AN EVALUATION OF ECOSYSTEM RESTORATION AND MANAGEMENT OPTIONS FOR LEE METCALF NATIONAL WILDLIFE REFUGE

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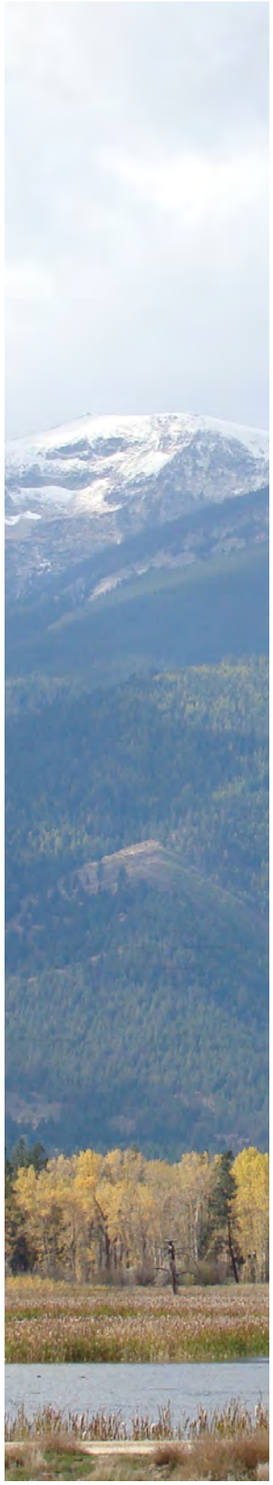

EXECUTIVE SUMMARY

Lee Metcalf National Wildlife Refuge (NWR) is a relatively small (ca. 2,800 acre) refuge in the Bitterroot River Valley of southwest Montana. The refuge was authorized for management of migratory birds and incidental fish and wildlife-orient recreation, protection of natural resources, and conservation of endangered and threatened species. The historic ecosystem in the Bitterroot Valley contained diverse forest, wet meadow, grassland, and wetland communities. This ecosystem now is highly altered and degraded from construction of extensive roads, ditches, levees, dams, and water-control structures in the Bitterroot River floodplain; tile drainage and discharge from surrounding agricultural lands; water diversions and irrigation systems on and adjacent to the refuge, and expansion of invasive plant species. The channel of the Bitterroot River has been altered from levees, bank stabilization, and some channelization. Lee Metcalf NWR also is located in an area of rapid human population growth and residential development and is extensively used by the public.

In 2009, a Comprehensive Conservation Plan (CCP) was initiated for Lee Metcalf NWR. This CCP process is being facilitated by an evaluation of ecosystem restoration and management options using hydrogeomorphic methodology (HGM). This report provides HGM analyses for Lee Metcalf NWR with the following objectives:

1. Identify the pre-European ecosystem condition and ecological processes in the Bitterroot River floodplain near Lee Metcalf NWR.

2. Evaluate changes in the Lee Metcalf NWR ecosystem from the Presettlement period with specific reference to alterations in hydrology, vegetation community structure and distribution, and resource availability to key fish and wildlife species.

3. Identify restoration and management options and ecological attributes needed to successfully restore specific habitats and conditions within the area.

The Bitterroot River Valley extends about 120 miles from the confluence of the East and West Forks of the Bitterroot River south of Darby to its junction with the Missoula Valley and Clark Fork River five miles south of Missoula. The Valley is a structural trough formed during the late Cretaceous emplacement of the Idaho batholiths and is bounded by the Bitterroot Mountains on the west and the Sapphire Mountains on the east. Four geomorphic surface zones occur on or near Lee Metcalf NWR and include: 1) Holocene floodplain of the Bitterroot Valley, 2) low elevation alluvial fans that extend into the floodplain, 3) high elevation, mostly Quaternary-derived terraces adjacent to the floodplain on the west side of the valley, and 4) high elevation Tertiary-derived outcrop benches/terraces on the east side of the valley.

The Bitterroot River has inherent unstable hydraulic configuration and high channel instability. The river reach immediately upstream from Lee Metcalf NWR has a complex multi-strand channel pattern that is characterized by numerous braided channels that historically spread over a wide area of the valley bottom. The main channel system has widened and straightened since 1937 and bank erosion is common. Chutes and side channels facilitate overbank flooding and complex networks of minor floodplain drainage channels occur throughout the floodplain. Two major tributaries to the Bitterroot River (North Burnt Fork Creek and Three Mile Creek) flow through Lee Metcalf NWR.

Nearly 25 soil types are present on or adjacent to Lee Metcalf NWR and the juxtaposition of soils reflects the numerous channel migrations of the Bitterroot River across the floodplain. Most soils on the refuge are shallow, with thin veneers of silt and clay over deeper sand and gravel. Sandy subsoil layers outcrop in many places near the river.

The climate of the Bitterroot Valley is characterized by cool summers, low precipitation, and relatively mild winters. Annual precipitation averages about 13 inches, but is variable related to position in the valley. The growing season is about 103 days. Spring is the wettest period of the year, with about 25% of annual precipitation falling in May and June. Runoff in the Bitterroot River is highest in spring, with about 55% of annual river discharge occurring in May and June following snowmelt and local rainfall. Flows in the Bitterroot River decline throughout summer and remain relatively stable through winter. The river exceeds 1,050 cubic-feet/second (cfs) at a 50% annual recurrence interval and causes some water to back flood into floodplain depressions and drainages. Modest overbank flooding occurs at > 10,000 cfs and a > 50-year recurrence interval. The last major overbank flood event at Lee Metcalf NWR was in 1974.

Historic vegetation in the Bitterroot River floodplain at Lee Metcalf NWR included seven distinct habitat/community types: 1) Riparian/Riverfront-type Forest, 2) floodplain Gallery-type Forest, 3) Persistent Emergent, 4) Wet Meadow Herbaceous, 5) Floodplain and Terrace Grassland, 6) Saline Grassland, and 7) Grassland-Sagebrush. Riverfront Forest contains mainly cottonwood and willow on newly deposited and scoured gravelly-sand and fine sandy loam soils near the active channel of the Bitterroot River. Gallery Forest is dominated by cottonwood and ponderosa pine, has a shrub understory, and is present on higher floodplain elevations with veneers of Chamokane loam soil along natural levees and point bar terraces adjacent to minor floodplain tributaries. Low elevation oxbows, depressions, and off-channel areas historically supported Persistent Emergent wetland vegetation such as cattail. These habitats typically have poorly drained Slocum loam-clay soils. Some sites adjacent to Persistent

Emergent communities contained diverse Wet Meadow vegetation dominated by sedges, rushes, and water tolerant grasses. The majority of higher elevations within the Lee Metcalf NWR floodplain region were covered with grasses and some scattered shrubs. Sites that had occasional surface flooding contained wet Grassland communities with interspersed herbaceous plants such as smartweed and sedges, while higher floodplain terraces, slopes, and alluvial fans contained mixed grasses and shrubs such as rabbit brush, sage, needle and thread, and june grass. Certain sites on Lee Metcalf NWR have saline soils that historically supported more salt tolerant grassland species. A composite map of potential historic vegetation communities, based on HGM attributes, is presented.

The Bitterroot River floodplain at Lee Metcalf NWR historically supported a wide diversity of animal species associated with the interspersed riverine, floodplain, wetland, and grassland habitats. Migratory birds are especially abundant in the region. Resources historically used by animals were seasonally dynamic and annually variable. Most bird species exploited seasonal resources during spring migration and summer; few species overwintered in the area. Many waterbird likely stayed in the Valley during wet summers to breed when floodplain wetlands had more extensive and prolonged water regimes. In contrast, limited numbers of waterbirds probably bred in the region in dry years.

The first European settlement in Montana was established at the present day site of Stevensville, near the Lee Metcalf NWR, in 1841. Early land use of the valley was primarily cattle grazing. Discovery of gold in western Montana in the mid-1950s fueled immigration of settlers to the state and a short lived flurry of gold exploration and mining occurred in the Bitterroot Valley. By the 1870s, the economy of the area was almost solely based on local agricultural crops, cattle production and some timber harvest. The dry climate of the valley created annual variation in the availability of water to support crops, and water rights in the region were quickly appropriated and subsequent adjudication occurred. In the early 1900s, the Bitterroot Valley Irrigation

Company started construction of a major irrigation system including construction of Lake Como, a diversion dam on Rock Creek, many miles of conveyance canal, and associated siphons, distribution ditches, and water-control structures. Drought, insufficient water delivery for orchard crops, and Depression era economics exacerbated water problems in the valley and ultimately curtailed large scale agricultural development in the region in the mid 1900s. The Bureau of Reclamation assumed operation of the Irrigation Company in the early 1930s and has made extensive improvements and repair to the irrigation delivery system to its current condition.

Agricultural and irrigation developments and increasing human populations greatly altered the Bitterroot Valley by the time the Lee Metcalf NWR was established in 1963. Most Riparian and Gallery Forest and floodplain grassland was cut, cleared, and/or converted to alternate land uses by the mid 1900s. Irrigation ditches significantly altered floodplain drainage and hydrology. Numerous roads were built in the region and a rail line and bridge was constructed at the north boundary of Lee Metcalf NWR. By the early 1990s, Ravalli County had the fastest growing population and residential expansion in Montana, which now surrounds the refuge. Irrigation development and changed land uses significantly altered hydrology and channel morphology of the Bitterroot River and caused degradation and loss of wetlands in this ecosystem.

Following acquisition, the U.S. Fish and Wildlife Service began extensive physical developments on floodplain lands at Lee Metcalf NWR. By the late 1980's, over 1,000 acres had been partly or completely impounded in 14 ponds for managed wetland units. These impoundments have been subsequently managed by diverting irrigation and tile drain water, flows in minor channels and tributaries, and Three Mile Creek water into and through the impoundments. Lee Metcalf NWR has 24 water rights claims and one permit totaling 50,495 acre-feet/year. Since establishment, most wetland impoundments have been managed to promote waterfowl production by holding water through summer or year round. Otter Pond

was stocked with warm-water fish in 1989. Level ditching, siphons, water-control structures, and sediment removal have been constructed in and near impoundments. Over 25 miles of road are present on the refuge. Certain upland areas were converted to warm-season grasses for dense nesting cover for waterfowl and predator exclusion fences were built around some fields. In the 1960s and early 1970s, some fields on the refuge were planted to small grains.

Collectively, the many landscape and hydrological changes in the Bitterroot Valley have dramatically changed the ecosystem at Lee Metcalf NWR, which now has: 1) reduced area of Riparian and Gallery Forest, 2) Increased Persistent Emergent and Open Water habitat, 3) increased Herbaceous Wetland, 4) decreased native Grassland, 5) increased agricultural and tame grass fields, and 6) increased invasive and exotic plant species. These vegetation community changes also have caused changes, and declines, in abundance and distribution of native animal species. Many of the management developments at Lee Metcalf NWR have attempted to convert this semi-arid and inherently dynamic western river floodplain-terrace ecosystem into more of a Northern Great Plains wetland basin system that supported consistent and higher waterfowl production. In essence, management and development of Lee Metcalf NWR since the 1960s have not been consistent with the naturally occurring physical, biotic, and sustaining ecological features of the site.

This report identifies options to restore and manage natural ecosystem processes, functions, and values at Lee Metcalf NWR based on hydrogeomorphic characteristics of the historic and current system. Comprehensive restoration of native communities and sustaining processes will be difficult because of: 1) the small size of the refuge, 2) the insular nature of the refuge that increasingly is surrounded by urban/residential development, 3) highly modified landforms and communities on and adjacent to the refuge, 4) constraints on sustaining the inherently unstable morphology and hydrology of the Bitterroot River, and 5) high public use and competing demands for refuge management and access. Despite these

challenges, future management of Lee Metcalf NWR should seek to:

1. Maintain the physical and hydrological character of the Bitterroot River and its floodplain on Lee Metcalf NWR.

2. Restore the natural topography, water regimes, and physical integrity of surface water flow patterns in and across the Bitterroot River floodplain and adjacent terraces and alluvial fans.

3. Restore and maintain the diversity, composition, distribution, and regenerating mechanisms of native vegetation communities in relationship to topographic landscape position.

Specific recommendations are provided to conduct restoration and management options for each of the above goals and to monitor and evaluate future management in an adaptive management framework.

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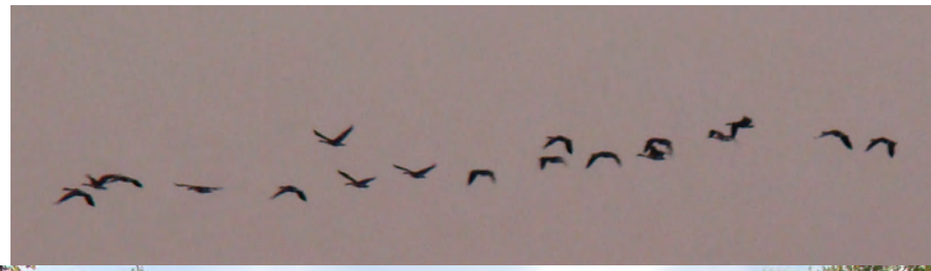

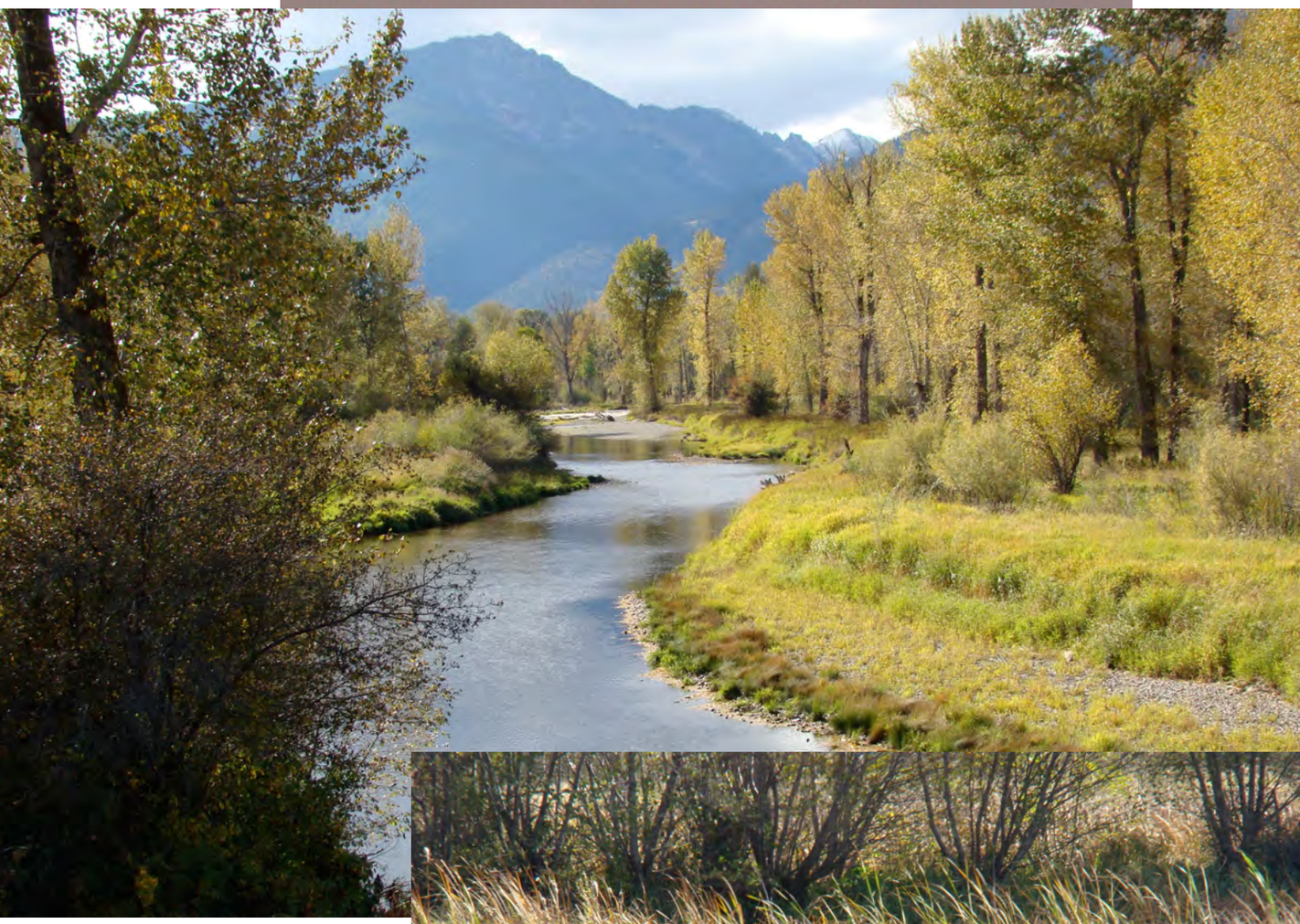

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