Idaho Transportation Department- District 6
Highway/Wildlife Linkage GIS Layers
Final Report
June 30, 2005

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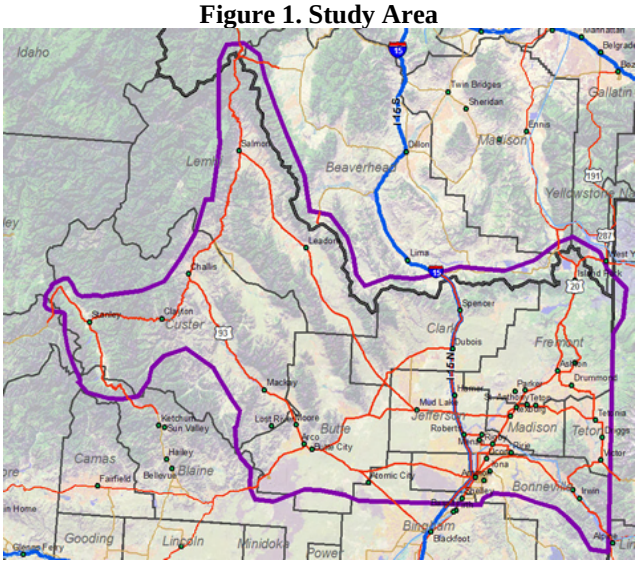
Introduction

The first portion of the report includes a summary of the results of identified wildlife linkage areas along state and federal highways in Idaho Transportation Department District 6. The process involved assembly of GIS layers and imagery, GIS analysis to develop a wildlife linkage model, and three expert workshops in District 6 of the Idaho Transportation Department (ITD). The assessment area included a four mile area on either side of the state and federal highways within the following nine counties: Bonneville, Butte, Clark, Custer, Fremont, Lemhi, Jefferson, Madison, Teton (see Figure 1). The purpose of the assessment was to identify opportunities and needs for protecting or creating appropriate movement habitats for wildlife, identify linkage areas for wildlife, and address areas of interest along the highway segments relating to wildlife habitat, development pressure and public safety. A total of 47 linkage areas of ecosystem importance, and 90 linkage areas of local importance were identified in the project. The process followed a rapid assessment format that has been utilized in northern Idaho and Western Montana (Ruediger, 2004).

The report was organized into four sections. Following the introduction, the second section reported the results of the linkage areas of interest, the primary product of this project. Maps were included for the linkage areas and comments and documentation on each area, provided during the expert workshops. The third section included descriptions of data layers used in the project and the analysis process for the large carnivore and ungulate linkage model, and GIS project deliverables, project methodology and list of participants in the three expert workshops. Section four included a summary of the process used to derive the linkage areas of interest and review the results, and documents project participants. Appendix A included the detailed linkage area of interest maps for the project. Appendix B documented the detailed GIS analysis steps for the large carnivore and ungulate wildlife linkage model generated for the project prior to the expert workshops. Appendix C included detailed acreage summaries for selected variables for a buffer area of four miles around each linkage area, providing relative measurements to compare linkage areas. Accompanying the report were six ESRI grid layers representing the final linkage model components, and four ESRI shapefile map layers including the point and polygon human influence source layers, partial fish barriers, wildlife-vehicle collision estimates (road kill), and the final linkage area of interest GIS polygon layer.

Figure 1. Study Area



Project Results

Figure 2 shows an overview of the linkage areas, and the map figures in Appendix A include detailed maps of each linkage area, along with an index of the map tiles. Comments and notes collected during the expert workshops are provided in Table 1 and subsequent review, along with species of interest in each linkage area (refer to the detailed maps in Appendix A to crosswalk the linkage area identification numbers to the location of the linkage area on the map.

Figure 2. Wildlife Linkage Areas of Interest

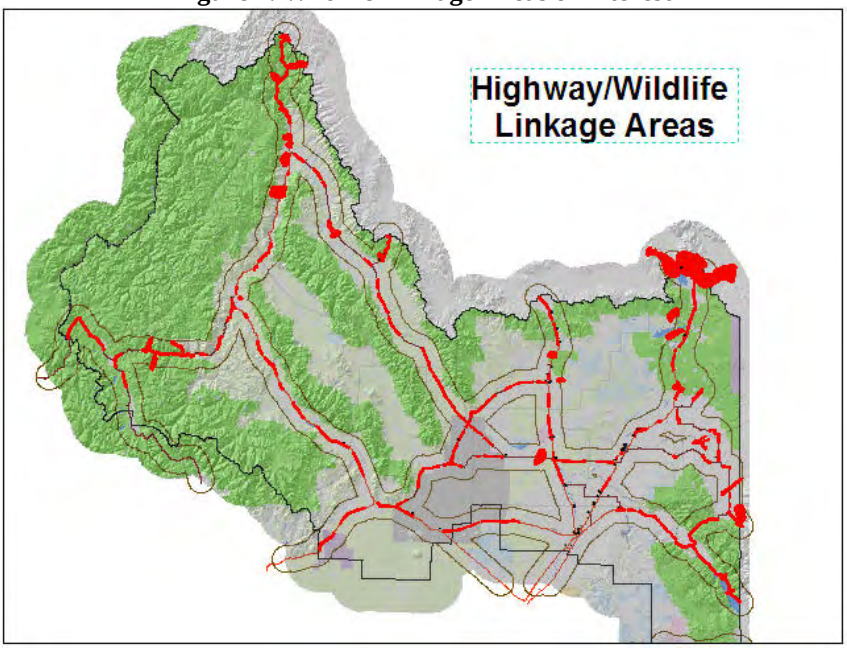


Table 1. Expert Comments on Linkage Areas

AOI ID	Species of Interest	Comments
ID6E01	mule deer/elk/moose/black bear/mountain lion/wolf/marten/large carnivores	Stoddard Creek to South edge of Spencer. Deer road kill area. many species. Spencer area.
ID6E02	mule deer/black bear/moutain lion/wolf	Mostly ungulates. I-15 at Monida. Linkage between Yellowstone and Central Idaho.
ID6E03	antelope/wolf	Antelope movement area. At Sheep Experiment Station but now blocked. Was an antelope movement area. At Sheep Experiment Station where fence obstructs. Pronghorn migration corridor from East and West if I-15 within Sheep Experiment Station. Adj to I-15 used by Sagegrouse.
ID6E04	antelope/wolf	North of Dubois. Was an antelope movement area. Also wolves cross there. Pronghorn East and West Migration. Also 2 wolves killed. Adj to I-15 used by Sagegrouse.
ID6E05	mule deer/ white tail deer/elk/moose/antelope	This polygon is interesting. We have resident populations and migrating animals (resident mule deer, elk, moose, and white tail). Hamer areas, Camus refuge attracts wildlife. Was an antelope movement area. Deer and elk seasonal crossings across I-15. Some pronghorn used to cross. Pronghorn Migration historically east and west. Just North of Hamer also. Moose adjacent to Camus NWR. Deer, Elk Migration across I-15 to Camas NWR. Adj to I-15 used by Sagegrouse.
ID6E06	elk/antelope	North of Sage Junction. Used to be a pronghorn crossing. Also elk cross there now. Elk and Pronghorn North of Sage Jct. Migration across I-15. Adj to I-15 used by Sagegrouse.
ID6E07	elk/moose	Market Lake. Elk and moose cross highway. Wetland complex changed by the highway interruption of water flow. North of Market Lake to South of Market Lake. Elk, Moose. I-15 construction impacted wetland hydrology. Adj to I-15 used by Sagegrouse.
ID6E08	white tail deer/elk	Highway 33.
ID6E09	mule deer/ white tail deer/ moose	Associated with Henry's fork riparian zone. Highway 33.
ID6E10	elk/antelope	Pronghorn crossings and elk. Highway 33. Pronghorn moving North and South.
ID6E11	elk/antelope	Highway 33.
ID6E12	elk/antelope	Highway 33.
ID6E13	elk/antelope	
ID6E14	elk/antelope	Pronghorn and elk. Into center pivots.
ID6E15	elk/antelope	Pronghorn and Elk. Going to spring for water.
ID6E16	elk/antelope	Pronghorn, elk at southern end. Seasonal movements. More northern portion of polygon is pronghorn and southerly section is elk. closer to mountain tip is elk.
ID6E17	antelope	Pronghorn seasonal migration. North of gravel pit. Pronghorn movement East and West & North and South.
ID6E18	mule deer/elk/antelope	Mostly elk. Deer and Elk West End.
ID6E19	antelope	Seasonal migration. Pronghorn East End.
ID6E20	elk	Elk West End East

ID6E21	elk/antelope	Seasonal, some movement within season (spamdeu) some elk
ID6E22	elk/antelope	Winter elk. Pronghorn year round.
ID6E23	mule deer/elk/antelope/bighorn sheep	Seasonal mule deer and pronghorn. 1 Bighorn hit. few bighorn sheep.
ID6E24	elk/antelope	some elk. elk, mostly pronghorn.
ID6E25	mule deer/elk/antelope/short-eared owls	West end in some years, many short-eared owls hit in late summer.
ID6E26	mule deer/elk/bighorn sheep	deer crossing area
ID6E27	mule deer/white tail deer/elk/moose	Deer and elk along highway, some moose. Seasonal movements. Periodic moose kills year round. Highway 26. Deer and Elk seasonal. Moose kill, Mule Deer, White-tail deer.
ID6E28	mule deer/white tail deer/moose	Mostly Winter
ID6E29	white tail deer/black bear	Increasing deer numbers. Black bear movement across highway.
ID6E30	mule deer/black bear	Mule Deer crossing. Granite Hill major crossing site for mule deer. Mile 360-370. Eagle Road Kill. Black bear movement across highway.
ID6E31	mule deer/white tail deer/elk/moose	
ID6E32	mule deer/white tail deer/moose	
ID6E33	mule deer	High mortality
ID6E34	mule deer	Very high mortality. Heavier concentration.
ID6E35	elk/moose/black bear/grizzly bear/mountain lion/lynx/wolverine/bighorn sheep/mountain goats	Moose, elk year round.
ID6E36	cutthroat/kokanee	Spawning stream. In low water cutthroat not able to get up the stream. Big Elk Creek. Obstruction at low water.
ID6E37	native fish species of concern (other than bull trout)	Spawning stream. In low water cutthroat not able to get up the stream. Indian Creek. Cutthroat Trout obstruction.
ID6E38	mule deer/elk	Deer, elk to canyon mouth. Highway 31. Deer and Elk seasonally.
ID6E39	mule deer/elk/moose/black bear/mountain lion/wolverine/bighorn sheep	Many forest carnivores. Fall migration corridor highest priority. Deer and Elk seasonal migration. Moose year round.
ID6E40	mule deer/elk/moose/forest carnivores	Fewer deer and elk than 39. Also forest carnivores. Not migratory corridors.
ID6E41	mule deer/moose/black bear/carnivores	All the way to the pass. Highway 33.
ID6E42	moose	Moose movement roadkill. Cottonwood corridors.
ID6E43	moose	Moose movement roadkill Cottonwood corridors
ID6E44	white tail deer	Teton Creek
ID6E45	white tail deer	Whitetail crossings. Cottonwood corridor.
ID6E46	mule deer/elk	Migration of Elk and Deer in fall and spring. Harris Hill.
ID6E47	mule deer/moose	Mule Deer at Canyon Creek. Crossing on Canyon Rim. Moose also.

ID6E48	mule deer/elk/moose	Badger Creek is moose.
ID6E49	mule deer/elk/moose	Moose all year round
ID6E50	mule deer/white tail deer/elk	
ID6E51	mule deer/elk/moose	Deer and elk migration from Yellowstone to Sand Creek. White tailed deer all year. Deer and Elk south end (county line south). North end Pronghorn Deer and elk.
ID6E52	white tail deer/moose	Deer crossing. Roadkill at Dry Bed.
ID6E53	white tail deer	Mostly deer
ID6E54	white tail deer/moose	White-tailed deer and moose at Thorton
ID6E55	white tail deer	Deer crossing at golf course north of Rigby.
ID6E56	moose	moose road kill
ID6E57	moose	Moose road kills
ID6E58	moose	Moose road kills. Moose at Fall River
ID6E59	mule deer/elk/moose	Mostly deer migration route. Ecosystem. Deer migration east and west. Some elk and moose.
ID6E60	mule deer/elk/moose	Moose and elk and deer migration route. Moose year around. Deer and elk migration East and WEst. Moose mortality.
ID6E61	mule deer/elk/moose	Moose and elk and deer crossing site. Federal Hill. Mile Post 373.
ID6E62	elk/moose	Moose and some elk. Swan Lake area.
ID6E63	moose/swan/geese	Waterfowl and many moose. Osborne bridge. Swan, Geese movement.
ID6E64	elk/moose/black bear	Below last chance along a stringer of timber. Moose and Elk migration corridor. Roadkill bear.
ID6E65	mule deer/elk/moose	Moose and elk and mule deer roadkills.
ID6E66	mule deer/elk/moose	Moose and elk concentration. Both sides of Henry's Fork crossing. Roadkill moose, deer, and elk. More roadkill than 65.
ID6E67	mule deer/elk/moose	Moose, and Elk, and Deer roadkills.
ID6E68	mule deer/elk/moose	Moose, and deer, and elk roadkill. Henry's Lake outlet
ID6E69	elk/moose/black bear	Linkage area for bears, moose, elk. Linkage area. ecosystem. Elk Migration, also Moose roadkill along Howard Creek.
ID6E70	elk/black bear/wolverine	Multi-species linkage including carnivores and bears and wolverines. Major linkage period. Elk movement from Montana to Idaho below Targhee Pass along east side of SH87 to Raenolds Pass.
ID6E71	antelope	Antelope kills. Fraser hill. MP 2.5
ID6E72	mule deer/elk/moose	Deer, Elk, and Moose kills.
ID6E73	white tail deer	White Tail kill concentration
ID6W01	wolf/wolverine/marten/fisher	Many species close to pass. South of pass. TR ecosystem. Wolf activity area. Wolverine/Fisher/Marten habitat and linkage area.
ID6W02	lynx	Many species close to pass. TR ecosystem. Lynx analysis/linkage area from Lost Trail Pass to MP 343.
ID6W03	elk	Many species close to pass. TR ecosystem. Elk winter range. MP 333-334.
ID6W04	black bear/chinook/golden eagle	Chinook spawning in North Fk. Salmon River mainstem/rearing in mouth of tributaries and mainstem. MP 342-326. Black Bear road kill at MP 337. Golden Eagle road kill at MP 329. AQ ecosystem.

ID6W05	peregrine	Peregrine nest site in lower drainage.
ID6W06	peregrine	Peregrine falcon nest territory at MP 332.
ID6W07	elk/moose/wolverine	Wolverine linkage corridor at Dahlonega Creek. Wolverine tracks in the area.
ID6W08	mule deer/antelope/otter/bighorn sheep/bald eagle/peregrine	Bighorn sheep, pronghorn, mule deer roadkill area at MP 324-315. Bald eagle nest territories at MP 317 and MP 324. River otter roadkill (Kriley Gulch); peregrine falcon nest territories at MP 318 and 316. Bighorn sheep and pronghorn wintering area from MP 315-226. TR ecosystem.
ID6W09	native fish species of concern (other than bull trout)	Fish migration and travel. Culverts across road with perennial water. MP 326(North Fork)-264(Ellis)representing anadromous fish migration corridor (vs. spawning/rearing). AQ ecosystem. Bald eagles tied into fisheries on ecosystem level.
ID6W10	mule deer/bald eagle/peregrine	High deer roadkill area from MP 307-308. Bald eagle nest territory at MP 308. Peregrine falcon nest territory at MP 306.
ID6W11	peregrine	Peregrine falcon nest territory at MP 303. West of road. South of Salmon.
ID6W12	bald eagle	Bald eagle nest territory at MP 300. West of road.
ID6W13	otter	Roadkill river otter at MP 298(Sevenmile Creek). Three known to be killed on the highway.
ID6W14	lynx	Lynx linkage unit MP 290-294 (Lake Creek to Twelvemile). TR ecosystem. MP 280
ID6W15	bobcat	Bobcat roadkill at MP 270. Bobcat crossing.
ID6W16	bighorn sheep	Bighorn sheep use area (Kronk's Canyon at MP 267-268). Bighorn all year.
ID6W17	bighorn sheep/turkey	
ID6W18	native fish species of concern (other than bull trout)	Heavy sportsman traffic area. Parking and fishing along side of the road. No parking area.
ID6W19	bald eagle	Bald eagle nest east of highway.
ID6W20	peregrine	Peregrine nest site east of highway.
ID6W21	mule deer/elk	MP 248-244.33. Elk and deer kill hotspot.
ID6W22	bighorn sheep	Highway 75. MP 243-244. Bighorn sheep population to North Highway 75 down to alfalfa fields along highway.
ID6W23	golden eagle/wild horses	MP 157. Golden eagle hit feeding on deer carcass. US-93. Wild horses in area MP 143-146 and Sper Canyon Area MP 152.
ID6W24	wild horses	Wild horses in area MP 143-146 and Sper Canyon Area MP 152.
ID6W25	antelope/wild horses	Wild horse crossing area MP 142-146. Also antelope roadkills in the area.
ID6W26	mule deer/elk/lynx/wolves	MP 141-134 Elk Migration at Willow Creek Summit. Few deer also. Wolves cross in the area, also Lynx linkage unit crossing the highway. TR ecosystem.
ID6W27	sand hill cranes	MP 130-131. Wiley Smith Meadows. Sandhill cranes hit on road and at crossings.
ID6W28	mule deer/elk	Trail Creek, Whiskey Springs, elk mortality and mule deer down to backwater area of Mackay Reservoir.
ID6W29	mule deer	Mule deer mortality from Mackay Reservoir Dam to MP 108. All along the roadway. More in the road when years are dry. Mackay to MP 101 Mule Deer.

ID6W30	moose/black bear	Moose mortality from MP 90-101. Much moose crossing. Black bears also cross.
ID6W31	mule deer/sage grouse	MP 224-231. Mule deer in Craters of the Moon. Crossing. Fall and spring primarily. Sage grouse mortality.
ID6W32	mule deer/antelope/golden eagles	MP 235-244. Includes golden eagles hit on road. Crossings.
ID6W33	peregrine/golden eagle	MP 240. Peregrine nest site, golden eagle mortality. Highway 75.
ID6W34	bald eagle	Bald eagle nest on Rattlesnake creek.
ID6W35	wild horses	crossings
ID6W36	golden eagle	Golden Eagle mortality.
ID6W37	mule deer/elk/wolf	Between Squaw Creek to Gardner Creek (Yankee Fork) wolf area. Deer in Spring. 10-20 deer/week. TR ecosystem. Elk wintering area between MP 219-221. MP 201 Elk mortality. Cougar siting near elk concentration. Culvert at Peach Creek is a fish barrier.
ID6W38	bull trout/native fish species of concern (other than bull trout)	Yankee Fork Fluvial Trout, Bull Trout, Cutthroat, and Rainbow Trout. Yankee Fork and down river from there. TR ecosystem. Thompson Creek, Warm Springs.
ID6W39	elk	Elk wintering area Junction SH21/SH75 down to MP 196. MP 188-190. Hotsprings. 80-90 wintering elk by Stanley Airport every year, cross highway.
ID6W40	elk/wolf	MP 180-184. Elk hit on road, quite a few, more during summer, but year round. Also wolf in area. Mark Molton knows easments. Easements all through the area. Elk winter along highway.
ID6W41	wolf/lynx/wolverine/marten/fisher	On SH-21, MP 105.1 Banner Summit, wolverine and lynx. At MP 119, wolf killed by a car and a couple of marten per year, fisher. Important fisheries area. TR ecosystem. Fisheries, also Bull trout, etc.
ID6W42	mule deer/black bear	Deer kill area at start of Highway 28. SH-28 along Lemhi River. MP 134-133 deer kill area HIGH! Bear killed on road at Geirtson Creek.
ID6W43	mule deer	Deer kill area. High concentration. Deer kill every mile to Lone Pine.
ID6W44	mule deer/white tail deer/moose/mountain lion/wolf/wolverine/bald eagle	Carnivore crossing (wolf, wolverine). Moose crossing. Bald eagle territory crosses MP 105 State Highway 28. Hayden Creek for mile north and a little south. Mountain lion crossing. Mule deer,white tails, etc. Hayden creek high use area.
ID6W45	elk/antelope/golden eagle/bald eagle	MP 122. Golden eagle kill. Bald eagle nest. Antelope and other wildlife crossing. North of MP 90, elk crossing, bald eagle territory. Mouth of Big Timber Creek. TR ecosystem?
ID6W46	elk/antelope/bighorn sheep	SH-29 Bighorn sheep crossing, antelope, elk. TR ecosystem.
ID6W47	mule deer/elk/moose/lynx/pygmy rabbit/sage grouse	Lynx linkage area. Carnivores. Elk, mule deer, moose crossing. Sage-steppe species. Mulitple wildlife crossings. Summit of highway along and west of state line. Highway 29. TR ecosystem.
ID6W48	bald eagle/golden eagle	SH-28 golden eagle kills. Bald eagle kills.
ID6W49	elk/moose/golden eagle	SH-28 moose and elk crossing. Wetlands. Includes MP 75 golden eagle kill spot. Moose and elk along highway.
ID6W50	elk/moose/antelope/wolverine/sage grouse	SH-28 Lynx linkage. MP 69. Mulitple species crossings including wolverine, elk, pronghorn. Gilmore Summit, south

		end pronghorn. TR ecosystem. Sage grouse along road.
ID6W51	mule deer/elk	Elk winter along highway. Winter use. Golden eagle and osprey killed along highway. Deer and elk at South End. MP 48-58 includes elk for 10 miles. MP 55 Golden Eagle killed. SH-28. MP 48 ends Bill's area at Lone Pine on SH-28.

A total of 47 of the 137 total linkage polygons areas were ranked of ecosystem level importance (see Figure 3), and 90 were rated of local importance. The final GIS layer for areas of interest includes a ecosystem rank score for each area of interest (see Table 2). This score was derived from individual rankings in the expert workshops by individual biologists, and a weighted average was computed from the individual scores. Figure 3 shows the 47 areas identified of ecosystem importance.

Figure 3. Linkage Areas of Ecosystem Importance

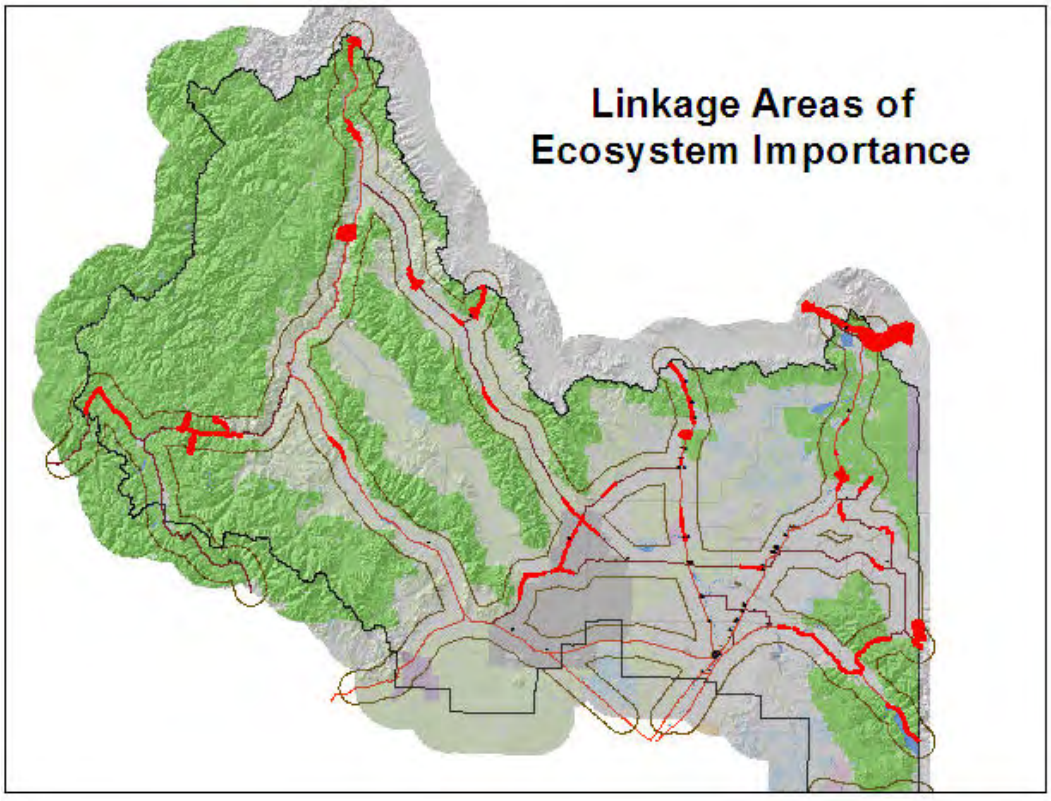


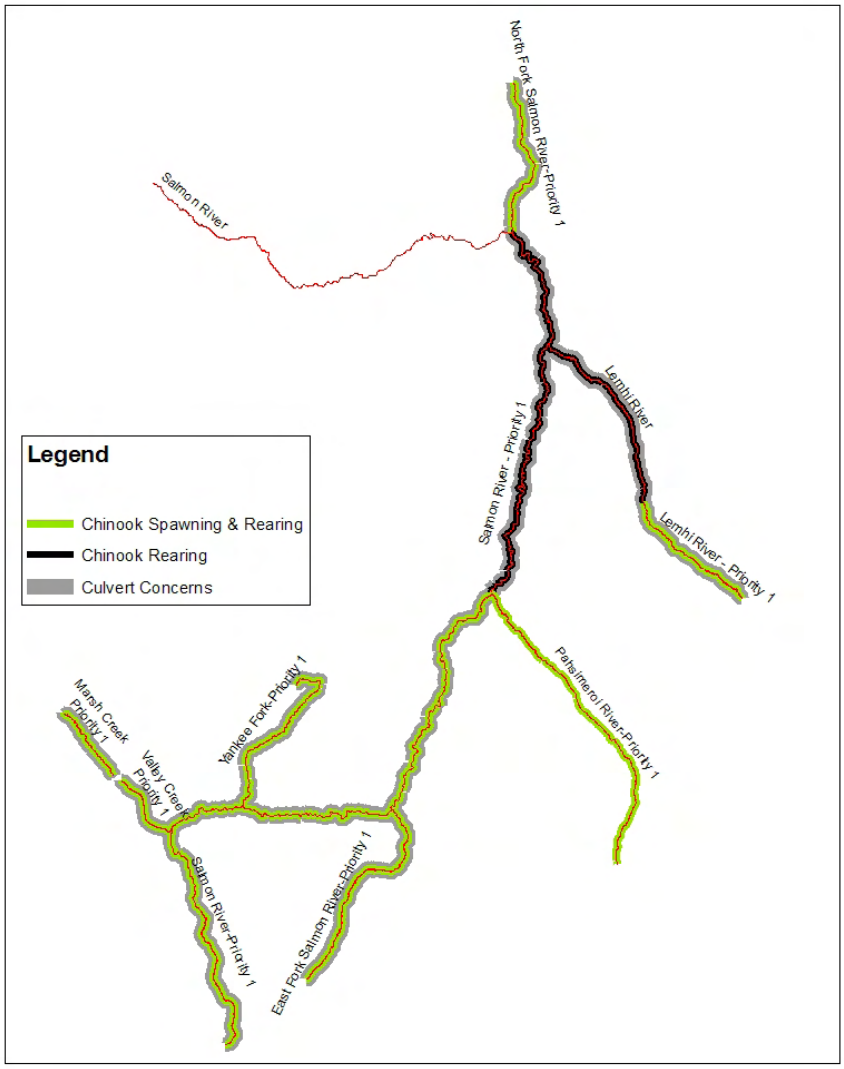
Table 2. Expert Rank of Ecosystem Level Linkage Areas

AOI_ID	EcoRank		
ID6E01	1.08	ID6E59	1.46
ID6E02	1.50	ID6E60	1.62
ID6E03	1.83	ID6E61	2.08
ID6E04	2.25	ID6E64	2.08
ID6E05	2.17	ID6E70	1.13
ID6E09	1.63	ID6E78	1.71

ID6E13	2.25	ID6E79	1.25
ID6E14	2.22	ID6W01	1.00
ID6E16	2.40	ID6W02	1.00
ID6E17	2.11	ID6W03	1.00
ID6E19	2.67	ID6W09	1.50
ID6E27	2.27	ID6W13	1.83
ID6E29	2.39	ID6W26	1.83
ID6E30	2.06	ID6W37	1.67
ID6E31	2.00	ID6W38	1.50
ID6E32	2.00	ID6W38	1.50
ID6E35	1.71	ID6W38	1.50
ID6E38	1.82	ID6W41	2.00
ID6E39	1.47	ID6W44	1.80
ID6E40	2.00	ID6W45	1.17
ID6E46	2.46	ID6W46	1.00
ID6E49	1.43	ID6W47	1.00
ID6E50	2.42	ID6W50	1.80
ID6E51	2.17		

The western portion of the District is an important area for fisheries, including west slope cutthroat trout, bull trout, and salmon species. Fisheries biologists expressed difficulty in identifying specific linkage areas for these fish species, with many drainages being of importance. A separate map of important fish habitat (see Figure 4) was prepared primarily by Tom Curet, Idaho Fish and Game fisheries biologist in the Challis, Idaho workshop.

Figure 4. Important Fisheries Habitat - Western Portion of District 6

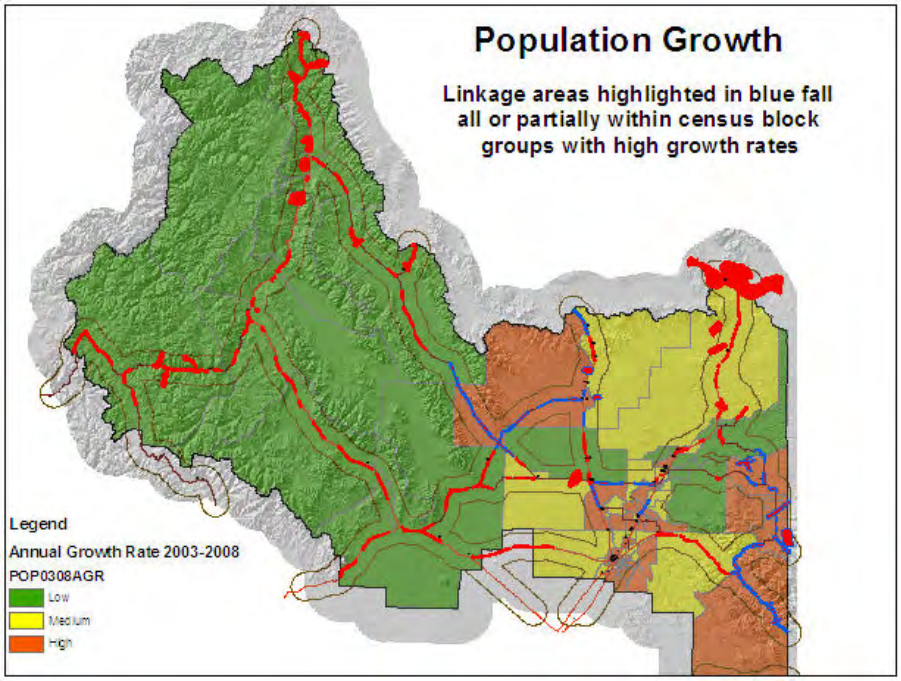


Fish barriers at stream crossings were identified from existing data provided by ITD in their hydrography GIS layers. These were displayed in the expert workshop, where blockage locations were suspected to exist. The fisheries biologists present at the workshop expressed concern that the barriers were incomplete. Subsequently, Geodata overlaid all perennial streams on the state and federal highway segments and created points at each intersection of the two layers. These were assigned a unique identifier, and large format maps sent back to the Idaho Fish and Game for further review at a district wide meeting of fisheries biologists held June 1, 2005. They identified 7 additional suspected barrier locations. The additional barriers identified were provided as an additional project deliverable in GIS format. This layer does not represent a comprehensive inventory of all fish barriers.

Land area and acreage of linkage areas were difficult to quantify. The linkage areas were usually not discreetly defined areas confined by vegetative or topographic features. More typically, they were general areas of highway or road segments identified between mileposts, or generally mapped in interactive GIS sessions. In some instances actual wildlife crossings of highways are at well defined locations, such as a bridge or overpass, other times they may generally cross laterally over a broad area, and in yet other areas may cross through funnel-shaped areas. For a general relative comparison of linkage areas, we placed a four mile buffer around each linkage area and calculated the number of acres of public land ownership, large carnivore and ungulate linkage model class, forest/non-forest land cover, and class of environmentally sensitive species. These tables are provided in Appendix C.

Residential development and suburban and exurban growth often contribute to increased pressure on wildlife species and also generally contribute to increased use of state and federal highways. Population projections by census block group (see Figure 5) were aggregated into three quantiles, high, medium and low overlaid with the linkage areas of interest. A total of 39 of the total 137 linkage areas were in census areas in the high quantile (representing areas with general population and household growth between 2003-2008) predicted to exceed 1.5% annual growth rate. Of these, 15 in the high growth rate areas were of ecosystem importance.

Figure 5. Population Growth 2003-2008



Additional project results will be available following the 2005 field season. A web mapping review and evaluation system, including an extensive post workshop data questionnaire on each area of interest was developed and will be maintained by Geodata Services, Inc. following the completion of the project, as part of the Wildlife Habitat

Project Portal and National Wildlife Habitat Project Registry maintained by Geodata and the Rocky Mountain Elk Foundation, and a consortium of wildlife conservation organizations.

GIS Data, Analysis and Deliverables

There were two primary GIS processing tasks required prior to conducting the expert workshops on highway linkages, developing the base layers for reference in the meetings and for data summarization in post workshop processing, and creating the wildlife linkage model for reference during the workshops. The base layers typically involved deriving a subset of the digital data from a larger regional or national data layer for vector based layers and re-projecting as necessary for efficiency in display and analysis. The image base was provided by the ITD from National Aerial Imagery Program (NAIP) files, compressed in Mr. Sid format, so additional processing was not needed. In addition, many of the GIS layers necessary for the project were provided pre-clipped to the District boundary. We identified additional sources for road event themes in the USFS Oracle databases for road updates and barrier information. This varied by National Forest, and none turned out to be available during the project timeframe. They could be incorporated in future revisions of the base data. Geodata had to do additional processing only on one significant layer, a composite of sensitive species prepared by Maxim, Inc. that was used during the expert workshops. It may have been the local version we received, but there was a map scale issue with the grid version of this data set that we corrected in our copy.

The wildlife linkage models we have used in similar highway linkage studies did not exist for the project area. Creating a new linkage model required significant amounts of time in collecting one of the base components (site development), and extensive GIS grid based processing to prepare the final model. The data layers and processes were described in detail in the linkage model section below.

Data Layers

National Land Cover Data layer (NLCD)

The NLCD layer was useful as a backdrop for general reference and orientation during the interactive expert workshop sessions. The generalized vegetation was also useful as a visual reference for deciduous and conifer cover adjacent to the highways. We used the NLCD image with a shaded relief image as a backdrop for the interactive sessions and map cartographic production. We also prepared a grid of the NLCD for the project area for general reference and for use as the source for the cover/non-cover inputs for the wildlife linkage model (see the section on the linkage model for more details on this portion of the process).

We compared NLCD hiding cover classes against a similar land cover map derived from Idaho GAP Analysis. The NLCD had fewer classes, and a more generalized

classification system, but GAP was mapped at a coarser scale of 1:500,000, so the NLCD was used for the wildlife linkage model, and background display in the expert workshops.

Shaded relief – USGS Digital Elevation Model (DEM)
We prepared the 1:24,000 DEM to use as a source for the shaded relief used in back drop layers and for the slope map indicating private lands that would not likely be developed for residential use due to slope restrictions for septic systems.

State and Federal Highways
Many road layers were analyzed including GDT Dynamap 1000 enhanced Tiger street map at a scale of 1:100,000, obtained from the Intermodal Transportation Database of the Bureau of Transportation Statistics, and ITD road layers from multiple sources at multiple scales.. There were approximately 1,300 miles of state and federal highways in the project area (see figure 1). For the linkage model and the final road layers for the level of planning required to analyze linkage areas and identify areas of interest, we used the ITD 1:24,000 scale road and transportation layer. A mosaiced map layer built from this source was used in a "moving circle analysis" for the wildlife linkage model (See Servheen, 2001 for details on methods and procedures). Major state and federal highways were extracted from this layer to generate four mile buffers and as a base for the highway locations and mileposts for the expert workshops.

Hydrologic layer - National Hydrologic Data
Perennial streams were extracted from the 1:100,000 National Hydrologic Data (NHD) layers provided by ITD. One primary use of these streams and rivers was to auto label the features for orientation and quick visual location by experts in the workshops. A second potential use of hydrography was in riparian delineation, with a cost distance function adjusting for slope to use as a clipping mask for riparian vegetation and wetlands in the linkage model. This layer was also displayed occasionally in the workshops to fill in areas where National Wetland Inventory data were not available, when inquiries were made regarding wetlands.

National Wetland Inventory (NWI)
ITD provided all available NWI data for the project area for use as a general reference layer in the workshops and as the source for riparian and wetlands in the wildlife linkage model. In areas where NWI was not available, we used land cover riparian classes to prepare a complete mosaic of wetlands and riparian areas.

Public Land Survey System (PLSS) – 1:100,000
We used the 1:100000 scale PLSS as a reference layer for the expert workshops. The sections were auto labeled. The PLSS layer was used as a orientation and reference layer by workshop participants.

Land Ownership
Public land ownership was provided by ITD, clipped from the State of Idaho 1:100,000 ownership layer maintained by the Idaho Dept of Water Resources and state GIS clearinghouse. Like most western states, public land ownership GIS layers, that layer

was not updated regularly and may not be accurate in all locations, but it provides a generally accurate ownership map for expert workshop participants. The majority of the nine counties in the study area do not have cadastral parcel maps prepared in consistent digital format to provide data private land parcels, so the public land layer provided the primary source on land ownership.

Protected Lands

For private lands in protected status from residential development, we used the latest conservation easement layer available for Idaho and Montana developed in conjunction with the local land trusts in the area and with the larger NGO's such as the Nature Conservancy and the Rocky Mountain Elk Foundation. Geodata Services, Inc. has worked with all the Idaho Land Trusts and maintains a database of the current conservation easements on private lands. These lands provided the base for an adequate, though not comprehensive, map of fee title and non-fee title land protections. These layers were used as a reference in the expert workshops. The layer did not represent all easements in the project area, but did include the majority.

Other Wildlife Layers

Rocky Mountain Elk Foundation M.A.P. Habitat™ data for winter, winter crucial, summer, summer crucial elk habitat (developed at a scale of 1:250,000) were clipped for the expert workshops. Geodata Services, Inc. has worked with the RMEF for several years and assisted in developing the elk habitat layer. These layers were used in the expert workshops. Large wildlife species data layers comprise much of the data preparation and GIS analysis data collected for reference in the expert workshops. This was primarily due to linkage issues and public safety concerns. GAP analysis included potential habitat models for many vertebrate species, but typically cover broad landscape areas and characteristics and were not as useful in these type of site specific workshops for lands at fine grain map scales. We gathered and documented site specific expert opinion on these wildlife and fisheries resources, but only used pre-existing wildlife data layers for display in the expert workshops.

Public Safety - Road Kill Data

Limited road kill data were summarized for key highway segments in the study area. The focus was on selected species of interest from a highway public safety perspective, primarily large ungulates and carnivores, The source of the data were Idaho Transportation Department road maintenance staff and Idaho Fish and Game wildlife biologists. This data did not cover multiple years and was incomplete, but was useful as an additional reference layer for the expert workshops. ITD staff and wildlife biologists coded map segments of road kill by categories of number per year in high (>20), medium (5-20) or low (< 5) for groupings of ungulates, large carnivores and miscellaneous other species. This map layer was provided as a deliverable.

Background Orthorectified Imagery

ITD provided complete orthophoto coverage from the Farm Services Agency NAIP program processed from recent aerial imagery at 1 meter resolution in natural color. These images were displayed by county for efficiency in conducting the interactive

workshops. The imagery was used as a back drop to other map layers. The orthophotos were also used in acquiring the site development points for the wildlife linkage model. This was conducted through on-screen digitizing from recognizable structures on the detailed imagery.

Human Site Development

Large ungulate and carnivore wildlife species are influenced by the intensity of human activity around developed sites. Depending on the species involved, they may act negatively, positively or in a neutral fashion. Negative responses to avoid areas surrounding developments may result in habitat loss or fragmentation, and positive responses or attraction to developed sites due to the presence of foods can result in increased mortality and highway public safety concerns. Human site development was a critical part of the wildlife linkage model, as well as a useful stand-alone layer for use in the expert workshops.

The site development layer was composed of residential and commercial locations and public recreational point sources. Geodata Services, Inc. also used commercial point locations based on a proprietary GIS database as part of their licensed ESRI Business Analyst software (source: Info USA). This data layer did not include 100% of the businesses, but the majority were available. Public recreational points (campsites, RV parks, etc.) typically do not exist in digital form and were digitized from USFS and BLM public map sources (typically at scales of approximately1:100,000). State park facilities were acquired from state sources. Garbage dumps were also not typically in digital form and were acquired from local expertise. Table 3 includes the full list of the type of human developments mapped for the linkage model.

Table 3. Type of Development & Human Influence Zone Assignment

Type of Developed Site & assigned human influence zone	GIS Source Layer
Admin Site – high	admin_sites_caribou
Admin Site – high	admin_sites_targhee
Airport – high	landmarp_region6
Airport or Airfield – high	landmarp_region6
Boat launch – low	admin_sites_targhee
Boat launch – low	Linkage Zone Model
Boat Ramp – low	recreation_site
Boating – low	rec_sites1
Camp – high	landmarp_region6
Camp (institutional) – high	admin_sites_targhee
Campground – high	admin_sites_targhee
Campground – high	landmarp_region6
Campground – high	Linkage Zone Model
Campground – high	rec_sites2
Campground – high	recreation_site
Campground (Family) -high	rec_sites1
Campground (FS) – high	rec_sites2
Campground (Group) – high	rec_sites1
Campsite – medium	Linkage Zone Model
Campsite – medium	rec_sites2

Campsite (FS) – medium	rec_sites2
Cemetery – high	landmarp_region6
Church – high	landmarp_region6
Church – high	Linkage Zone Model
Community – high	Linkage Zone Model
Corrals – high	admin_sites_caribou
Fairgrounds – high	landmarp_region6
Fire Department – high	landmarp_region6
Fish hatchery – high	admin_sites_targhee
Fish Hatchery – high	recreation_site
FIshing access – low	Linkage Zone Model
Fishing access – low	admin_sites_targhee
Fishing Access – low	recreation_site
FS Facility – high	recreation_site
Garbage dump – high	Linkage Zone Model
Golf Course – high	landmarp_region6
Government Center – high	landmarp_region6
Guard Station – medium	recreation_site
Guard Station – medium	admin_sites_caribou
Guest lodge – high	Linkage Zone Model
Guest lodge – high	admin_sites_targhee
Helispot – high	landmarp_region6
Historic_site – high	admin_sites_caribou
Horse Camp – high	rec_sites1
Hospital – high	landmarp_region6
Livestock operation – high	Linkage Zone Model
Lookout Tower – medium	landmarp_region6
Micro_tower – low	admin_sites_caribou
Mine – medium	admin_sites_caribou
Misc structure – low	Linkage Zone Model
Misc structure – low	admin_sites_targhee
Outfitter camp – medium	Linkage Zone Model
Overlook – medium	recreation_site
Picnic (Family) – medium	rec_sites1
Picnic (FS) – medium	rec_sites2
Picnic (Group) – medium	rec_sites1
Picnic Area – medium	recreation_site
Picnic Area – medium	rec_sites2
Radio repeater – low	admin_sites_caribou
Ranger Station – high	recreation_site
Rec site – high	admin_sites_targhee
Recreation Area – high	recreation_site
Recreation Site – high	recreation_site
Recreation Site (Wilderness) – high	rec_sites1
Residence – high	Linkage Zone Model
Residence – high	admin_sites_targhee
Residence – high	landmarp_region6
Restaurant – high	Linkage Zone Model
Restrooms – high	recreation_site
School – high	Linkage Zone Model
School – high	landmarp_region6
Seismic/DOE – low	admin_sites_caribou
Semi developed – high	admin_sites_targhee

Small_bldg – medium	admin_sites_caribou
Substation – low	admin_sites_targhee
Summer camp – high	Linkage Zone Model
Tower – low	landmarp_region6
Trailhead – low	Linkage Zone Model
Trailhead – low	admin_sites_targhee
Trailhead – low	recreation_site
Trailhead – low	rec_sites1
Trailhead – low	admin_sites_caribou
Viewpoint – medium	Linkage Zone Model
Viewpoint – medium	admin_sites_targhee
Visitor Center – high	recreation_site
Warminghut – medium	admin_sites_caribou
Water treatment plant – high	admin_sites_targhee
Work station – medium	Linkage Zone Model
Work station – medium	admin_sites_targhee

Residential development was required for the linkage model, and as a resource layer for display in the expert workshops. In selected counties these are available from cadastral property layers in digital form, linked to property tax mass appraisal databases. In this portion of Idaho, complete digital cadastral layers were not available from the nine counties involved, so we collected the data through on-screen digitizing using the orthophoto images. There were approximately 80,000 homes in the project area (2004 estimates for all nine counties), with an average growth rate of 1.67%, based on demographic census and commercial demographic data. Approximately 76,000 of these residences were single family. Most of these residences (over 93% in this area) were found in the urban areas and were less critical for this study except on the urban fringe. In urban areas, we digitized polygons around site development areas and for rural and ex-urban areas we digitized points on each structure. For purposes of preparing the grid based wildlife linkage model, both sources were combined into a 30m grid cell resolution layer for further processing.

In addition to the existing site development layer described above, we prepared a demographic layer of census block groups showing population estimates for 2000, 2003 and projections for 2008 and accompanying demographic and economic summary statistics to assist identification of habitat fragmentation areas and potential future fragmentation. This layer was not used in the linkage model but was a useful reference layer for the workshops. This data was based on commercial data composed of census data and supplemented by over 3,000 additional proprietary commercial data variables (source: ESRI Business Analyst) and was used in the workshops but was proprietary and not available as a project deliverable following the workshops.

Wildlife Linkage Modeling

We had two wildlife linkage models available as reference layers for the expert workshops. The two models focused on the same general concept of identifying important linkage areas that occur primarily between large blocks of public lands with relatively secure blocks of habitat. One model which was already developed for the

study area, was developed by American Wildlands and based on the general methodology initially developed as Corridors of Life (Ament and Craighead, 1998) and was targeted at large scale landscapes and was designed for a larger landscape than that included in this study area. This model was a least cost path model and was not as applicable to site specific locations since it does not incorporate fine scale data sets such as site development and riparian areas. Nevertheless, it has proved useful as a reference layer in previous expert workshops, particularly in identifying how this study area may fit in with the larger landscape in the Northern Rockies.

The second wildlife linkage model we developed for the expert workshops was based on methodology originally developed developed by Meitz (1994) and Servheen (2001). The model was targeted at large carnivores and ungulates, and identified linkage areas along highway corridors at a scale appropriate to the size of study area identified for this effort. The model included vegetation hiding cover, road density, riparian areas and site development, and complemented the habitat fragmentation analysis required for other wildlife, serving as a surrogate for many other species. The model also identified areas where cooperation was necessary and where opportunities were greatest for wildlife benefits in coordination between transportation departments, public land managers, wildlife biologists, NGOs and private land owners. In addition to the final model, the derivative layers were also useful individually as reference layers in the expert workshops.

The process for the final linkage model combined the four input data layers (roads, developed sites, cover conditions, riparian areas) and subsequently divided the results into four categories. In the "minimal" combined impact category, a given cell in the model had to have beneficial or neutral impact on all four individual layers or no more than one layer with a low impact value. The criteria progressed in this manner up through the low, moderate and high impact values (see description below). Details on this linkage model methodology was available in a report provided by Chris Servheen, National Grizzly Bear Coordinator with the US Fish and Wildlife Service (Servheen, 2001), and in a thesis by Per Sandstrom (Sandstrom, 1996).

ITD Linkage Model Tools

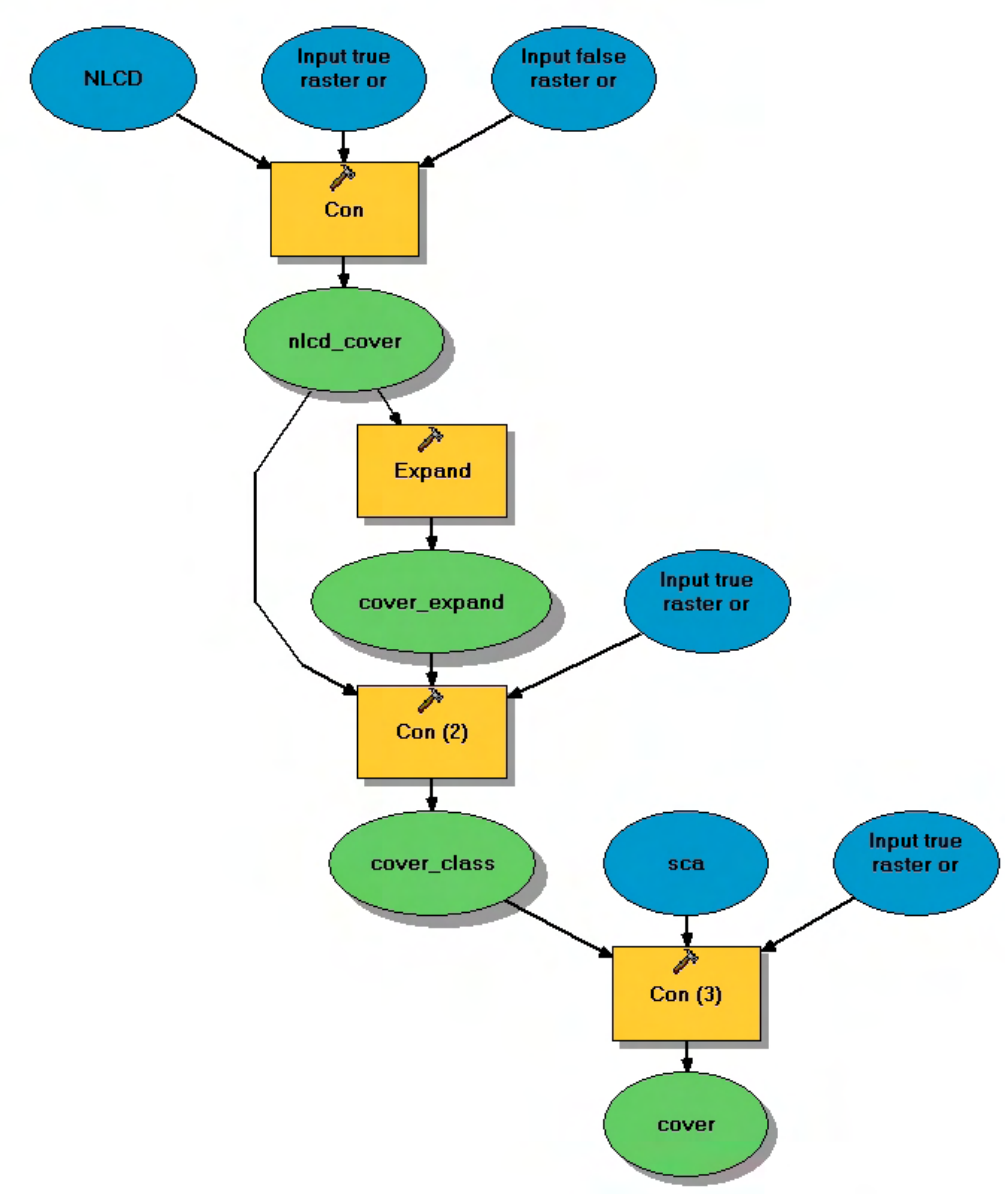
These tools are the modules of the Identification of Potential Linkages Zones model for large carnivores and ungulates. The tools were built in ESRI Modelbuilder, a component of Arcview 9 and provided as a deliverable for this project. The toolbox for the model and associated parameters can be optionally loaded along with the grid layers to re-run or tweak parameters of the model. Impacts of human activities and beneficial features of the landscape were considered. A rating system for each type of impact and vegetation condition was used to score each model component and then the values were combined and classified into impact level categories of high, moderate, low, or minimal. The impacts and vegetation conditions considered were distance from roads, road density, developed sites, riparian areas and hiding cover. While distance from roads was not applied directly to the final score it was used to define secure core areas which was then used to modify the rating of road density and hiding cover.

The following pages each describe the primary component of the model, along with a flowchart from Modelbuilder illustrating the relationships. Refer to Appendix A for detailed GIS steps implementing the model processes. The formal FGDC metadata, associated with each GIS layer and grid includes additional details on the model process and data layer documentation.

Hiding Cover

Extracts the cover types from the National Land Cover Data that could be considered as hiding cover. A 30 meter edge buffer was created that expanded the hiding cover areas. Finally, the hiding cover values were modified by their location either in or out of secure core areas (SCA). All areas, hiding, edge, or open were classified as hiding within secure core areas. Edge areas outside of a SCA were given an impact rating one level higher than hiding cover and open areas were given a rating of 2 levels higher than hiding cover.

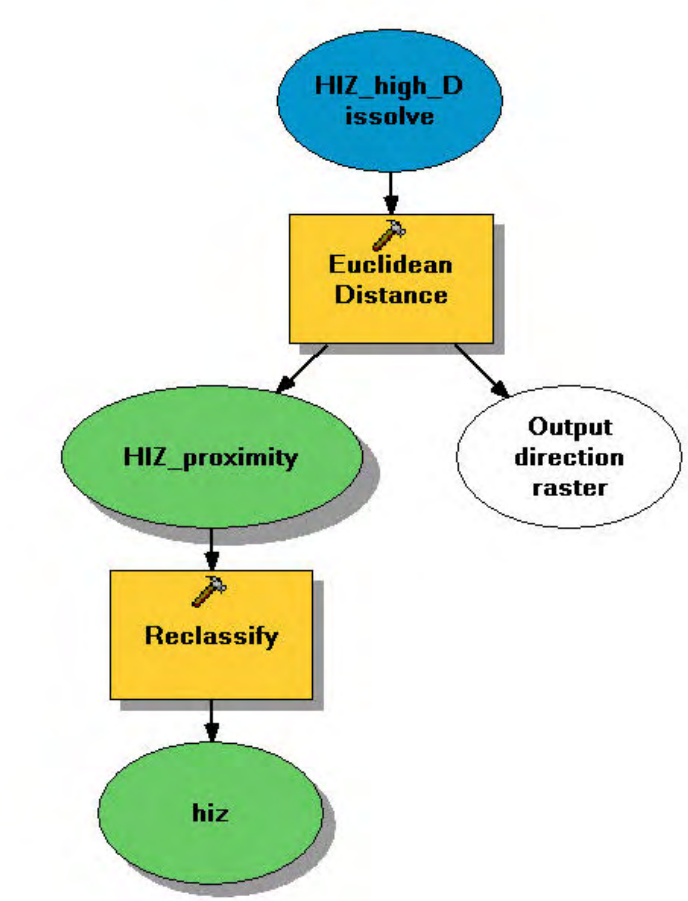
Figure 6. Hiding Cover Model Flowchart



Human Influence Zone

Defines Human Influence Zones around developed sites. A high impact zone layer was generated by buffering all developed site point and polygon features. The high impact zone layer is the primary input for this tool, which then creates two additional impact zones, each 120 meters wide, around the high impact zone. These additional rings are then assigned medium and low impact values moving outward from the high impact zone.

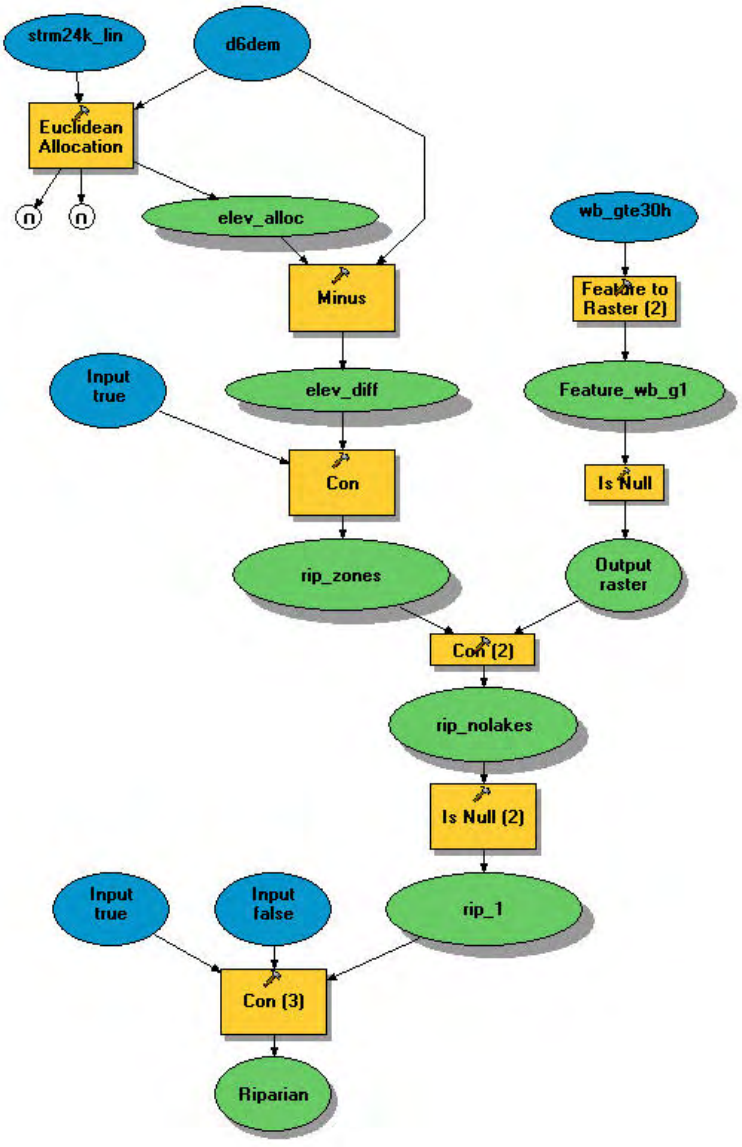
Figure 7. Human Influence Zone Model Flowchart



Riparian

This model generates an approximate or potential riparian zone grid based on proximity to streams and elevation gradient. The process follows the method outlined in the "Identification of Potential Linkage Zones for Grizzly Bears in the Swan Clearwater Valley Using GIS", P. Sandstrom, 1996.

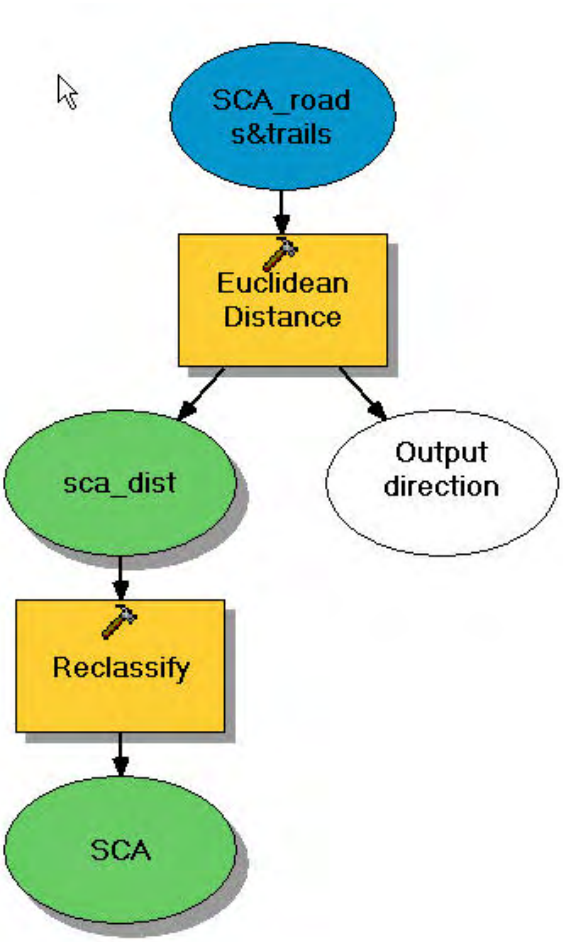
Figure 8. Riparian Model Flowchart



Secure Core Area

This tool generates the secure core areas (SCA) based on distance from selected roads and high use trails. The euclidian distance to the nearest road segment is calculated for each grid cell and then reclassified as either "In SCA" (greater than 500 meters from a road or high use trail), or "Out of SCA" (within 500 meters of a road or high use trail).

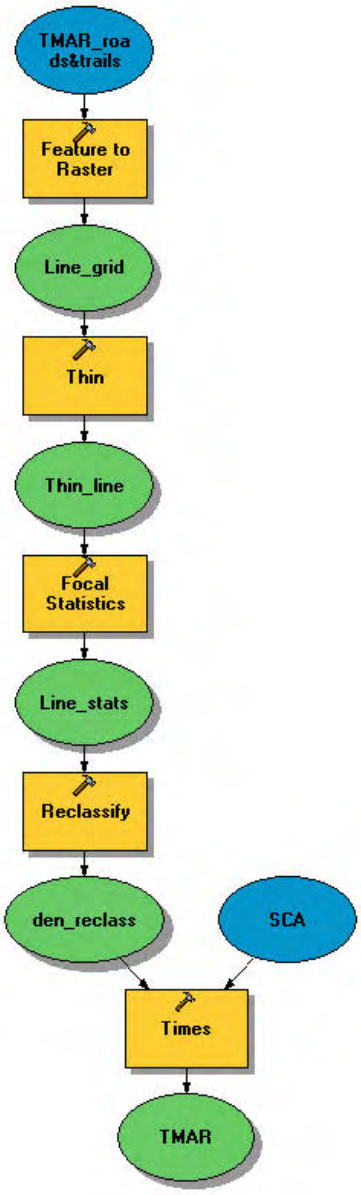
Figure 9. Secure Core Area Model Flowchart



Total Motorized Access Routes

Uses a "moving window" analysis routine to calculate the road density in the one square mile (circular) area around each grid cell. The road density is then classified into 4 categories - 0 miles/sq. mile, 0.01 - 1 miles/sq mile, 1.01 - 2 miles/sq mile, and > 2 miles/sq mile. Impact values are assigned to each category and then modified based on whether they are in or out of secure core areas (SCA). Impact values for areas out of SCA are increased by one level, and areas within an SCA retain the original value.

Figure 10. Total Motorized Access Routes Model Flowchart



Combined Impacts

LZ Combined Impacts adds the impact values from the component models and classifies the resultant grid into impact categories of minimal (1), low (2), moderate (3), or high (4).

MINIMAL: In general, to be considered in the "minimal" combined impact category, the pixel had to have "neutral" or beneficial" impact values for all 4 individual layers, or only one condition have a "minimal" or "low" impact value.

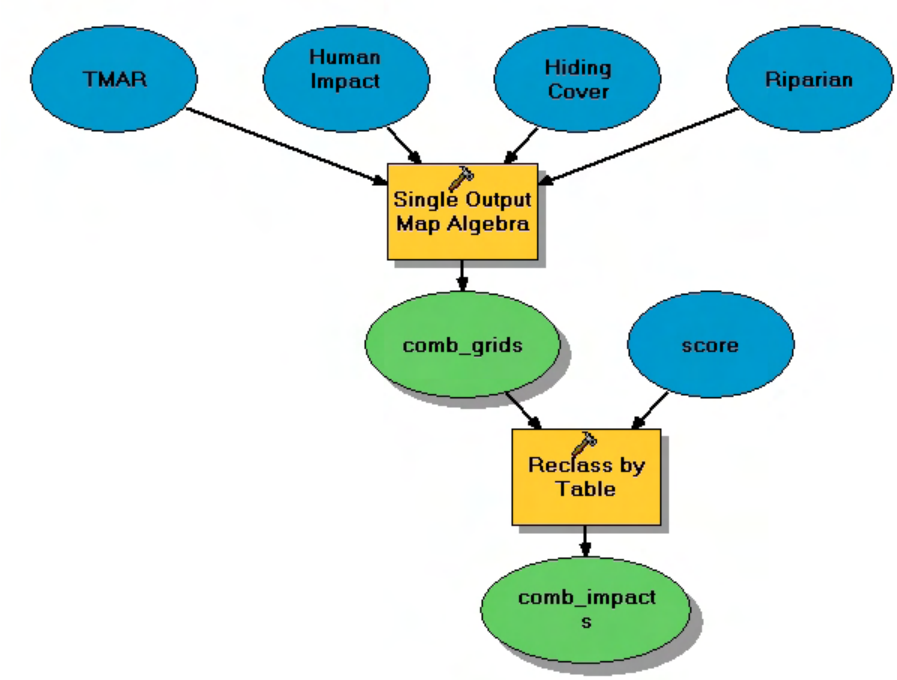
4 beneficial or neutral
3 beneficial or neutral and 1 minimal or low

LOW: To be considered in the "low" combined impact category, 2 conditions could be in the "minimal" or "low" category, or 1 condition in the "minimal" or "low" category and/or 1 condition in the "moderate" category while the others had to be "beneficial" or "neutral".

2 minimal or low and 2 beneficial or neutral
1 minimal or low and 1 moderate and 2 beneficial or neutral
1 moderate and 3 beneficial or neutral

MODERATE OR HIGH: To be considered in the "moderate" or "high" combined impact category, the individual impact values had to be different combinations of "low", "moderate", and "high impact values

Figure 11. Combined Impacts Model Flowchart



Project Deliverables

Project deliverables for this project included this final project report including data summaries for the areas of interest and documentation collected from biologists and other experts during workshops and review comments. In addition to the report, ten original GIS layers were developed during the project, and formal metadata for each layer is included in Appendix A. The physical model used to develop these grid layers was also a deliverable. The map layers included:

- Human development point map layers in rural portions of the District and polygons for populated areas in ArcView® shapefile format
- Wildlife linkage model for the entire study area and the five major subcomponents of the model, delivered in or ArcInfo® grid file format
- Wildlife linkage areas of interest documented on highway segments throughout the study area
- Additional suspected fish barriers identified in the expert workshops
- Road kill categories by highway segments indentified and mapped by wildlife biologists and road maintenance personnel prior to the expert workshops

Three expert workshops were organized, coordinated and facilitated to develop area of interest maps for the project area and provide the content for the wildlife linkage assessment. Both workshops followed a similar format and were approximately one day in duration. Two workshops were held in Idaho Falls, and one in Challis, Idaho. The workshops were attended by biologists and engineers from state, federal and local government agencies, and representatives of several non-governmental organizations. In addition to the expert workshops, the process also involved extensive external review opportunities of site specific information through internet based web map services, prior to summarizing and preparing the final report.

The ten original GIS data layers developed in the project were provided to ITD in the Idaho Transverse Mercator (IDTM) projection, a single-zone system that is widely accepted for use in the State of Idaho and is the state standard. The projection parameters for this standard are as follows:

Projection Name: Idaho Transverse Mercator NAD83 (IDTM83)

Units: meters
Datum: NAD83
Vertical Datum: NAVD88
Scale factor: .99960
Central Meridian: -114 00 00
Latitude of Origin: 42 00 00
False Easting: 2500000
False Northing: 1200000

Project Process and Participation

Project Methodology

Three expert workshops were held in ITD District 6.. All three workshops followed a similar format and were approximately one day in duration. Two workshops were held in Idaho Falls, and another one was held in Challis, Idaho. The workshops were attended by biologists and engineers from the Idaho Transportation Department, and wildlife biologists from the Idaho Fish and Game, the US Fish and Wildlife Service, Bureau of Land Management and US Forest Service. The Idaho Falls meeting included biologists from the Targhee and Salmon/Challis National Forests and the Challis meeting included biologists from the Sawtooth National Forest, and well as the Salmon/Challis National Forest. Biologists from several non-governmental organizations also attended the workshops. A full list of participants in each workshop is provided below.

The purpose of the workshops were to review data layers and collectively and individually identify areas of interest for wildlife linkage, review planned highway projects and anticipate other site specific issues related to wildlife habitat, public safety and other wildlife linkage topics. Workshop attendees had access to interactive GIS services to review data layers and model results, paper wall maps and other documentation. The expert workshops included interactive mapping as a group, supplemented by completion of documentation and worksheets, identification of whether each linkage area of interest was of ecosystem or local importance, and prioritization of areas of interest.

The general format for the workshops were as follows:

- 1 hr – General introductions of meeting participants and introduction to the process and the data layers and maps available for the process
- 0.5 hr - Presentation by Idaho Transportation Department on highway improvement projects and maintenance opportunities in the appropriate sections of the study area
- 5-7 hours – All group review and discussion of individual highway segments with mile by mile summary and identification of key areas of interest, and group summary discussion of key wildlife issues and opportunities, and individual worksheet completion and documentation by workshop participants in identified area of interest polygons, and identification of additional research and information needs, additional contacts and issue delineation.

Expert Workshop Participants

Challis, Idaho May 18, 2005
Tim Cramer, ITD
Chris Servheen, USFWS
Ken Wall, Geodata Services, Inc.
Brent Inghram, Federal Highway Administration
Michael Steck, USFS
Bill Vermaas, ITD

Dan Hawkins, ITD
Nikki Leonard, NOAA
Zack Funkhouser, ITD
Jennifer Purvine, USFS
Ron Robinson, ITD
Connie Jones, ITD
Elizabeth Roberts, American Wildlands
Joshua Burnim, American Wildlands
Beth Waterbury, IDFG
Eric Verner, ITD
Vincent Guyer, BLM
Tom Curet, IDFG

Idaho Falls, Idaho May 19, 2005
Tim Cramer, ITD
Chris Servheen, USFWS
Ken Wall, Geodata Services, Inc.
Eric Verner, ITD
Lynn Merrill, IDFG
Gary Vecellio, IDFG
Curtis Hendricks, IDFG
Lew Huddleston, IDFG
Terry Thomas, IDFG
John Hanson, IDFG
Justin Naderman, IDFG
Doug Peterson, IDFG
Bruce Penske, IDFG
Paul Faulkner, IDFG
Dan Duggan, IDFG

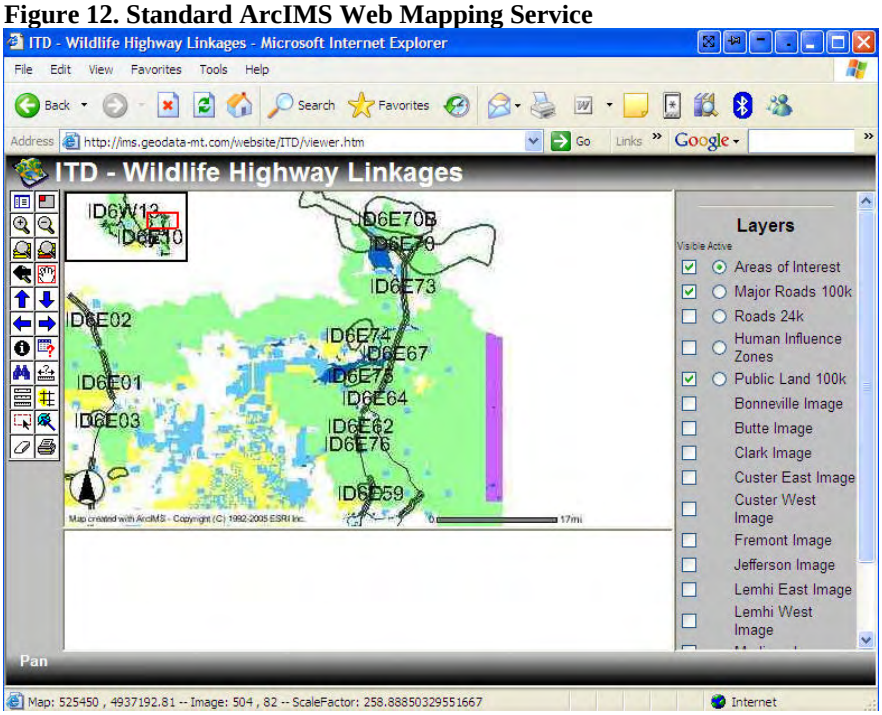
Idaho Falls, (Rigby) Idaho May 25, 2005
Tim Cramer, ITD
Chris Servheen, USFWS
Ken Wall, Geodata Services, Inc.
Eric Verner, ITD
Scott Christensen, GYC
Joshua Burnim, American Wildlands
Rob Cavalloro , Teton Land Trust
Matt Davison, ITD
Jon Beckmann, Wildlife Conservation Society
Darrell Ricks, ITD
Darrin May, ITD
Lyle Holder, ITD
Ron Atchley, ITD
Don Gilstrap, ITD
Darell Ricks, ITD

Dee Newcomb, ITD
Bryan Aber, USFS

Full list of email participants with opportunity to comment (As of June 3, 2005)
'Tim Cramer'; 'Bill Vermaas'; 'Dan Hawkins'; 'Ronald Atchley'; 'Lyle Holden'; 'Don Gilstrap'; 'Darrin May'; 'Matt Davison'; 'alison_beck_haas@fws.gov'; 'James Capurso'; 'lmabey@fs.fed.us'; 'morme@fs.fed.us'; 'mark_robertson@fws.gov'; 'Marv Hoyt'; 'Nikki Leonard'; 'schristensen@greateryellowstone.org'; 'stevetrafton@henrysfork.org'; 'rgarwood@fs.fed.us'; 'dkenney@fs.fed.us'; 'dwenger@fs.fed.us'; 'rlarson@fs.fed.us'; 'vincent_guyer@blm.gov'; 'scott_feldhausen@blm.gov'; 'patrick_koelsch@blm.gov'; 'glen_guenther@blm.gov'; 'carol_mccoybrown@blm.gov'; 'joe_lowe@blm.gov'; 'mdavidson@tnc.org'; 'amay@tnc.org'; 'kdavitt@wildlands.org'; 'grizz@forestry.umt.edu'; 'gaillard@predatorconservation.org'; 'mike@tetonlandtrust.org'; 'lance@grizzlybear.org'; 'Carol_A_Evans@r1.fws.gov'; 'daleb@cskt.org'; 'angelas@nezperce.org'; 'jayh@nezperce.org'; 'ccolter@shoshonebannocktribes.com'; 'dchristopherson@shoshonebannocktribes.com'; 'hray@shoshonebannocktribes.com'; 'jhanson@idfg.idaho.gov'; 'dmeints@idfg.idaho.gov'; 'bhsmith@fs.fed.us'; 'Inghram, Brent'; 'TCuret@idfg.state.id.us'; 'gpainter@idfg.idaho.gov'; 'bwaterbury@idfg.idaho.gov'; 'tkeegan@idfg.idaho.gov'; 'Vecellio,Gary'; 'Ken Hahn'; 'Brian Kremer'; 'msteck@fs.fed.us'; 'jpurvine@fs.fed.us'; 'ron.robinson@itd.idaho.gov'; 'connie.jones@itd.idaho.gov'; 'eroberts@wildlands.org'; 'jburnim@wildlands.org'; 'eric.verner@itd.idaho.gov'; 'rob@tetonlandtrust.org'; 'jbeckmann@wcs.org'; 'swanvalleyoutfit@hol.com'; 'DNewcomb@itd.idaho.gov'; 'baber@fs.fed.us'; 'lbmerrill@hotmail.com'; 'chendricks@idfg.idaho.gov'; 'lhuddleston@idfg.idaho.gov'; 'tthomas@idfg.idho.gov'; 'jnaderman@idfg.idaho.gov'; 'dpetersen@idfg.idaho.gov'; 'penske@ida.net'; 'pfaulkner@idfg.idaho.gov'; 'rwall@geodata-mt.com'; 'kwall@geodata-mt.com'

Post Workshop Processing
Following each workshop, Geodata entered all worksheets and comments received at the sessions and conducted post processing summary statistics for the areas of interest polygons identified in the sessions. The AOI polygons were run through zonal statistics routines to summarize key values such as land ownership acreages of public lands, acres of linkage model categories and land cover. These descriptive summaries were combined with and narrative summary of expert comments and released via the Geodata website in draft form. They were available in Adobe pdf format, supplemented by two forms of web mapping tools.

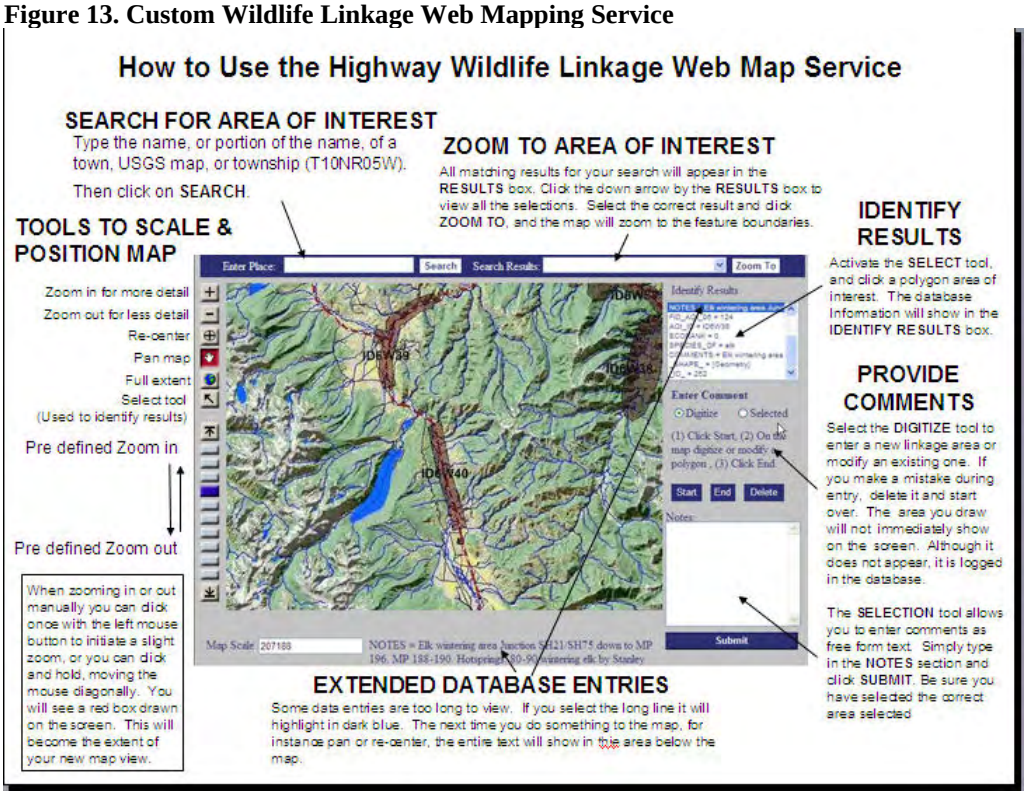
Figure 12. Standard ArcIMS Web Mapping Service



We used the web mapping as a convenient and inexpensive way to review the results of the meetings with participants and capture review comments. Users were able to log on using a common web browser like Internet Explorer, and review and comment on the polygons with full control over the level of detail they wish to zoom in to see. It was easier than routing around paper maps and coordinating the review process. One web tool was a traditional layer based ArcIMS service.

It was designed to view multiple map layers, and print maps locally. It was more technical to use and had more GIS tools available for analysis (see Figure 12). The second was a web tool to view the results for each area of interest, options to suggest additions, modifications or deletions from the linkage areas mapped in the workshops and provide a simple mechanism for open ended comments (see Figure 13). With a map base provided from web services like the National Map from USGS, and ESRI and National Geographic, this interface was much simpler to use by non-technical users and provides a means for site specific user feedback accessible with no training. We have used these two web services for similar projects and found they work well in complementing each other, providing 24/7 access for workshop participants of varying technical levels and easy and inexpensive means of flexible review of spatial and non-spatial data.

Figure 13. Custom Wildlife Linkage Web Mapping Service



We also supplemented the spatial data review with structured digital comment forms, based on SurveyMonkey online survey web forms and questionnaires. These provide easy to use structured questions that can be completed by experts reviewing the results on their own time, and cutting the data entry and processing costs via the digital submission format.

We accepted comments during a three week post processing and three week review timeframe following each workshop for participants to review, modify and supplement the workshop content and results. This web mapping review and evaluation system, including an extensive post workshop data questionaire on each area of interest was developed and will be maintained following the completion of the project, as part of the Wildlife GIS Portal and National Wildlife Habitat Project Registry maintained by Geodata and the Rocky Mountain Elk Foundation, and a consortium of wildlife conservation organizations.

Documentation and Metadata

We prepared formal FGDC compliant metadata for the wildlife linkage model developed in the process and for the final area of interest polygon layer. The metadata were provided in XML format.

References

Ament, R. and L. Craighead. 1998 Corridors of Life. The Journal of American Wildlands. Spring/Summer, 1998 Vol 9, No 1

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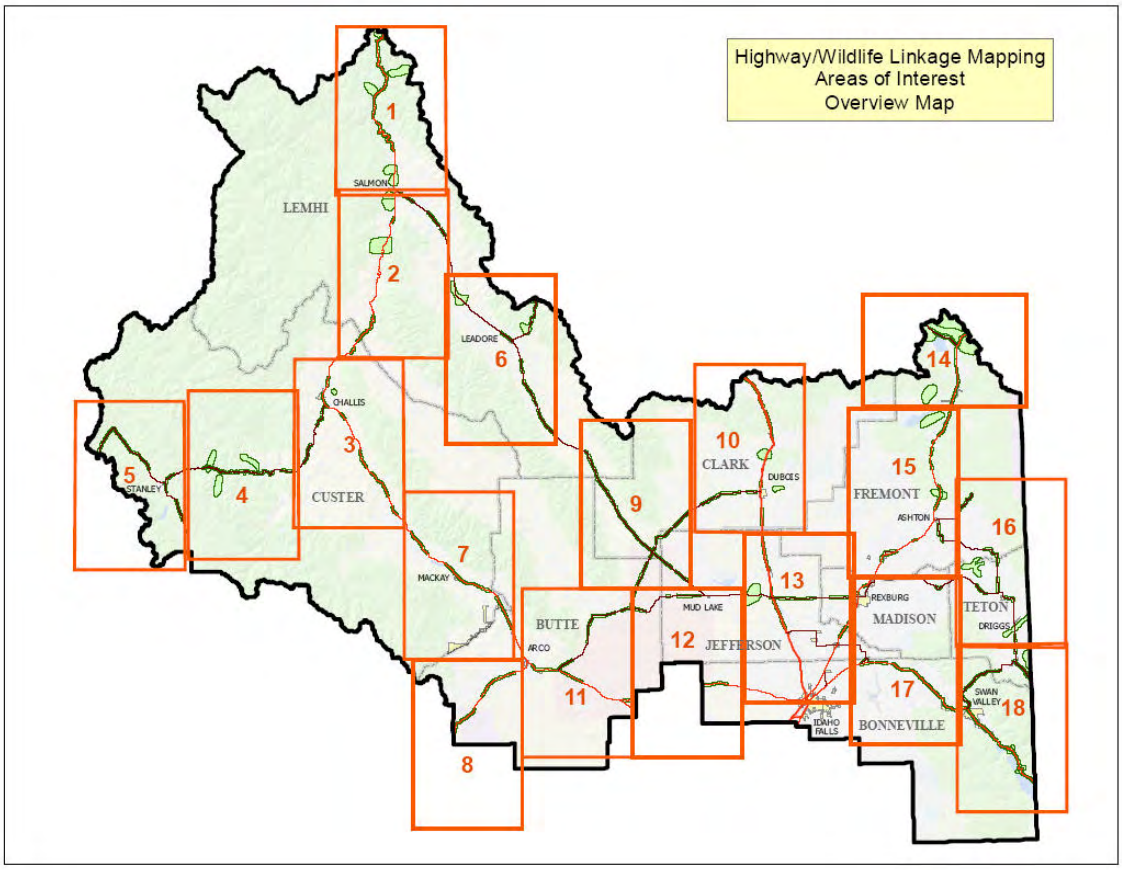
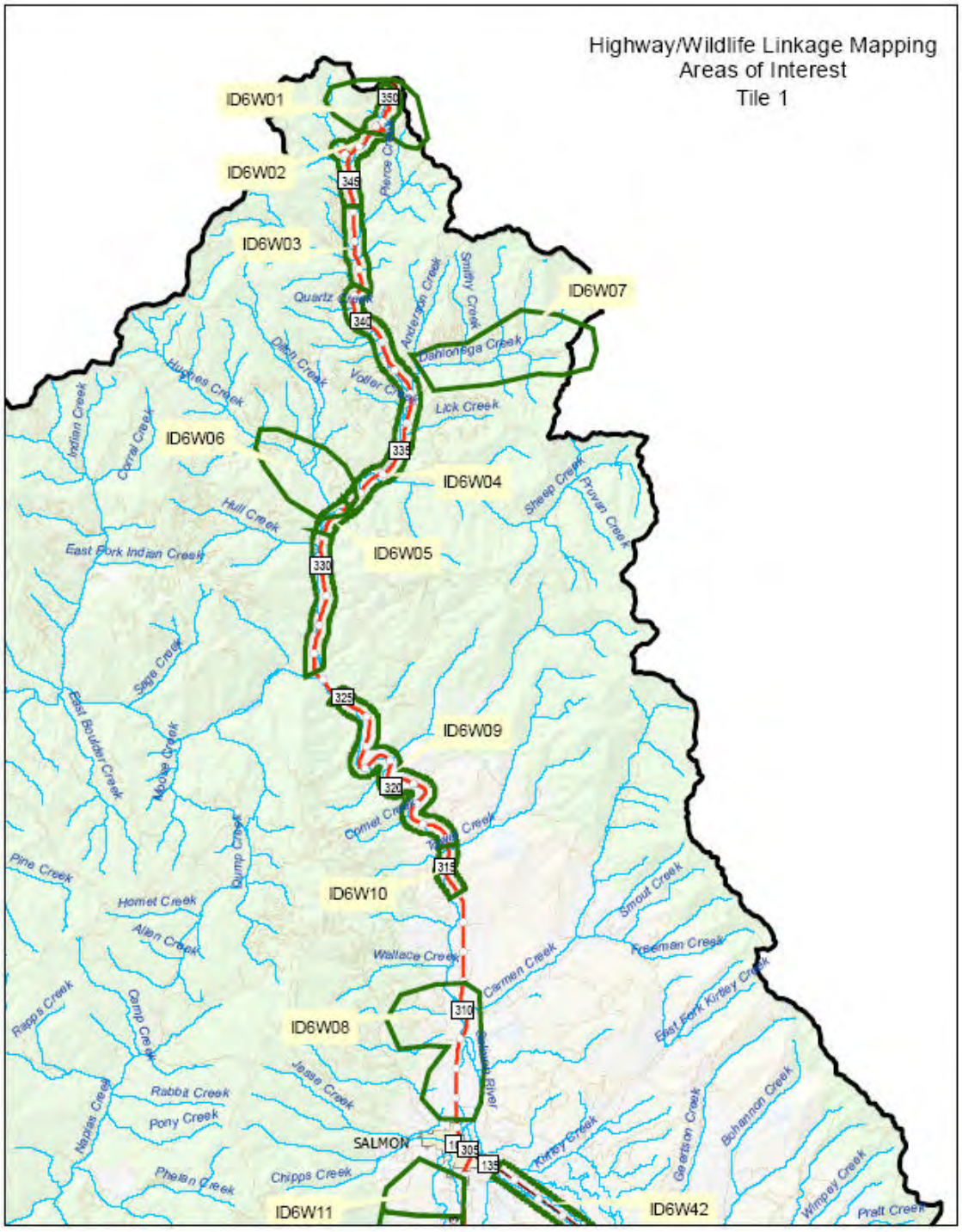
Ruediger, B and J. Lloyd. 2004. A rapid assessment process for determining potential wildlife, fish and plant linkages for Highways. Conference Presentation for ICOET, 2004.

Sandstrom, P.L. 1996. Identification of potential linkage zones for grizzly bears in the Swan-Clearwater valley using GIS. MS Thesis. University of Montana. 72 pp.

Servheen, C., J. Waller and P. Sandstrom. 2001. Identification and management of linkage zones for Grizzly Bears between large blocks of public land in the Northern Rockies. USFWS Manuscript. University of Montana

Appendix A- Detailed maps of Linkage Areas of Interest

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ID6W03
ID6W04
ID6W05
ID6W06
ID6W07
ID6W08
ID6W09
ID6W10
ID6W11
ID6W42
SALMON
Pierce Creek
Quartz Creek
Anderson Creek
Shelby Creek
Dahlonega Creek
Ditch Creek
Voller Creek
Lick Creek
Hughes Creek
Indian Creek
Corral Creek
Hull Creek
East Fork Indian Creek
Sheep Creek
Beaver Creek
Sage Creek
East Boulder Creek
Moose Creek
Comet Creek
Bump Creek
Pine Creek
Hornet Creek
Allen Creek
Wallace Creek
Carmen Creek
Smout Creek
Freeman Creek
East Fork Kirtley Creek
Rapps Creek
Camp Creek
Jesse Creek
Rabbit Creek
Pony Creek
Napias Creek
Phelan Creek
Chipps Creek
Kenney Creek
Geertson Creek
Bohannon Creek
Wimpey Creek
Pratt Creek
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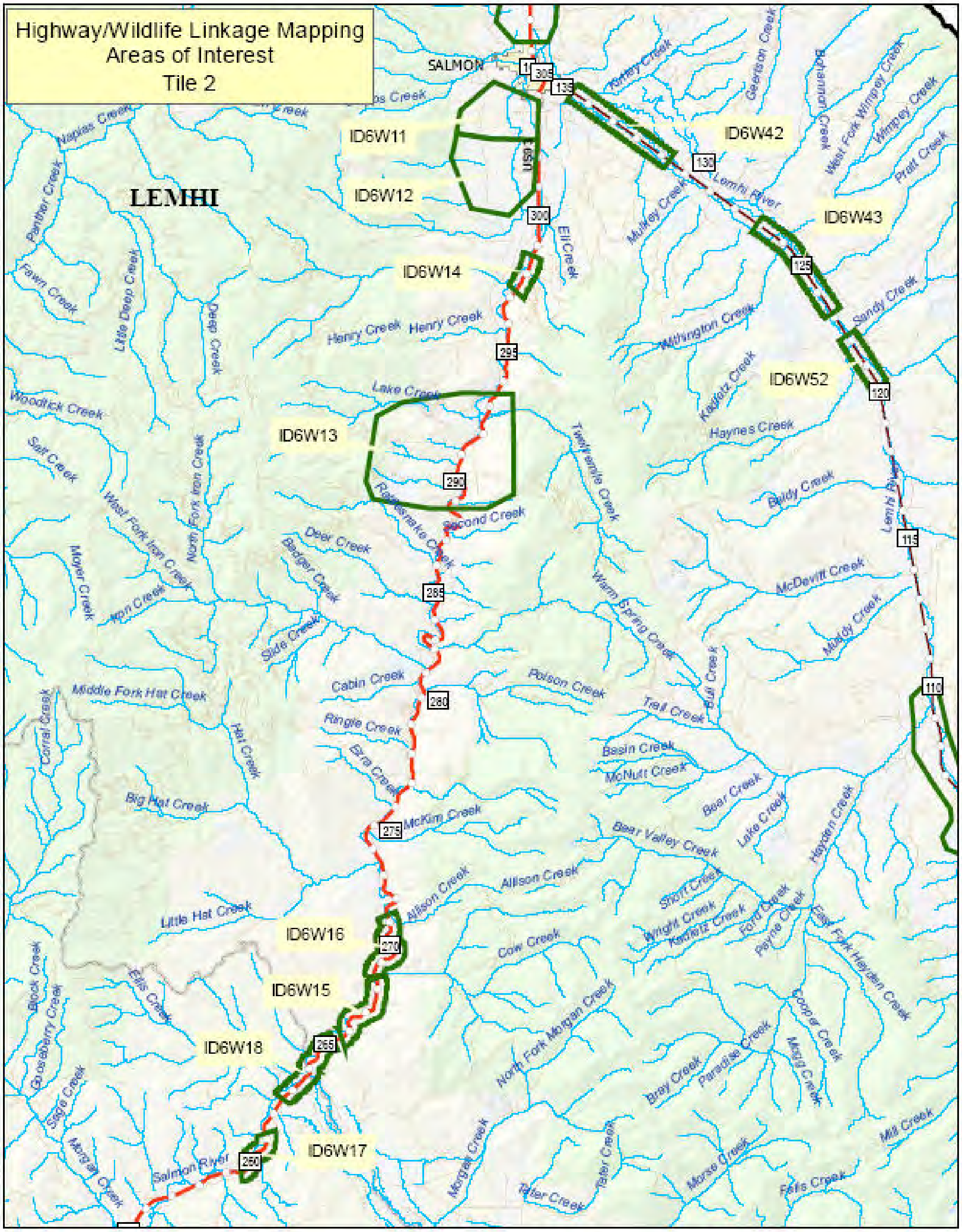
345
340
335
330
325
320
315
310
305
135


Highway/Wildlife Linkage Mapping
Areas of Interest
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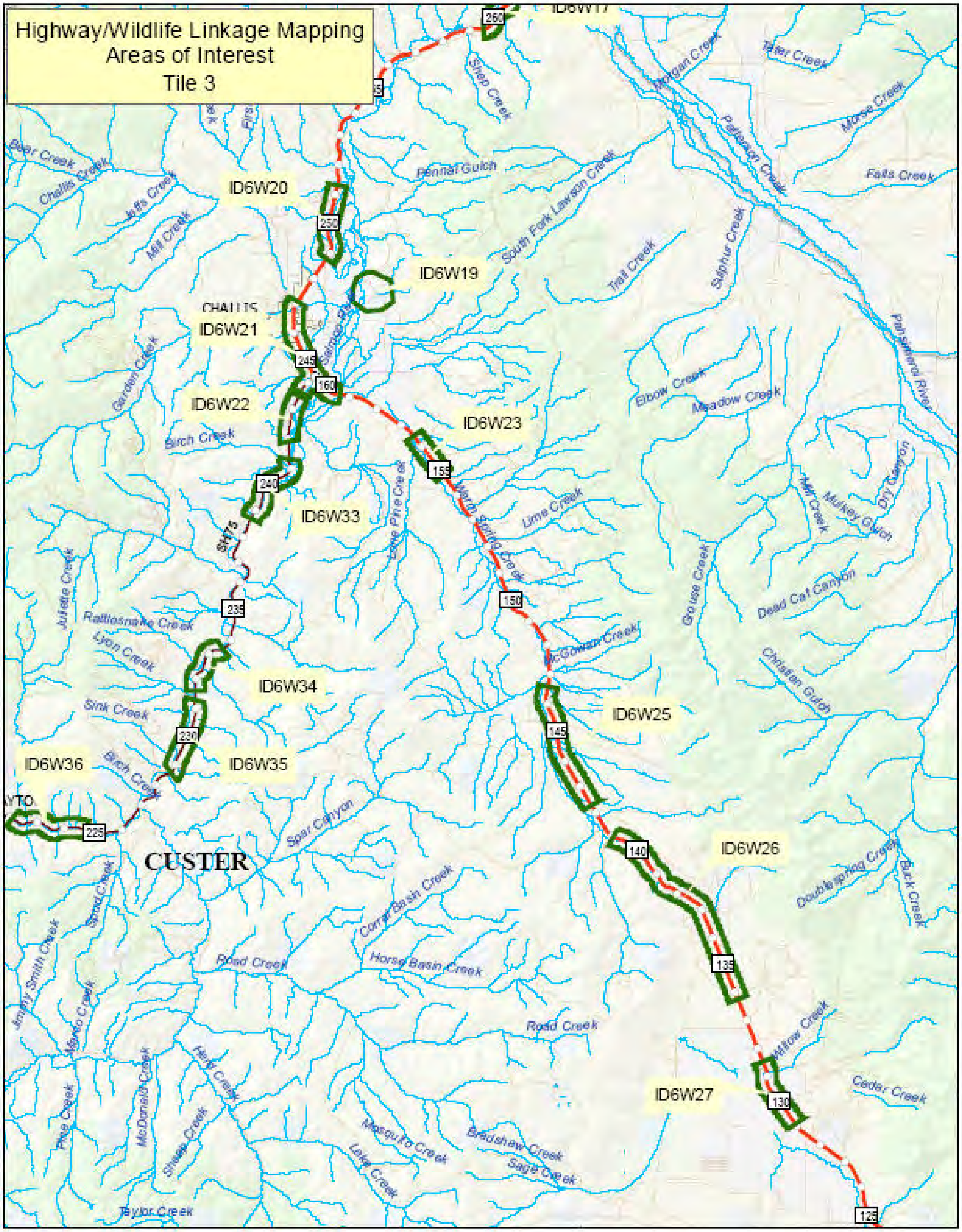
LEMHI
ID6W11
ID6W12
ID6W13
ID6W14
ID6W15
ID6W16
ID6W17
ID6W18
ID6W42
ID6W43
ID6W52
Lemhi River
Salmon River



Highway/Wildlife Linkage Mapping
Areas of Interest
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ID6W19
ID6W21
CHALLIS
ID6W22
ID6W23
ID6W33
ID6W34
ID6W25
ID6W35
ID6W36
ID6W26
ID6W27
CUSTER
Bear Creek
Challis Creek
Jeffs Creek
Mill Creek
Garden Creek
Birch Creek
Juliette Creek
Rattlesnake Creek
Lyon Creek
Sink Creek
Spar Canyon
Corral Basin Creek
Horse Basin Creek
Road Creek
Lime Creek
McGowan Creek
Elbow Creek
Meadow Creek
Trail Creek
Sulphur Creek
Pennal Gulch
South Fork Lawson Creek
Morgan Creek
Tater Creek
Morse Creek
Falls Creek
Pahsimeroi River
Grouse Creek
Dead Cat Canyon
Christian Gulch
Mulkey Gulch
Dry Canyon
Doublespring Creek
Buck Creek
Willow Creek
Cedar Creek
Bradshaw Creek
Sage Creek
Mosquito Creek
Lake Creek
Herd Creek
Sheep Creek
McDonald Creek
Pine Creek
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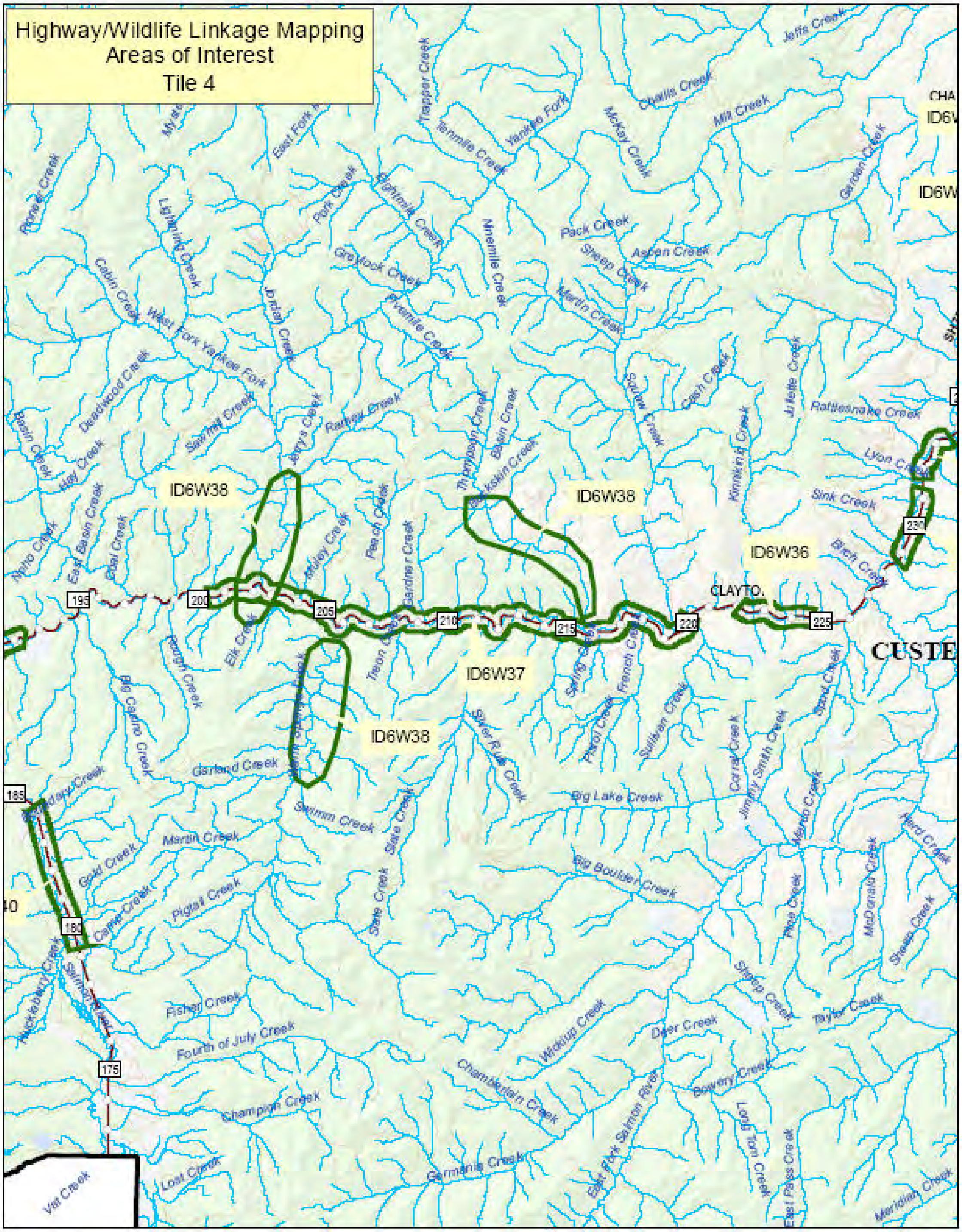
Highway/Wildlife Linkage Mapping
Areas of Interest
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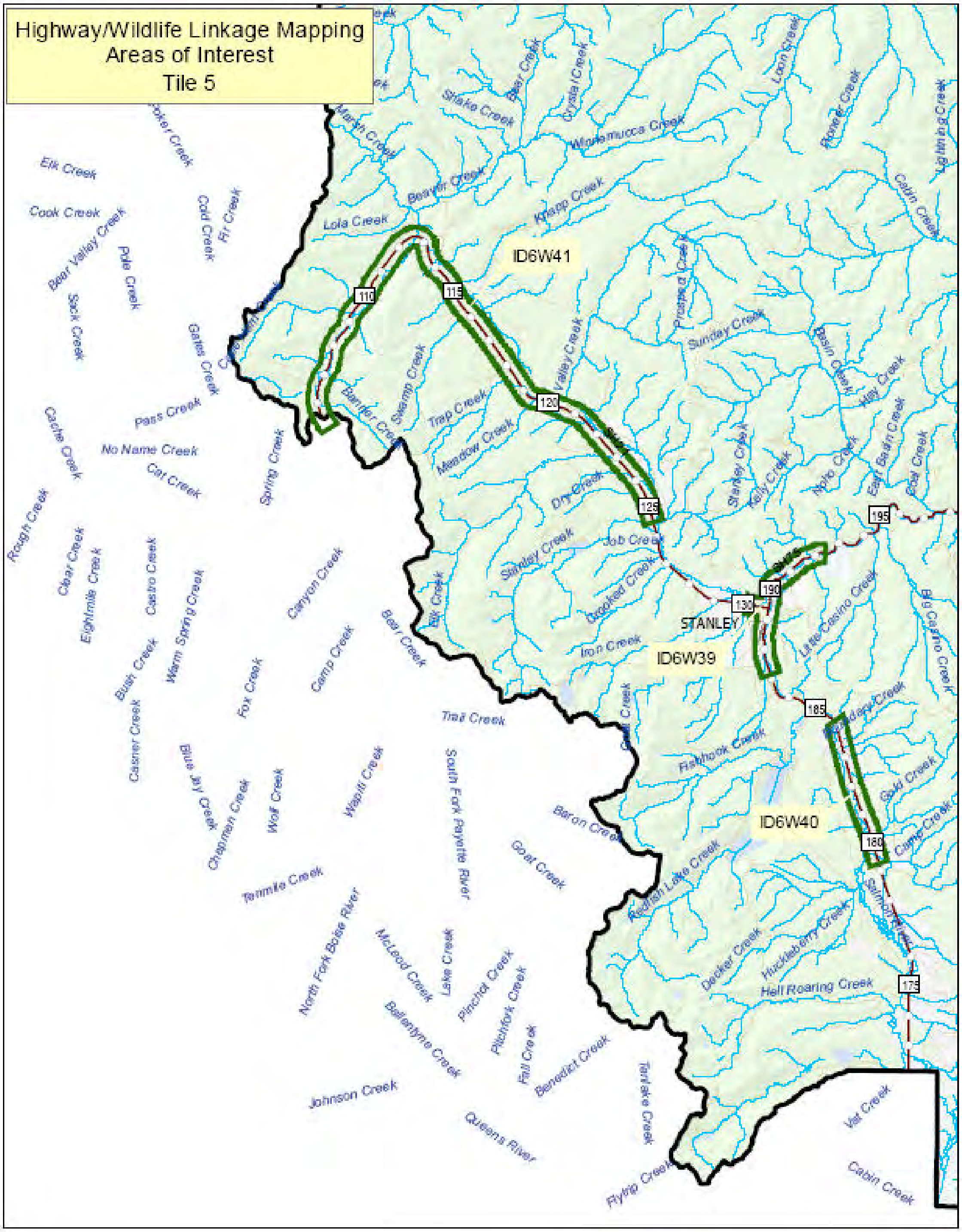
ID6W38
ID6W36
ID6W37
ID6W38
CLAYTO
CUSTE


Highway/Wildlife Linkage Mapping
Areas of Interest
Tile 5
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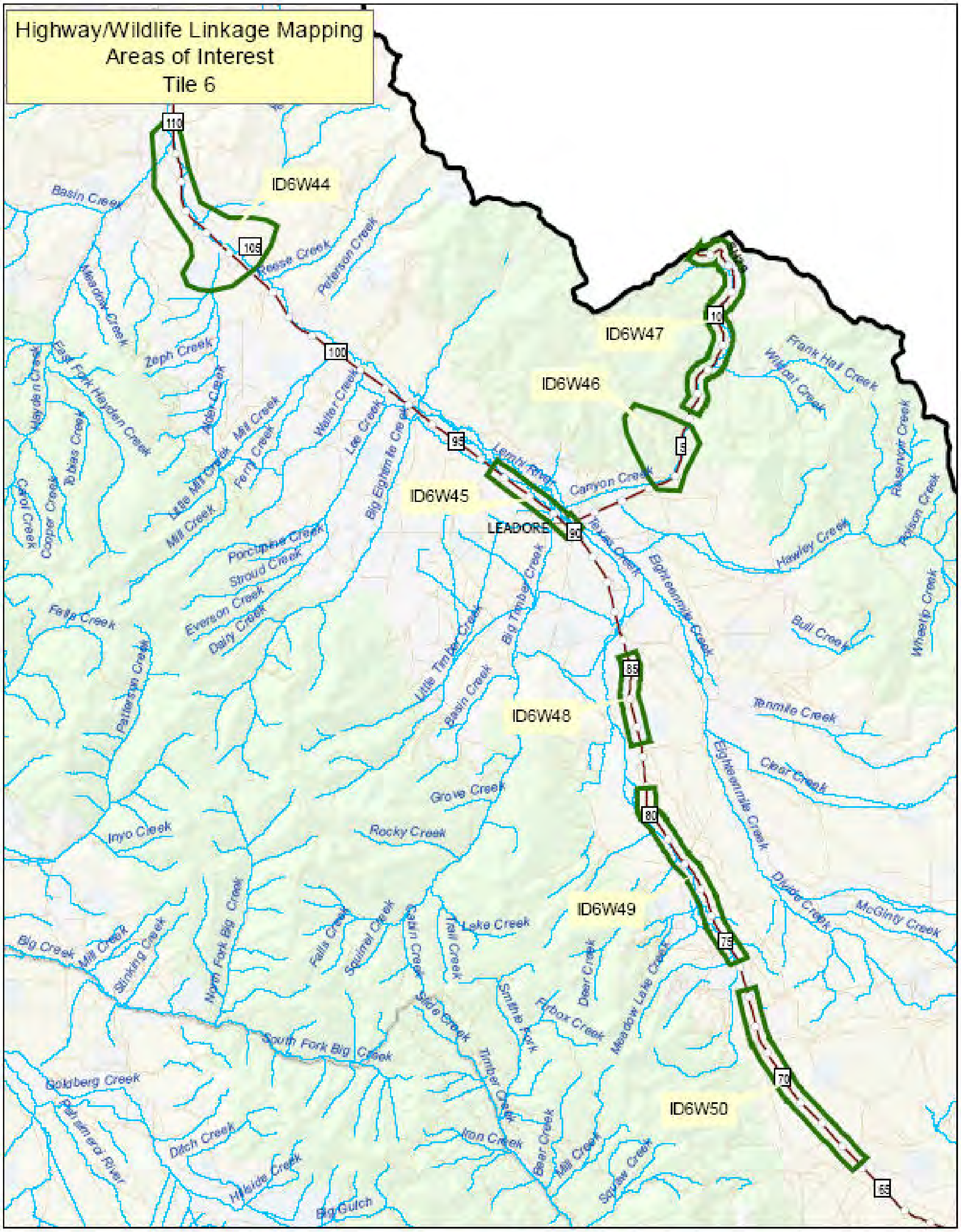
ID6W39
ID6W40
STANLEY
110
115
120
125
130
190
195
185
180
175
Elk Creek
Cook Creek
Bear Valley Creek
Pole Creek
Sack Creek
Cold Creek
Fir Creek
Gates Creek
Pass Creek
Cache Creek
No Name Creek
Cat Creek
Spring Creek
Rough Creek
Clear Creek
Eightmile Creek
Castro Creek
Warm Spring Creek
Canyon Creek
Bush Creek
Casner Creek
Fox Creek
Camp Creek
Bear Creek
Elk Creek
Blue Jay Creek
Chapman Creek
Wolf Creek
Wapiti Creek
Trail Creek
South Fork Payette River
Baron Creek
Goat Creek
Tenmile Creek
North Fork Boise River
McLeod Creek
Lake Creek
Pinchot Creek
Pitchfork Creek
Ballentyne Creek
Fall Creek
Benedict Creek
Johnson Creek
Queens River
Tenlake Creek
Flytrip Creek
Lola Creek
Beaver Creek
Knapp Creek
Stake Creek
Bear Creek
Crystal Creek
Winnemucca Creek
Loon Creek
Pioneer Creek
Lightning Creek
Cabin Creek
Prospect Creek
Sunday Creek
Basin Creek
Valley Creek
Swamp Creek
Trap Creek
Meadow Creek
Dry Creek
Stanley Creek
Job Creek
Crooked Creek
Iron Creek
Stanley Creek
Kelly Creek
Noho Creek
Hay Creek
East Basin Creek
Goat Creek
Little Casino Creek
Big Casino Creek
Fishhook Creek
Gold Creek
Camp Creek
Redfish Lake Creek
Decker Creek
Huckleberry Creek
Hell Roaring Creek
Vat Creek
Cabin Creek


Highway/Wildlife Linkage Mapping
Areas of Interest
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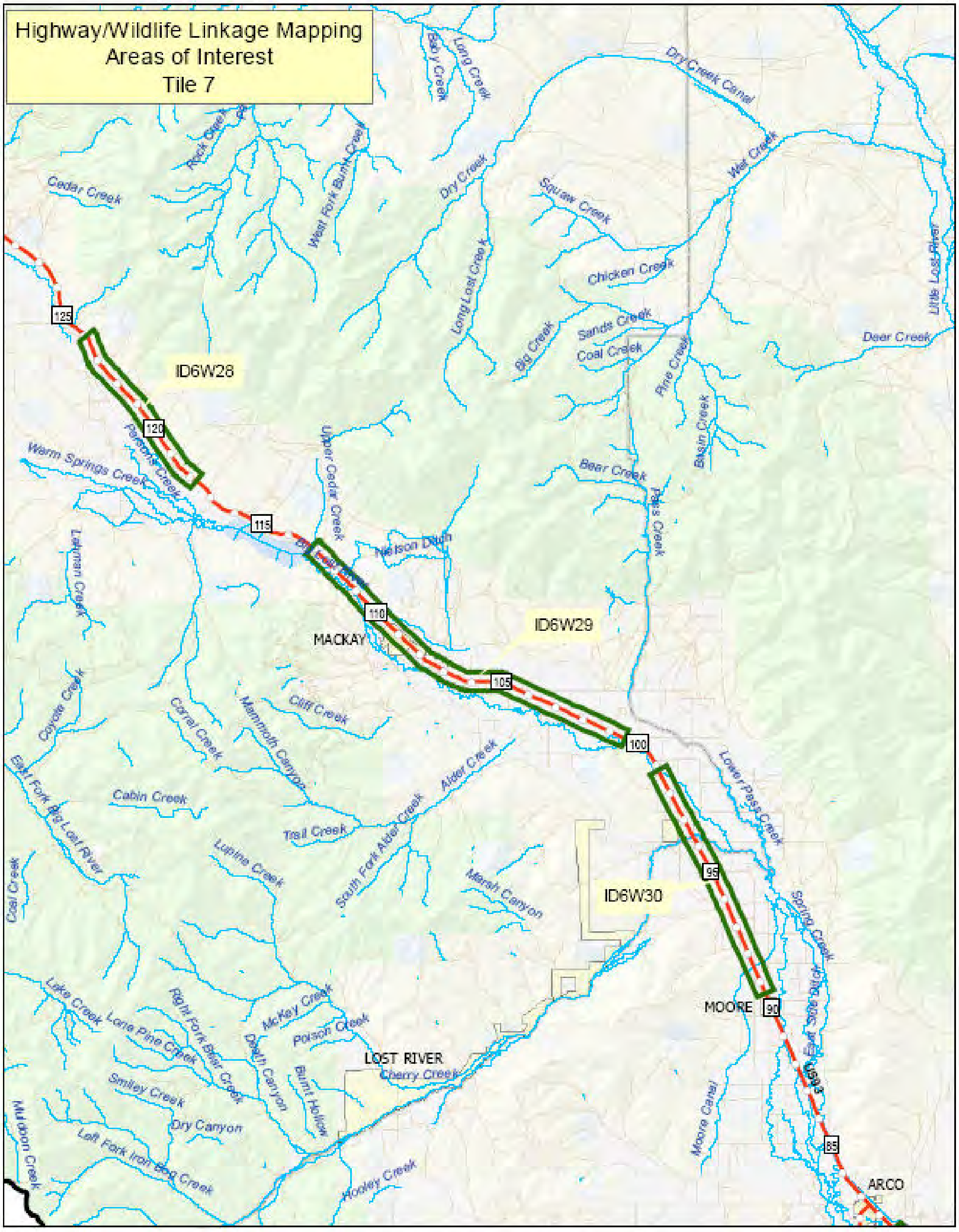
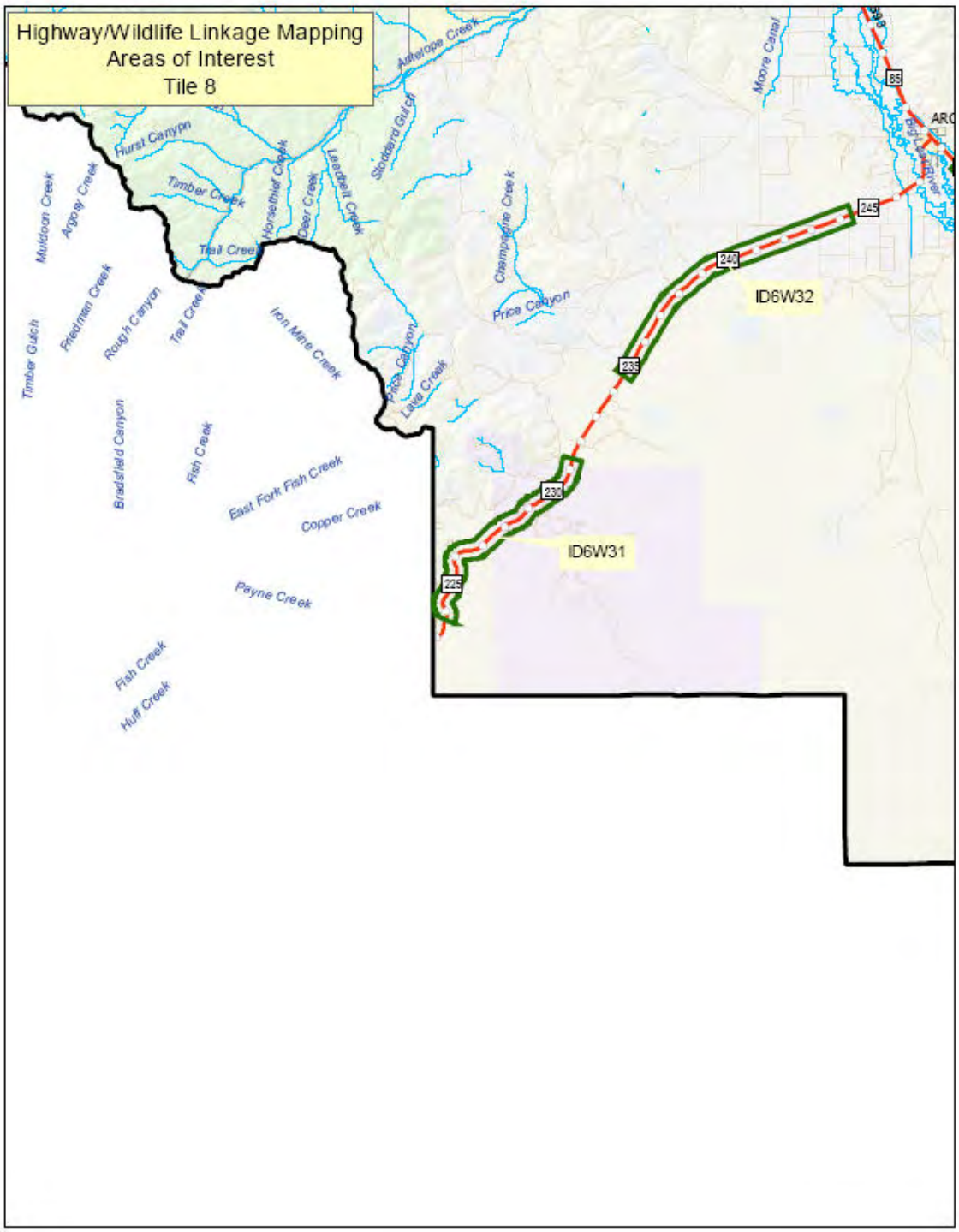
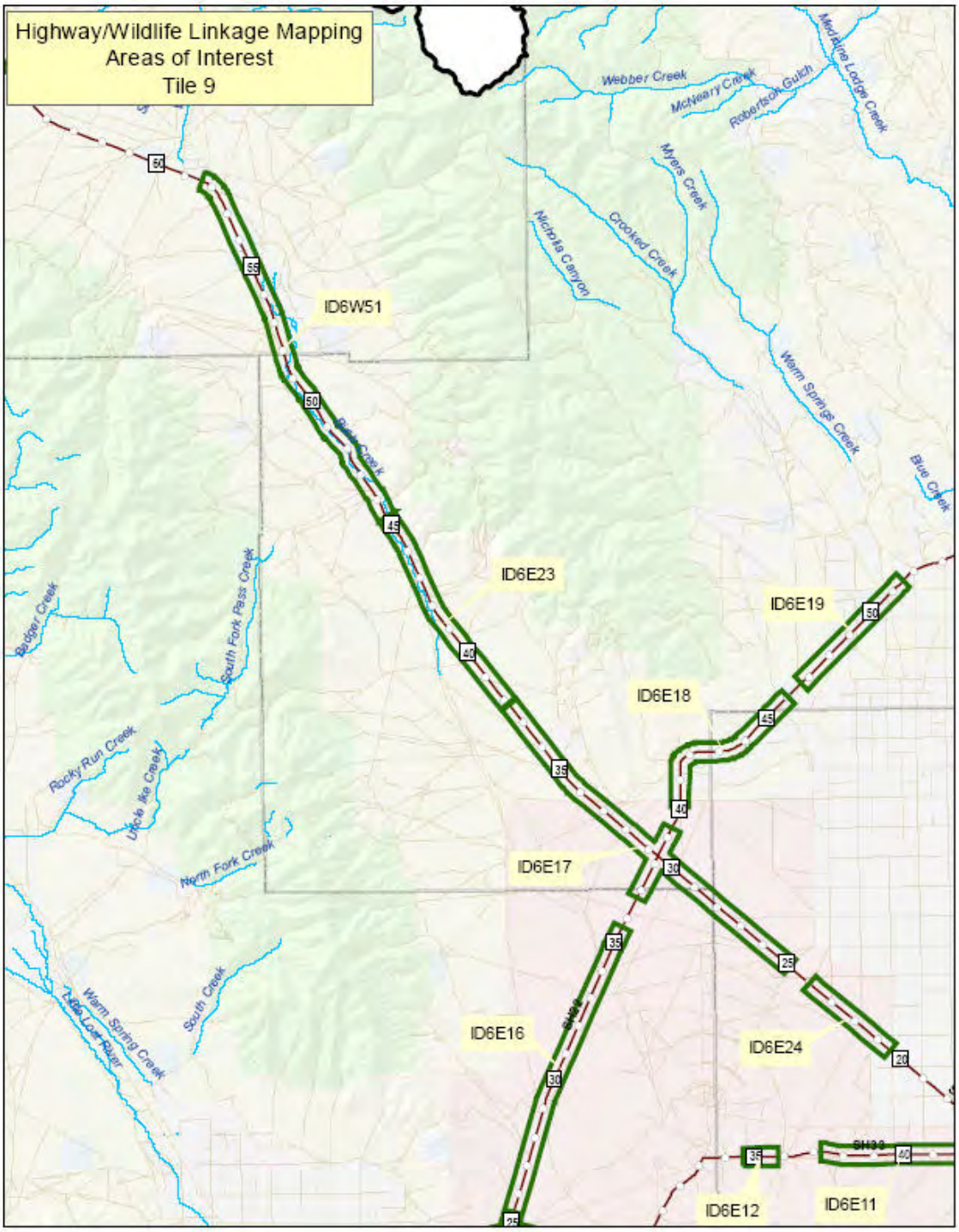
ID6W46
ID6W47
ID6W48
ID6W49
ID6W50
LEADORE
Basin Creek
Reese Creek
Peterson Creek
Meadow Creek
Zeph Creek
Hayden Creek
East Fork Hayden Creek
Tobias Creek
Carol Creek
Cooper Creek
Little Mill Creek
Mill Creek
Perry Creek
Wafer Creek
Lee Creek
Big Eightmile Creek
Lemhi River
Canyon Creek
Texas Creek
Porcupine Creek
Stroud Creek
Everson Creek
Daily Creek
Fells Creek
Patterson Creek
Little Timber Creek
Big Timber Creek
Basin Creek
Eighteenmile Creek
Hawley Creek
Frank Hall Creek
Wildcat Creek
Reservoir Creek
Bull Creek
Wheelrip Creek
Tenmile Creek
Clear Creek
Grove Creek
Rocky Creek
Inyo Creek
Divide Creek
McGinty Creek
Big Creek
Mill Creek
Sinking Creek
North Fork Big Creek
Falls Creek
Squirrel Creek
Cabin Creek
Tall Creek
Lake Creek
Deer Creek
Meadow Lake Creek
Smiths Fork
Firbox Creek
Slide Creek
South Fork Big Creek
Timber Creek
Goldberg Creek
Pahsimeroi River
Ditch Creek
Hillside Creek
Big Gulch
Iron Creek
Bear Creek
Mill Creek
Squaw Creek



Geodata Services, Inc. 104 South Ave. E. , Missoula, Montana 59801
406.721.8865 406.721.1023 (Fax) www.geodata-mt.com


Highway/Wildlife Linkage Mapping
Areas of Interest
Tile 8
Antelope Creek
Moore Canal
Hurst Canyon
Timber Creek
Trail Creek
Horsethief Creek
Deer Creek
Leadbelt Creek
Stoddard Gulch
Champagne Creek
Price Canyon
Muldoon Creek
Argyle Creek
Friedman Creek
Rough Canyon
Timber Gulch
Iron Mine Creek
Lava Creek
Bradsfield Canyon
Fish Creek
East Fork Fish Creek
Copper Creek
Payne Creek
Huff Creek
ID6W32
ID6W31
245
240
235
230
225
85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Areas of Interest
Tile 9
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McNeary Creek
Robertson Gulch
Medicine Lodge Creek
Myers Creek
Crooked Creek
Nichols Canyon
Warm Spring Creek
Blue Creek
ID6W51
ID6E23
ID6E19
ID6E18
ID6E17
ID6E16
ID6E24
ID6E12
ID6E11
Badger Creek
South Fork Pass Creek
Rocky Run Creek
Uncle Ike Creek
North Fork Creek
South Creek
Warm Spring Creek
Lemhi River
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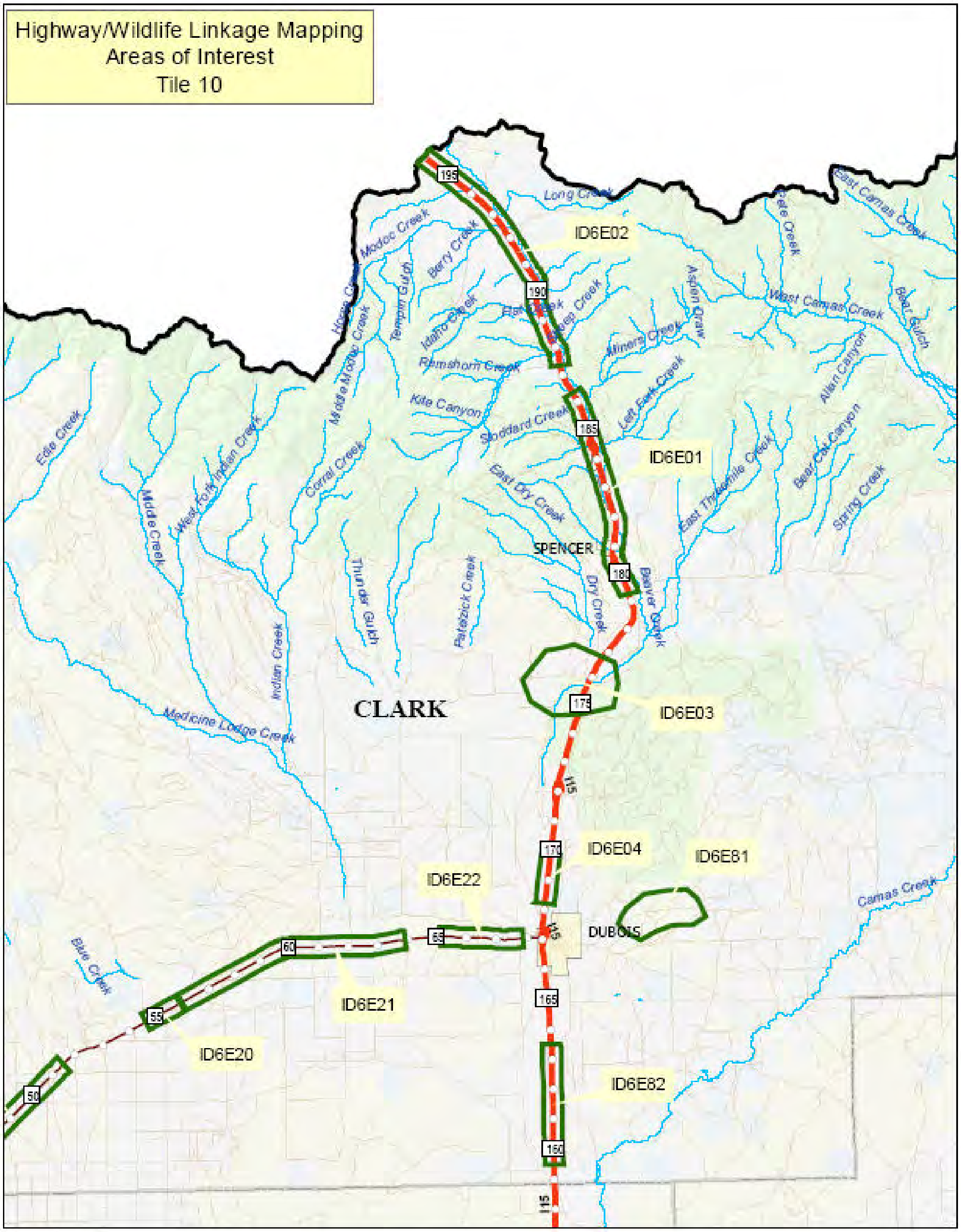
40
35
30
25
20


Highway/Wildlife Linkage Mapping
Areas of Interest
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ID6E01
ID6E03
ID6E04
ID6E81
ID6E22
ID6E21
ID6E20
ID6E82
CLARK
SPENCER
DUBOIS
Long Creek
Modoc Creek
Berry Creek
Tempin Gulch
Idaho Creek
Ramshorn Creek
Kite Canyon
Stoddard Creek
East Dry Creek
Dry Creek
Beaver Creek
Miners Creek
Left Fork Creek
Aspen Draw
West Camas Creek
East Camas Creek
Bear Gulch
Allan Canyon
Bear Cat Canyon
Spring Creek
East Threemile Creek
Edie Creek
Middle Creek
West Fork Indian Creek
Indian Creek
Corral Creek
Thunder Gulch
Patelzick Creek
Medicine Lodge Creek
Blue Creek
Camas Creek
Middle Modoc Creek
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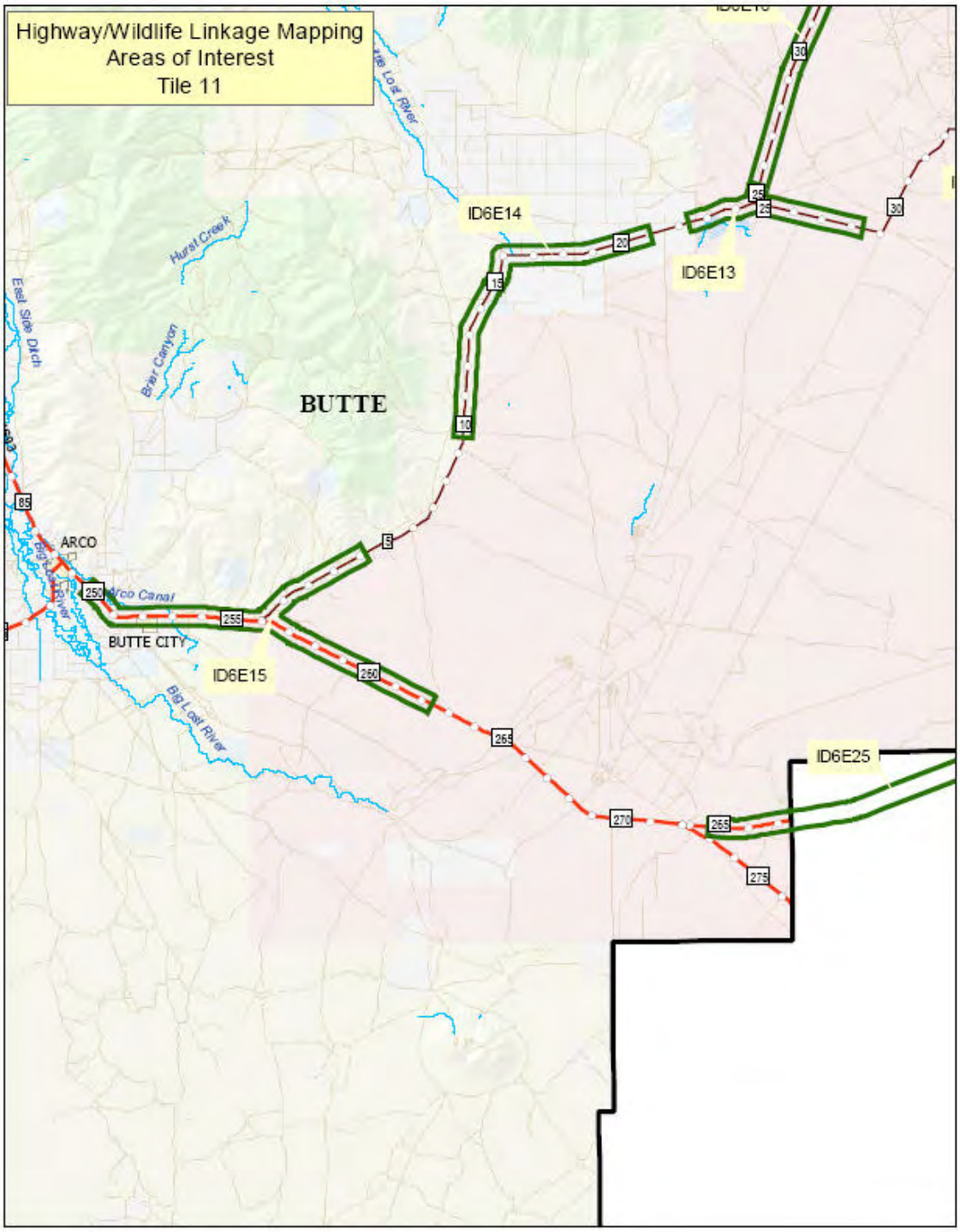
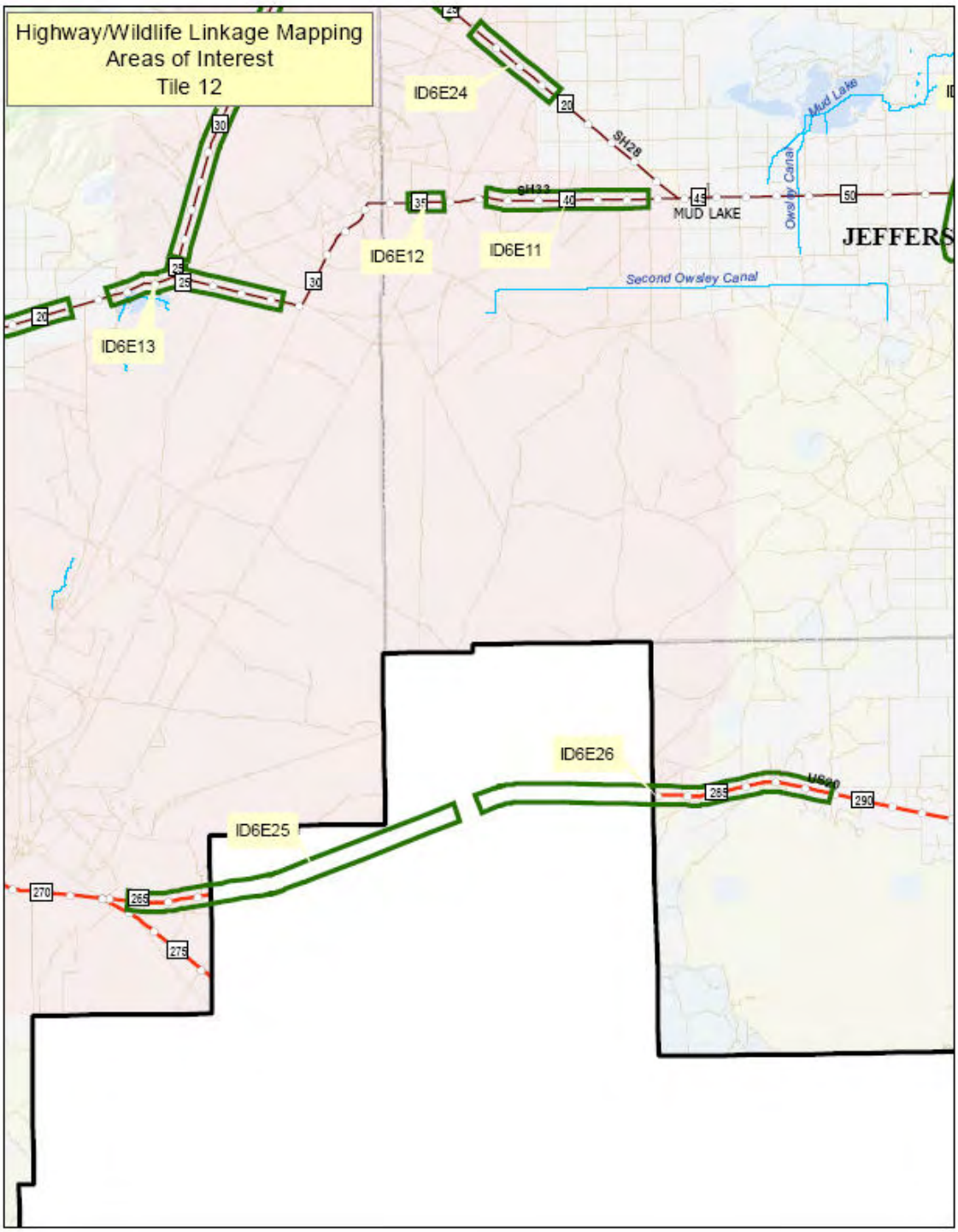

Highway/Wildlife Linkage Mapping
Areas of Interest
Tile 11
ID6E14
ID6E13
BUTTE
ARCO
BUTTE CITY
ID6E15
ID6E25
Big Lost River
Hurst Creek
Brier Canyon
Esel Side Ditch
Arco Canal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Areas of Interest
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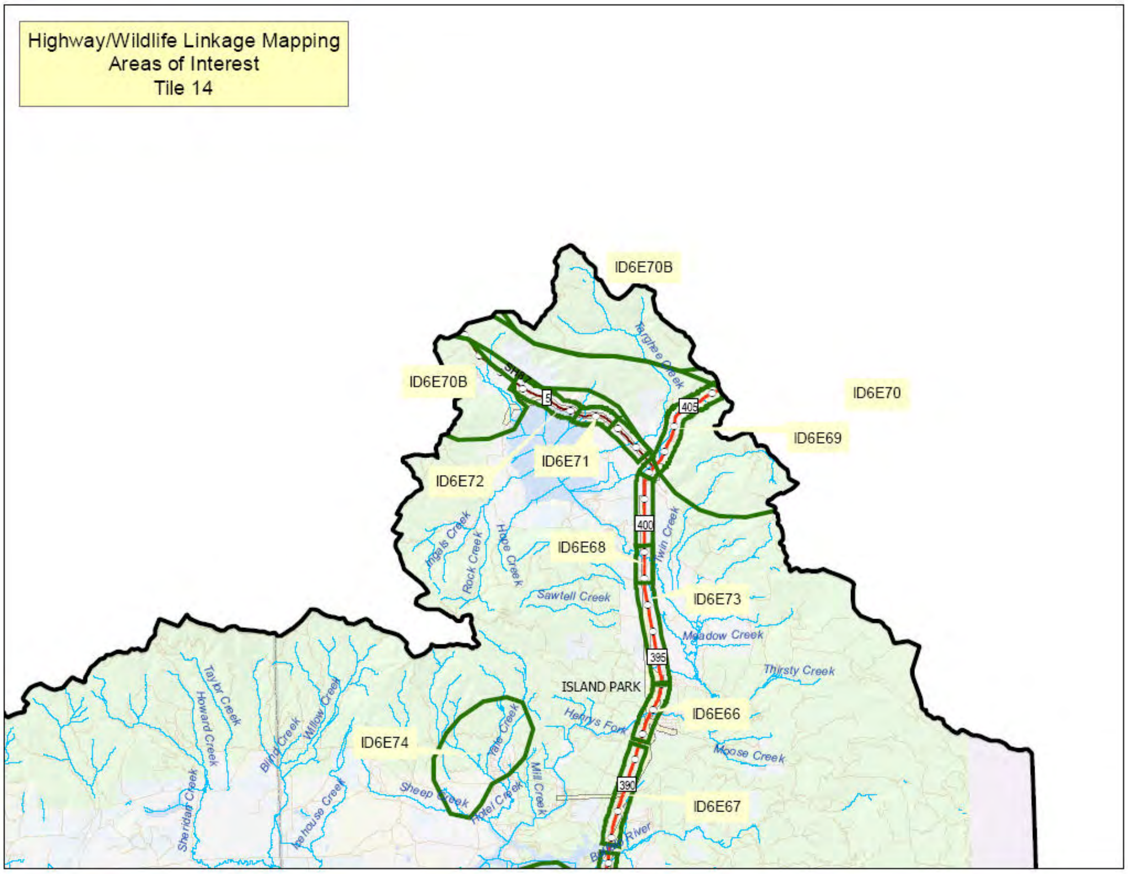
ID6E12
ID6E11
ID6E13
ID6E26
ID6E25
SH28
SH33
MUD LAKE
Mud Lake
Owsley Canal
Second Owsley Canal
JEFFERS
US20


Highway/Wildlife Linkage Mapping
Areas of Interest
Tile 13
ID6E05
PARKER
ID6E10
ID6E06
ID6E08
ID6E09
JEFFERSON
ID6E83
ID6E07
ID6E54
ID6E53
ID6E52
MENAN
ROBERTS
LEWISVILLE
RIGBY
SH48
UCON
ID6E28
IONA
Mud Lake
Camas Creek
Henrys Fork
Teton River
Warm Slough
Spring Creek
Portneuf Ditch
Osgood Canal
Birgess Canal
Idaho Canal
Snake River
Crane Creek
US20
SH43
US26



Highway/Wildlife Linkage Mapping
Areas of Interest
Tile 14
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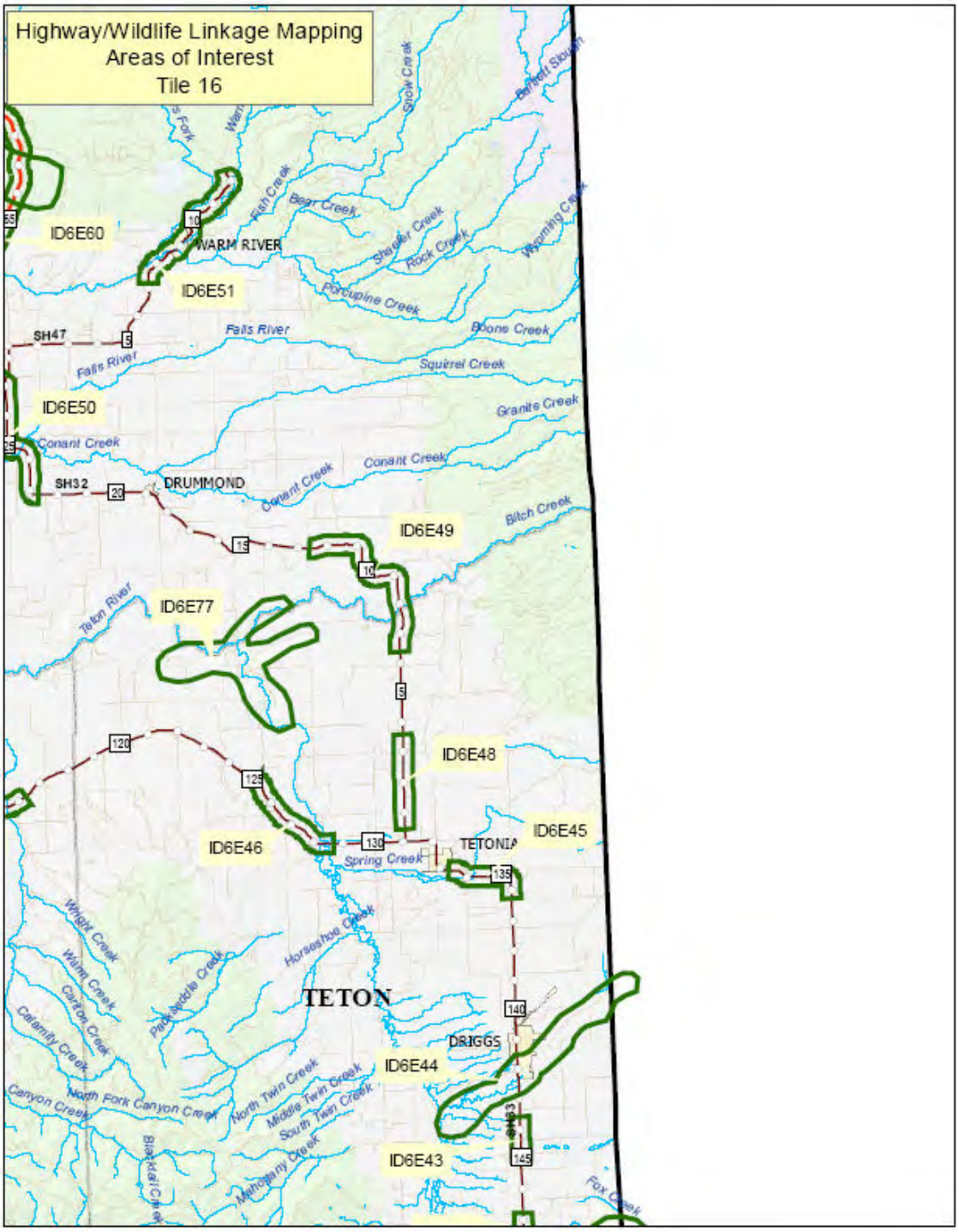
ID6E70B
ID6E70
ID6E69
ID6E71
ID6E72
ID6E68
ID6E73
ISLAND PARK
ID6E66
ID6E74
ID6E67
Sawtell Creek
Meadow Creek
Thirsty Creek
Moose Creek
Henrys Fork
Taylor Creek
Howard Creek
Willow Creek
Sheridan Creek
Icehouse Creek
Sheep Creek
Mill Creek
Hotel Creek
Tate Creek
Hope Creek
Rock Creek
Twin Creek
Targhee Creek


Highway/Wildlife Linkage Mapping
Areas of Interest
Tile 15
FREMONT
ID6E67
ID6E75
ID6E65
ID6E64
ID6E63
ID6E62
ID6E76
ID6E61
ID6E59
ID6E60
ID6E51
ID6E50
ID6E58
ID6E57
ID6E77
ASHTON
ST ANTHONY
PARKER
TETON
NEWDALE
DRUMMOND
US20
SH47
SH32
SH33
Sheep Creek
Sheridan Creek
Toms Creek
Warm River
Blue Creek
Sand Creek
Pine Creek
Spring Creek
Falls River
Conant Creek
Squirrel Creek
Teton River
Henrys Fork
Canyon Creek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Areas of Interest
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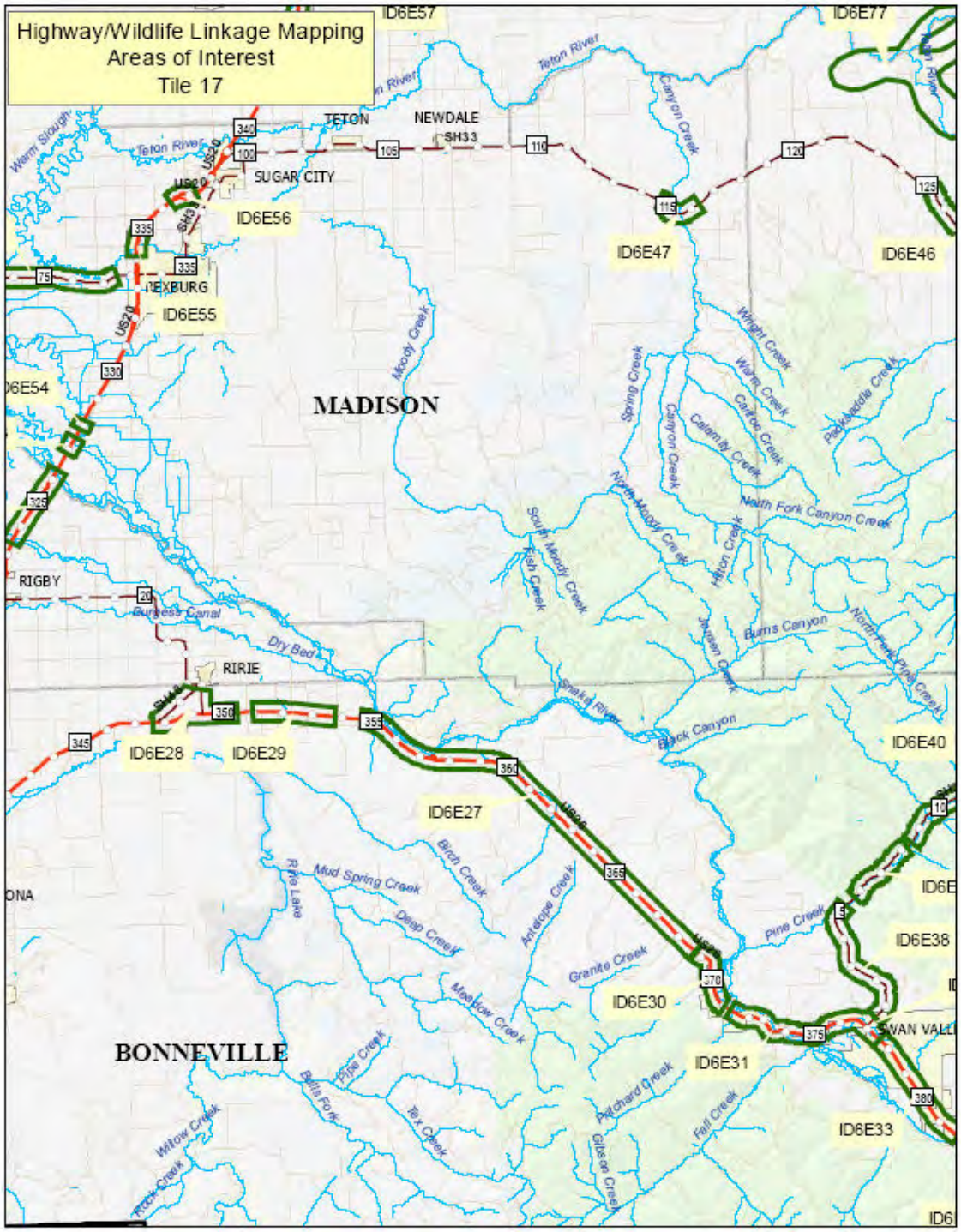
ID6E51
SH47
Falls River
ID6E50
Conant Creek
SH32
DRUMMOND
ID6E49
ID6E77
Teton River
ID6E48
ID6E46
ID6E45
TETONIA
Spring Creek
TETON
DRIGGS
ID6E44
ID6E43
Fish Creek
Bear Creek
Sheeler Creek
Rock Creek
Porcupine Creek
Boone Creek
Squirrel Creek
Granite Creek
Bitch Creek
Horsethief Creek
Packsaddle Creek
Wright Creek
Warm Creek
Carlton Creek
Calamity Creek
Canyon Creek
North Fork Canyon Creek
North Twin Creek
Middle Twin Creek
South Twin Creek
Mahogany Creek
Fox Creek


Highway/Wildlife Linkage Mapping
Areas of Interest
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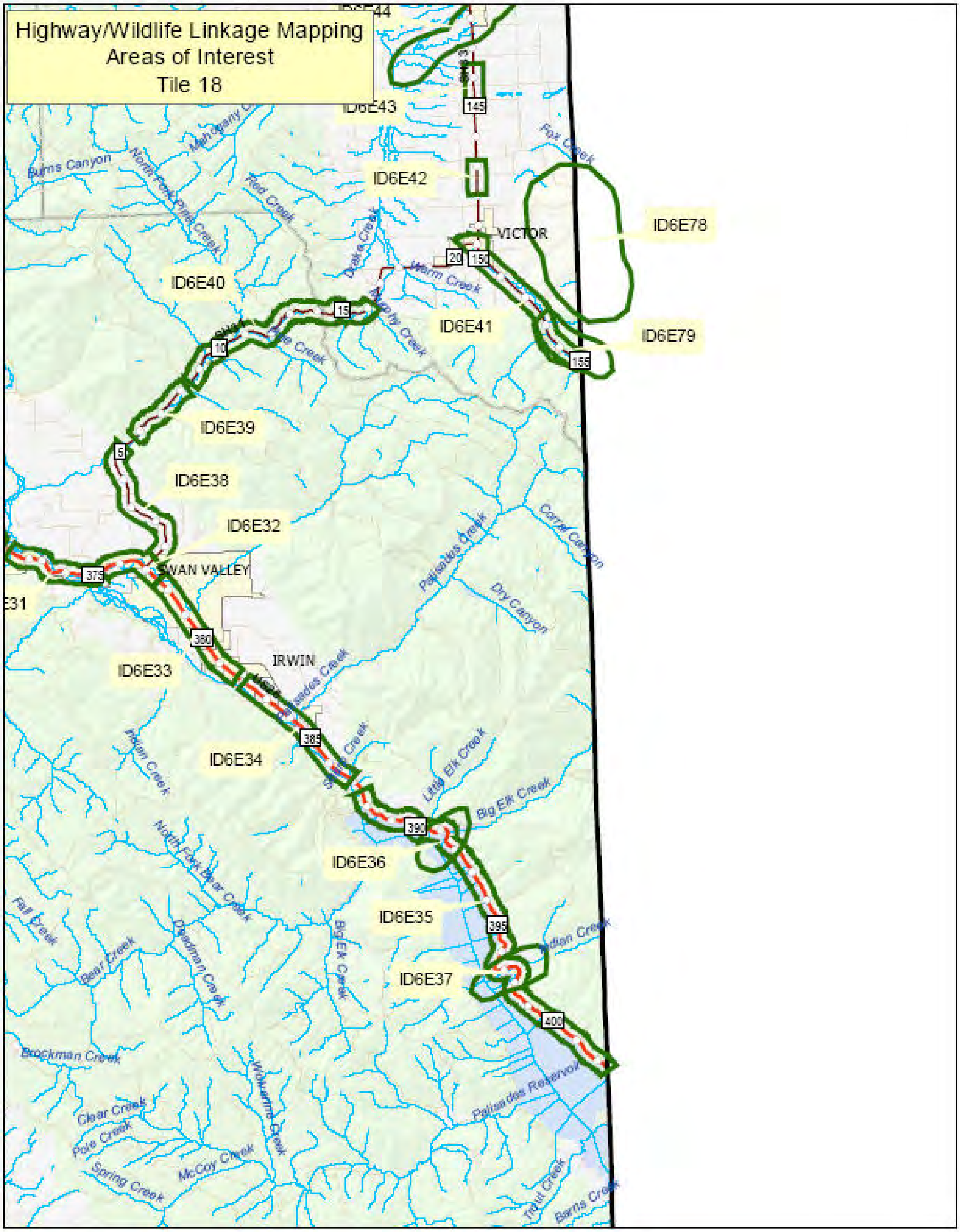
ID6E77
Teton River
TETON
NEWDALE
SH33
SUGAR CITY
ID6E56
ID6E47
ID6E46
REXBURG
ID6E55
MADISON
Moody Creek
Spring Creek
Canyon Creek
Wright Creek
Warm Creek
Cardoe Creek
Calamity Creek
Packsaddle Creek
North Fork Canyon Creek
South Moody Creek
Fish Creek
North Moody Creek
Hatch Creek
Burns Canyon
Jackson Creek
North Fork Pine Creek
RIGBY
Burgess Canal
Dry Bed
RIRIE
Snake River
Black Canyon
ID6E28
ID6E29
ID6E27
ID6E40
Mud Spring Creek
Birch Creek
Antelope Creek
Rainey Lake
Deep Creek
Pine Creek
ID6E38
Granite Creek
ID6E30
Meadow Creek
BONNEVILLE
ID6E31
Bells Fork
Willow Creek
Rock Creek
Tex Creek
Orchard Creek
Fall Creek
Gibson Creek
ID6E33


Highway/Wildlife Linkage Mapping
Areas of Interest
Tile 18
ID6E43
ID6E42
ID6E78
VICTOR
ID6E40
ID6E41
ID6E79
ID6E39
ID6E38
ID6E32
SWAN VALLEY
IRWIN
ID6E33
ID6E34
ID6E36
ID6E35
ID6E37
Burns Canyon
North Fork Pine Creek
Red Creek
Drake Creek
Warm Creek
Fox Creek
Corral Canyon
Palisades Creek
Dry Canyon
Little Elk Creek
Big Elk Creek
North Fork Bear Creek
Fall Creek
Bear Creek
Deadman Creek
Big Elk Creek
Brockman Creek
Clear Creek
Pole Creek
Spring Creek
McCoy Creek
Palisades Reservoir
Trail Creek

Appendix B – Detailed GIS Methodology for the Wildlife Linkage Model

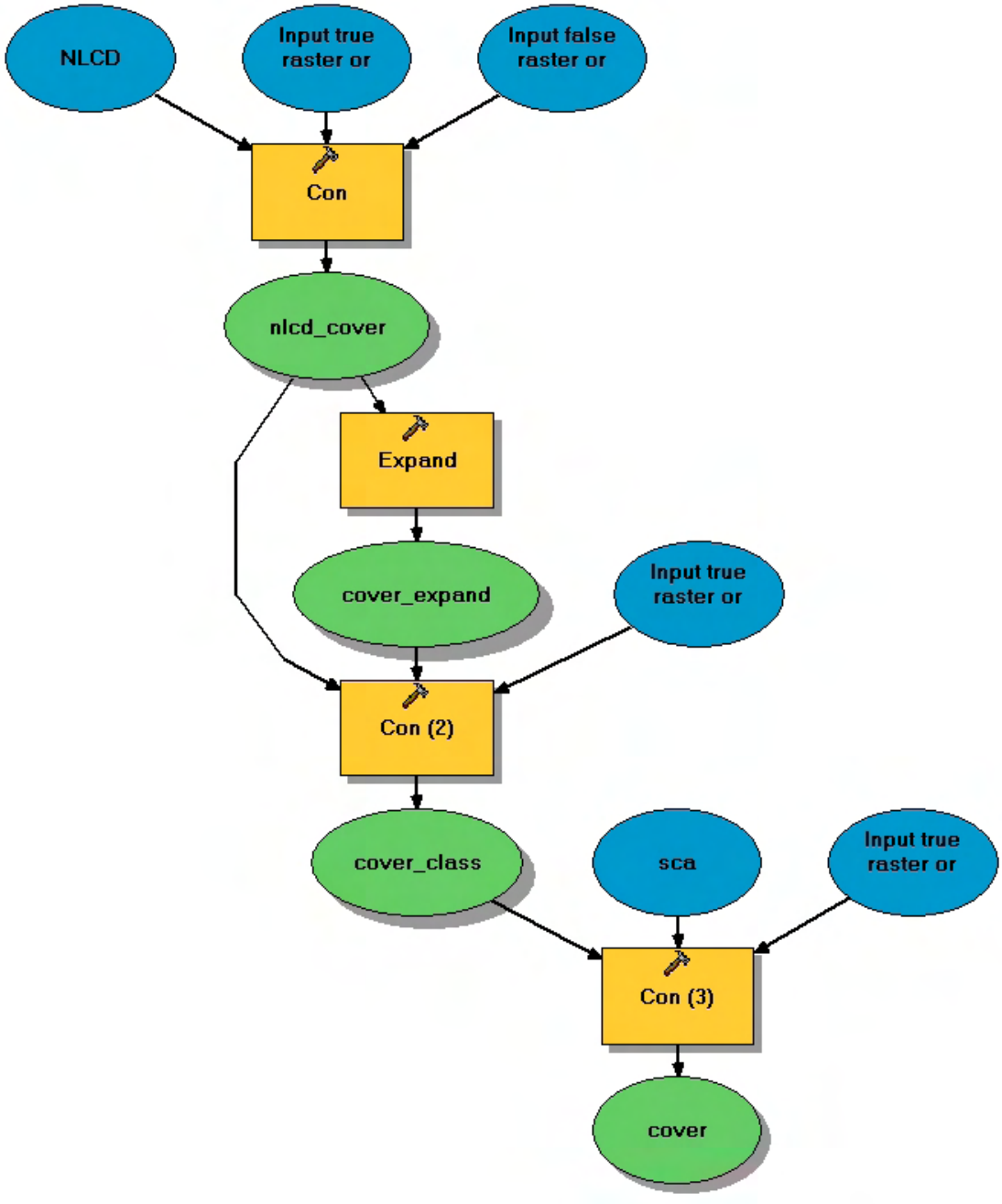
ITD Linkage Model Tools

These tools are the modules of the Identification of Potential Linkages Zones model for large carnivores and ungulates. The tools were built in ESRI Modelbuilder, a component of Arcview 9 and provided as a deliverable for this project. The toolbox for the model and associated parameters can be optionally loaded along with the grid layers to re-run or tweak parameters of the model. Impacts of human activities and beneficial features of the landscape were considered. A rating system for each type of impact and vegetation condition was used to score each model component and then the values were combined and classified into impact level categories of high, moderate, low, or minimal. The impacts and vegetation conditions considered were distance from roads, road density, developed sites, riparian areas and hiding cover. While distance from roads was not applied directly to the final score it was used to define secure core areas which was then used to modify the rating of road density and hiding cover.

The following pages each describe the primary component of the model, along with a flowchart from Modelbuilder illustrating the relationships, along with formal metadata and Grid processing steps.

Hiding Cover

Extracts the cover types from the National Land Cover Data that could be considered as hiding cover. A 30 meter edge buffer was created that expanded the hiding cover areas. Finally, the hiding cover values were modified by their location either in or out of secure core areas (SCA). All areas, hiding, edge, or open were classified as hiding within secure core areas. Edge areas outside of a SCA were given an impact rating one level higher than hiding cover and open areas were given a rating of 2 levels higher than hiding cover.



LZ Cover

Data format: ArcToolBox Tool

Abstract: LZ Cover extracts the cover types from the National Land Cover Data that could be considered as hiding cover. A 30 meter edge buffer was created that expanded the hiding cover areas. Finally, the hiding cover values were modified by their location either in or out of secure core areas (SCA). All areas, hiding, edge, or open were classified as hiding within secure core areas. Edge areas outside of a SCA were given an impact rating one level higher than hiding cover and open areas were given a rating of 2 levels higher than hiding cover.

ISO and ESRI Metadata:

Metadata elements shown with blue text are defined in the International Organization for Standardization's (ISO) document 19115 *Geographic Information - Metadata.* Elements shown with green text are defined by ESRI and will be documented as extentions to the ISO 19115. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog.

Metadata Information

***Last update:** 20050520

Back to Top

Resource Identification Information:

Citation:

Title: LZ Cover

Party responsible for the resource:
Individual's name: Joe Grigsby
Organization's name: Geodata Services, Inc.
Contact's position: GIS Analyst
Contact's role:

Contact information:
Phone:
Voice: 406.721.8856
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Address:
Delivery point:
104 South Ave. E.
City: Missoula
Administrative area: MT
Postal code: 59801
Country: USA
e-mail address: kwall@geodata-mt.com

Descriptive keywords:
Keywords: National Land Cover Database, secure core areas, hiding cover, edge, NLCD

Abstract:
LZ Cover extracts the cover types from the National Land Cover Data that could be considered as hiding cover. A 30 meter edge buffer was created that expanded the hiding cover areas. Finally, the hiding cover values were modified by their location either in or out of secure core areas (SCA). All areas, hiding, edge, or open were classified as hiding within secure core areas. Edge areas outside of a SCA were given an impact rating one level higher than hiding cover and open areas were given a rating of 2 levels higher than hiding cover.

Resource constraints:
Constraints:
Limitations of use:

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Distribution Information:

Distributor:
Available format:
Format name: ArcToolBox Tool

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Model Report **Expand/Collapse All**

Generated on: Mon May 23 11:14:30 2005

Variables

sca

Data Type:Composite Geodataset

Value:D:\data\ITD\LZ Model\SCA\sca

Input true raster or constant value (3)

Data Type:Composite Geodataset
Value:10

NLCD

Data Type:Composite Geodataset
Value:D:\data\ITD\LULC\NLCD\nlcd

Input true raster or constant value (2)

Data Type:Composite Geodataset
Value:100

Input false raster or constant value (2)

Data Type:Composite Geodataset
Value:10000

nlcd_cover

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Cover\nlcd_cover

Input true raster or constant value

Data Type:Composite Geodataset
Value:10

cover_expand

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Cover\cover_expand

cover_class

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Cover\cover_class

cover

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Cover\cover

Processes

Con

Tool Name:Con
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst

Tools.tbx\Conditional\Con

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input conditional raster	Input	Required	Composite Geodataset	D:\data\ITD\LULC\NLCD\nlcd
Input true raster or constant value	Input	Required	Composite Geodataset	100
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Cover\nlcd_cover
Input false raster or constant value	Input	Optional	Composite Geodataset	10000
Expression	Input	Optional	SQL Expression	"Value" = 41 OR "Value" = 42 OR "Value" = 43 OR "Value" = 91

Messages:

Expand

Tool Name:Expand
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Generalization\Expand

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\Cover\nlcd_cover
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Cover\cover_expand
Number of cells	Input	Required	Long	1
Zone values	Input	Required	Multiple Value	100

Messages:

Con (2)

Tool Name:Con
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Conditional\Con

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input conditional raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\Cover\nlcd_cover
Input true raster or constant value	Input	Required	Composite Geodataset	10
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Cover\cover_class
Input false raster or constant value	Input	Optional	Composite Geodataset	D:\data\ITD\LZ Model\Cover\cover_expand
Expression	Input	Optional	SQL Expression	VALUE = 100

Messages:

Con (3)

Tool Name:Con
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Conditional\Con

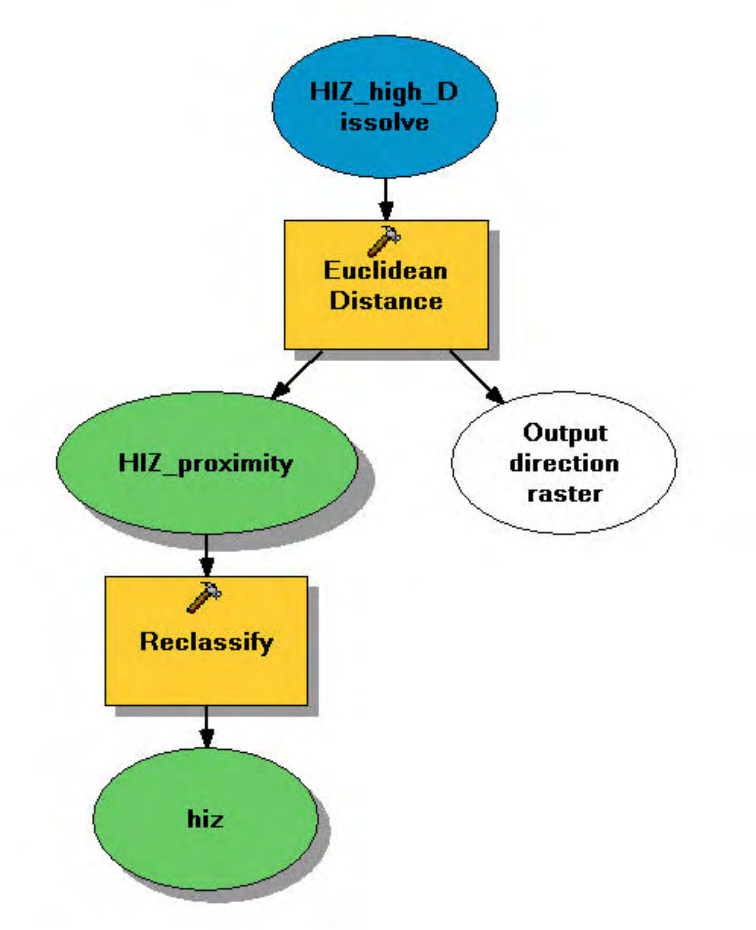
Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input conditional raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\SCA\sca
Input true raster or constant value	Input	Required	Composite Geodataset	10
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Cover\cover
Input false raster or constant value	Input	Optional	Composite Geodataset	D:\data\ITD\LZ Model\Cover\cover_class
Expression	Input	Optional	SQL Expression	Value = 1

Messages:

Human Impact Zone

Defines Human Impact Zones around developed sites. A high impact zone layer was generated by buffering all developed site point and polygon features. The high impact zone layer is the primary input for this tool, which then creates two additional impact zones, each 120 meters wide, around the high impact zone. These additional rings are then assigned medium and low impact values moving outward from the high impact zone.



LZ_HIZ

Data format: ArcToolBox Tool

Abstract: Defines Human Impact Zones around developed sites. A high impact zone layer was generated by buffering all developed site point and polygon features. The high impact zone layer is the primary input for this tool, which then creates two additional impact zones, each 120 meters wide, around the high impact zone. These additional rings are then assigned medium and low impact values moving outward

from the high impact zone.

ISO and ESRI Metadata:

- Metadata Information
- Resource Identification Information
- Distribution Information

Metadata elements shown with blue text are defined in the International Organization for Standardization's (ISO) document 19115 *Geographic Information - Metadata*. Elements shown with green text are defined by ESRI and will be documented as extentions to the ISO 19115. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog.

Metadata Information

***Last update:** 20050628

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Resource Identification Information:

Citation:

Title: LZ_HIZ

Party responsible for the resource:
Individual's name: Joe Grigsby
Organization's name: Geodata Services, Inc.
Contact's position: GIS Analyst
Contact's role:

Contact information:
Phone:
Voice: 406.721.8865
Fax: 406.721.1023

Address:
Delivery point:
104 South Ave E.
City: Missoula
Administrative area: MT
Postal code: 59801
Country: USA
e-mail address: kwall@geodata-mt.com

Descriptive keywords:

Keywords: developed sites, Cumulative Effects Modeling, human influence zone, habitat reduction

Abstract:
Defines Human Impact Zones around developed sites. A high impact zone layer was generated by buffering all developed site point and polygon features. The high impact zone layer is the primary input for this tool, which then creates two additional impact zones, each 120 meters wide, around the high impact zone. These additional rings are then assigned medium and low impact values moving outward from the high impact zone.

Resource constraints:
Constraints:
Limitations of use:

Back to Top

Distribution Information:

Distributor:
Available format:
Format name: ArcToolBox Tool

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Model Report **Expand/Collapse All**

Generated on: Mon May 23 15:51:31 2005

Variables

HIZ_high_Dissolve

Data Type:Feature Layer
Value:HIZ_high_Dissolve

Output direction raster

Data Type:Raster Dataset
Value:

Messages:

The value is empty.

HIZ_proximity

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\HIZ\hiz_proximity

hiz

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\HIZ\hiz

Processes

Euclidean Distance

Tool Name:Euclidean Distance
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Distance\EucDistance

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster or feature source data	Input	Required	Composite Geodataset	HIZ_high_Dissolve
Output distance raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\HIZ\hiz_proximity
Maximum distance	Input	Optional	Double	240
Output cell size	Input	Optional	Analysis cell size	
Output direction raster	Output	Optional	Raster Dataset	

Messages:

Executing (Euclidean Distance): EucDistance HIZ_high_Dissolve "D:\data\ITD\LZ Model\HIZ\HIZ_proximity" 240 30 #

Start Time: Sat May 14 15:36:07 2005

Validating...

Executing EucDistance...

Processing...

Completed EucDistance.

Executed (Euclidean Distance) successfully.

End Time: Sat May 14 18:05:27 2005 (Elapsed Time: 8960.00 secs)

Reclassify

Tool Name:Reclassify
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Reclass\Reclassify

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\HIZ\hiz_proximity
Reclass field	Input	Required	Field	Value
Reclassification	Input	Required	Remap	0 100000;0 120 10000;120 240 1000;NODATA 10
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\HIZ\hiz
Change missing values to NoData	Input	Optional	Boolean	false

Messages:

Executing (Reclassify): Reclassify "D:\data\ITD\LZ Model\HIZ\hiz_proximity" Value "0 100000;0 120 10000;120 240 1000;NODATA 10" "D:\data\ITD\LZ Model\HIZ\hiz" DATA

Start Time: Tue May 17 10:27:37 2005

Validating...

Executing Reclassify...

Processing...

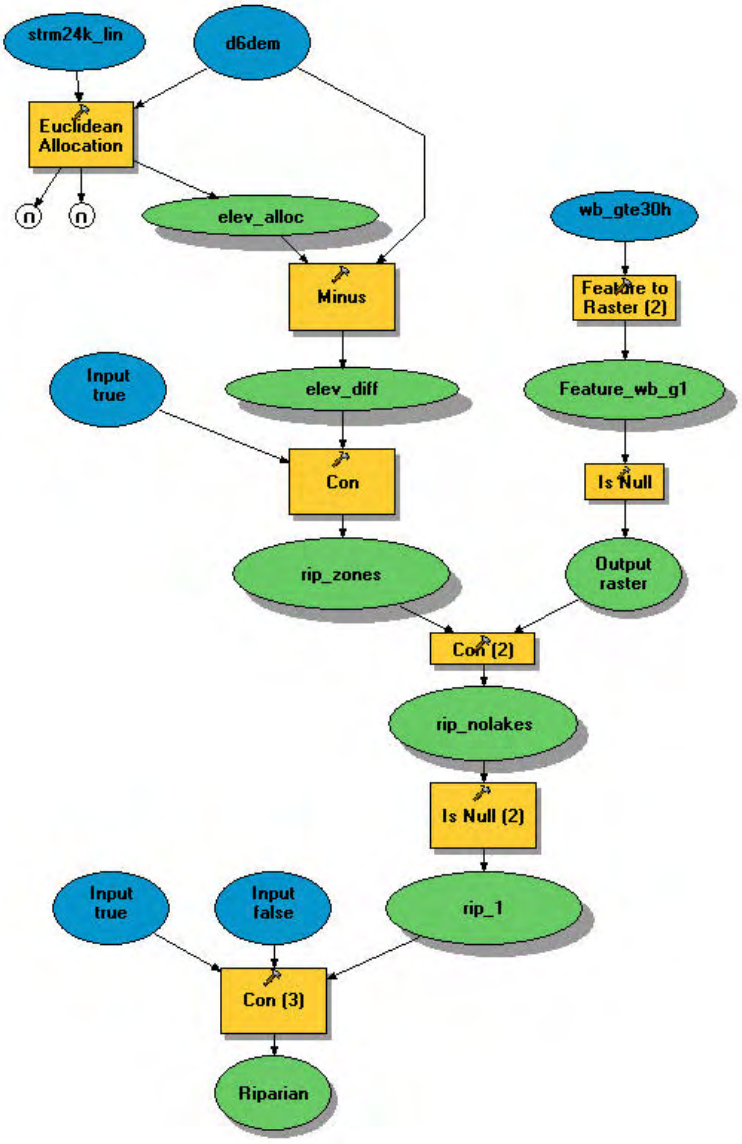
Completed Reclassify.

Executed (Reclassify) successfully.

End Time: Tue May 17 10:28:35 2005 (Elapsed Time: 58.00 secs)

Riparian

This model generates an approximate or potential riparian zone grid based on proximity to streams and elevation gradient. The process follows the method outlined in the "Identification of Potential Linkage Zones for Grizzly Bears in the Swan Clearwater Valley Using GIS", P. Sandstrom, 1996.



LZ Riparian

Data format: ArcToolBox Tool

Abstract: This model generates an approximate or potential riparian zone grid based on proximity to streams and elevation gradient. The process follows the

method outlined in the "Identification of Potential Linkage Zones for Grizzly Bears in the Swan Clearwater Valley Using GIS", P. Sandstrom, 1996.

ISO and ESRI Metadata:

- Metadata Information
- Resource Identification Information
- Distribution Information

Metadata elements shown with blue text are defined in the International Organization for Standardization's (ISO) document 19115 *Geographic Information - Metadata*. Elements shown with green text are defined by ESRI and will be documented as extentions to the ISO 19115. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog.

Metadata Information

***Last update:** 20050628

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Resource Identification Information:

Citation:

Title: LZ Riparian

Party responsible for the resource:
Individual's name: Joe Grigsby
Organization's name: Geodata Services, Inc.
Contact's position: GIS Analyst
Contact's role:

Contact information:
Phone:
Voice: 406.721.8865
Fax: 406.721.1023

Address:
Delivery point:
104 South Ave E.
City: Missoula
Administrative area: MT
Postal code: 59801
Country: USA
e-mail address: kwall@onewest.net

Descriptive keywords:

Keywords: DEM, Digital Elevation Model, hydrography, perennial, intermittent, lakes, swamps, marshes, riparian

Abstract:
This model generates an approximate or potential riparian zone grid based on proximity to streams and elevation gradient. The process follows the method outlined in the "Identification of Potential Linkage Zones for Grizzly Bears in the Swan Clearwater Valley Using GIS", P. Sandstrom, 1996.

Resource constraints:
Constraints:
Limitations of use:

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Distribution Information:

Distributor:
Available format:
Format name: ArcToolBox Tool

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Model Report **Expand/Collapse All**

Generated on: Mon May 23 11:27:18 2005

Variables

wb_gte30ha.shp

Data Type:Feature Layer
Value:D:\data\ITD\Hydrogrophy\wb_gte30ha.shp

Feature_wb_g1

Data Type:Raster Dataset
Value:D:\data\ITD\Hydrogrophy\feature_wb_g1

Output raster

Data Type:Raster Dataset
Value:D:\data\ITD\Hydrogrophy\isnull_featu1

d6dem

Data Type:Composite Geodataset

Value:D:\data\ITD\DEM\d6dem

strm24k_line-features.shp

Data Type:Feature Layer
Value:D:\data\ITD\LZ Model\Riparian\strm24k_line-features.shp

elev_alloc

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Riparian\elev_alloc

elev_diff

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Riparian\elev_diff

Input true raster or constant value (3)

Data Type:Composite Geodataset
Value:1

rip_zones

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Riparian\rip_zones

rip_nolakes

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Riparian\rip_nolakes

rip_1

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Riparian\rip_1

Input true raster or constant value

Data Type:Composite Geodataset
Value:10

Input false raster or constant value

Data Type:Composite Geodataset
Value:1

Riparian

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\Riparian\riparian

Output distance raster

Data Type:Raster Dataset
Value:

Messages:

The value is empty.

Output direction raster

Data Type:Raster Dataset
Value:

Messages:

The value is empty.

Processes

Feature to Raster (2)

Tool Name:Feature to Raster
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Conversion Tools.tbx\To Raster\FeatureToRaster

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input features	Input	Required	Composite Geodataset	D:\data\ITD\Hydrogrophy\wb_gte30ha.shp
Field	Input	Required	Field	HYDRO4_
Output raster	Output	Required	Raster Dataset	D:\data\ITD\Hydrogrophy\feature_wb_g1
Output cell size	Input	Optional	Analysis cell size	30

Messages:

Is Null

Tool Name:Is Null
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Math\Logical\IsNull

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*

Input raster	Input	Required	Composite Geodataset	D:\data\ITD\Hydrogrophy\feature_wb_g1
Output raster	Output	Required	Raster Dataset	D:\data\ITD\Hydrogrophy\isnull_featu1

Messages:

Euclidean Allocation

Tool Name:Euclidean Allocation
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Distance\EucAllocation

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster or feature source data	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\Riparian\strm24k_line-features.shp
Output allocation raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Riparian\elev_alloc
Maximum distance	Input	Optional	Double	210
Input value raster	Input	Optional	Composite Geodataset	D:\data\ITD\DEM\d6dem
Output cell size	Input	Optional	Analysis cell size	
Source field	Input	Optional	Field	FNODE_
Output distance raster	Output	Optional	Raster Dataset	
Output direction raster	Output	Optional	Raster Dataset	

Messages:

Minus

Tool Name:Minus
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Math\Minus

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*

Input raster or constant value 1	Input	Required	Composite Geodataset	D:\data\ITD\DEM\d6dem
Input raster or constant value 2	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\Riparian\elev_alloc
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Riparian\elev_diff

Messages:

Con

Tool Name:Con
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Conditional\Con

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input conditional raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\Riparian\elev_diff
Input true raster or constant value	Input	Required	Composite Geodataset	1
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Riparian\rip_zones
Input false raster or constant value	Input	Optional	Composite Geodataset	
Expression	Input	Optional	SQL Expression	VALUE < 8

Messages:

Con (2)

Tool Name:Con
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Conditional\Con

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input conditional raster	Input	Required	Composite Geodataset	D:\data\ITD\Hydrogrophy\isnull_featu1
Input true raster or constant value	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\Riparian\rip_zones

Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Riparian\rip_nolakes
Input false raster or constant value	Input	Optional	Composite Geodataset	
Expression	Input	Optional	SQL Expression	

Messages:

Is Null (2)

Tool Name:Is Null
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Math\Logical\IsNull

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\Riparian\rip_nolakes
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Riparian\rip_1

Messages:

Con (3)

Tool Name:Con
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Conditional\Con

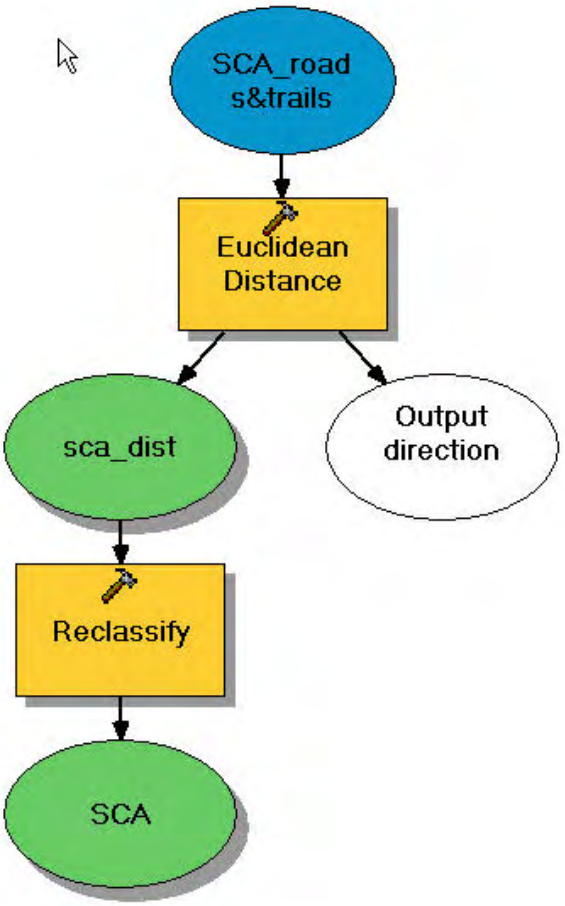
Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input conditional raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\Riparian\rip_1
Input true raster or constant value	Input	Required	Composite Geodataset	10
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\Riparian\riparian
Input false raster or constant value	Input	Optional	Composite Geodataset	1
Expression	Input	Optional	SQL Expression	Value = 1

Messages:

Secure Core Area

This tool generates the secure core areas (SCA) based on distance from selected roads and high use trails. The euclidian distance to the nearest road segment is calculated for each grid cell and then reclassified as either "In SCA" (greater than 500 meters from a road or high use trail), or "Out of SCA" (within 500 meters of a road or high use trail).



LZ SCA

Data format: ArcToolBox Tool

Abstract: This tool generates the secure core areas (SCA) based on distance from selected roads and high use trails. The euclidian distance to the nearest road segment is calculated for each grid cell and then reclassified as either "In SCA" (greater than 500 meters from a road or high use trail), or "Out of SCA" (within 500 meters of a road or high use trail).

ISO and ESRI Metadata:

- Metadata Information

- Resource Identification Information
- Distribution Information

Metadata elements shown with blue text are defined in the International Organization for Standardization's (ISO) document 19115 *Geographic Information - Metadata.* Elements shown with green text are defined by ESRI and will be documented as extentions to the ISO 19115. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog.

Metadata Information

***Last update:** 20050630

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Resource Identification Information:

Citation:

Title: LZ SCA

Party responsible for the resource:
Individual's name: Joe Grigsby
Organization's name: Geodata Services, Inc.
Contact's position: GIS Analyst
Contact's role:

Contact information:
Phone:
Voice: 406.721.8865
Fax: 406.721.1023

Address:
Delivery point:
104 South Ave. E.
City: Missoula
Administrative area: MT
Postal code: 59801
Country: USA
e-mail address: kwall@geodata-mt.com

Descriptive keywords:

Keywords: SCA, secure core area, roads, high use trails

Abstract:

This tool generates the secure core areas (SCA) based on distance from selected roads and high use trails. The euclidian distance to the nearest road segment is calculated for each grid cell and then reclassified as either "In SCA" (greater than 500 meters from a road or

high use trail), or "Out of SCA" (within 500 meters of a road or high use trail).

Resource constraints:
Constraints:
Limitations of use:

Back to Top

Distribution Information:

Distributor:
Available format:
Format name: ArcToolBox Tool

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Model Report **Expand/Collapse All**

Generated on: Thu May 26 15:05:08 2005

Variables

SCA_roads&trails.shp

Data Type:Feature Layer
Value:D:\data\ITD\LZ Model\SCA\SCA_roads&trails.shp

Output direction raster

Data Type:Raster Dataset
Value:

Messages:

The value is empty.

sca_dist

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\SCA\sca_dist

SCA

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\SCA\sca

Euclidean Distance

Tool Name:Euclidean Distance
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Distance\EucDistance

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster or feature source data	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\SCA\SCA_roads&trails.shp
Output distance raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\SCA\sca_dist
Maximum distance	Input	Optional	Double	
Output cell size	Input	Optional	Analysis cell size	30
Output direction raster	Output	Optional	Raster Dataset	

Messages:

Executing (Euclidean Distance): EucDistance "D:\data\ITD\LZ Model\SCA\SCA_roads&trails.shp" "D:\data\ITD\LZ Model\SCA\sca_dist" # 30 #

Start Time: Thu May 26 14:53:49 2005

Validating...

Executing EucDistance...

Processing...

Completed EucDistance.

Executed (Euclidean Distance) successfully.

End Time: Thu May 26 14:55:40 2005 (Elapsed Time: 111.00 secs)

Reclassify

Tool Name:Reclassify
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Reclass\Reclassify

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\SCA\sca_dist
Reclass field	Input	Required	Field	Value
Reclassification	Input	Required	Remap	0 500 10;500 20000 1
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\SCA\sca
Change missing values to NoData	Input	Optional	Boolean	false

Messages:

Executing (Reclassify): Reclassify "D:\data\ITD\LZ Model\SCA\sca_dist" Value "0 500 10;500 20000 1" "D:\data\ITD\LZ Model\SCA\sca" DATA

Start Time: Thu May 26 14:55:40 2005

Validating...

Executing Reclassify...

Processing...

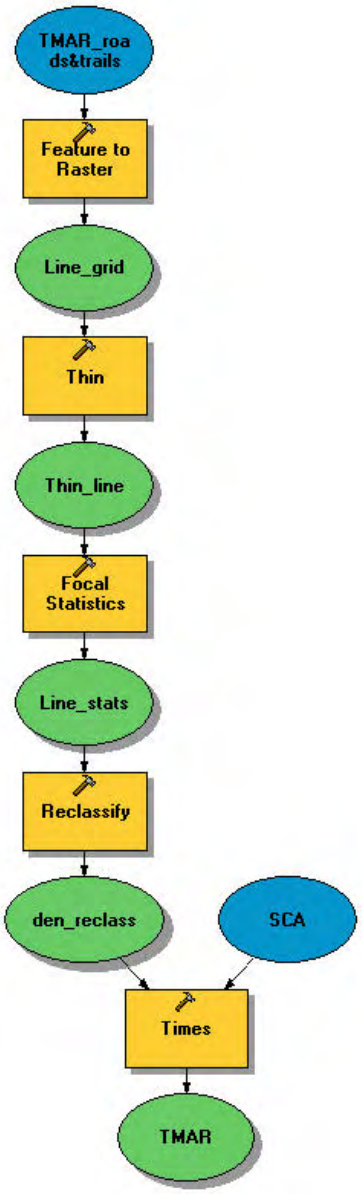
Completed Reclassify.

Executed (Reclassify) successfully.

End Time: Thu May 26 14:56:08 2005 (Elapsed Time: 28.00 secs)

Total Motorized Access Routes

Uses a "moving window" analysis routine to calculate the road density in the one square mile (circular) area around each grid cell. The road density is then classified into 4 categories - 0 miles/sq. mile, 0.01 - 1 miles/sq mile, 1.01 - 2 miles/sq mile, and > 2 miles/sq mile. Impact values are assigned to each category and then modified based on whether they are in or out of secure core areas (SCA). Impact values for areas out of SCA are increased by one level, and areas within an SCA retain the original value.



LZ TMAR

Data format: ArcToolBox Tool

Abstract: Uses a "moving window" analysis routine to calculate the road density in the one square mile (circular) area around each grid cell. The road density is then classified into 4 categories - 0 miles/sq. mile, 0.01 - 1 miles/sq mile, 1.01 - 2 miles/sq mile, and > 2 miles/sq mile. Impact values are assigned to each category and then modified based on whether they are in or out of secure core areas (SCA). Impact values for areas out of SCA are increased by one level, and areas within an SCA retain the original value.

ISO and ESRI Metadata:

Metadata elements shown with blue text are defined in the International Organization for Standardization's (ISO) document 19115 *Geographic Information - Metadata.* Elements shown with green text are defined by ESRI and will be documented as extentions to the ISO 19115. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog.

Metadata Information

***Last update:** 20050628

Back to Top

Resource Identification Information:

Citation:

Title: LZ TMAR

Party responsible for the resource:
Individual's name: Joe Grigsby
Organization's name: Geodata Services, Inc.
Contact's position: GIS Analyst
Contact's role:

Contact information:
Phone:
Voice: 406.721.8865
Fax: 406.721.1023

Address:
Delivery point:

104 South Ave E.
City: Missoula
Administrative area: MT
Postal code: 59801
Country: USA
e-mail address: kwall@geodata-mt.com

Descriptive keywords:

Keywords: TMAR, total motorized access routes, SCA, secure core areas, roads, trails, road density

Abstract:

Uses a "moving window" analysis routine to calculate the road density in the one square mile (circular) area around each grid cell. The road density is then classified into 4 categories - 0 miles/sq. mile, 0.01 - 1 miles/sq mile, 1.01 - 2 miles/sq mile, and > 2 miles/sq mile. Impact values are assigned to each category and then modified based on whether they are in or out of secure core areas (SCA). Impact values for areas out of SCA are increased by one level, and areas within an SCA retain the original value.

Resource constraints:

Constraints:

Limitations of use:

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Distribution Information:

Distributor:

Available format:

Format name: ArcToolBox Tool

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Model Report Expand/Collapse All

Generated on: Mon May 23 15:32:36 2005

Variables

TMAR_roads&trails

Data Type:Composite Geodataset
Value:TMAR_roads&trails

Line_grid

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\TMAR\line_grid

Thin_line

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\TMAR\thin_line

Line_stats

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\TMAR\line_stats

den_reclass

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\TMAR\den_reclass

SCA

Data Type:Composite Geodataset
Value:D:\data\ITD\LZ Model\SCA\sca

TMAR

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\TMAR\tmar

Processes

Feature to Raster

Tool Name:Feature to Raster
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Conversion Tools.tbx\To Raster\FeatureToRaster

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input features	Input	Required	Composite Geodataset	TMAR_roads&trails
Field	Input	Required	Field	GridValue
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\TMAR\line_grid
Output cell size	Input	Optional	Analysis cell size	30

Messages:

Executing (Feature to Raster): FeatureToRaster TMAR_roads&trails GridValue "D:\data\ITD\LZ Model\TMAR\line_grid" 30

Start Time: Mon May 16 15:42:26 2005

Validating...

Executing FeatureToRaster...

Processing...

Completed FeatureToRaster.

Executed (Feature to Raster) successfully.

End Time: Mon May 16 15:42:52 2005 (Elapsed Time: 26.00 secs)

Thin

Tool Name:Thin
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Generalization\Thin

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\TMAR\line_grid
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\TMAR\thin_line
Background value	Input	Optional	String	NODATA
Filter input first	Input	Optional	Boolean	false
Shape for corners	Input	Optional	String	SHARP
Maximum thickness of input linear features	Input	Optional	Double	45

Messages:

Executing (Thin): Thin "D:\data\ITD\LZ Model\TMAR\line_grid" "D:\data\ITD\LZ Model\TMAR\thin_line" NODATA NO_FILTER SHARP 45

Start Time: Mon May 16 15:42:53 2005

Validating...

Executing Thin...

Processing...

Completed Thin.

Executed (Thin) successfully.

End Time: Mon May 16 15:43:19 2005 (Elapsed Time: 26.00 secs)

Focal Statistics

Tool Name:Focal Statistics
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Neighborhood\FocalStatistics

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\TMAR\thin_line
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\TMAR\line_stats
Neighborhood	Input	Optional	Neighborhood	Circle, 30,CELL
Statistics type	Input	Optional	String	SUM
Ignore NoData in calculations	Input	Optional	Boolean	false

Messages:

Executing (Focal Statistics): FocalStatistics "D:\data\ITD\LZ Model\TMAR\thin_line" "D:\data\ITD\LZ Model\TMAR\line_stats" "Circle, 30,CELL" SUM NODATA

Start Time: Mon May 16 15:43:19 2005

Validating...

Executing FocalStatistics...

Processing...

Completed FocalStatistics.

Executed (Focal Statistics) successfully.

End Time: Mon May 16 17:40:12 2005 (Elapsed Time: 7013.00 secs)

Reclassify

Tool Name:Reclassify
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Reclass\Reclassify

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\TMAR\line_stats
Reclass field	Input	Required	Field	Value
Reclassification	Input	Required	Remap	0 1;1 53 10;54 105 100;106 10000 1000;NODATA 1
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\TMAR\den_reclass
Change missing values to NoData	Input	Optional	Boolean	false

Messages:

Executing (Reclassify): Reclassify "D:\data\ITD\LZ Model\TMAR\line_stats" VALUE "0 1;1 53 10;54 105 100;106 10000 1000;NODATA 1" "D:\data\ITD\LZ Model\TMAR\den_reclass" DATA

Start Time: Mon May 16 17:40:12 2005

Validating...

Executing Reclassify...

Processing...

Completed Reclassify.

Executed (Reclassify) successfully.

End Time: Mon May 16 17:41:02 2005 (Elapsed Time: 50.00 secs)

Times

Tool Name:Times
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Math\Times

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster or constant value 1	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\TMAR\den_reclass
Input raster or constant value 2	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\SCA\sca
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\TMAR\tmar

Messages:

Executing (Times): Times "D:\data\ITD\LZ Model\TMAR\den_reclass" "D:\data\ITD\LZ Model\SCA\sca" "D:\data\ITD\LZ Model\TMAR\tmar"

Start Time: Mon May 16 17:41:02 2005

Validating...

Executing Times...

Processing...

Completed Times.

Executed (Times) successfully.

End Time: Mon May 16 17:41:18 2005 (Elapsed Time: 16.00 secs)

Combined Impacts

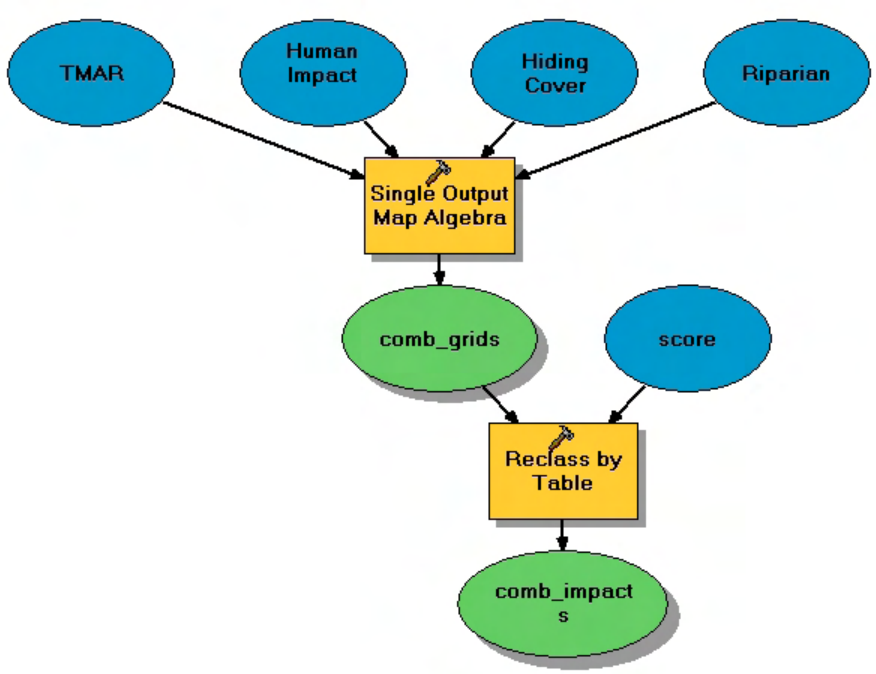
LZ Combined Impacts adds the impact values from the component models and classifies the resultant grid into impact categories of minimal (1), low (2), moderate (3), or high (4).
MINIMAL: In general, to be considered in the "minimal" combined impact category, the pixel had to have "neutral" or beneficial" impact values for all 4 individual layers, or only one condition have a "minimal" or "low" impact value.

4 beneficial or neutral
3 beneficial or neutral and 1 minimal or low

LOW: To be considered in the "low" combined impact category, 2 conditions could be in the "minimal" or "low" category, or 1 condition in the "minimal" or "low" category and/or 1 condition in the "moderate" category while the others had to be "beneficial" or "neutral".

2 minimal or low and 2 beneficial or neutral
1 minimal or low and 1 moderate and 2 beneficial or neutral
1 moderate and 3 beneficial or neutral

MODERATE OR HIGH: To be considered in the "moderate" or "high" combined impact category, the individual impact values had to be different combinations of "low", "moderate", and "high impact values



LZ Combined Impacts

Data format: ArcToolBox Tool

Abstract: LZ Combined Impacts adds the impact values from the component models and classifies the resultant grid into impact categories of minimal (1), low (2), moderate (3), or high (4).

ISO and ESRI Metadata:

Metadata elements shown with blue text are defined in the International Organization for Standardization's (ISO) document 19115 *Geographic Information - Metadata*. Elements shown with green text are defined by ESRI and will be documented as extentions to the ISO 19115. Elements shown with a green asterisk (*) will be automatically updated by ArcCatalog.

Metadata Information

***Last update:** 20050628

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Resource Identification Information:

Citation:

Title: LZ Combined Impacts

Party responsible for the resource:
Individual's name: Joe Grigsby
Organization's name: Geodata Services, Inc.
Contact's position: GIS Analyst
Contact's role:

Contact information:
Phone:
Voice: 406.721.8865
Fax: 406.721.1023

Address:
Delivery point:
104 South Ave. E.
City: Missoula
Administrative area: MT
Postal code: 59801

Country: USA
e-mail address: kwall@geodata-mt.com

Descriptive keywords:
Keywords: cover, TMAR, total motorized access routes, SCA, secure core areas, riparian, HIZ, human impact zone

Abstract:
LZ Combined Impacts adds the impact values from the component models and classifies the resultant grid into impact categories of minimal (1), low (2), moderate (3), or high (4).

Resource constraints:
Constraints:
Limitations of use:

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Distribution Information:

Distributor:
Available format:
Format name: ArcToolBox Tool

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Model Report **Expand/Collapse All**

Generated on: Mon May 23 10:47:33 2005

Variables

TMAR

Data Type:Composite Geodataset
Value:D:\data\ITD\LZ Model\TMAR\tmar

Human Impact Zones

Data Type:Composite Geodataset
Value:D:\data\ITD\LZ Model\HIZ\hiz

Hiding Cover

Data Type:Composite Geodataset
Value:D:\data\ITD\LZ Model\Cover\cover

Riparian

Data Type:Composite Geodataset
Value:D:\data\ITD\LZ Model\Riparian\riparian

comb_grids

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\comb_grids

score.dbf

Data Type:Table View
Value:D:\data\ITD\LZ Model\score.dbf

comb_impacts

Data Type:Raster Dataset
Value:D:\data\ITD\LZ Model\comb_impacts

Processes

Single Output Map Algebra

Tool Name:Single Output Map Algebra
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Map Algebra\SingleOutputMapAlgebra

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Map Algebra expression	Input	Required	MapAlgebra Expression	D:\data\ITD\LZ Model\Riparian\riparian + D:\data\ITD\LZ Model\Cover\cover + D:\data\ITD\LZ Model\HIZ\hiz + D:\data\ITD\LZ Model\TMAR\tmar
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\comb_grids
Input raster or feature data	Input	Optional	Multiple Value	'D:\data\ITD\LZ Model\TMAR\tmar';'D:\data\ITD\LZ Model\HIZ\hiz';'D:\data\ITD\LZ Model\Cover\cover';'D:\data\ITD\LZ Model\Riparian\riparian'

Messages:

Reclass by Table

Tool Name:Reclass by Table
Tool Source:C:\Program Files\ArcGIS\ArcToolbox\Toolboxes\Spatial Analyst Tools.tbx\Reclass\ReclassByTable

Parameters:

Name	*Direction*	*Type*	*Data Type*	*Value*
Input raster	Input	Required	Composite Geodataset	D:\data\ITD\LZ Model\comb_grids
Input remap table	Input	Required	Table View	D:\data\ITD\LZ Model\score.dbf
From value field	Input	Required	Field	CIC#
To value field	Input	Required	Field	CIC#
Output value field	Input	Required	Field	code
Output raster	Output	Required	Raster Dataset	D:\data\ITD\LZ Model\comb_impacts
Change missing values to NoData	Input	Optional	Boolean	false

Messages:

Appendix C – Acreage Summaries for Linkage Areas of Interest

The following four tables list acreage summaries for land ownership, forest/non-forest, sensitive environmental areas, and large carnivore-ungulate final linkage zone model within a four mile buffer around each linkage area of interest. These are intended for relative comparison and should not be summed, since the buffer areas around linkage areas of interest overlap each other in many instances.

Public Land Ownership for each Linkage AOI (with 4 mile buffer)

Sum of Acres

AOI_ID	AOI acres (with buffer)	Private	Forest Service	B.L.M.	USFWS	National Parks & Monuments	Department of Energy	Military Reservations	State of Idaho	Open water	UNK
ID6E01	74190	15105	43205	10923					4956		
ID6E02	58813	19978	34156	2523					2058		99
ID6E03	58493	22192	20650	13271					2380		
ID6E04	44501	24884	8294	9338					1985		
ID6E05	79785	42929		24643	9919				1873	420	
ID6E06	45931	12632		30100	680				2122	397	
ID6E07	71504	31757	132	32102					6098	1415	
ID6E08	82031	17504		57338					6149	1040	
ID6E09	66719	51642		13795					849	432	
ID6E10	75939	38383		29336	4528				2703	989	
ID6E11	65419	21552		522			43091		254		
ID6E12	42010	578					41432				
ID6E13	69087	9877		3414			54701		628	466	
ID6E14	97208	24631	10514	22212			37728		1657	466	
ID6E15	118962	20997	3428	40808			51244		2485		
ID6E16	91836	3170		10389			77182		628	466	
ID6E17	111768	10641	2380	41375			57371				
ID6E18	66759	15785	3852	27178			19422		522		
ID6E19	62083	31066	2336	26557			319		1804		
ID6E20	42640	22622		18294					1724		
ID6E21	79020	44142		31345					3533		
ID6E22	50551	34385	494	13389					2283		
ID6E23	76171	3973	13633	57558			1007				
ID6E24	54674	22468		114			32091				
ID6E25	43630	19		1			43611				
ID6E26	52715	20844		22986			6945		1940		
ID6E27	113093	81986	16605	9490				202	3151	1659	
ID6E28	52971	49756		1756				430	388	642	
ID6E29	50646	41444	611	6174				444	1146	828	

ID6E30	47010	27828	14722	3753						707	
ID6E31	52558	28397	20230	3076					78	777	
ID6E32	47618	26075	18407	2343					78	715	
ID6E33	58375	26895	29368	1384					78	650	
ID6E34	62220	16111	42629	630					179	2671	
ID6E35	89625	6089	67364	276					689	15207	0
ID6E36	49030	2268	39592	148					179	6842	
ID6E37	43459	1587	31822							10050	0
ID6E38	59790	28266	27648	2932					78	866	
ID6E39	48940	13282	34873	665					78	42	
ID6E40	74727	14113	60615	0							
ID6E41	48236	24862	18402	4927							44
ID6E42	38372	33856	58	4448							9
ID6E43	40108	38474		1626							8
ID6E44	59648	57054	2257	284					33		20
ID6E45	46625	45907		551					164		3
ID6E46	54608	52709	674	495					731		
ID6E47	43786	39418	2	1033					3333		
ID6E48	52785	52322	118	124					220		
ID6E49	66719	57472	7990	973					284		
ID6E50	60121	58986		313					5	818	
ID6E51	62091	27091	31607	444					2602	347	
ID6E52	51247	49128		1754						365	
ID6E53	38712	36773		1583						356	
ID6E54	37213	35454		1469						290	
ID6E55	39873	39410		351						112	
ID6E56	40554	39874		652						28	
ID6E57	63488	58460	6	980					3382	659	
ID6E58	42547	41680		316						551	
ID6E59	59057	14317	37672	5098					1441	529	
ID6E60	68669	24311	36796	5321					1500	740	
ID6E61	39068	167	37242						1433	227	
ID6E62	46479	4360	39090						2153	875	
ID6E63	39333	4619	31956						1819	939	
ID6E64	44820	4680	37254						1796	1090	
ID6E65	59955	7732	46264	329					3227	2402	
ID6E66	47768	10555	33054	251					3442	464	
ID6E67	56679	6774	44271	91					3558	1986	
ID6E68	42996	14062	20186	721					6441	1585	
ID6E69	41726	8807	22910	954					4726	4257	73
ID6E70	69512	14644	41399	1160					6225	5902	183
ID6E70B	52723	10293	32545	936					2831	5980	138

ID6E71	42422	10857	19935	1030					4473	6079	48
ID6E72	56096	11888	31100	1070					5857	6079	101
ID6E73	77540	17847	46605	1248					7182	4634	25
ID6E74	69099	9955	45019	6620					3273	4197	35
ID6E75	74033	13864	43616	2850					5261	8441	
ID6E76	44360	1402	40770						1737	451	
ID6E77	79317	75666		2579					1073		
ID6E78	37038	22668	9421	4927							23
ID6E79	28513	7563	16924	3981							44
ID6E81	52459	30068	8034	11847					2511		
ID6E82	57570	34328		20727					2515		
ID6E83	48927	8929		34550					4872	576	
ID6W01	20811	321	20393								97
ID6W02	31316	375	30852								89
ID6W03	45336	2192	43077								68
ID6W04	115737	7215	108114							392	15
ID6W05	42346	2810	39529							6	
ID6W06	61427	3602	57819							6	
ID6W07	51230	2866	48229								135
ID6W08	72555	24627	25577	20745					1125	481	
ID6W09	74122	11056	48342	13396					631	697	
ID6W10	44688	11869	16073	15683					631	432	
ID6W11	54768	21415	18788	13010					1228	327	
ID6W12	60726	21366	20789	16990					1228	354	
ID6W13	83185	5664	50050	26353					635	483	
ID6W14	42674	10482	12270	18913					731	279	
ID6W15	49165	7008	9917	32042						198	
ID6W16	48011	4789	14534	28491						197	
ID6W17	44524	6758	4622	33087						58	
ID6W18	49974	6141	2148	41570						115	
ID6W19	44064	18391	6248	19237					29	158	
ID6W2	49211	17763	3388	27974						87	

0											
ID6W21	57259	21319	45	34824					804	267	
ID6W22	44113	13416	45	28878					1486	288	
ID6W23	44549	9058	4330	29298					1634	230	
ID6W25	59256	2614	8520	45052					3070		
ID6W26	74554	7826	15414	48747					2567		
ID6W27	48531	13916	8379	24505					1731		
ID6W28	69216	19671	15064	29995					3504	982	
ID6W29	104946	36978	18394	45363					3023	1187	
ID6W30	81022	42650	2859	34385					1128		
ID6W31	53057	5386		22176		25019			476		
ID6W32	89037	45360		38579		2891			2207		
ID6W33	48933	6862	1588	37976					2162	344	
ID6W34	45387	2119	4803	36303					1892	269	
ID6W35	49808	2488	3431	41293					2365	231	
ID6W36	49364	3411	10589	32824					2312	228	
ID6W37	130668	4696	98582	25979					1073	339	
ID6W38	162667	4668	141248	16032					433	286	
ID6W39	64466	5544	57043						1146	732	
ID6W40	62852	4683	56089						590	1489	
ID6W41	115078	3799	110927	108						244	
ID6W42	57242	29941	1305	23417					2272	307	
ID6W43	57071	24993	1332	25363					5383		
ID6W44	78872	23745	2918	49009					3199		
ID6W45	54868	24193	10787	17407					2480		
ID6W46	55946	8806	33073	13281					778		7
ID6W47	45424	1222	33894	9577					696		36

ID6W48	52223	19069	6047	24572					2535		
ID6W49	72100	12814	19178	37262					2846		
ID6W50	74395	6766	19261	45661					2706		
ID6W51	106973	8102	16308	78386					4176		
ID6W52	46235	16836	1927	23376					4096		

Forest/Non-forest for each Linkage AOI (with 4 mile buffer)

Sum of Acres

AOI_ID	AOI Acres (w buffer)	Forest (Acres)	Non-Forest (Acres)
ID6E01	74190	20879	53308
ID6E02	58813	15170	43643
ID6E03	58492	2603	55888
ID6E04	44501	22	44478
ID6E05	79785	149	79632
ID6E06	45931	35	45894
ID6E07	71504	561	70946
ID6E08	82031	994	81042
ID6E09	66719	2443	64281
ID6E10	75939	78	75863
ID6E11	65419	6	65412
ID6E12	42010	4	42005
ID6E13	69087	4	69084
ID6E14	97208	1611	95600
ID6E15	118962	339	118613
ID6E16	91836	8	91827
ID6E17	111768	20	111745
ID6E18	66759	204	66556
ID6E19	62083	13	62072
ID6E20	42639	4	42635
ID6E21	79020	21	78997
ID6E22	50551	6	50546
ID6E23	76171	3819	72355
ID6E24	54673	7	54665
ID6E25	43630	0	43623
ID6E26	52714	2	52706
ID6E27	113092	19049	94042
ID6E28	52971	1901	51070
ID6E29	50646	3612	47034
ID6E30	47010	11258	35750
ID6E31	52558	12776	39782
ID6E32	47618	11762	35855
ID6E33	58375	20562	37812
ID6E34	62220	28806	33411
ID6E35	89625	46079	43548
ID6E36	49030	24314	24714

ID6E37	43459	21461	21995
ID6E38	59790	18014	41776
ID6E39	48940	22510	26430
ID6E40	74727	40728	34001
ID6E41	48236	19516	28718
ID6E42	38372	5663	32704
ID6E43	40108	3528	36581
ID6E44	59648	5023	54627
ID6E45	46625	4064	42562
ID6E46	54608	3199	51409
ID6E47	43786	852	42931
ID6E48	52785	3942	48845
ID6E49	66719	10247	56472
ID6E50	60121	1059	59065
ID6E51	62091	26424	35671
ID6E52	51247	1849	49400
ID6E53	38712	1658	37053
ID6E54	37213	1451	35763
ID6E55	39873	2046	37825
ID6E56	40554	1798	38756
ID6E57	63488	1316	62172
ID6E58	42547	856	41692
ID6E59	59057	30549	28504
ID6E60	68669	28696	39976
ID6E61	39068	20913	18154
ID6E62	46479	22389	24086
ID6E63	39333	20224	19110
ID6E64	44820	24688	20132
ID6E65	59954	32783	27177
ID6E66	47768	25149	22620
ID6E67	56679	32057	24621
ID6E68	42996	18724	24266
ID6E69	41726	19872	21854
ID6E70	69512	32388	37121
ID6E70B	52723	22106	30616
ID6E71	42422	16387	26031
ID6E72	56096	24338	31757
ID6E73	77540	38845	38678
ID6E74	69098	39302	29796
ID6E75	74033	33787	40245
ID6E76	44360	22665	21699

ID6E77	79317	2494	76825
ID6E78	37038	13217	23819
ID6E79	28513	15720	12792
ID6E81	52459	6	52450
ID6E82	57570	22	57550
ID6E83	48927	45	48883
ID6W01	20811	19067	1745
ID6W02	31316	28336	2981
ID6W03	45336	39853	5484
ID6W04	115737	74393	41350
ID6W05	42345	25445	16902
ID6W06	61427	41669	19759
ID6W07	51230	41526	9704
ID6W08	72555	16340	56214
ID6W09	74122	20835	53292
ID6W10	44688	8401	36286
ID6W11	54768	11768	43000
ID6W12	60726	13379	47344
ID6W13	83185	37744	45431
ID6W14	42674	7294	35378
ID6W15	49165	2716	46447
ID6W16	48011	4203	43807
ID6W17	44524	439	44088
ID6W18	49974	1457	48516
ID6W19	44064	739	43324
ID6W20	49211	738	48475
ID6W21	57259	1716	55548
ID6W22	44113	2843	41268
ID6W23	44549	302	44250
ID6W25	59256	5560	53698
ID6W26	74554	6267	68286
ID6W27	48531	3099	45432
ID6W28	69216	4678	64535
ID6W29	104946	8305	96642
ID6W30	81022	1546	79476
ID6W31	53057	160	52898
ID6W32	89037	151	88883
ID6W33	48933	5313	43620
ID6W34	45387	5590	39795
ID6W35	49808	3994	45809
ID6W36	49364	12156	37206

ID6W37	130668	78258	52411
ID6W38	162667	109251	53420
ID6W39	64466	35737	28729
ID6W40	62852	37139	25712
ID6W41	115078	77333	37744
ID6W42	57242	1381	55863
ID6W43	57071	2619	54455
ID6W44	78872	4272	74599
ID6W45	54868	2610	52259
ID6W46	55946	9381	46568
ID6W47	45424	10099	35324
ID6W48	52223	4908	47312
ID6W49	72100	14076	58025
ID6W50	74394	11073	63324
ID6W51	106972	4697	102275
ID6W52	46235	1614	44619

Cumulative Sensitive Environmental Areas for each Linkage AOI (with 4 mile buffer)

		Sum of Sensitive Categories				
AOI_ID	AOI Acres (w buffer)	0	1	2	3	4
ID6E01	74190	22330	47921	3939	0	
ID6E02	58813	30926	24682	3205	0	
ID6E03	58493	18378	36201	3913	0	
ID6E04	44501	21221	19716	3564	0	
ID6E05	79785	61513	8302	6210	3760	
ID6E06	45931	40593	4123	1050	165	
ID6E07	71504	57762	9204	2993	1545	
ID6E08	81986	66717	9705	4055	1509	45
ID6E09	66541	47714	12322	6025	480	177
ID6E10	75939	64667	6458	2650	2165	
ID6E11	65419	65095	324	0		
ID6E12	42010	41928	82			
ID6E13	69087	53084	11042	4958	2	
ID6E14	97208	78245	15224	3736	3	
ID6E15	118962	105608	13354			
ID6E16	91836	73417	12296	6120	2	
ID6E17	111768	106858	4910			
ID6E18	66759	58861	7898			
ID6E19	62083	58994	3089			
ID6E20	42640	42154	486			
ID6E21	79020	65632	13380	8		
ID6E22	50551	32741	17799	11		
ID6E23	76171	69263	6813	95		
ID6E24	54674	54325	349			
ID6E25	43630	38397	5233			
ID6E26	52715	46138	6577			
ID6E27	113004	89851	17785	4380	987	89
ID6E28	52954	44038	6100	2310	507	18
ID6E29	50646	39843	8671	1840	293	
ID6E30	46961	34496	8753	3100	612	49
ID6E31	52558	39354	10381	2298	525	
ID6E32	47618	37049	8069	2035	465	
ID6E33	58375	45849	10488	1613	425	
ID6E34	62220	45313	14471	2176	259	
ID6E35	89579	54657	25715	7176	2030	46
ID6E36	48972	29391	17467	2033	81	58
ID6E37	43459	28174	12370	2829	85	

ID6E38	59779	45477	10074	3707	522	11
ID6E39	48940	42864	4363	1674	38	
ID6E40	74727	67087	7090	533	17	
ID6E41	48236	38752	7985	1411	89	
ID6E42	38225	22035	11116	4977	97	147
ID6E43	39799	10705	17359	11318	416	309
ID6E44	59241	11228	29262	16293	2459	406
ID6E45	46582	17110	21020	7919	532	43
ID6E46	54576	37722	15136	1347	371	32
ID6E47	43786	40329	2774	604	79	
ID6E48	52773	36533	13203	2612	425	12
ID6E49	66719	52171	13018	1451	78	
ID6E50	60121	31971	24450	3693	7	
ID6E51	62091	16100	39978	6014		
ID6E52	51213	37457	10826	2388	542	34
ID6E53	38681	25968	10076	2160	476	31
ID6E54	37190	26205	8716	1926	343	22
ID6E55	39755	31170	5730	2601	254	118
ID6E56	40543	32387	7155	852	149	11
ID6E57	63488	30763	25726	6836	163	
ID6E58	42547	12462	23744	6341		
ID6E59	59057	6655	48300	4102		
ID6E60	68669	10389	53133	5147		
ID6E61	39068	18209	19741	1118		
ID6E62	46479	20704	19488	6161	126	
ID6E63	39333	14052	16945	7387	949	
ID6E64	44820	12967	21573	8917	1363	
ID6E65	59955	10151	31837	14973	2994	
ID6E66	47768	6580	24161	14265	2762	
ID6E67	56679	9417	28480	14729	4053	
ID6E68	42945	3640	25867	10858	2580	51
ID6E69	41675	1110	25733	8729	6103	51
ID6E70	69353	2129	34130	23120	9973	159
ID6E70B	52503	1402	16261	23625	11216	220
ID6E71	42275	297	16502	14951	10526	147
ID6E72	55924	1015	23397	20659	10853	172
ID6E73	77489	5925	43741	19213	8610	51
ID6E74	69099	38564	23156	7379	0	
ID6E75	74033	29599	23280	18309	2845	
ID6E76	44360	20440	21690	2230		
ID6E77	79317	72195	6199	480	444	

ID6E78	37038	27996	7784	1203	55	
ID6E79	28513	26041	2230	213	28	
ID6E81	52459	32775	15415	4269	0	
ID6E82	57570	56981	590			
ID6E83	48927	42294	2928	2416	1289	
ID6W01	20811	13151	7497	146	18	
ID6W02	31316	20257	10846	195	18	
ID6W03	45336	31455	13608	256	18	
ID6W04	115737	66616	46894	2119	108	
ID6W05	42346	22118	18913	1276	39	
ID6W06	61427	37110	22942	1336	40	
ID6W07	51230	36253	14695	281	0	
ID6W08	72506	37128	33431	1545	402	49
ID6W09	74122	35352	36227	2302	241	
ID6W10	44688	14343	28609	1474	262	
ID6W11	54719	40327	13620	460	312	48
ID6W12	60692	43924	15891	510	367	34
ID6W13	83185	50192	32020	824	149	
ID6W14	42674	33312	8889	268	205	
ID6W15	49126	38767	9432	544	383	39
ID6W16	47972	37729	9385	579	278	39
ID6W17	44524	42567	1467	216	274	
ID6W18	49960	43572	5749	297	343	14
ID6W19	44037	34978	8517	440	102	27
ID6W20	49151	35512	12706	789	144	60
ID6W21	57248	47723	9091	348	86	12
ID6W22	44113	34923	8943	226	22	
ID6W23	44549	18148	25592	809		
ID6W25	59256	41338	13206	4637	75	
ID6W26	74554	46780	22577	3343	1854	
ID6W27	48531	9433	31209	6035	1854	
ID6W28	69216	47774	19806	1637	0	
ID6W29	104946	52666	44912	7086	281	
ID6W30	81022	75818	5204			
ID6W31	53057	47845	5212	0		
ID6W32	89037	88484	553			
ID6W33	48933	30308	18028	495	102	
ID6W34	45387	14880	29608	720	179	0
ID6W35	49808	16923	31910	802	172	0
ID6W36	49364	36006	12581	674	102	
ID6W37	130668	110275	19602	743	48	

ID6W38	162667	140288	21569	761	48	
ID6W39	64310	36702	16935	9672	1001	155
ID6W40	62852	52067	9015	1737	33	
ID6W41	114411	24720	48938	35557	5196	667
ID6W42	57193	47219	9061	482	431	49
ID6W43	57071	52762	3838	268	203	
ID6W44	78836	16609	50243	11285	700	36
ID6W45	54868	21853	29904	2628	483	0
ID6W46	55946	29195	24813	1682	257	0
ID6W47	45424	28676	16276	444	28	
ID6W48	52223	12115	35654	4242	212	0
ID6W49	72100	49487	20662	1942	9	
ID6W50	74395	65331	7401	1662		
ID6W51	106973	93201	13201	570		
ID6W52	46235	43375	2514	220	126	

Results of Final Linkage Zone model (Combined Impact Categories) for each Linkage AOI (with 4 mile buffer)

Sum of Acres		Category			
AOI ID	AOI acres (w buffer)	Minimal Impact (acres)	Low Impact (acres)	Moderate Impact (acres)	High Impact (acres)
ID6E01	74190	31592	14424	23305	4867
ID6E02	58813	33025	11773	10471	3543
ID6E03	58492	15646	8147	32496	2202
ID6E04	44501	3966	3735	32920	3879
ID6E05	79785	25524	7699	34023	12534
ID6E06	45931	10822	3340	27345	4421
ID6E07	71504	13977	5606	37926	13998
ID6E08	82031	20167	6643	51197	4030
ID6E09	66719	12816	4571	15391	33946
ID6E10	75939	13735	4167	43242	14798
ID6E11	65419	14913	5006	34001	11498
ID6E12	42010	11262	4647	25042	1057
ID6E13	69087	28457	10527	28384	1719
ID6E14	97208	37941	15951	35359	7960
ID6E15	118962	49072	19906	39806	10169
ID6E16	91836	35000	14040	42341	454
ID6E17	111768	29918	15548	63060	3240
ID6E18	66759	21093	10729	32816	2121
ID6E19	62083	11399	8256	38729	3701
ID6E20	42639	5401	5304	29857	2078
ID6E21	79020	10243	9282	55753	3740
ID6E22	50551	6734	5495	34143	4180
ID6E23	76171	26868	15271	33027	1008
ID6E24	54673	9351	2575	34633	8114
ID6E25	43630	18041	8613	14418	2551
ID6E26	52714	24183	9586	18296	643
ID6E27	113092	44688	23963	28382	16058
ID6E28	52971	9810	6345	10083	26732
ID6E29	50646	12259	8236	12602	17550
ID6E30	47010	22475	9121	9333	6079
ID6E31	52558	23846	7356	9011	12345
ID6E32	47618	18956	5801	7253	15607
ID6E33	58375	28235	5540	7013	17586
ID6E34	62220	38933	5221	4789	13275
ID6E35	89625	71423	6348	4721	7135

ID6E36	49030	38468	3732	3233	3596
ID6E37	43459	37393	2782	1778	1504
ID6E38	59790	29360	7584	8023	14823
ID6E39	48940	34775	5261	5033	3871
ID6E40	74727	55851	6812	3427	8638
ID6E41	48236	24007	4448	3521	16258
ID6E42	38372	9624	3450	4272	21022
ID6E43	40108	9087	3772	6210	21040
ID6E44	59648	14578	6999	9711	28362
ID6E45	46625	9494	6891	8585	21656
ID6E46	54608	11779	11157	18372	13300
ID6E47	43786	15292	9175	14577	4740
ID6E48	52785	11581	9732	12672	18803
ID6E49	66719	22726	13935	14350	15708
ID6E50	60121	10572	8082	15878	25592
ID6E51	62091	22183	16693	9361	13858
ID6E52	51247	5142	2812	3314	39981
ID6E53	38712	4877	2346	3560	27928
ID6E54	37213	5055	2453	3547	26158
ID6E55	39873	5761	2728	2571	28810
ID6E56	40554	6096	2915	3002	28541
ID6E57	63488	10373	4745	14614	33757
ID6E58	42547	6246	5081	16129	15092
ID6E59	59057	33899	12602	6336	6217
ID6E60	68669	33801	13133	8367	13371
ID6E61	39068	20389	11929	5926	822
ID6E62	46479	25590	12036	7238	1612
ID6E63	39333	24223	7804	5145	2162
ID6E64	44820	29336	7435	4391	3659
ID6E65	59954	29654	12648	7420	10239
ID6E66	47768	15707	13440	7375	11247
ID6E67	56679	19837	14400	8090	14352
ID6E68	42996	21541	7836	4278	9335
ID6E69	41726	27075	4758	3140	6753
ID6E70	69512	47079	8240	4673	9518
ID6E70B	52723	37966	4868	3702	6186
ID6E71	42422	29052	3279	2645	7442
ID6E72	56096	37666	5646	4137	8646
ID6E73	77540	37870	16047	8549	15056
ID6E74	69098	41975	14180	7498	5445
ID6E75	74033	40230	12823	10090	10890

ID6E76	44360	21754	14010	7328	1273
ID6E77	79317	25590	15839	22718	15172
ID6E78	37038	14766	2640	3011	16619
ID6E79	28513	19709	1591	1257	5955
ID6E81	52459	4375	5731	38501	3849
ID6E82	57570	19644	8514	25427	3987
ID6E83	48927	11491	3755	31866	1816
ID6W01	20811	17105	3123	411	173
ID6W02	31316	25729	4633	685	270
ID6W03	45336	31642	11294	1461	939
ID6W04	115737	71395	32338	6131	5879
ID6W05	42345	21931	15323	2562	2532
ID6W06	61427	31790	23394	3315	2928
ID6W07	51230	33972	13945	1713	1600
ID6W08	72555	21423	17086	16220	17825
ID6W09	74122	42914	15742	6685	8785
ID6W10	44688	18030	11697	5703	9257
ID6W11	54768	17967	6942	13315	16546
ID6W12	60726	20902	6706	14779	18336
ID6W13	83185	46656	19812	11295	5412
ID6W14	42674	13663	6132	12933	9945
ID6W15	49165	27908	7350	10173	3732
ID6W16	48011	30179	7642	8267	1921
ID6W17	44524	23350	7596	9606	3975
ID6W18	49974	28153	8047	10163	3611
ID6W19	44064	12079	8086	9408	14490
ID6W20	49211	17154	8458	9427	14174
ID6W21	57259	21327	8241	10610	17085
ID6W22	44113	20595	5197	7112	11206
ID6W23	44549	15344	10210	12616	6381
ID6W25	59256	27791	12520	18344	602
ID6W26	74554	32820	10977	29487	1269
ID6W27	48531	15608	5087	24672	3164
ID6W28	69216	26643	10701	24092	7777
ID6W29	104946	28465	12808	43929	19745
ID6W30	81022	14443	11005	30338	25236
ID6W31	53057	34718	5707	11171	1462
ID6W32	89037	37012	10960	31966	9096
ID6W33	48933	24473	8184	10187	6090
ID6W34	45387	24843	7439	11054	2048
ID6W35	49808	27329	7426	12588	2459

ID6W36	49364	34279	5046	6996	3041
ID6W37	130668	100625	14836	8325	6884
ID6W38	162667	131565	15252	7744	8110
ID6W39	64466	42572	9313	6885	5697
ID6W40	62852	48076	4746	5249	4779
ID6W41	115078	88546	17274	6629	2627
ID6W42	57242	11505	7285	18031	20424
ID6W43	57071	18077	11086	15133	12777
ID6W44	78872	25456	16373	27701	9342
ID6W45	54868	16305	8633	22065	7866
ID6W46	55946	24730	9388	18454	3376
ID6W47	45424	23600	8339	13222	262
ID6W48	52223	17598	8116	23046	3462
ID6W49	72100	24304	14435	30708	2655
ID6W50	74394	20857	15985	35954	1600
ID6W51	106972	27818	22628	54928	1599
ID6W52	46235	12204	9247	15910	8872