

APPENDIX I – GEOGRAPHIC INFORMATION SYSTEM (GIS)

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1. Overview

The Catherine Creek Tributary Assessment (TA) provides technical information to decision makers tasked with implementing habitat rehabilitation projects pertaining to Reclamation responsibilities described in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. The goal of the TA is to describe and prioritize the potential for habitat rehabilitation within discrete stream segments. The Catherine Creek TA's findings provides the basis for future, detailed studies that identify site-specific projects that will promote viable, sustainable steelhead and spring Chinook populations within the Grande Ronde subbasin.

The TA is conducted over a geographic extent that generally encompasses a watershed. Specific to the Catherine Creek TA this translates to the Catherine Creek hydrologic system from the confluence with State Ditch, upstream past the towns of Cove and Union, and including the tributaries and headwaters of Catherine Creek. Though primary emphasis is placed on conditions and processes within the watershed, broader scale information is required for regional context.

The Catherine Creek TA is a relatively coarse-level investigation sufficient to provide the scientific basis for describing 1] spatio-temporal distribution and habitat use of listed steelhead and Spring Chinook, 2] geomorphic conditions and processes that influence habitat dynamics, 3] abiotic and biotic in-stream conditions, and 4] land use within the watershed that may affect habitat quality and condition.

The role of Geographic Information Systems (GIS) in conducting the TA is to make geospatial and spatio-temporal data and analytical tools available to resource specialists to: 1] describe the properties associated with specific site locations based on spatially coincident phenomena, 2] identify inter-connectivity and dynamics within the landscape over time that influences site conditions, and 3] create cartographic products to present the assessment area information.

2. Technical Approach

The Catherine Creek TA was conducted in collaboration with the following partners and contributors:

- Grande Ronde Model Watershed
- Union County Soil and Water Conservation District
- Oregon Department of Fish and Wildlife
- Natural Resource Conservation Service

- Bureau of Reclamation
- NOAA Fisheries
- Confederated Tribes of the Umatilla Indian Reservation
- U.S. Fish and Wildlife Service
- Oregon Water Resources Department

In addition, the area had been studied prior to conducting the TA, which suggests the existence of pertinent data and information for the Grande Ronde subbasin that could contribute to the conduct of the TA. Therefore, the technical approach in building geospatial data holdings for the Catherine Creek TA emphasized:

1. Identification and acquisition of existing data and information;
2. Developing a strategy to integrate multi-source geospatial into a common project library and identify standardized site and / or feature reference;
3. Identifying information gaps and data needs, filling information gaps and meeting associated data needs by processing data or generating new data sets; and
4. The design and development of a data library structure to facilitate data-sharing and distribution between the various Catherine Creek TA partners and contributors.

3. GIS Tasks

GIS-specific tasks included the acquisition of data, data processing, and spatial analyses, production of cartographic maps and figures, and geospatial data management in terms of compilation, storage, and distribution. Data acquisition, processing, and management are described below. Detailed description of the data that were acquired and the processing that was performed is organized by data theme and annotated with summarized metadata reporting identification and source information (complete metadata records are available with the data). The results of geospatial data management are presented as an outline of the compiled library. The cartographic maps and figures are presented in the various other reports for which they were specifically produced.

3.1 Data Acquisition

Existing data includes reference geospatial data authored and maintained by government agencies for use in various applications (e.g., National Hydrography Dataset and National Elevation Dataset maintained by USGS, National Agriculture Imagery Program (NAIP) administered by USDA's Farm Service Agency). Other existing data pertinent to the Catherine Creek TA was created specifically for local or regional studies and is often more detailed, in both resolution and content. As such, the data acquisition effort involved searching various sources to assemble a comprehensive, multi-scale geospatial data library for use in the Catherine Creek TA. The data acquisition effort was important in that using existing data minimizes the laborious effort of creating data (or otherwise, recreating, and/or duplicating data) and provides a valid basis to associate or correlate the current TA with previous or potential future work undertaken within the study area.

3.2 Data Processing and Creation

While existing data are specific to target themes they generally cover broad spatial extent and are attributed with a large number and wide range of data values. This is done intentionally so the data can be applied and are relevant at regional, national, and even global scales. Much of the data processing performed for the Catherine Creek TA involved spatially filtering datasets into more manageable subsets. Likewise, the number of attributes may have been reduced and/or other TA-specific attributes added to make the subset applicable to the immediate information requirements of the TA. In other cases, data are received in formats that are not readily useable in GIS and require processing to be made functional. The processing may include conversion from ASCII or binary files, geo-rectification and geo-referencing or other preparation of source data that makes it amenable to spatial processing and analysis.

Not all the geospatial data needs for the Catherine Creek TA are met in acquiring existing data. The creation of new data is in fact a significant part of conducting the TA and is undertaken by various resource specialists. Data created from field collection and the products of modeling are described in the perspective specialists' report.

3.3 Data Storage and Documentation

A defined data management strategy for the collection, creation, sharing, and storage of geospatial data ensures that a relevant, comprehensive, and well-documented collection of geospatial is readily available for timely analyses and reporting in the Catherine Creek TA. The preceding sections have addressed aspects of the technical approach relating to 1) collecting and integrating data from previous, associated studies, 2) making data from multiple sources compatible for use in the current assessment, and 3) processing data

into formats that can be used in the various analyses. This section outlines aspects of data management specifically related to data storage and documentation. A well-structured data library facilitates the discovery of data by TA team members and cooperating partners; well-documented data informs users of appropriateness for use.

4. Data Acquisition and Processing

4.1 Aerial Photography

Current and historic aerial photography provides image representation of past and present conditions from which spatially and temporally explicit changes in the landscape can be identified and described.

4.1.1 Historic

Historic aerial photography for 1956, 1964, and 1971 was obtained from the University of Oregon Map Library through the Map and Aerial Photography Research Service (MAPRS). Aerial photographs were requested for the geographic extent covered by the 2007 and 2009 aerial photography. The University of Oregon MAPRS scanned archived contact prints at 600 dots per inch (dpi) and delivered the scanned images to Reclamation in Tiff format. Reclamation Pacific Northwest Regional GIS Specialists (PNGIS) geo-rectified and geo-referenced the individual images for use in GIS.

Reclamation obtained historic aerial photography for 1937 from the Natural Resources Conservation Service office archives in La Grande, Oregon. Idaho Blueprint Service of Boise scanned the contact prints at 450 dpi and provided the imagery to Reclamation's GIS in digital format who then geo-rectified and geo-referenced the digital imagery.

National Agriculture Imaging Program (NAIP) aerial photography for 1994 and 2004 was obtained from the Aerial Photography Field Office (APFO) and delivered as compressed county mosaics (CCMs). The 1994 and 2004 CCMs cover all of Union County, Oregon. The CCMs required no processing by PN GIS to make them useable in GIS.

4.1.2 Current

High-resolution (6-inch spatial resolution, i.e., instantaneous field of view) aerial photography was acquired for all of Catherine Creek in 2007 and 2009 (Figure 1). The 2007 acquisition included Catherine Creek and the immediate valley from the confluence of Catherine Creek and the old channel of the Grande Ronde River (river mile [RM] 23.3) upstream to RM 42.6. The 2009 acquisition included areas downstream and upstream of the 2007 acquisition. The downstream area included Catherine Creek

and the immediate valley from the confluence of Catherine Creek and State Ditch (RM 0.0) upstream to RM 23.8. The upstream area extended from RM 42.5 to RM 52 (approximately 2.9 river miles downstream of the confluence of the north and south forks of Catherine Creek). The 2007 and 2009 aerial photography were delivered to Reclamation as ortho-rectified imagery.

NAIP aerial photography for 2009 was accessed through the Oregon Imagery EXPLORER ArcGIS Server (<http://navigator.state.or.us/ArcGIS/services>).

4.2 Biologic

Geospatial data of fish habitat distribution provide the combined knowledge gained from years of sampling and the professional field experience of numerous biologists. Stream reach based information is compiled for extensive geographic areas.

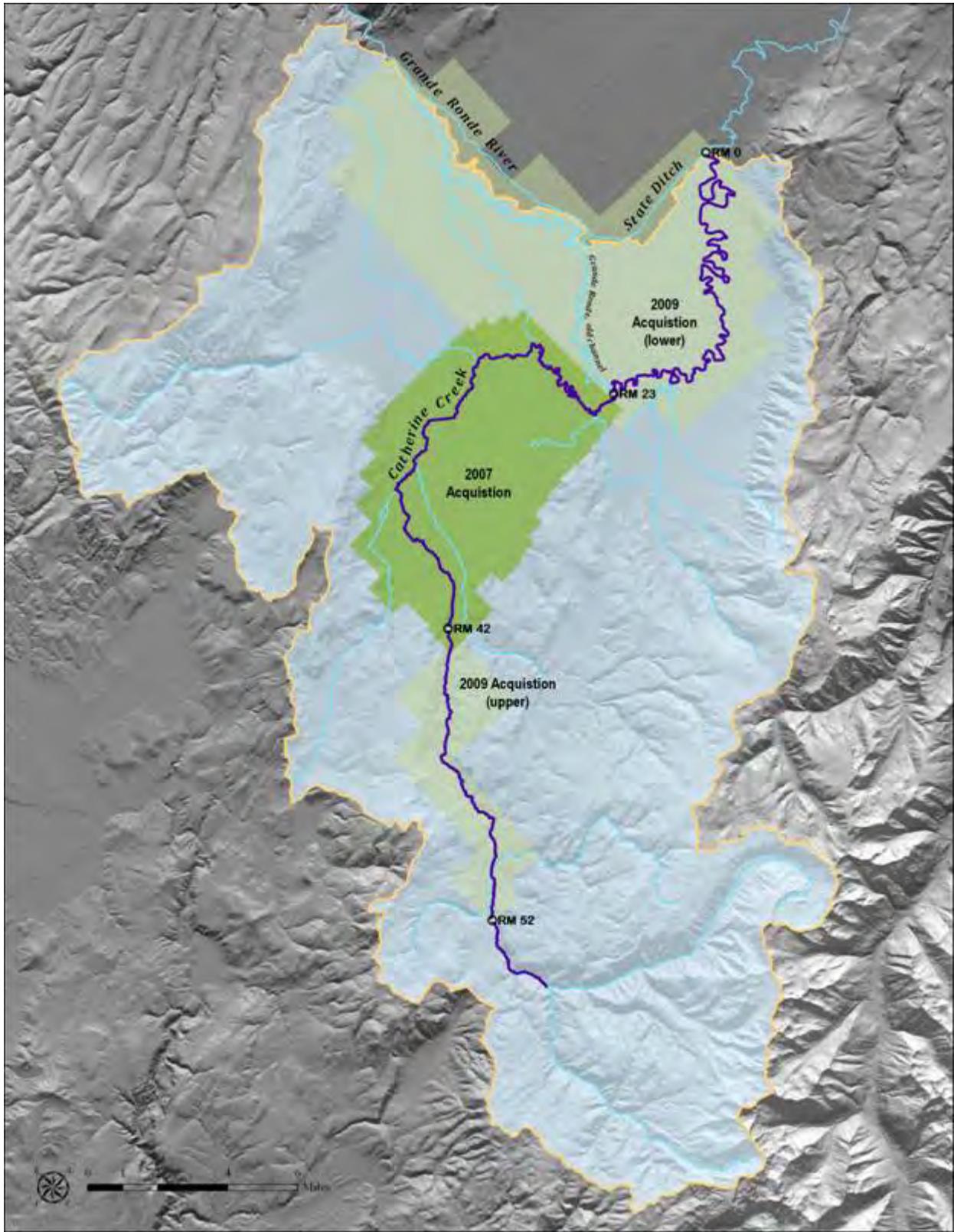


Figure 1. Areas of aerial photography and LiDAR acquisition.

Fish distribution data, as geospatial data, was obtained from the Oregon Department of Fish and Wildlife (ODFW) Natural Resource Information Management Program (NRIMP) for spring Chinook and summer steelhead (<http://nrimp.dfw.state.or.us/nrimp/default.aspx?pn=fishdistdata>). The data is the product of years of field survey and the professional judgment of ODFW and other natural resource agency staff biologists. The datasets include fish distribution throughout the state of Oregon. The data was clipped to represent fish habitat distribution limited to the Catherine Creek watershed and Grande Ronde subbasin.

An on-going study is being undertaken by ODFW biologist at the La Grande Fish Research Station to track juvenile spring Chinook in the Catherine Creek system. Juvenile Chinook were captured and a small tracking device was implanted in each fish. Using radio telemetry, the locations of the fish were recorded with GPS on a regular basis. Data for the period of October 2009 through March 2010 were provided to PNGIS. Using the geographic coordinates collected with GPS, the tabular data were converted to geospatial data in GIS. The data were also linked to the Catherine Creek river mile (segment) dataset and through a process called 'spatial join', the river mile attribute was read into the juvenile location dataset. This enabled summary statistics to be generated for fish location based on river mile with relationships drawn between other features referenced by river mile.

4.3 Climate

As an element of the hydrologic cycle, precipitation data provides important information (in terms of amount and distribution) towards understanding surface hydrologic flows.

Average monthly and annual precipitation data were obtained from the PRISM Climate Group at Oregon State University as separate datasets for each month and the annual summary. The datasets were received in raster format and cover the entire continental United States. PNGIS Specialists clipped the datasets to the boundary extents of the Catherine Creek watershed and Grande Ronde River contributing area. 'Clipping' (i.e., reducing the data to the bounds of an area of interest), was performed to reduce the datasets to manageable sizes and facilitate use for cartography. The fields 'inches', 'red', 'green', and 'blue' were added to the PRISM value attribute table. The values 'inches' were calculated as a conversion from the source values (millimeters times a factor of 100) to inches. The 'red', 'green', and 'blue' values comprise RGB values to emulate the PRISM colormap and provide consistent symbology between each month's dataset. This resulted in a gradient of color from low precipitation to high precipitation with precipitation amounts being symbolized by the same color between all maps.

Summary statistics of average monthly and annual precipitation were produced for the Catherine Creek watershed, stratified by watershed (i.e., the hydrologic contributing areas associated with established stream gage stations).

4.4 Elevation

Digital terrain surfaces provide the means to depict landform, model surface hydrologic flow, and study the processes by which landscapes are formed.

LiDAR (Light Detection And Ranging) data were collected in 2007 and 2009 (simultaneous and coincident with aerial photography acquisition, Figure 1) to provide high-resolution terrain surface information for analysis and modeling. The LiDAR data were delivered ready for use; no additional processing was required. This high-resolution data (1-meter postings) is appropriate for use at large scales (narrow geographic extent). At this resolution, historic stream channels within the active channel migration zone are detectable.

NED (National Elevation Dataset) 10-meter digital elevation models (DEMs) were obtained for use at small scales (i.e., broad geographic extent). The datasets were obtained as binary floating-point value (FLT) files with geographic extents of 1/3 arc-second. Files were processed into separate tiles (each tile is 1 degree latitude by 1 degree longitude square) and merged (i.e., seamlessly combined) into one contiguous dataset and was assigned the GCS NAD 83 (Geodetic Coordinate System North American Datum 1983) geographic projection. The merged dataset was processed to remove sinks (an anomalous convergence and termination of surface flow) to prepare the dataset for generating flow models. The 'corrected' surface model was then re-projected to the Lambert Conformal Conic NAD 83 geographic projection. This is a conformal projection (all angles at each point are preserved) suitable for mapping a range of scales (continent, region, and medium and large scale) and suitable for use in topographic and geologic applications as well as cartographic presentation. The 10-meter DEM does not reveal the surface detail that is realized with the 1-meter LiDAR-derived surface models, but provides a more manageable dataset (relative to data size and processing overhead) for use at broad geographic extent (extending beyond and thereby including all areas within the Catherine Creek watershed).

Since large areas within the Catherine Creek watershed have minimal topographic relief, the 10-meter DEM was reconditioned to adjust surface elevations and force flow to mapped stream channels. The process (using AGREE) drops surface elevations corresponding to vector flowline. Given the resolution of the DEM, the flow accumulation matrix could construct numerous parallel channels within flat terrain. With reconditioning, flow direction is managed by the adjusted surface and the flow accumulation matrix reflects the actual channel location.

Processing was performed on the 10-meter DEM to compute hydrological terrain parameters, which include flow models (flow direction and flow accumulation matrix) and catchments. Where flow direction and a flow accumulation matrix were interim products, catchments were the final, desired product. Catchments were generated for the Grande Ronde River, Catherine Creek, and stream networks defined based on stream flow measurement locations.

4.5 Geology

Geology and soils data provides insight into the processes and dynamics that shape the landscape in historic and current times as well under potential future scenarios.

Geology data were obtained from the Oregon Department of Geology and Mineral Industries (DOGAMI). The geospatial data were reprocessed to represent surficial geology according to the designations developed by Ferns and McConnell (DOGAMI 2002). The dataset was clipped to the Grande Ronde River contributing area and Catherine Creek watershed. The designations are a combination of field values for ‘group’ and ‘label’, so the geographically filtered attribute table was reduced to those two fields.

The Soil Survey Geographic (SSURGO) database was obtained from the USDA Natural Resources Conservation Service for Union County and the Wallowa-Whitman National Forest. The database consists of both geospatial and tabular datasets. The geospatial datasets representing the soil map units (soilsmu_a_625 and soilsmu_a_631) were clipped to the Catherine Creek watershed and linked to tabular datasets through a GIS function “data join.” The first join was between the geospatial attribute table and the ‘component’ table, linking the fields “mucky/”. The ‘component’ table directly links to the geospatial and carries the field “cokey” which enables additional linkage to other tables. The additional linkage made in this case was to the ‘cogeomordesc’ table using the “cokey” field. The geospatial data were exported to retain the cogeomordesc attributes in the geospatial attribute table. The two geospatial datasets (soilsmu_a_625 and soilsmu_a_631) were combined into a single dataset. The field “geomfname” was used to perform summary statistics and symbolize the dataset in cartography to report and represent geomorphic landform.

4.6 Hydrography

Hydrographic datasets were obtained from the USGS (National Hydrography Dataset (NHD)) and the Pacific Northwest Hydrography Framework (PNHF) as the basis for representing stream networks and water bodies in the Grande Ronde subbasin and Catherine Creek watershed. The datasets were ‘clipped’ to reduce the national (NHD) and regional (PNHF) to the geographic extents of the Catherine Creek TA. The clipped

flow line (stream network) datasets were modified to reflect recent changes to Ladd Creek.

A river mile dataset was created for use as a standardized means to reference locations on Catherine Creek. This was accomplished by copying the Grande Ronde River and Catherine Creek flowlines from source data and creating a single line segment. The line was divided at 528-foot intervals, and the processing results were output to both point and line datasets, representing discrete point locations tenth-mile line segments, respectively.

It should be noted that the source hydrographic datasets retain the name “Grande Ronde River” for the stream segment between State Ditch and the historic confluence of Catherine Creek and the Grande River. Since the flow of the Grande Ronde River was diverted through State Ditch, the Grande Ronde River stream channel between most upstream point of State Ditch and Catherine Creek (referred to in the Catherine Creek TA as the old channel of the Grande Ronde River) has become non-existent within some stretches of the former, primary channel. This has resulted in a modification of hydrology within that area. Whereas, prior to the construction of State Ditch, the Catherine Creek watershed would have extended upstream from what is now the old channel of the Grande Ronde River, in the Catherine Creek TA the Catherine Creek watershed extends upstream from the confluence with most downstream point of State Ditch and includes the old channel of the Grande Ronde.

Watershed analyses for the Catherine Creek TA were performed based on present day hydrology. Catherine Creek and the Catherine Creek watershed include what were historically stream channels and catchments of the Grande Ronde River. Watershed analyses for the Catherine Creek TA were performed using modified hydrographic datasets (recognizing hydrologic changes induced by State Ditch) and 10-meter NED.

Other analysis related to hydrography and conducted for the Catherine Creek TA includes the calculation of drainage density within the Catherine Creek watershed.

4.7 Lands and Land Use/Land Cover

Lands and land cover / land use data were obtained from numerous sources, including Union County Assessor’s Office, USDA Farm Service Agency (FSA) and Forest Service, and USGS.

4.7.1 Legal boundary

Geospatial data with tax lot parcels for Union County and the associated database identifying legal owners was purchased from Union County (Department of Revenue, Cadastral Information Systems Unit). The purpose in acquiring this dataset was to use it

in requesting permission to access property in the course of conducting fieldwork for the Catherine Creek TA. Two copies were maintained; a full copy was provided to the Grande Ronde Model Watershed (GRMW) and the second copy was distributed through the geospatial data library. The geospatial data library copy was purged of all personal information and only contained map tax lot number (a unique identifier for properties) and the property owner's last name. The process for requesting access was to first identify the properties in GIS that would be associated with field survey efforts and record the tax lot map numbers for those properties. This information was provided to GRMW personnel who then request the access permissions. GRMW developed a related database that included point of contact information for each property and records of when contacts were made, type of contact made, purpose of access, and the dates of access.

4.7.2 Land Cover / Land Use

Geospatial data for agriculture in Union County was obtained in both vector and raster data formats. The common land unit geospatial dataset (digitized agricultural field boundaries) was obtained from the FSA. This dataset provided areal delineation but contained no data identifying land use / land cover. It served as the basis for mapping land cover in the area; minimizing digitizing efforts and adopting pre-established boundaries for land cover / land use. Other land cover / land use data developed from Landsat 7 imagery was obtained from the USGS. The USGS National Land Cover Database (NLCD) includes 21 classes of land cover / land use derived the imagery. Other independent datasets including per-pixel estimates of percent imperviousness and percent tree canopy were also obtained with the NLCD. All these datasets were clipped to reduce their extent from national coverage to that of the Grande Ronde River contributing area and Catherine Creek watershed.

Other datasets relating to land cover modification (i.e., wildland fire and timber harvest) within the Wallowa-Whitman National Forest was obtained from the USDA Forest Service.

4.8 Water Quality and Hydrology

FLIR (Forward Looking Infrared) imaging of Catherine Creek was obtained from the Oregon Department of Environmental Quality (ODEQ). The imagery had been acquired by ODEQ in 1999 for the preparation of Total Maximum Daily Load (TMDL) reports. FLIR provides spatially continuous data of surface water temperature and is used to identify spatial variability of temperatures. Thermal changes can be associated with confluences of tributaries, land cover patterns, and subsurface hydrology (groundwater inflow or springs) and thereby used to identify the environmental conditions influencing

stream temperature. For purposes of the Catherine Creek TA, this information is applied to assess fish habitat quality.

The 1999 FLIR images are not geo-rectified and therefore not directly suitable for use in GIS. The nadir (ground center point) of each photo was recorded by GPS (Global Positioning System) at the time of capture. The spatially enabled photo points were attributed with photo-specific summary statistics (mean, maximum, and minimum temperature) to produce a temperature profile that could be used in GIS in conjunction with other geospatial data.

An array of gaging stations on the Grande Ronde River and Catherine Creek are providing temporally continuous data for water quality and hydrologic analyses. The array consists of stations that were installed and maintained by the USGS and Oregon Water Resources Department (OWRD) supplemented with stations installed by Reclamation specifically for the Catherine Creek Tributary Assessment. The station locations were created into geospatial data by GPS-derived geographic coordinates of each station. Watershed processing was performed to generate catchments for each gaging stations in order to relate data received from that gaging station to its hydrologically connected area within the tributary assessment study area. Each station represents the most downstream point (i.e., the pour point) of the hydrologically defined catchment. Summary statistics for gaging stations were stratified by catchment.

5. Data Storage and Documentations

A geospatial data library was designed and assembled which contained all the data acquired and collected for the Catherine Creek TA. The purpose of the geospatial data library is to distribute and make the data available to resource specialists conducting the TA. It is therefore imperative to document the geospatial data with Federal Geographic Data Committee (FGDC) compliant metadata. Metadata provides information about the data including general description, sources, processing, spatial reference, access and use restrictions, and contacts. It is also important to organize the library such that it will support a logical search. The Catherine Creek TA geospatial data library is organized by theme and geographic extent. The geographic extents are the Catherine Creek watershed and the Grande Ronde “subbasin” (combined HUC 8-digit subbasins Lower Grande Ronde, Upper Grande Ronde, Wallowa, and Innaha). A complete listing of the geospatial data library by theme is provided below. Those datasets warranting description are annotated with a summary (identification information and, where applicable, source citation) of the metadata.

Biologic-Ecologic

Catherine Creek Watershed

SpringChinook_20091021_20091230¹

Grande Ronde Subbasin

Chinook_Reaches²

Steelhead_Reaches³

Climate

Catherine Creek Watershed

Precip_01_Jan_CCW⁴
Precip_02_Feb_CCW⁴
Precip_03_Mar_CCW⁴
Precip_04_Apr_CCW⁴
Precip_05_May_CCW⁴
Precip_06_Jun_CCW⁴
Precip_07_Jul_CCW⁴
Precip_08_Aug_CCW⁴
Precip_09_Sep_CCW⁴
Precip_10_Oct_CCW⁴
Precip_11_Nov_CCW⁴
Precip_12_Dec_CCW⁴
Precip_Annual_CCW⁴

Grande Ronde Subbasin

Precip_01_Jan_GR⁴
Precip_02_Feb_GR⁴
Precip_03_Mar_GR⁴
Precip_04_Apr_GR⁴
Precip_05_May_GR⁴
Precip_06_Jun_GR⁴
Precip_07_Jul_GR⁴
Precip_08_Aug_GR⁴
Precip_09_Sep_GR⁴
Precip_10_Oct_GR⁴
Precip_11_Nov_GR⁴
Precip_12_Dec_GR⁴
Precip_Annual_GR⁴

Elevation

Grande Ronde Subbasin

ned10m_dem⁵
ned10m_hshd⁶

Upper Grande Ronde LiDAR

be_lcath_shd (Lower Catherine Creek 2009 bare earth, hillshade)
be_lowcath (Lower Catherine Creek 2009 bare earth, DEM)
be_ucath_shd (Upper Catherine Creek 2009 bare earth, hillshade)
be_upcath (Upper Catherine Creek 2009 bare earth, DEM)
c_be_dem (Catherine Creek 2007 bare earth, DEM)
c_be_hsd (Catherine Creek 2007 bare earth, hillshade)
c_hh_dem (Catherine Creek 2007 highest hit, DSM)
c_hh_hsd (Catherine Creek 2007 highest hit, hillshade)
hh_lowcath_shd (Lower Catherine Creek 2009 highest hit, hillshade)
hh_lowcath (Lower Catherine Creek 2009 highest hit, DSM)
hh_ucath_shd (Upper Catherine Creek 2009 highest hit, hillshade)
hh_ucath (Upper Catherine Creek 2009 highest hit, DSM)

Geology and Soils

Catherine Creek Watershed

Landform_CCW⁷
SurficialGeology_CCW⁸

Hydrography

Catherine Creek Watershed

CatherineCreek_mainstem_rm⁹
CatherineCreek_mainstem_segment¹⁰

CatherineCreek_mainstem_wc ¹¹

CatherineCreekWatershed ¹²

Grande Ronde Subbasin

fp100yr_UnionCounty ¹³

fp500yr_UnionCounty ¹⁴

GrandeRondeContributingArea ¹⁵

MNHD_carto_20100518 ¹⁶

Landcover

Catherine Creek Watershed

CCW_canopy ¹⁷

CCW_impervious ¹⁸

CCW_landcover ¹⁹

fireHis_pnt_boehne ²⁰

fireHis_poly_boehne ²¹

past_harvest_boehne (Wallowa-Whitman NF Timber Harvest History, 1976-2008)

Grande Ronde Subbasin

GR_canopy ¹⁷

GR_impervious ¹⁸

GR_landcover ¹⁹

Lands

Grande Ronde Subbasin

clu_public_a_or61 ²²

TaxlotParcels_UnionCounty ²³

Water Quality

Grande Ronde Subbasin

Lakes_303d_2004_2006

Streams_303d_1998

Streams_303d_2002

Streams_303d_2004_2006

Imagery

CatherineCreek_Orthos_2008 (associated with LiDAR acquisition, see Product Reports)

CatherineCreekGeorectified_1937 (historical imagery acquired from USDA NRCS (Union County, La Grande Service Center), scanned by Idaho Blueprint Service (Boise, ID), and georectified by Reclamation PN GIS)

CatherineCreekGeorectified_1956 (historical imagery acquired from University of Oregon Map Library, georectified by Reclamation PN GIS)

CatherineCreekGeorectified_1964 (historical imagery acquired from University of Oregon Map Library, georectified by Reclamation PN GIS)

CatherineCreekGeorectified_1971 (historical imagery acquired from University of Oregon Map Library, georectified by Reclamation PN GIS)

LowerCatherineCreek_Orthos_2009 (associated with LiDAR acquisition, see Product Reports)

UnionCounty_CCM (historical imagery acquired from APFO)

naip_1-1_2n_s_or601_2004_2.sid

ortho_e1-1_s_or061_1994.sid

UpperCatherineCreek_Orthos_2009

MetaData Summaries

¹ Identification Information:

Originator: Bureau of Reclamation, La Grande Field Office and Oregon Department of Fish and Wildlife La Grande Fish Research Station

Title: Spring Chinook Locations on Catherine Creek, Grande Ronde Subbasin, 21 October 2009 through 30 December 2009

Abstract: Monitored locations of tagged Spring Chinook in Catherine Creek.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for

mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset was created through the joint Reclamation and Oregon Department of Wildlife Spring Chinook Over-wintering Study. The intent of the study is to determine spatio-temporal distribution of Spring Chinook salmon in Catherine Creek, a tributary of the Grande Ronde River. This is an on-going study; this data will be appended as more observations are recorded.

² **Identification Information:**

Originator: Oregon Department of Fish and Wildlife

Publication_Date: 20100205

Title: Oregon Fish Habitat Distribution - Spring Chinook

Edition: 1

Abstract: Oregon Fish Habitat Distribution

These data describe areas of suitable habitat believed to be used currently by wild, natural, and/or hatchery fish populations. The term "currently" is defined as within the past five reproductive cycles. This information is based on sampling, the best professional opinion of Oregon Dept. of Fish and Wildlife or other natural resources agency staff biologists or modeling. Habitat distribution data are mapped at a 1:24,000 scale statewide and are based on the Pacific Northwest Framework Hydrography dataset. The data were developed over an extensive time period ranging from 1996 to 2009.

Purpose: To provide an inventory of fish habitat distribution for documentation, mapping and analysis.

Source_Contribution: ODFW District Biologists and fisheries biologists from other state, federal and tribal natural resource agencies.

³ **Identification Information:**

Originator: Oregon Department of Fish and Wildlife

Publication_Date: 20100309

Title: Oregon Fish Habitat Distribution - Summer Steelhead

Edition: 1

Abstract: Oregon Fish Habitat Distribution

These data describe areas of suitable habitat believed to be used currently by wild, natural, and/or hatchery fish populations. The term "currently" is defined as within the past five reproductive cycles. This information is based on sampling, the best professional opinion of Oregon Dept. of Fish and Wildlife or other natural resources agency staff biologists or modeling. Habitat distribution data are mapped at a 1:24,000 scale statewide and are based on the Pacific Northwest Framework Hydrography dataset. The data were developed over an extensive time period ranging from 1996 to 2009.

Purpose: To provide an inventory of fish habitat distribution for documentation, mapping and analysis.

Source_Contribution: ODFW District Biologists and fisheries biologists from other state, federal and tribal natural resource agencies.

⁴ **Identification Information:**

Originator: The PRISM Climate Group at Oregon State University.

Publication_Date: 061206

Title: Catherine Creek Watershed and Grande Ronde Contributing Area Average Monthly and Annual Precipitation, 1971-2000

Abstract: This data set [a subset of the source data set] contains spatially gridded average monthly and annual precipitation for the climatological period 1971-2000. Distribution of the point measurements to a spatial grid was accomplished using the PRISM model, developed and applied by Chris Daly of the PRISM Climate Group at Oregon State University.

Purpose: Display and/or analyses requiring spatially distributed monthly or annual precipitation for the climatological period 1971-2000.

⁵ **Identification Information:**

Originator: Bureau of Reclamation, Pacific Northwest Region

Title: Grande Ronde Subbasin 10-meter National Elevation Dataset DEM, April 2010

Abstract: National Elevation Dataset 10-meter DEM for Lower Grande Ronde, Upper Grande Ronde, Wallowa, And Imnaha Hydrologic Unit 8 subbasins and surrounding areas.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset provides a digital elevation model for the FCRPS Grande Ronde Subbasin at 10-meter resolution.

Source Information:

Originator: U.S. Geological Survey (USGS)

Publication Date: 2009

Title: National Elevation Dataset (NED)

Edition: 2

Source Contribution: geometry and land surface elevation values

⁶ **Identification Information:**

Originator: Bureau of Reclamation, Pacific Northwest Region

Title: Grande Ronde Subbasin 10-meter Shaded Relief, April 2010

Abstract: National Elevation Dataset 10-meter DEM for Lower Grande Ronde, Upper Grande Ronde, Wallowa, And Imnaha Hydrologic Unit 8 subbasins and surrounding areas.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset provides a shaded relief for the FCRPS Grande Ronde Subbasin at 10-meter resolution.

Source Information:

Originator: U.S. Geological Survey (USGS)

Publication Date: 2009

Title: National Elevation Dataset (NED)

Edition: 2

Source Contribution: geometry and land surface elevation values

⁷ **Identification Information:**

Originator: Bureau of Reclamation, Pacific Northwest Regional Office

Title: Catherine Creek River-mile, Union County, OR

Abstract: Catherine Creek river-mile based on Pacific Northwest (PNW) Hydrography Framework water course.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset provides standardized river miles to be used in the Catherine Creek Tributary Assessment which relate (though not exactly*) to river miles published on Grande Ronde Drainage Basin (Water Resources Dept., Salem Oregon, 1975). The 'comments' field in the feature attribute table notes where oxbows have since been separated from the main channel and are currently disconnected.

* Source data were processed in GIS and do not relate directly to the cartographic dimensioning of the water course.

Source Information:

Originator: OR BLM/USFS

Publication Date: 20050829

Title: Washington and Oregon Framework Hydrography

Source Contribution: Geospatial data geometry

⁸ **Identification Information:**

Originator: Bureau of Reclamation, Pacific Northwest Regional Office

Title: Catherine Creek Stream Segments, Union County, OR

Abstract: Catherine Creek flowline extracted from the Pacific Northwest (PNW) Hydrography Framework and segmented in tenth-mile intervals.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset provides a standardized flowline, segmented into tenth-mile intervals, and referenced with river mile for use in database relationships for the Catherine Creek Tributary Assessment. River mile segments relate (though not exactly*) to river miles published on Grande Ronde Drainage Basin (Water Resources Dept., Salem Oregon, 1975). The 'comments' field in the feature attribute table notes where oxbows have since been separated from the main channel and are currently disconnected.

* Source data were processed in GIS and do not relate directly to the cartographic dimensioning of the water course.

Source Information:

Originator: OR BLM/USFS

Publication_Date: 20050829

Title: Washington and Oregon Framework Hydrography

Source_Contribution: Geospatial data geometry

⁹ **Identification Information:**

Originator: Bureau of Reclamation, Pacific Northwest Regional Office

Title: Catherine Creek, Union County, OR

Other_Citation_Details: Subset of Washington and Oregon Framework Hydrography (water courses)

Abstract: Catherine Creek flowline extracted from the Pacific Northwest (PNW) Hydrography Framework.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset provides a standardized flowline for developing reference river miles to be used in the Catherine Creek Tributary Assessment.

Source Information:

Originator: OR BLM/USFS

Publication_Date: 20050829

Title: Washington and Oregon Framework Hydrography

Source_Contribution: Geospatial data geometry

¹⁰ **Identification Information:**

Originator: Bureau of Reclamation, Pacific Northwest Region

Title: Catherine Creek Watershed

Abstract: Catherine Creek Watershed, representing the contributing area of Catherine Creek upstream from the confluence with State Ditch; includes the active stream channel formerly known as Grande Ronde River and also includes the 'abandoned channel'.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset is the Catherine Creek Watershed, defined as the upstream contributing area above the confluence with State Ditch and Grande Ronde River. Catherine Creek hydrology includes the channels previously known as the Grande Ronde River (i.e., 1] the abandoned channel between the former confluence of the Grande Ronde River and Catherine Creek and the upstream diversion of the Grande Ronde River into State Ditch and 2] the segment of the former Grande Ronde beginning at the

downstream portion of the abandoned channel and currently receives primary active flow from Catherine Creek and joins the Grande Ronde River at the downstream mouth of State Ditch).

Source Information:

Originator: U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency, USDA Forest Service, and other Federal, State and local partners.

Title: NHDFlowline

Edition: NHD090503

Originator: U.S. Geological Survey (USGS)

Publication Date: 2009

Title: National Elevation Dataset (NED)

Edition: 2

Source Contribution: Provided elevation values to model the terrain surface for the area of interest.

¹¹ Identification Information:

Originator: Union County, Planning Department

Title: 100-year Floodplain, Union County, OR

Abstract: Digitized shapefile delineating 100yr floodplain

Purpose: Digitized shapefile delineating 100yr floodplain

Supplemental Information: Digitized shapefile delineating 100yr floodplain. Shapefile contains newly digitized polygons, and corrected vertices from previously digitized info. Polygons have been created based on georeferenced TIF, created from FEMA paper maps, circa 1984 data.

¹² Identification Information:

Originator: Union County Planning Department

Title: 500-year Floodplain, Union County, OR

Abstract: Digitized shapefile delineating 500yr floodplain

Purpose: Digitized shapefile delineating 500yr floodplain

Supplemental Information: Digitized shapefile delineating 100yr floodplain. Shapefile contains newly digitized polygons, and corrected vertices from previously digitized info. Polygons have been created based on georeferenced TIF, created from FEMA paper maps, circa 1984 data.

¹³ Identification Information:

Originator: Bureau of Reclamation, Pacific Northwest Region

Title: Grande Ronde Contributing Area

Abstract: Grande Ronde River Contributing Area, representing the contributing area of the Grande Ronde River upstream from the confluence with the Snake River.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset is the Grande Ronde River contributing area, defined as the upstream contributing area above the confluence with the Snake River. NOTE: this dataset differs from NHD 8-digit HUCs and FCRPS subbasins in that it is not sub-divided into Upper Grande Ronde, Lower Grande Ronde, and Wallowa subbasins nor does it include the Imnaha HUC8 subbasin.

Source Information:

Originator: U.S. Geological Survey in cooperation with U.S. Environmental Protection Agency, USDA Forest Service, and other Federal, State and local partners.

Title: NHDFlowline

Edition: NHD090503

Source Contribution: Provided vector data for reconditioning 1/3 arc second National Elevation Dataset (NED).

Originator: U.S. Geological Survey (USGS)

Publication Date: 2009

Title: National Elevation Dataset (NED)

Edition: 2

Source_Contribution: Provided elevation values to model the terrain surface for the area of interest.

¹⁴ Identification Information:

Originator: Bureau of Reclamation, Pacific Northwest Regional Office

Title: Pacific Northwest Region Cartographic Hydrography, May 2010

Abstract: National Hydrography Dataset modified for use in cartographic products.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff with managed geospatial data resources for mapping and analyses in support of Reclamation projects. The geographic extent of the database covers the Columbia River basin and Pacific Northwest Coast, including Idaho, Oregon, Washington, and portions of California, Nevada, Montana, Utah, and Wyoming.

Source_Information:

Originator: U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency

Publication_Date: 1999

Title: NHD Flowlines, medium resolution

Source_Contribution: Provides the geometry of the dataset

¹⁵ Identification Information:

Originator: Bureau of Reclamation, Pacific Northwest Regional Office

Title: Landform in the Catherine Creek Watershed, May 2010

Abstract: Soil Survey Geographic (SSURGO) data modified for use in cartographic products.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset uses SSURGO data to depict geomorphic landform within the Catherine Creek watershed, Union County, Oregon.

Source_Information:

Originator: U.S. Department of Agriculture, Natural Resources Conservation Service

Publication_Date: 20100209

Title: Soil Survey Geographic (SSURGO) Database for Union County Area, Oregon

Other_Citation_Details: or625

Source_Contribution: Spatial geometry feature attribution

Originator: U.S. Department of Agriculture, Natural Resources Conservation Service

Publication_Date: 20100209

Title: Partial Soil Survey Geographic (SSURGO) Database for Wallowa-Whitman National Forest, Oregon

Other_Citation_Details: or631

Source_Contribution: Spatial geometry feature attribution

¹⁶ Identification Information:

Originator: Bureau of Reclamation, Pacific Northwest Regional Office

Title: Surficial Geology Catherine Creek Watershed, May 2010

Abstract: Oregon geology data modified for use in cartographic products.

Purpose: Part of Reclamation's Pacific Northwest Region GIS data holdings to provide Reclamation staff, other Action Agencies, and cooperating partners with managed geospatial data resources for mapping and analyses in support of Reclamation projects related to habitat quality improvement as prescribed in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion. This specific dataset uses Oregon geology data to depict surficial geology within the Catherine Creek watershed, Union County, Oregon.

Source_Information:

Originator: Oregon Department of Geology and Mineral Industries

Publication_Date: 2009
Title: G_MAP_UNIT
Source_Contribution: Spatial geometry feature attribution

¹⁷ Identification Information:

Originator: U.S. Geological Survey

Publication_Date: 20030901

Title: National Land Cover Database Zone 01 Tree Canopy Layer for the Catherine Creek Watershed and Grande River Contributing Area

Edition: 1.0

Abstract: THIS IS A SUBSET OF - The National Land Cover Database 2001 tree canopy layer for mapping zone 01 was produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium. The MRLC Consortium is a partnership of federal agencies (www.mrlc.gov), consisting of the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), the U.S. Forest Service (USFS), the National Park Service (NPS), the U.S. Fish and Wildlife Service (FWS), the Bureau of Land Management (BLM) and the USDA Natural Resources Conservation Service (NRCS). One of the primary goals of the project is to generate a current, consistent, seamless, and accurate National Land cover Database (NLCD) circa 2001 for the United States at medium spatial resolution.

Purpose: The goal of this project is to provide the Nation with complete, current and consistent public domain information on its land use and land cover.

¹⁸ Identification Information:

Originator: U.S. Geological Survey

Publication_Date: 20030901

Title: National Land Cover Database Zone 01 Imperviousness Layer for the Catherine Creek Watershed and Grande Ronde Contributing Area

Edition: 1.0

Abstract: THIS IS A SUBSET OF - The National Land Cover Database 2001 for mapping zone 01 was produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium. The MRLC Consortium is a partnership of federal agencies (www.mrlc.gov), consisting of the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), the U.S. Forest Service (USFS), the National Park Service (NPS), the U.S. Fish and Wildlife Service (FWS), the Bureau of Land Management (BLM) and the USDA Natural Resources Conservation Service (NRCS). One of the primary goals of the project is to generate a current, consistent, seamless, and accurate National Land Cover Database (NLCD) circa 2001 for the United States at medium spatial resolution.

Purpose: The goal of this project is to provide the Nation with complete, current and consistent public domain information on its land use and land cover.

¹⁹ Identification Information:

Originator: U.S. Geological Survey

Publication_Date: 20110216

Title: NLCD 2006 Land Cover for the Catherine Creek Watershed and Grande River Contributing Area

Edition: 1.0

Abstract: THIS IS A SUBSET OF - The National Land Cover Database products are created through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium. The MRLC Consortium is a partnership of federal agencies (www.mrlc.gov), consisting of the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), the U.S. Forest Service (USFS), the National Park Service (NPS), the U.S. Fish and Wildlife Service (FWS), the Bureau of Land Management (BLM) and the USDA Natural Resources Conservation Service (NRCS).

Purpose: The goal of this project is to provide the Nation with complete, current and consistent public domain information on its land use and land cover.

²⁰ **Identification Information:**

Originator: Fire Staff

Publication_Date: 5/30/2008

Title: Historical Fire Start locations of the Malheur, Umatilla, and Wallowa-Whitman NF's

Edition: 1

Abstract: Initial Start Locations of fires reported into NIFMID by the Pendleton Interagency Dispatch Center, North East Oregon Dispatch Center, or the Malheur NF Dispatch Center.

Purpose: Shows spatial location of Points where fires start. Point of origin for wildfires, escaped fires, and prescribed natural fires.

²¹ **Identification Information:**

Originator: Umatilla, Malheur, and Wallowa-Whitman National Forests

Publication_Date: 01/31/2006

Title: Large Fire Perimeters of the Blue Mountains

Edition: 6

Abstract: The final mapped wildfire perimeters of the Blue Mountains of Eastern Oregon

Purpose: The data is tracked at the forest level to track the area affected by fire. Spatial data is stored via a region feature class due to overlapping fire perimeters.

²² **Identification Information:**

Originator: USDA-FSA Aerial Photography Field Office

Publication_Date: 20080114

Title: Common Land Unit for Union, Oregon

Edition: 20080114

Abstract: The common land unit (CLU) dataset consists of digitized farm tract and field boundaries and associated attribute data. The USDA Farm Service Agency (FSA) defines farm fields as agricultural land that is delineated by natural and man-made boundaries such as road ways, tree lines, waterways, fence lines, etc. Field boundaries are visible features that can be identified and delineated on aerial photography and digital imagery. Farm tracts are defined by FSA as sets of contiguous fields under single ownership. Common land units are used to administer USDA farm commodity support and conservation programs in a GIS environment.

Purpose: This CLU data will aid County Field Service Centers in identifying and delineating farm tracts and field boundaries as they administer USDA programs for their customers. Better providing more accurate time-saving acreage, field and tract information to their customers.

²² **Identification Information:**

Originator: Department of Revenue - Cadastral Information Systems Unit

Publication_Date: 05/31/2001 (original, contains database updates of October 14, 2009)

Publisher: Union County Assessor's Office

Title: TaxlotParcels_UnionCounty

Edition: First

Abstract: Taxlot polygon for Union Countywide, Union County

Purpose: The data was created to have a complete inventory of the real property in Union County. From which other applications (soil maps, flood plains) can be created. All of the data is for the Assessment & Taxation functions

6. References

Parenthetical Reference	Bibliographic Citation
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DOGAMI 2002	Oregon Department of Geology and Mineral Industries. 2002. A groundwater case study: Catherine Creek and the Upper Grande Ronde Valley. Cascadia, Volume 2, Number 1, pp. 7-8.
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