Ferry County Rail Corridor use <p>Potential Restoration Opportunities</p> <p>Create easements to encourage planting of grass or woody planting strips between agricultural fields and stream banks.</p> <p>Potential Protection Opportunities</p> <p>Protect native riparian and wetland vegetation to preserve and support re-establishment of this land-cover type. Promote land-use BMPs for water quality improvements within the basin to reduce influx of nutrients into Curlew Lake to reduce algal blooms and protect aquatic habitat.</p>	