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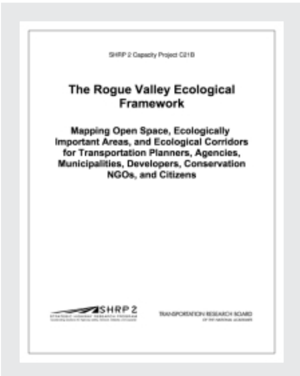
SHRP 2 Capacity Project C21B

The Rogue Valley Ecological Framework

Mapping Open Space, Ecologically Important Areas, and Ecological Corridors for Transportation Planners, Agencies, Municipalities, Developers, Conservation NGOs, and Citizens

The Rogue Valley Ecological Framework: Mapping Open Space, Ecologically Important Areas, and Ecological Corridors for Transportation Planners, Agencies, Municipalities, Developers, Conservation NGOs, and Citizens

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Rogue Valley Council of Governments

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Rogue Valley Council of Governments

TRANSPORTATION RESEARCH BOARD
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Executive Summary

Background

The Rogue Valley, Jackson County, southern Oregon, is experiencing growing pains all too common in the western United States. The valley's population has increased by 40% in the last 20 years, and is expected to grow by another 30% by 2030 (OEA 2004; Jackson County 2007; U.S. Census Bureau 2012). Space is limited by surrounding mountains, so urban growth occurs at the expense of fertile agricultural lands, salmon stream floodplains, wetlands, and oak woodlands. Transportation projects have struggled to keep up with the uncoordinated and haphazard development projects. Special habitats (e.g., wetlands) and species of concern have added regulatory layers. A lack of easily accessible environmental information makes it more difficult for transportation planning agencies to plan appropriate projects or future transportation direction. Our project goal was to improve the environmental and ecological data informing transportation planning in the Rogue Valley, Jackson County, Oregon.

Research Approach

Our project was chosen as one of four national pilot projects for the Transportation Research Board's (TRB) Strategic Highway Research Program 2 (SHRP 2), Capacity Division, Research Project C21. We tested the first three steps of a nine-step planning framework developed by Oregon State University's Institute for Natural Resources (INR et al. 2010). This framework was the result of SHRP 2 Capacity Research Projects C06A and C06B, which developed ecosystem-based transportation planning tools. The product of our test was a "Regional Ecosystem Framework" (REF), which we defined as an overlay of regional environmental, ecological, and archeological data with planned and existing transportation infrastructure. We hoped this REF would be a helpful transportation planning tool for the Rogue Valley.

We convened a stakeholder committee representing diverse public and private sector interests and a technical committee of local resource experts to help create the REF. We created a data library with almost 200 spatially-linked data sets from federal, state, and county agencies; universities; non-governmental organizations; and individual scientists. Using a program called Corridor Design (Majka et al. 2007) and Esri's ArcMap (2009), we mapped valley locations with the highest concentrations of environmental and ecological factors ("nodes") and corridors between them ("linkages"). We overlaid planned and existing transportation structures and archeologically and historically important areas to create the final REF (Figure ES.1) A larger version of this map is shown in Figure 3.4.

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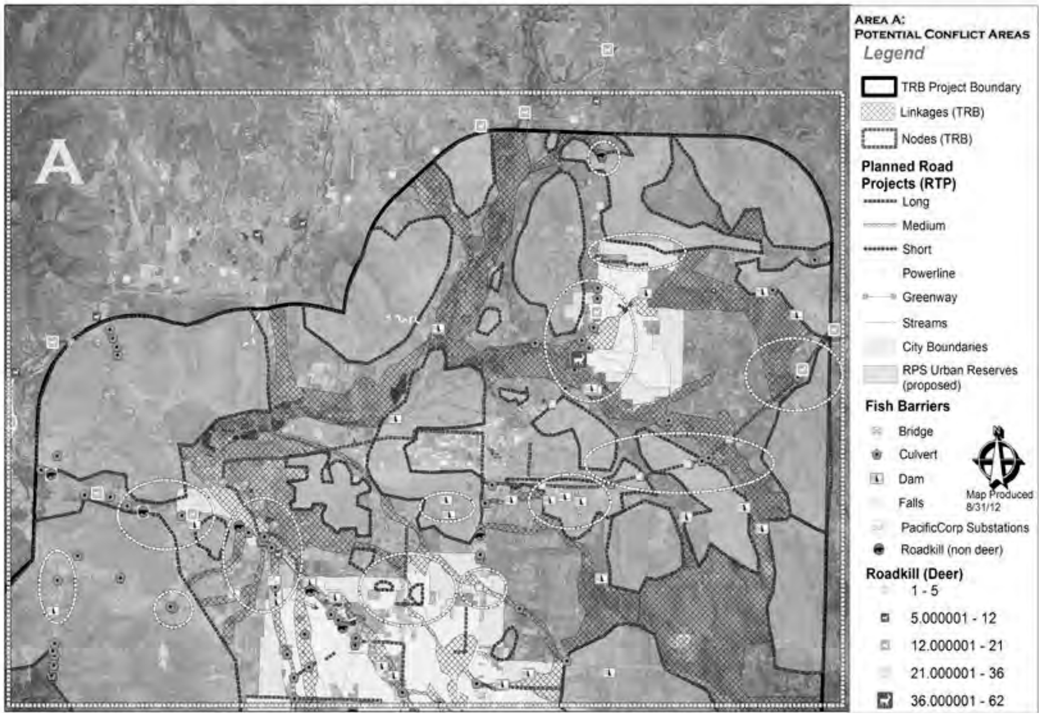

Figure ES.1. Sample of the conflict and opportunity map, covering a small portion of the project area, Rogue Valley, Jackson County, Oregon.

Findings and Applications

We found that we had to modify the original C06 framework. For example, we found that pursuing memoranda of understanding and funding in Step 1 was premature; these actions should be moved to Steps 3 or 4. We also believe that mapping ecologically important areas do not need to include identifying conservation and restoration priorities (Step 2, substep 2f), which could stall the process for months. We recommend that these modifications be applied to the framework before it is distributed nationally.

We also tested other TRB tools: the Transportation for Communities website, a stakeholder survey, and the SHRP 2 website. We found that each of these tools needs improvement before they can be useful to a wide range of transportation planning teams.

We had overwhelming support from data providers. It took much more time than anticipated to manipulate the data into shape files suitable for analysis; other teams replicating this process should budget accordingly.

We were pleased with the results of our map analysis. We produced three maps: 1) raster analysis results; 2) ecological nodes and linkages; and 3) conflict and opportunities (our version of the REF; Figure ES.1). The ecological nodes and linkages highlights the location of ecologically and environmentally important areas in the valley. The conflict and opportunities

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map illustrates where planned transportation projects intersect with these areas (as well as with archeologically and historically important areas).

We found that both the stakeholder and review teams were critical to the project's success. Overall, participants enthused about the applicability of the mapping products.

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CHAPTER 1
Background

Participants

Rogue Valley Council of Governments

Rogue Valley Council of Governments' (RVCOG) fundamental role is to provide technical expertise and project management for cities and other jurisdictions in the Rogue River basin of southern Oregon. Our Natural Resources and Planning Departments were involved in this project, with Natural Resources taking the lead. The Natural Resources Department has been working on integrating conservation and economic development for many years. Recent projects include removing the Gold Hill Dam and monitoring the effects; basin-wide water quality monitoring; an integrated wetland conservation and economic development plan in the northwest corner of the valley (the Agate Desert Vernal Pool Conservation Plan); and working with a variety of partners to provide economically viable conservation options. RVCOG's Planning Department provides planning services for local municipalities; it also staffs the region's Metropolitan Planning Organization (MPO).

Partners

Sixty-eight people from 41 different agencies and groups helped complete this project. Partners included city, county, state, and federal agencies; universities; consulting scientists; and representatives from conservation groups, economic infrastructure entities, the agricultural sector, and the transportation industry. A complete list of all participants and their affiliations can be found in Appendix A.

Context: Environmental, Social, and Transportation

The Rogue Valley is a 30- by-10-mile river valley in the middle Rogue River basin of southern Oregon, hemmed in by forested mountain ranges on all sides (Figure 1.1). Bear Creek, once an important salmon stream, flows down the middle of the valley, paralleled by Interstate-5 and constrained by urban development. In the last 20 years, the county's population has grown by almost 40% (OEA 2004; Jackson County 2007; U.S. Census Bureau 2012). Another 30% are expected to arrive in the next 30 years. Approximately 70% of the valley's 200,000 residents live in the incorporated cities (Jackson County 2007); the rest are scattered across rural and agricultural lands in the valley bottom and foothills.

Rampant population growth has converted over 30?% of the valley's orchards into an uncoordinated tangle of business and housing projects (OSU Extension Service 2008). Piecemeal and uncoordinated urban development has fragmented and perforated sensitive environmental areas, e.g., wetlands, riparian areas, and oak woodlands.

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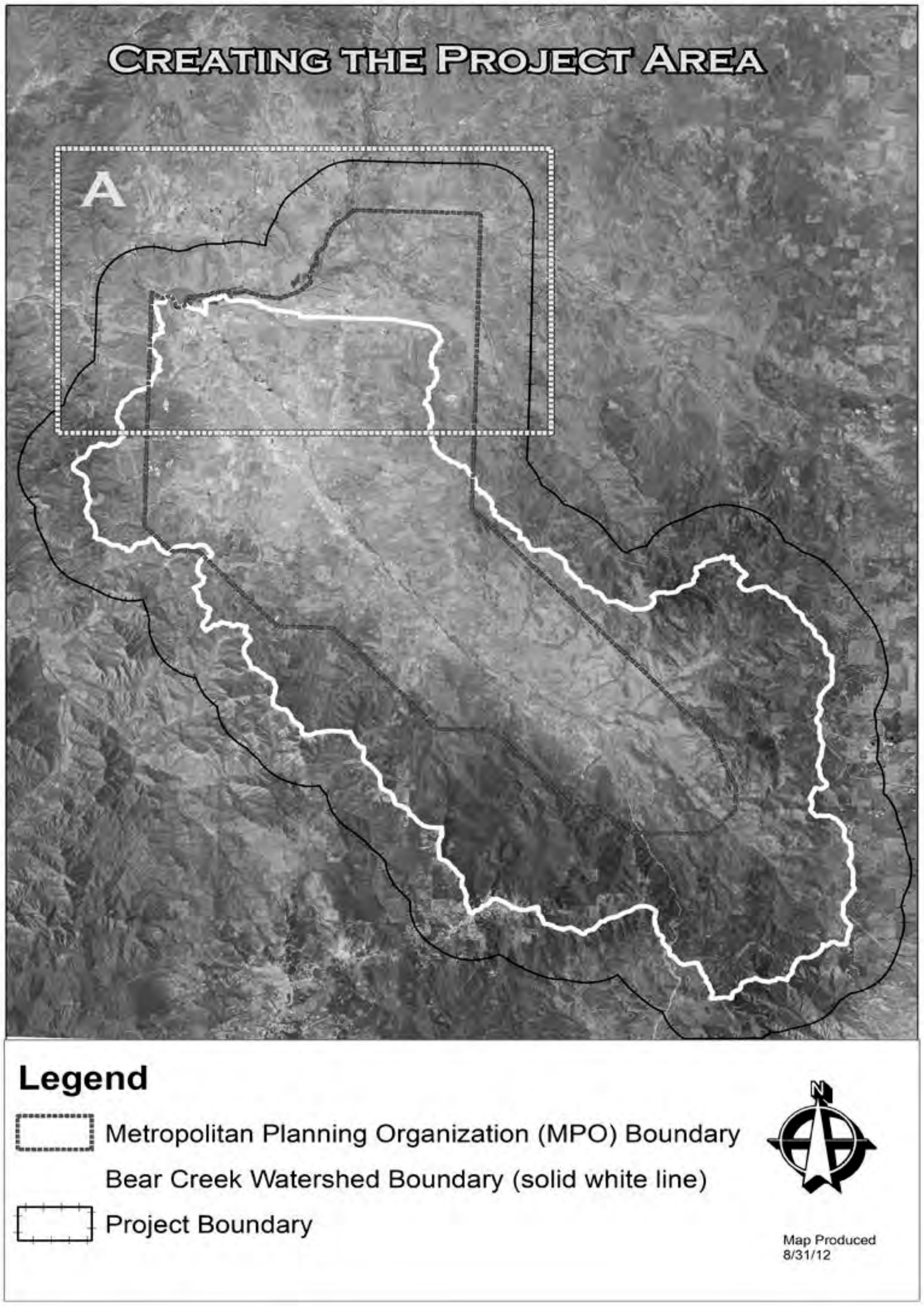

Figure 1.1. Project area, Rogue Valley Ecosystem Framework, Jackson County, Oregon.

Box inset (A) refers to subsequent maps in the document, which show only this section of the project area in order to show mapping detail.

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Human-wildlife conflicts (e.g., cougar and bear incidents, deer-auto accidents) are increasing as development interrupts migration corridors or fragments habitat. Among the federally and state listed species in the project area, two plants and one animal species have been federally listed under the Endangered Species Act due to vernal pool habitat loss (USFWS 2003; USFWS 2005; Table 1.1). Seventy-seven federal and state species of concern occur within the small project area (Appendix B); shrinking or fragmented habitat poses risks to these species as well. This is a concern to the community, which values recreational opportunities in the surrounding mountains, as well as economic growth. Surrounding mountains are primarily managed by federal agencies (U.S. Bureau of Land Management and U.S. Forest Service), private timber companies, or private ranches for timber production, livestock grazing, and wildfire management.

Table 1.1. Federally or State Listed Species Occurring Within the Project Area (), Jackson County, Oregon.

Species		Federal Listing Status[a]	State Listing Status[b]	Habitat Association	Critical Habitat
Common Name	**Scientific Name**				
Gentner's fritillary	*Fritillaria gentneri*	E	E	Forest, meadows, oak woodlands	No
Cook's desert parsley	*Lomatium cookie*	E	E	Vernal pools	2010
Large-flowered woolly meadowfoam	*Limnanthes floccose ssp. grandiflora*	E	E	Vernal pools	2010
Northern spotted owl	*Strix occidentalis caurina*	T	T	Old-growth conifer forest	2008
Southern Oregon/ Northern California Coasts coho salmon	*Oncorhynchus kisutch*	T	SV	Rivers, streams	2000
Vernal pool fairy shrimp	*Branchinecta lynchi*	T	--	Vernal pools	2006
Wayside aster	*Eucephalus vialis*	SOC	T	Dry upland mixed conifer/hardwood forest openings	--
Dwarf wooly meadowfoam	*Limnanthes floccose ssp. Pumila*	SOC	T	Vernal pools on top of two mesas	--

Note: The project area is the Bear Creek Watershed combined with the Metropolitan Planning Organization Boundary surrounded by a 2-mile buffer.

[a] Listing Status under the federal Endangered Species Act, as amended 1973. E = Endangered; T = Threatened; SOC = Species of Concern. Accessed 2/8/2012. www.fws.gov/oregonfwo/Species/Lists/Documents/County/JACKSON%20COUNTY.pdf.

[b] Listing Status by the State of Oregon. E = Endangered; T = Threatened; SV = Sensitive-Vulnerable. Wildlife: Accessed 2/8/2012. www.dfw.state.or.us/wildlife/diversity/species/docs/SSL_by_category.pdf; Plants: Accessed 2/8/2012. www.oregon.gov/ODA/PLANT/CONSERVATION/county_list_a.shtml#Jackson.

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Problem

As the Rogue Valley's population skyrockets, valley leaders have been struggling to retrofit undersized and awkwardly-located transportation routes to meet traffic demand. Long-range transportation planning has been complicated by the environmental and ecological sensitivity of the valley (e.g., listed species, unique habitats, culturally important scenic vistas, "wild" recreational areas) and the lack of easily available biological/ecological information.

Data is not easily available for several reasons. Each agency uses only its own data library within its own Geographic Information Systems (GIS) department. Each department uses different mapping projections and data storage protocol. Agency employees are overworked and often cannot finish collecting data, digitizing data, or even properly storing data. Much data languishes in file cabinets or even in binders.

Without enough reliable data, plans bog down in arguments and distrust, projects grind to a halt over unforeseen mitigation needs, and projects are rarely considered in the context of the "big picture." Project delays due to public outcry, regulatory planning document revision, and/or mitigation add to mounting frustration, expense, and a final transportation product that benefits neither the environment nor the transportation corridor.

Solution

The Transportation Research Board (TRB) of the National Academy of Sciences works to resolve problems with transportation planning. Through its Strategic Highway Research Program 2 (SHRP 2), it funded two projects in 2008 through its C06 research initiative (TRB 2008). These projects were tasked to develop tools to aid transportation agencies and municipal planning organizations in using an ecosystem approach to transportation planning. One of the funded organizations was Oregon State University's Institute for Natural Resources (OSU-INR). As its tool, OSU-INR developed a nine-step "Integrated Ecosystem Framework" (Table 1.2). This framework guides a regional, multi-agency team through integrating conservation and transportation planning while expediting transportation product delivery, e.g., creating memoranda of understanding (MOUs), regulatory assurance agreements, and mitigation crediting (INR et al. 2010). The first three steps of this process lead the team through the creation of a "Regional Ecosystem Framework" (REF). A REF as defined by OSU-INR is a map overlaying planned transportation projects with ecological conservation areas. Such a map (and associated data products) or something similar, would be the solution to the Rogue Valley's dilemma.

For several years, our team had understood the need for such a map in the Rogue Valley. As mentioned above, the lack of environmental and ecological information at the valley scale had made many planning efforts more difficult. Several mapping efforts had taken place over the previous decade, yet these efforts were very large scale [e.g., The Nature Conservancy's Klamath Mountains Ecoregion Assessment {Vander Schaaf et al. 2004)], specific to a particular effort, or focused on federal lands. The TRB's C21 funding presented the opportunity to both create mapping/data products needed for the Rogue Valley, and to help TRB refine ecosystem

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approach transportation planning tools for eventual use nationwide. TRB selected our project as one of the four research efforts funded by C21.

Table 1.2. The Nine Steps of the Integrated Ecosystem Framework as developed by Oregon State University's INR et al. 2010).

Step 1: Build and Strengthen Collaborative Partnerships and Vision.
Step 2: Integrate Ecosystem Plans.
Step 3: Create Regional Ecosystem Framework.
Step 4: Assess Transportation Effects.
Step 5: Establish and Prioritize Ecological Actions.
Step 6: Develop Crediting Strategy.
Step 7: Develop Agreements.
Step 8: Implement Agreements.
Step 9: Monitoring and Adaptive Management.

Note ;Substeps have been omitted. The three steps tested with this project are in bold.

Goals and Objectives

1. Test one of the SHRP 2 C06 tools developed to improve the ecosystem approach for transportation planning, nationwide.
    a. Use and evaluate the first three steps of OSU-INR's framework:
        i. Were the proposed substeps appropriate, efficient, practical, and repeatable by others?
        ii. Did the substeps guide us to the completion of a REF?
    b. Evaluate additional SHRP 2 program tools [e.g., Transportation for Communities website (www.transportationforcommunities.com), stakeholder survey].
2. Improve the environmental and ecological data informing transportation planning in the Rogue Valley, Jackson County, Oregon.
    a. Gather all known environmental and ecological data for the Rogue Valley, Oregon into a geospatial data library.
    b. Map ecologically and environmentally important areas.
    c. Map potential conflict and restoration opportunity areas between transportation projects and ecologically/environmentally important areas.
    d. Make sure all information is available to all.

We hoped our mapping products would build a "big picture" foundation for long-term planning; give an early "heads-up" for short-term project planning; help planners, developers, and conservation advocates work together during the planning process; and streamline regulatory review.

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CHAPTER 2
Research Approach

Methods Note: This report was does not include a complete record of our methods for creating our Geographical Information Systems maps because this was not the information of interest to the TRB. We realize that others (e.g., other councils of government) may want to replicate our efforts; therefore, we have included additional information about our mapping methods in Appendix C.

Test SHRP 2 C06 Integrated Ecosystem Framework, Steps 1-3

Our project tested steps 1-3 of the Integrated Ecosystem Framework (IEF) developed by Oregon State University's Institute of Natural Resources under SHRP 2 C06 (INR et al. 2010; Table 2.1). Since we were testing this framework, we only used their steps as a loose guideline, and adjusted the steps as necessary as we went through our process.

Table 2.1. Steps 1-3, With Substeps, of SHRP 2 C06 Integrated Ecosystem Framework

Step 1: Build and strengthen collaborative partnerships, vision.
1a. Identify planning region. 1b. Build relationships. 1c. Convene stakeholders. 1d. Record ideas; develop MOU on potential new processes for increasing conservation, efficiency and predictability. 1e. Explore funding and long-term management options.
Step 2: Characterize resource status. Integrate conservation, natural resource, watershed, and species recovery and state wildlife action plans.
2a. Identify spatial data needed for baseline. 2b. Prioritize ecological resources and issues. 2c. Develop necessary agreements from agencies and NGOs to provide plans and data. 2d. Identify data gaps. Reach consensus on an efficient process for filling gaps. 2e. Produce geospatial overlays of data and plans. 2f. Stakeholder review of geospatial overlay, restoration/conservation goals and priorities. Identify actions to support them. 2g. Record everything. 2h. Distribute map of conservation and restoration priorities to stakeholders for review and adoption.

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Step 3: Create Regional Ecosystem Framework
3a. Overlay the geospatially-mapped Long-Range Transportation Plan with conservation priorities. 3b. Identify and show areas and resources 1) potentially impacted by transportation projects and 2) potentially opportunities for joint action on conservation or restoration priorities. 3c. Identify high-level conservation goals. 3d. Stakeholder review.

Evaluate Additional TRB Tools

Stakeholder Survey

Upon request from TRB, we set up a "before and after" survey evaluation. We used the stakeholder survey tool from the Transportation for Communities (TCAPP) website (www.transportationforcommunities.com). We provided our stakeholder committee (below, under Project Participants) with information regarding the TCAPP website and asked them to take the stakeholder survey during July, 2011. At this time the stakeholder committee had met twice. The stakeholder committee took the same survey again after the January 2012 meeting. Stakeholders were also asked to provide feedback regarding the ease of using the TCAPP website and whether information on the website assisted the stakeholders with their responsibilities regarding communicating, understanding and committing to the stakeholder process.

The TCAPP survey tool was designed for stakeholder groups making decisions about specific transportation projects. Our stakeholder committee was convened to advise us as we developed tools (data library, maps) to help with early stages of transportation plans. After talking with TRB and the consultant responsible for making revisions to the TCAPP survey, we decided to use the original survey questions (as of July, 2011). We knew this could cause confusion within our specific stakeholder committee, but we also felt it would provide useful feedback for the survey developers.

TCAPP Website, SHRP 2 Website, SHRP 2 C06 Pilot Studies

Part of our responsibility to TRB was to use and evaluate the TCAPP website. We attempted to use this website to help us understand the transportation planning process, to access transportation-related documents, and, as stated, for the stakeholder survey. We also tried to find information via the SHRP 2 website. We were provided with appendices from the SHRP 2 C06 pilot studies at the beginning of our project. We reviewed these reports before we set up our analysis process.

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Create Regional Ecosystem Framework and Associated Maps

Regional Ecosystem Framework Defined

The C06 team defined a REF as the merger, or overlay of a regional conservation strategy and a transportation plan (INR et al. 2010). A conservation strategy identifies and prioritizes the ecological and environmental areas to be conserved or protected ("ecological framework"). A transportation plan includes the transportation-related infrastructure planned to support predicted urban and rural growth or change (economic, residential, and otherwise) in a particular area. We used this definition as a guide, but as we developed the REF, we adapted the concept to the needs of and data available to our valley.

Project Participants

We convened two groups to assist with the project: a stakeholder committee representing diverse public and private sector interests and a technical committee of local resource experts (Appendix A, Table A.1). The stakeholder committee met monthly. The technical review team met twice; we also requested assistance from individual members throughout the project. Eighteen people representing 14 entities participated in the monthly stakeholder meetings. Thirteen people representing 10 entities were members of the technical review group. Several others provided additional technical assistance (Appendix A). Our own project team was made up of a mix of RVCOG employees and contractors, who provided important technical expertise (Appendix A, Table A.2).

Project Area

Our project area encompassed the intersection of the Metropolitan Planning Organization (MPO) boundary and the entire Bear Creek Watershed, surrounded by a 2-mile buffer (Figure 1.1). We added the buffer to create ecological connectivity across the mountains into adjacent valleys. We removed a small portion of the buffer that would have extended into California, to avoid collecting data from two states, two counties, and two National Forests mapped with different projections.

The project area includes seven municipalities; county, state, and federal lands and parks; many large orchards and farms; an interstate; an airport; an irrigation canal system; a recreational greenway; one large and several small reservoirs for municipal water, irrigation, or flood control; vernal pools, wetlands, and streams; complex vegetation types; and approximately 200,000 people.

GIS Analysis: Brief Overview

We created a digital library of spatially-linked data sets from federal, state, and county agencies; universities; non-governmental organizations; and individual scientists. Much of these data required manipulation (e.g., reprojecting, clipping, merging) before being functional. We

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evaluated all data received to determine if each met our criteria for inclusion in the data library and for use in the GIS analysis (see Appendix C for details).

Using a type of program called a "raster calculator" from Corridor Design (Majka et al. 2007) with Esri's ArcMap (2009), we mapped valley locations with the highest concentrations of environmental and ecological factors. A raster calculator lays a grid over the project area and "counts" the number of factors in each cell. For our analyses, the project team selected 63 of the best, most complete, and most important data layers (Appendix D) from our collected library. We refined our list based on feedback from the stakeholder group and review team members. We used different data sets (Appendix D) for each of four different modeling analyses (Appendix C). We overlaid an additional six layers for our conflict and opportunities map.

From these results and information from additional data layers (e.g. oak woodlands), we determined "nodes" of ecological importance (highly-ranked areas) and "linkages" between these nodes (Meiklejohn et al 2009; Hess and Fisher 2001). We overlaid planned and existing transportation structures and archeologically and historically important areas to create the final REF. We highlighted "potential conflict and opportunity areas" where planned transportation projects could potentially cause problems or alleviate existing ones.

The stakeholders and technical review team reviewed every aspect of the GIS mapping process, from data collection to the final mapping products.

Outreach

Early on, we created an internal project web page at our corporate site. This allowed us to post things for the stakeholders and review team members. We also made a public web page which included a basic project description and external links.

Throughout the project, we periodically presented product drafts to our partners, the Oregon Department of Transportation (ODOT) and the Rogue Valley MPO Technical Committee. After we completed our analyses and map products, we organized additional presentations at local groups throughout the valley.

We included a short article in the RVCOG's February newsletter. We created a two-page brochure summarizing the project for distribution at presentations. As of this writing, we intend to organize newspaper coverage and an article in a regional magazine. We are also collaborating with other pilot projects on a technical article for a professional journal.

Project Budget

Our project budget totaled approximately $160,000.

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CHAPTER 3
Findings and Applications

SHRP 2 C06 Integrated Ecosystem Framework, Steps 1-3 versus RVCOG Method: Comparisons And Explanations

We tested the first three steps of OSU-INR's nine-step "Integrated Ecosystem Framework" (IEF). Table 3.1 compares OSU-INR's version with our final set of steps. In the following section, we compare the original framework with our process and explain why we adhered to or deviated from each substep. See Appendix E for the complete, nine-step IEF.

Step 1: Build and strengthen collaborative partnerships, vision

C06 Substep 1a: Identify planning region.
RVCOG: Same. (RVCOG Substep 1-b; see Table 3.1)

Explanation: We agree that identifying an appropriate planning region is an essential early step to creating a regional ecosystem plan. However, it should follow "build relationships" – the essential first step before embarking on any time of regional planning.

C06 Substep 1b: Build relationships.
RVCOG: Moved. (RVCOG Substep 1-a.)

Table 3.1. Comparing Step 1 of the Original Integrated Ecosystem Framework Model With the Process Used by Rogue Valley Council of Governments (RVCOG) in this C21 Pilot Project

Step 1: Build and strengthen collaborative partnerships, vision.	
C06 Version	RVCOG Pilot Test
1a. Identify planning region. 1b. Build relationships. 1c. Convene stakeholders. 1d. Record ideas; develop MOU on potential new processes for increasing conservation, efficiency, and predictability. 1e. Explore funding and long-term management options.	1b. Build relationships 1a. Identify planning region. 1c. Convene stakeholders *and technical review team.* ~~1d. Record ideas; develop MOU on potential new processes for increasing conservation, efficiency and predictability.~~ ~~1 e. Explore funding and long-term management options.~~

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Table 3.2. Steps 1-3 of the Integrated Ecosystem Framework Model and the Revised Steps from the Rogue Valley Council of Governments (RVCOG), This Report

Step 1: Build and strengthen collaborative partnerships, vision.	
C06 Version	RVCOG Pilot Test
1a. Identify planning region. 1b. Build relationships. 1c. Convene stakeholders. 1d. Record ideas; develop MOU on potential new processes for increasing conservation, efficiency and predictability. 1e. Explore funding and long-term management options.	1a. Build relationships 1b. Identify planning region. 1c. Convene stakeholders *and technical review team.*
Step 2: Characterize resource status. Integrate conservation, natural resource, watershed, and species recovery and state wildlife action plans.	
C06 Version	RVCOG Pilot Test
2a. Identify spatial data needed for baseline. 2b. Prioritize ecological resources and issues. 2c. Develop necessary agreements from agencies and NGOs to provide plans and data. 2d. Identify data gaps. Reach consensus on an efficient process for filling gaps. 2e. Produce geospatial overlays of data and plans. 2f. Stakeholder review of geospatial overlay, restoration/conservation goals and priorities. Identify actions to support them. 2g. Record everything. 2h. Distribute map of conservation and restoration priorities to stakeholders for review and adoption.	2a. Identify spatial data needed for baseline. Also includes: 2a-1. Prioritize ecological resources and issues. 2a-2. Stakeholder review. 2b. Data collection. Also includes: 2b-1. Data standards, meta data, projections 2b-2. Develop necessary agreements 2b-3. Identify data gaps. 2b-4. Data organization. 2b-5. Stakeholder review. 2c. Produce geospatial overlays of data and plans; stakeholder review. 2d. Prioritize ecological resources and issues; stakeholder review. 2e. Record everything. 2f. Preliminary map and adjust model; stakeholder review. 2g. Final map; stakeholder review.

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Step 3: Create Regional Ecosystem Framework	
C06 Version	RVCOG Pilot Test
3a. Overlay the geospatially-mapped Long-Range Transportation Plan with conservation priorities. 3b. Identify and show areas and resources 1) potentially impacted by transportation projects and 2) potentially (sic) opportunities for joint action on conservation or restoration priorities. 3c. Identify high-level conservation goals 3d. Stakeholder review.	3a. Overlay the geospatially-mapped Long-Range Transportation Plan with conservation priorities. 3b. Identify and show areas and resources 1) potentially impacted by transportation projects and with 2) potential opportunities for joint action on conservation or restoration priorities. 3d. Stakeholder review.

Explanation: The relationships among the participating agencies must be established, either formally or informally, *before* the process even begins. It is not necessary for every *person* in the room to know each other. We have learned through decades of experience that relationships are the most important component to any kind of regional planning project – especially when it involves planning issues approached from potentially conflicting value systems. In the Rogue Valley, agencies, non-governmental organizations (NGOs), universities, and other entities have been collaborating in various combinations on a wide variety of natural resource management and planning initiatives and projects for decades. We understand that this factor alone is one reason why we could finish our mapping products in such a short time-span.

C06 Substep 1c: Convene stakeholders
RVCOG: Altered (italics): Convene stakeholders *and technical review team* (RVCOG Substep 1c.)

Explanation: In addition to a stakeholder committee, we recruited a team of 26 local environmental specialists to be a technical review team. In past projects, we have found that creating a technical advisory group results in more involvement from the professional sector, which gives the stakeholders more confidence in their decisions as well. It also reduces the critique period after the product has been created because so many technical experts had the opportunity to participate in the creation of the mapping products. Our Stakeholder group was a mix of agency specialists from planning, engineering, and environmental backgrounds, business interests, and a variety of NGOs (e.g., Oregon Hunters Association, The Nature Conservancy).

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C06 Substep 1d: Record ideas; develop MOU on potential new processes for increasing conservation, efficiency, and predictability.
RVCOG: Deleted. Possibly move to Step 3.

Explanation: We did not follow this step because it was apparent to us that trying to forge an MOU – even with an individual agency - at this early date was very premature, and would have slowed down and possibly killed the entire project. The stakeholder committee took a long time to understand the project and the process. In addition, many of the members did not fully commit until they were able to see draft products (in Step 3). We found that the process of submitting the grant already forced agencies and entities to "support" the project; this was sufficient motivation for agencies and NGOs to participate.

C06 Substep 1e: Explore funding and long-term management options.
RVCOG: Deleted. Possibly move to Step 3.

Explanation: Again, we found that exploring funding and long-term management of conserved areas at this early stage was too premature. Most of the stakeholders were hesitant to support the mapping products until they saw draft versions (in Step 3).

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Step 2: Characterize resource status. Integrate conservation, natural resource, watershed, and species recovery and state wildlife action plans.

Table 3.3. Comparing Step 2 of the Original Integrated Ecosystem Framework Model with the Process Used by Rogue Valley Council of Governments (RVCOG) in This C21 Pilot Project

Step 2: Characterize resource status. Integrate conservation, natural resource, watershed, and species recovery and state wildlife action plans.	
C06 Version	RVCOG Pilot Test
2a. Identify spatial data needed for baseline. 2b. Prioritize ecological resources and issues. 2c. Develop necessary agreements from agencies and NGOs to provide plans and data. 2d. Identify data gaps. Reach consensus on an efficient process for filling gaps. 2e. Produce geospatial overlays of data and plans. 2f. Stakeholder review of geospatial overlay, restoration/conservation goals and priorities. Identify actions to support them. 2g. Record everything. 2h. Distribute map of conservation and restoration priorities to stakeholders for review and adoption.	2a. Identify spatial data needed for baseline. Also includes: • 2b. Prioritize ecological resources and issues; • (2f) Stakeholder review. *New A. Data collection*. Also includes: • *New A1. Data standards, meta data, projections.* • 2c. Develop necessary agreements. • 2d. Identify data gaps. • *New A2. Data organization.* • 2f. Stakeholder review. 2e. Produce geospatial overlays of data and plans; (2f) *stakeholder review.* 2b. Prioritize ecological resources and issues; (2f) *stakeholder review.* 2g. Record everything. *New B. Preliminary map and adjust model; stakeholder review.* 2h. Final map; (2f) *stakeholder review*.

C06 Substep 2a: Identify spatial data needed for baseline.
RVCOG: Added C06 Substeps 2b, 2f. (RVCOG Substep 2a; see Table 3.3.)
Includes:

- C06 Substep 2b. Prioritize ecological resources and issues. (Repeated again later.)
- C06 Substep 2f. Altered. Stakeholder and Technical Team review.

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Explanation: Our team had the necessary GIS and ecological expertise to easily identify necessary base data layers needed to create a readable map that would provide context for the ecological data. If a project team does not have this expertise, we recommend seeking assistance from experienced GIS users.

We agree that some sort of prioritization should take place early in the process. Searching for and mining data is very time-consuming; therefore, setting boundaries allows the team to focus on finding the most important types of data to answer the ecological questions set forth by the project. For example, one of the issues driving our project was the lack of valley-bottom and low-elevation foothill environmental and ecological data. We prioritized finding data to address this need. (See Appendix C for details.)

NEW SUBSTEP: *Collect Data; build data library; stakeholder and technical team review.* (RVCOG Substep 2c). Includes:

- *Establish data standards and metadata categories; choose projection(s). (RVCOG Substep 2-c-1)*
- MOVED: C06 Substep 2c. Develop necessary agreements with agencies and NGOs to provide plans and data. (RVCOG Substep2c2)
- MOVED: C06 Substep 2d. Identify data gaps. Reach consensus on an efficient process for filling gaps. (RVCOG Substep 2c3)
- *Data organization.* (RVCOG Substep 2c4)

Explanation: We understand that the C06 team incorporated "collecting data" into the other substeps; we added it as a separate step in order to highlight not only the vast amount of work inherent in collecting data, but also the critical pieces of this process that might otherwise not be recognized in this framework, for which time and funds need to be budgeted. See Appendix C for details on this, creating a data library, data gaps, and data standards. An example of a data sharing agreement can be found in Appendix F.

C06 Substep 2e: Produce geospatial overlays of data and plans.
RVCOG: Altered (italics): Produce geospatial overlays of data and plans; *stakeholder and technical team review.* (RVCOG Substep 2d.)

Explanation*:* This step entails the physical work of clipping, reprojecting, merging, and otherwise manipulating the geospatial data (e.g., in ArcMap or a similar program) into useable layers. The GIS team walked the stakeholders through these processes so that they would understand the work involved in readying data layers for use in an analytical program.

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C06 Substep 2f: Stakeholder review of geospatial overlays, restoration/conservation goals and priorities. Identify actions to support them.
RVCOG: Altered (italics, strikeout): Stakeholder *and technical team* review. ~~of geospatial overlays. restoration/conservation goals and priorities. Identify actions to support them.~~ Moved. (See RVCOG Substep 2a, 2b, 2c, 2d, 2f, 2g.)

Explanation: We added stakeholder and/or technical team review at every important review point in order to make the process as understandable and transparent as possible for the stakeholders and review team members. We believe that such transparency streamlines the process. Understanding how the map was created also improves the stakeholders' ability to become advocates.

C06 Substep 2g: Record everything.
RVCOG: Same. (RVCOG Substep 2f.)

Explanation: We agree that the managing team must be diligent about tracking internal and stakeholder decisions regarding the REF and any other products produced by the team. No matter how many are involved, there will always be key regional players who were not involved. If the process is not transparent, those key players will not "buy in" to the products, and the long-term success of the project is jeopardized.

NEW SUBSTEP: *Create preliminary conservation strategy (ecological/environmentally important areas); adjust model; stakeholder and technical team review.* (RVCOG Substep 2g.) Includes:

- C06 Substep 2b. Prioritize ecological resources and issues (REPEATED from above).

Explanation: We added this substep in order to help identify the financial and personnel resources needed to create the "conservation strategy" map portion of an REF. This substep entails using a geospatially-linked modeling program or other method to prioritize areas of ecological or environmental importance based on the parameters chosen by the team. In our pilot test effort, this work was time-consuming. As is typical for computer modeling exercises, great care had to be taken to ensure that all model input (i.e., geospatial data layers) was flawless. Many problems are invisible until they surface in a draft modeling run. Hence, we recommend prioritizing data a second time, for the modeling exercise. See "Research Approach" for a quick summary of our process, and Appendix C for more detail.

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C06 Substep 2h: Distribute final map of conservation and restoration priorities to stakeholders for review and adoption.
RVCOG: Altered (italics): Distribute *final* map of *environmentally/ecologically important areas* (can be considered conservation and restoration priorities) to stakeholders *and technical team* for review and adoption. (RVCOG Substep 2h).

Explanation: By this point, the stakeholders and technical team members should have had significant opportunity to review the process at many points. This step is simply the final run of the modeling effort in RVCOG Substep 2g, above.

Step 3: Create Regional Ecosystem Framework.

Table 3.4. Comparing Step 3 of the Original Integrated Ecosystem Framework Model With the Process Used by Rogue Valley Council of Governments in the C21 Pilot Project

Step 3: Create Regional Ecosystem Framework	
C06 Version	RVCOG Pilot Test
3a. Overlay the geospatially-mapped Long-Range Transportation Plan with conservation priorities. 3b. Identify and show areas and resources 1) potentially impacted by transportation projects and 2) potentially (sic) opportunities for joint action on conservation or restoration priorities. 3c. Identify high-level conservation goals 3d. Stakeholder review.	3a. Overlay the geospatially-mapped Long-Range Transportation Plan with conservation priorities. 3b. Identify and show areas and resources 1) potentially impacted by transportation projects and with 2) potential opportunities for joint action on conservation or restoration priorities. ~~3c. Identify high-level conservation goals~~ 3d. Stakeholder review.

C06 Substep 3a: Overlay the geospatially-mapped Long-Range Transportation Plan with conservation priorities.
RVCOG: Same. (RVCOG Substep 3a.)

Explanation: We expanded this concept. Our REF also included areas of potential conflict between proposed new urban growth boundaries and nodes, linkages, and archeological sensitivity areas. Fish passage barriers and wildlife collisions provided additional information about current environmental-transportation conflicts.

C06 Substep 3b: Identify and show areas and resources 1) potentially impacted by transportation projects and 2) potential opportunities for joint action on conservation or restoration priorities.
RVCOG: Delete.

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Explanation: This step should really be part of Step 3a. We also recommend rephrasing this concept because the situation can be looked at both ways: not only are environmental/ecological resources potentially impacted by transportation projects, but transportation projects are potentially delayed or prevented due to environmental issues.

C06 Step 3d: Stakeholder review.
RVCOG: Moved. Same. (RVCOG Step 3c.)

C06 Step 3c: Identify high-level conservation goals
RVCOG: Deleted for this pilot project, but should be retained in Step 3.

Explanation: The goal for our project was to provide information in map form to ODOT and other regional entities. We used the modeling effort in Step 2 to map out important areas for conservation. However, we stressed that the map was neither regulatory nor binding in any way. We feel that long-term funding for data library and mapping product storage and maintenance needs to be identified before moving forward with a regional conservation plan.

Evaluation of Additional TRB Tools

Stakeholder Survey (TCAPP Website)

Fifteen out of 18 people (83%) replied to the July 2011 survey (Appendix H, Table H.1). At this time, most members were comfortable with the level of communication within and between the stakeholder committee and staff. Stakeholders were still a little unclear about the group's objectives and role in the project. This confusion appeared to be caused by two factors: 1) the stakeholders had yet to see some draft data or map products; and, 2) the TCAPP survey is not really designed for our type of stakeholder group.

Nine out of 18 people (50%) replied to the January 2012 survey (Appendix H, Table H.2). Most members were more comfortable with the level of communication within and between the stakeholder committee and staff, and more comfortable with the group's role. In January 2012, the website was changed from a "Draft" website to a "Beta" website in the middle of our survey window. Some of the stakeholders were unable to complete the survey due to technical difficulties generating the survey result report. After trying multiple times, they gave up. This contributed to the lower number of participants.

In general, the stakeholders considered the website survey easy to use. As noted above, some of the questions on the survey tool were confusing to our stakeholders because the survey tool was designed for a stakeholder group with different responsibilities. We also noticed that because survey participants were required to email their completed surveys to the project manager, survey results were no longer anonymous. Most of the committee members chose to include their names – but not all. Those without names were still identifiable by their email

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addresses. We recommend that the survey submittal process be improved to allow truly anonymous reporting.

TCAPP Website, SHRP 2 Website, SHRP 2 C06 Pilot Studies

During our project, we turned to some TRB tools: the TCAPP website, SHRP 2 website, and SHRP 2 C06 pilot studies (appendices) for help regarding transportation planning processes, background information, global applicability, jargon definitions, and stakeholder tools. Below are some suggestions for improvement.

1. TCAPP Website
www.transportationforcommunities.com

    a. Simplify site design to better accommodate browsers and first-time users.
    b. Hotlink all jargon.
    c. Make the TCAPP library searchable.

2. SHRP 2 Website
www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blank2.aspx

    a. Improve internal site links.
    b. Add a publication search engine.

3. SHRP 2 C06B Pilot Study Reports
Include the following, in addition to the usual background, methods, and project summary:

    a. Author(s) and contact information;
    b. A brief cost assessment;
    c. An analysis of whether the methods and tools helped or hindered the team; and
    d. Recommendations for improvement.

The report to which these appendices were attached, is not available online; this makes them difficult to reference.

Regional Ecosystem Framework and Associated Maps

Regional Ecosystem Framework: SHRP 2 C06 Version versus RVCOG

Our REF differed slightly but significantly from the SHRP 2 C06 version. Both overlay areas important for conservation with planned transportation projects. However, the C06 version asks the team to spend time prioritizing conservation areas; we did not. We felt that months would be wasted. During a previous conservation planning effort for vernal pools, the stakeholder

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committee spent two years determining its prioritization process. Our REF includes the map of nodes and linkages but stops short of identifying which nodes or linkages are more important. In addition, our REF includes more than planned transportation projects. We included current urban growth plans, utilities, wildlife-traffic conflict areas ("road kill"), and fish passage barriers created by transportation infrastructure. We also mapped State Historic Preservation Office approved historically and archeologically important sites.

Data Library

Our final digital library contained 103 unique data sets, some of which were projected at two different spatial scales for a total of 193 data layers. One stakeholder committee member declared our digital library " . . . the best collection of geospatial data for the Rogue Valley in existence."

We did not anticipate the amount of time needed to build the data library. Every data layer collected had to be analyzed for inclusion. Every data layer included had to be manipulated in some way: clipped to the project area (too big), merged with compatible layers to create a new layer covering the entire project area (too small), reprojected to our chosen map projection (NAD_1983_StatePlane_Oregon_South_FIPS_3602), or transformed to be functional in our analysis program. During this time, the stakeholder committee had nothing to do. We recommend that others repeating our process ensure adequate funding and employee availability to both complete this necessary task adequately and to reduce the amount of project time spent on this task.

GIS Analysis

We created three mapping products: 1) raw raster calculator results (Figures 3.1 and 3.2); 2) ecological nodes and linkages (Figure 3.3); and 3) conflict and opportunity areas (Figure 3.4). We found that including the raster analyses as stand-alone maps proved successful in helping the stakeholder committee understand the next step. The technical review team members pored over these maps to examine their accuracy. The raster maps in Figures 3.1 and 3.2 provide a snapshot of an area at the north end of the valley (see Figure 1.1). Dark areas in Figure 3.1 show greater numbers of ecological and environmental data. In this area of the valley, these areas support oak woodlands and vernal pool habitat as well as Threatened and Endangered vernal pool obligate species (Table 1.1). Dark areas in Figure 3.2 are concentrated along riparian areas including the Rogue River (curving north to west, or from the top center to the left center of the figure), Bear Creek (flowing south to north on the left side of the figure), and Little Butte Creek (flowing east to west).

These areas of ecological importance then show up as nodes and linkages in Figure 3.3. The high level of coverage is not typical for the rest of the valley. However, it underscores the ecological sensitivity of this northern area. See Appendix C for details on how nodes and linkages were created.

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Across the valley, about half of our nodes have conflict areas within in them. For example, in Figure 3.4, 10 of the approximately 20 nodes have white dashed ovals through all or part of the node. These ovals highlight areas where either planned or existing transportation projects intersect with ecologically sensitive areas. This area of the valley is slated for industrial development, airport expansion, and a highway bypass, as well as many small transportation improvement projects.

The conflict and opportunity maps also illustrate sites along roads with wildlife collision problems. This project is the first time these data have been mapped. Including these data as an overlay has allowed ODOT to consider improving wildlife crossing areas as future mitigation or restoration projects.

Our simple, transparent, and inclusive approach to the GIS analysis proved very successful. Using a simple raster calculator program without weighting data layers allowed people not familiar with data analysis to easily understand the maps. Stakeholders, technical reviewers, and project partners had no issue with our process, and provided helpful ideas and insightful critique throughout. Our analytically simple approach also saved considerable time and money, keeping the GIS team on budget.

The stakeholder committee members reviewed the raster results, but were much more engaged with the other two maps, especially the conflicts and opportunities map. At the final stakeholder meeting, the committee members spent the bulk of their time reviewing this map and discussing its relevance to transportation and development projects.

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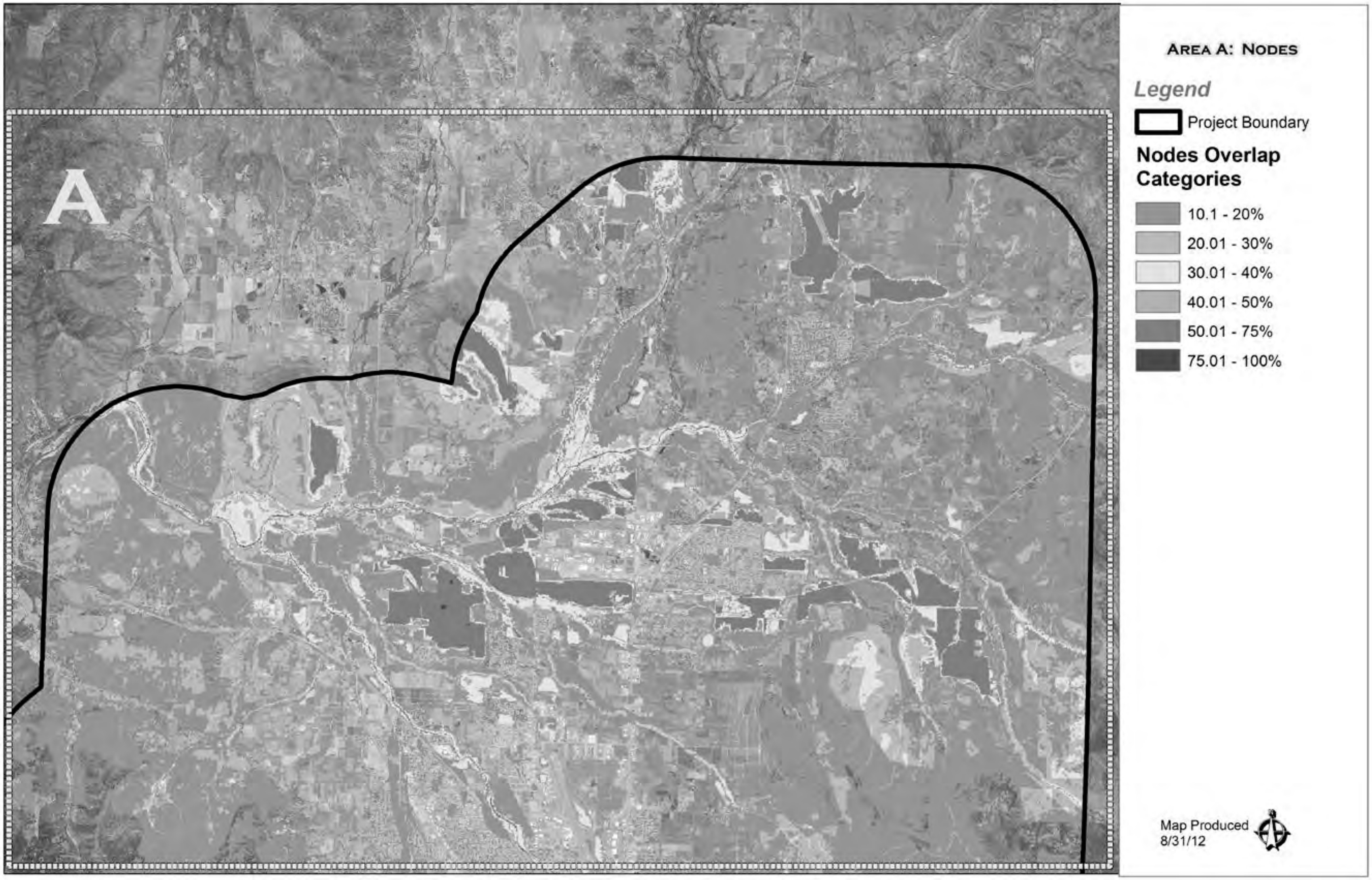

Figure 3.1. Results of the raster calculator model to develop nodes, using Corridor Design. Rogue Valley Ecological Framework, Jackson County, OR.

Note: The landscape is divided into a grid; each cell is color coded by the amount of ecological or environmental data found in that cell. Given that data are as synoptic as possible, darker cells can be assumed to have more ecological importance. In this map, many of the dark areas in the center have vernal pool habitat, listed species, and other values. See Appendix C for more information.

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Figure 3.2. Results of the raster calculator model to develop linkages, using Corridor Design. Rogue Valley Ecological Framework, Jackson County, OR.

Note: The landscape is divided into a grid; each cell is color coded by the amount of ecological or environmental data found in that cell. Given that data are as synoptic as possible, darker cells can be assumed to have more ecological importance. In this map, many of the cells of high linkage value occur along riparian corridors. See Appendix C for more information.

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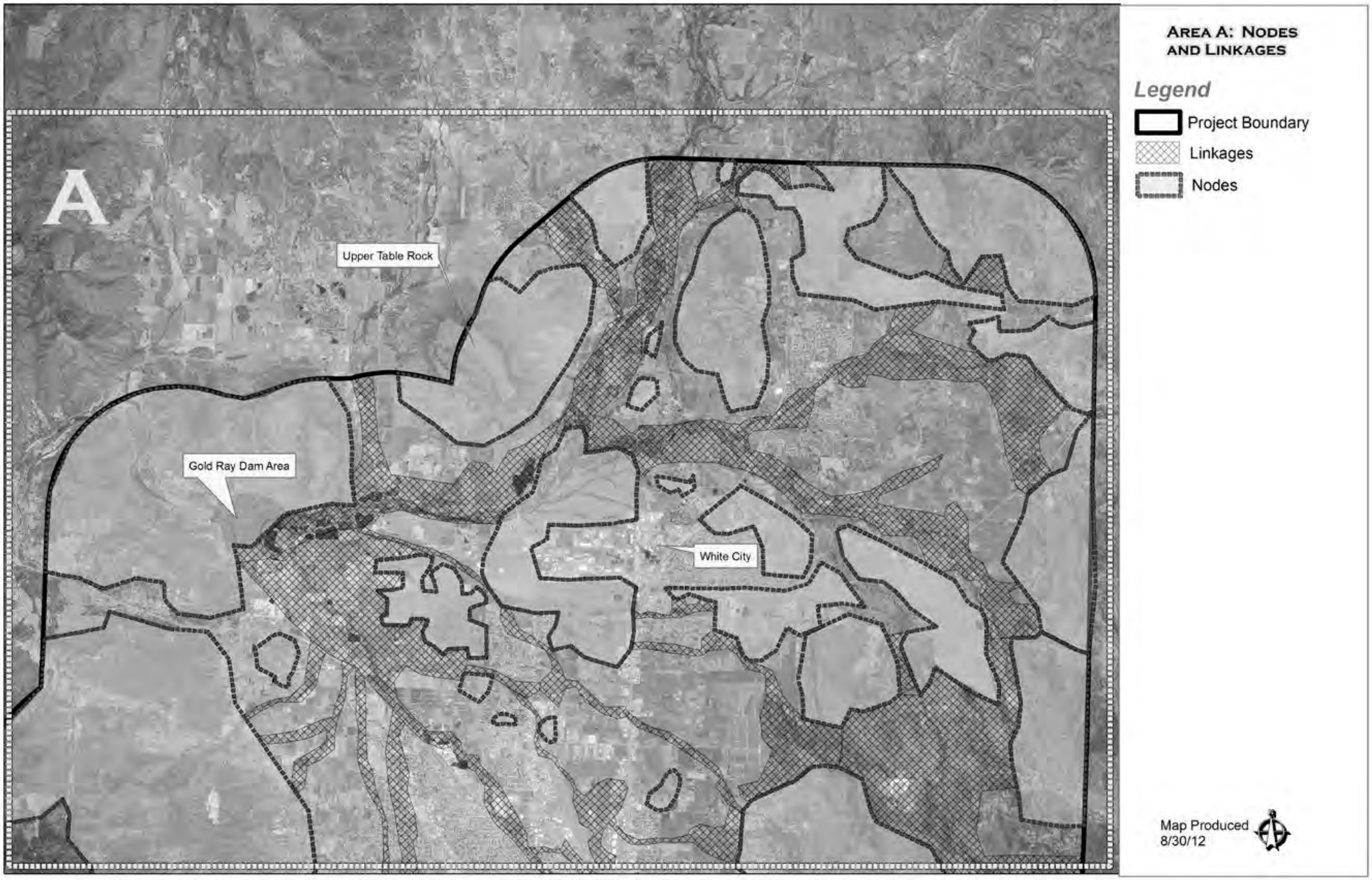

Figure 3.3. Areas of ecological and environmental importance (nodes, light shading with dark boundaries), and the linkages, or corridors between them (cross hatching). Rogue Valley Ecosystem Framework, Jackson County, OR.
Note: Note that linkages also flow out of the project area. Matrix areas have no shading, but show the aerial view of the ground surface, so are not blank.

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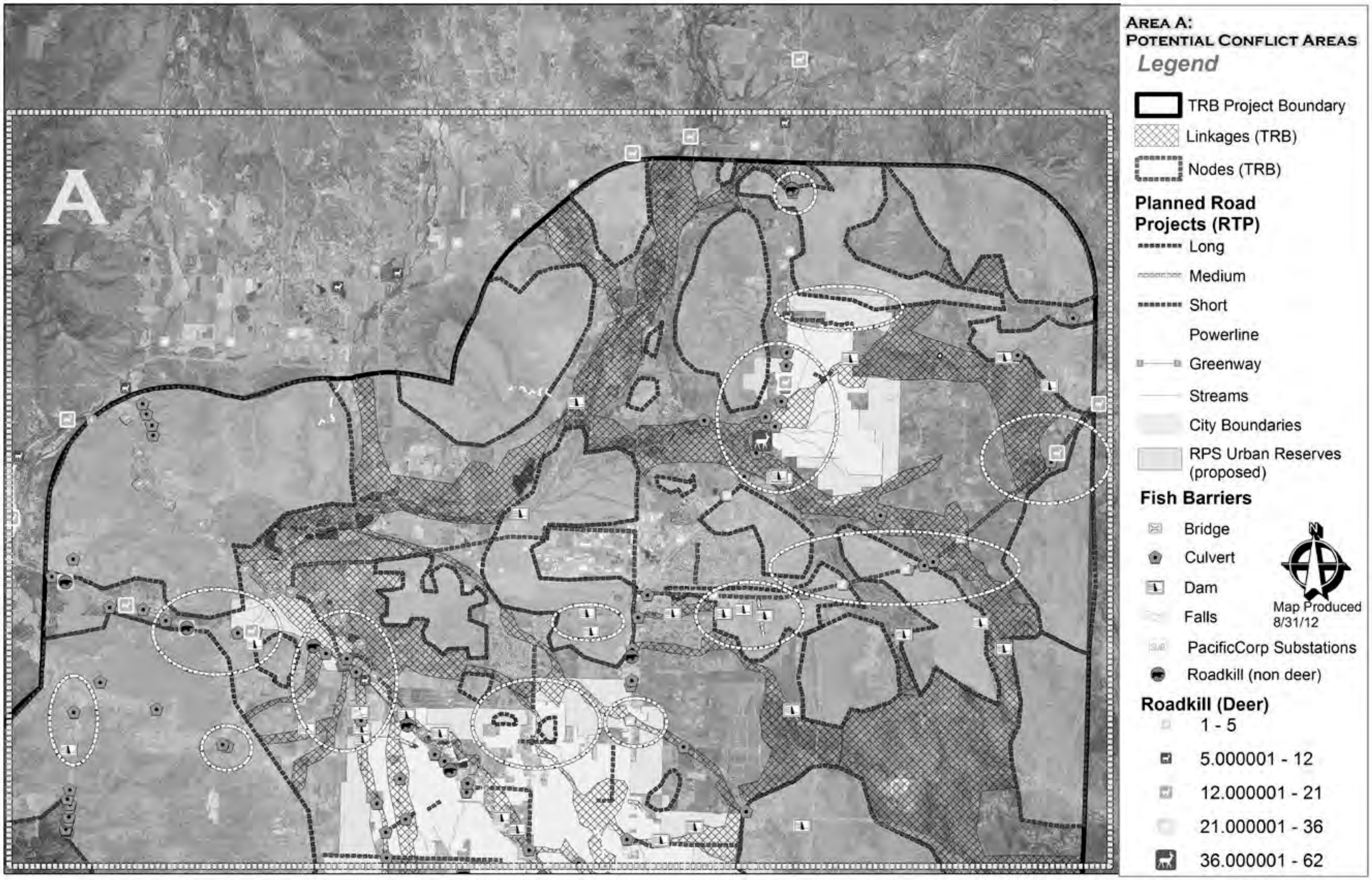

Figure 3.4. Potential conflict and opportunity areas between planned transportation projects, existing transportation infrastructure, and ecological and archeological resources. Rogue Valley Ecosystem Framework, Jackson County, OR.

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Community Response and General Applicability

Response to the mapping products has been overwhelmingly positive. An important caveat is that a few participants were reticent until the mapping products were finished. Some had a difficult time visualizing the maps before they were created. This is one of the reasons why we recommend creating an REF without prioritizing conservation actions. Once participants can see the map, and understand its application, they are generally willing to spend another six months on additional planning.

Others were unwilling to commit until they could ascertain the usefulness of the mapping products for transportation planning. This was especially true of federal and state agency personnel. The Rogue Valley has seen many regional restoration planning and data unification efforts, most of which sit on the shelf. This makes it difficult for professionals to justify involvement in yet another effort. Helping with such efforts comes at the expense of high priority work. This makes it difficult to find the time, regardless of the long-term benefit. We offer that this situation is an issue for every project and every region of the country.

Our meetings with ODOT focused less on content and more on the integration and application of our mapping products into ODOT's planning processes. ODOT suggested that once these maps are integrated into ODOT's GIS system, ODOT will use the information for both long-term and project planning, including identifying potential "show stoppers." ODOT's environmental and planning departments also saw the potential for identifying mitigation opportunities early in project planning. They suggested using the REF to create a "mitigation bank" of ready-to-go mitigation projects.

The stakeholder committee members immediately saw the usefulness of the mapping products to non-transportation projects. Some were interested in using the maps for other valley-wide planning efforts; for example, the Regional Problem Solving effort to redefine urban growth boundaries. Others saw its usefulness for development projects: redesigning proposed development in an ecological node to include conservation easements.

The geospatial data library has already proven to be a useful tool for small municipalities, which cannot afford to compile their own. As we present our findings to local resource professionals who were not involved in the project, we anticipate that additional non-transportation agencies and organizations will request these data.

What Next?

Future steps include working with ODOT's GIS department to decide how to store and update the geospatial data library. Once decided, we will develop a Memorandum of Understanding with our partners. We hope to establish a "web-based" updating platform. We will be seeking funding for this in the coming year. RVCOG's Planning Department suggested that we update the maps every four years, in sync with the Rogue Valley MPO schedule. We anticipate that the final keeper of the data library will be the MPO.

As we acquire funding, we plan to improve on our data library and mapping products. We plan to collect missing but important data identified by various project participants, for

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example: fish and wildlife migration barriers, culverts, stream restoration projects, and birds. Some of these data exist but need to be converted to a geospatial data layer. Others must be collected in the field. We plan to work with various partners to fill these data gaps.

At a map review meeting, review group members suggested we create a method to "unpack" the layers contributing to the identification of a node or linkage area. Currently, a user must return to the original raster calculator layer to identify which layers contributed to high-value cells. We hope to solve this problem in future iterations of our product.

We also plan to conduct an overlay analysis: comparing the location and size of our nodes and linkages with conservation areas identified by other planning efforts (e.g. Oregon Department of Fish and Wildlife Conservation Opportunity Areas (ODFW) or The Nature Conservancy's Klamath Mountains Ecoregion Assessment Portfolio Sites (Vander Schaaf et al. 2007). Such an analysis may improve our own node and linkage designations, or may highlight ecologically important areas missed by earlier plans which relied on fewer data.

We will continue presenting our findings to regional groups. As of this writing (August 2012), upcoming presentations include Jefferson Fish Society and Southern Oregon University's science seminar program. We are currently deciding on an appropriate professional conference. We also intend to publish articles in local and regional print media.

Summary

If we have one single message to convey, it is that "simpler is better." We strongly recommend using a simple analytical process so that stakeholders understand and trust the process, the data used, concepts developed, and the resulting products produced (i.e., maps). Buy-in leads to use of the products. We also recommend using a simple analytical program that does not require a "black box" approach. A simpler approach supports the "living" aspect of the products (i.e., maps) with scheduled updates. The simple approach also allows new data to be added, data to be re-envisioned, and changes in the process to be made as the region changes.

We believe that the C06 framework provides useful guidance, but recommend simplifying the first three steps per Table 3.2. It would also be helpful to let users know that the process can be followed in whatever order makes the most sense for a project.

We suggest continuing to redesign TCAPP's website to make it more understandable and user friendly. The site contains a wealth of information, but is overwhelming to the end user. We strongly suggest: 1) Simplifying site design to better accommodate browsers and first-time users, 2) Hotlinking all jargon; and, 3) Making the TCAPP library searchable.

We are grateful for the funding and support provided by TRB. Our work illustrates that creating an ecological data and mapping framework for transportation planning is possible at the small, regional scale with modest funding.

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APPENDIX A
PROJECT PARTICIPANTS

Table A.1. Project Participants Organized by Affiliation

Data Provider: -Personally provided data for the mapping effort. -Data Facilitator: -Helped us find the right person to ask for data. Financial Support: -Provided funding or personnel for projecttTeam. -Stakeholder Committee: -Member of Stakeholder Committee, attended at least one meeting. -Technical Assistance: -Advised us on the type or nature of data we collected, on our data analysis, or on the global applicability of our project. -Technical Review Group: -Attended at least one review group meeting, or provided input via email.

Individual	**Affiliation(s)**	Role(s)
Pepper Trail, PhD	Audubon Society, Rogue Valley Chapter; U.S. Fish and Wildlife Service (FWS)	Technical Review Group
Tom Humphrey	City of Central Point; Oregon Hunters' Association	Stakeholder Committee
Jim Huber	City of Medford, Planning	Stakeholder Committee
Chris Oliver	City of Medford, Planning	Data Provider
Brian Barr	Geos Institute	Technical Review Group
Jessica Leonard	Geos Institute	Technical Assistance
Keith Massey	Jackson County, GIS	Data Provider
Jon Vial	Jackson County, Roads and Parks	Stakeholder Committee
Jeff LaLande, PhD	Jeffrey M LaLande Consulting (archaeological/historical consulting)	Technical Review Group
Jaime Stephens	Klamath Bird Observatory	Technical Review Group, Letter of Support for Grant Application
John Alexander, PhD	Klamath Bird Observatory	Technical Review Group, Letter of Support for Grant Application
Bill Leavens	L & S Rock Products	Stakeholder Committee
Brian Spence	NOAA, National Marine Fisheries Service (NMFS)	Data Facilitator

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Individual	**Affiliation(s)**	Role(s)
Eric Bjorkstetd	NOAA, National Marine Fisheries Service (NMFS)	Data Facilitator
Leora Nanus	NOAA, National Marine Fisheries Service (NMFS)	Data Provider
Mike Gardiner	Oak Harbor Freight Lines	Stakeholder Committee
Lindsey Wise	Oregon Biodiversity Information Center (ORBIC)	Data Provider
Sue Vrilikis	Oregon Biodiversity Information Center (ORBIC)	Data Provider
Jimmy Kagan	Oregon Biodiversity Information Center (ORBIC); Oregon State University Institute for Natural Resources (OSU-INR)	Data Provider, Technical Assistance
Brent Crowe	Oregon Department Fish and Wildlife (ODFW)	Stakeholder Committee
Dan Van Dyke	Oregon Department Fish and Wildlife (ODFW)	Stakeholder Committee, Data Provider
Steve Niemela	Oregon Department Fish and Wildlife (ODFW)	Stakeholder Committee, Data Provider
Jerry Vogt	Oregon Department of Transportation (ODOT)	Stakeholder Committee
Jim Collins	Oregon Department of Transportation (ODOT)	Stakeholder Committee, Financial Partner (funding)
Kasey Ragain	Oregon Department of Transportation (ODOT)	Technical Assistance
Philip Smith	Oregon Department of Transportation (ODOT)	Technical Assistance
Shirley Roberts	Oregon Department of Transportation; Metropolitan Planning Organization	Letter of Support for Grant Application, Funding Support
Anna Krug	Oregon Department Parks and Recreation (OPRD)	Stakeholder Committee
Kathy Schutt	Oregon Department Parks and Recreation (OPRD)	Stakeholder Committee
Jeff Griffin	Oregon Governor's Economic Revitalization Team	Stakeholder Committee
Dennis Griffin, PhD	Oregon State Historic Preservation Office (SHPO)	Technical Assistance
John Brauer	Oregon State University Institute for Natural Resources (OSU-INR)	Data Provider
Matt Noone	Oregon State University Institute for Natural Resources (OSU-INR)	Data Provider

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Individual	**Affiliation(s)**	Role(s)
Gail Achterman	Oregon State University Institute for Natural Resources (OSU-INR); Oregon Transportation Commission	Technical Assistance
Joel Simmons	PacificCorp (power company)	Data Provider
Monte Mendenhall	PacificCorp (power company)	Data Facilitator
Yuichiro Miyata	PacificCorp (power company)	Data Provider
Randy Frick	Randy Frick Consulting (fisheries consulting)	Technical Review Group, Data Provider
Mike Quilty	Rogue Valley Metropolitan Planning Organization (MPO)	Stakeholder Committee
Mike Montero	Rogue Valley Metropolitan Planning Organization (MPO); Rogue Valley Clean Cities Coalition; Montero & Associates (development consulting)	Stakeholder Committee
Julie Brown	Rogue Valley Transportation District (RVTD)	Stakeholder Committee
Mike Ayers	Rogue Whitewater Company	Stakeholder Committee
Brian Auman	SEDA Council of Governments (Pennsylvania)	Technical Assistance
Kristi Mergenthaler	Southern Oregon Land Conservancy (SOLC)	Technical Review Group
Su Rolle	Southern Oregon Land Conservancy (SOLC)	Data Provider
Ron Fox	Southern Oregon Regional Economic Development, Inc. (SOREDI)	Stakeholder Committee
Paul Blanton, PhD	Southern Oregon University, Dept. of Environmental Studies (SOU)	Financial partner (intern)
Greg Jones, PhD	Southern Oregon University, Dept. of Environmental Studies (SOU); Southern Oregon Winegrowers' Association (SOWA)	Data Provider
Michael Schindel	The Nature Conservancy, Conservation Information System, Portland, OR (TNC)	Data Provider
Darrin Borgias	The Nature Conservancy, Southern Oregon Field Office (TNC)	Stakeholder Committee, Data Provider, Letter of Support
Molly Sullivan	The Nature Conservancy, Southern Oregon Field Office (TNC)	Data Facilitator

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Individual	**Affiliation(s)**	Role(s)
Corrie Veenstra	U.S. -Federal Highways Administration (FHWA)	Project Liaison
Chad Stewart	U.S. Army Corps of Engineers (ACOE)	Technical Review Group
Mark Mousseaux	U.S. Bureau of Land Management, Medford District (BLM)	Technical Review Group, Data Provider
Steve Godwin	U.S. Bureau of Land Management, Medford District (BLM)	Data Provider, Technical Review Group
Steve Haney	U.S. Bureau of Land Management, Medford District (BLM)	Data Provider
Cindy Donegan	U.S. Fish and Wildlife Service (FWS)	Stakeholder Committee
Jim Thrailkill	U.S. Fish and Wildlife Service (FWS)	Data provider, Letter of Support for Grant Application
Sam Friedman	U.S. Fish and Wildlife Service (FWS)	Data provider, Technical Review Group
Dave Clayton	U.S. Forest Service, Rogue-Siskiyou National Forest (USFS)	Technical Review Group, Data Provider
Ian Reid	U.S. Forest Service, Rogue-Siskiyou National Forest (USFS)	Data Provider
Scott Conroy	U.S. Forest Service, Rogue-Siskiyou National Forest (USFS)	Letter of Support for Grant Application
Stephen Brazier	U.S. Forest Service, Rogue-Siskiyou National Forest (USFS)	Data Provider
Su Maiyo	U.S. Forest Service, Rogue-Siskiyou National Forest (USFS)	Technical Review Group, Data Provider
Ralph Hessian	U.S. National Academies' Transportation Research Board (TRB)	Project Liaison
Paul Hosten, PhD	U.S. National Park Service; formerly U.S. BLM, Medford District	Data Provider, Review Team
Erin Kurtz	USDA, Natural Resource Conservation Service (NRCS)	Stakeholder Committee
Evelyn Conrad	USDA, Natural Resource Conservation Service (NRCS)	Stakeholder Committee

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Table A.2. Rogue Valley Council of Governments Project Team
Core team in bold.

Individual	Affiliation(s)	Funding	Role(s)
Craig Tuss	**RVCOG, Natural Resources**	**This grant**	**Project Coordinator (all tasks)**
Jeannine Rossa	**Contractor (self-employed)**	**This grant**	**Assistant Project Coordinator (all tasks)**
Craig Harper	**RVCOG, Natural Resources**	**This grant**	**Stakeholder Team Coordination, Budget Assistance, Editing**
Dominic DiPaolo	**Contractor (self-employed)**	**This grant**	**GIS Database Lead**
Eugene Weir	**RVCOG, Natural Resources**	**This grant**	**Data Collection**
Greg Stabach	**RVCOG, Natural Resources**	**This grant**	**GIS Analysis Lead**
Jeff LaLande, PhD	**Contractor (self-employed)**	**This grant; ODOT**	**Archaeology Support/Data**
Steve Kale	**Contractor (self-employed)**	**This grant**	**Document Editing**
Therese DuVon	**Southern Oregon University**	**This grant**	**GIS Student Intern**
Pat Foley	RVCOG, Planning	This grant	Website, Stakeholder Team Support
Dick Converse	RVCOG, Planning	This grant	Support, Planning Dept.
Dan Moore	RVCOG, Planning	This grant	Support, Planning Dept.
Vicki Guarino	RVCOG, Planning/MPO	This grant	Support, Planning/MPO
Shirley Roberts	RVCOG – ODOT MPO Liaison	ODOT	ODOT Liaison, Fiscal support
Sue Casavan	RVCOG, Planning	RVCOG Planning Funds	Support, Planning GIS
Alan Hudson	RVCOG, Admin	RVCOG Admin Funds	Support, budget
Brian Benton	RVCOG, Admin	RVCOG Admin Funds	Support, IT
Lisa Marston	RVCOG, Admin	RVCOG Admin Funds	Support, contracts
Pat Bale	RVCOG, Admin	RVCOG Admin Funds	Support, budget
René Sjothun	RVCOG, Admin	RVCOG Admin Funds	Support, meetings
Sandi Morton	RVCOG, Admin	RVCOG Admin Funds	Support, contracting

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APPENDIX B
Federal and State Species of Concern

Table B.1. Federal and State Species of Concern (Excluding Federal or State "Threatened" Or "Endangered") Occurring Within Project Area In Jackson County, Oregon.

SPECIES		Federal Listing Status[a]	State Listing Status[b]
Common Name	**Scientific Name**		
Fisher	*Martes pennanti*	C	SC
North American wolverine	*Gulo gulo luscus*	C	
Yellow-billed cuckoo	*Coccyzus americanus*	C	
Oregon spotted frog	*Rana pretiosa*	C	
Mardon skipper	*Polites mardon*	C	
Whitebark pine	*Pinus albicaulis*	C	
Umpqua mariposa lily	*Calochortus umpquaensis*	C	
Siskiyou mariposa lily	*Calochortus persistens*	C	
Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	SOC	SC
Purple martin	*Progne subis*	SOC	SC
Yellow rail	*Coturnicops noveboracensis*		SC
Oregon vesper sparrow	*Pooecetes gramineus affinis*	SOC	SC
Streaked horned lark	*Eremophila alpestris strigata*		SC
Western pond turtle	*Actinemys marmorata marmorata*	SOC	SC
Fringed myotis	*Myotis thysanodes*	SOC	SV
Long-legged myotis	*Myotis volans*	SOC	SV
Yuma myotis	*Myotis yumanensis*	SOC	
Pallid bat	*Antrozous pallidus pacificus*	SOC	SV
Long-eared myotis	*Myotis evotis*	SOC	
Silver-haired myotis	*Lasionycteris noctivagans*	SOC	SV
Northern goshawk	*Accipiter gentilis*	SOC	SV
Tricolored blackbird	*Agelaius tricolor*	SOC	
Western burrowing owl	*Athene cunicularia hypugaea*	SOC	
Yellow-breasted chat	*Icteria virens*	SOC	
Band-tailed pigeon	*Patagioenas fasciata*	SOC	
White-headed woodpecker	*Picoides albolarvatus*	SOC	
Acorn woodpecker	*Melanerpes formicivorus*	SOC	
Lewis' woodpecker	*Melanerpes lewis*	SOC	
Mountain quail	*Oreortyx pictus*	SOC	
Olive-sided flycatcher	*Contopus cooperi*	SOC	SV
Del Norte salamander	*Plethodon elongatus*	SOC	SV

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Siskiyou Mountains salamander	*Plethodon stormi*	SOC	SV
Coastal tailed frog	*Ascaphus truei*	SOC	SV
Cascades frog	*Rana cascadae*	SOC	SV
Common kingsnake	*Lampropeltis getula*	SOC	SV
California mountain kingsnake	*Lampropeltis zonata*	SOC	SV
Coastal cutthroat trout	*Oncorhynchus clarkii ssp.*	SOC	
Denning's Agapetus caddisfly	*Agapetus denningi*	SOC	
Franklin's bumblebee	*Bombus franklini*	SOC	
Siskiyou Chloaeltis grasshopper	*Chloaeltis aspasma*	SOC	
Green Springs Mountain Farulan caddisfly	*Farula davisi*	SOC	
Sagehen Creek Goeracean caddisfly	*Goeracea oregona*	SOC	
Schuh's Homoplectron caddisfly	*Homoplectra schuhi*	SOC	
Siskiyou carabid beetle	*Nebria gebleri siskiyouensis*	SOC	
Greene's mariposa lily	*Calochortus greenei*	SOC	
Broad-fruit mariposa lily	*Calochortus nitidus*	SOC	
Howell's Camassia	*Camassia howellii*	SOC	
Baker's cypress	*Cupressa bakeri*	SOC	
Clustered lady's slipper	*Cypripedium fasciculatum*	SOC	
Siskiyou willow-herb	*Epilobium siskiyouense*	SOC	
Henderson's Horkelia	*Horkelia hendersonii*	SOC	
Bellinger's meadowfoam	*Limnanthes floccosa ssp. Bellingerana*	SOC	
Mt. Ashland lupine	*Lupinus aridus spp. Ashlandensis*	SOC	
White Meconella	*Meconella oregano*	SOC	
Detling's Microseris	*Microseris laciniata ssp. Detlingii*	SOC	
Red root yampah	*Perideridia erythrorhiza*	SOC	
Coral-seeded allocarya	*Plagiabothrys figuratus var. corallicarpus*	SOC	
Howell's Tauschia	*Tauschia howellii*	SOC	
Small-flowered death camas	*Zigadenus fontanus*	SOC	
California myotis	*Myotis californicus*		SV
Hoary bat	*Lasiurus cinereus*		SV
Swainson's hawk	*Buteo regalis*		SV
American peregrine falcon	*Falco pregrinus anatum*		SV
Great gray owl	*Strix nebulosa*		SV
Pileated woodpecker	*Dryocopus pileatus*		SV
Willow Flycatcher	*Empidonax traillii adastus*		SV
Little Willow Flycatcher	*Empidonax traillii brewsteri*		SV

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White-breasted Nuthatch	*Sitta carolinensis aculeata*		SV
Western bluebird	*Sialia mexicana*		SV
Steelhead, Klamath Mountains Province, Rogue summer run	*Oncorhynchus mykiss*		SV
Chinook Salmon, Rogue spring -run	*Oncorhynchus tshawytscha*		SV
Chinook Salmon, Rogue fall run	*Oncorhynchus tshawytscha*		SV
Western brook lamprey	*Lampetra richardsoni*		SV
Pacific lamprey	*Lampetra tridentate (Entosphenus tridentate)*		SV
Foothill yellow-legged frog	*Rana boylii*		SV
Northern red-legged frog	*Rana aurora*		SV
Western toad	*Anaxyrus boreas*		SV

[a] Listing Status under the federal Endangered Species Act, as amended 1973. -C= Candidate; SOC = Species of Concern. -http://www.fws.gov/oregonfwo/Species/Lists/Documents/County/JACKSON%20COUNTY.pdf; accessed 2/8/2012.

[b] Listing Status by the State of Oregon – Wildlife: -SC = Sensitive-Critical; SV = Sensitive-Vulnerable. http://www.dfw.state.or.us/wildlife/diversity/species/docs/SSL_by_category.pdf; accessed 2/8/2012.

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APPENDIX C
Detailed GIS Analysis Methods

Background

As stated in the body of the document, our project had two objectives: 1) test the first three steps of a planning tool (the Integrated Ecological Framework) developed by Oregon State University's Institute for Natural Resources (OSU-INR) to aid with integrating conservation and transportation planning; and 2) create a Regional Ecosystem Framework (REF) to aid transportation planning in the Rogue Valley, Jackson County, Oregon. The first three steps of OSU-INR's framework are intended to guide a interdisciplinary interagency team through the process of creating an REF.

The results of testing the first three steps of OSU-INR's planning tool are included in the body of this document, under "Research Approach." This appendix details our methods in creating the Regional Ecosystem Framework.

Regional Ecosystem Framework Defined

The C06 team defined a REF as the merger or overlay of a regional conservation strategy and a transportation plan (INR et al. 2010). A conservation strategy identifies and prioritizes the ecological and environmental areas to be conserved or protected. A transportation plan includes the transportation-related infrastructure planned to support predicted urban and rural growth or change (economic, residential, and otherwise) in a particular area. We used this definition as a guide, but as we developed the REF, we adapted the concept to the needs of and data available to our valley. We refer to the Rogue Valley REF as the Conflict and Opportunity map.

Overall Approach

In order to complete a Geographic Information Systems (GIS) analysis, we first had to build a geospatial data library (Figure C.1). Although every GIS map has an associated data library, our objective was to build a comprehensive geospatial database of as many quality environmental and infrastructure data sets as possible given funding and time limitations in order to improve the data available to ODOT (and other regional entities) for its planning efforts.

In the process of developing the REF, we created three mapping products, all of which are stand-alone tools to aid with transportation planning: 1) the raw raster calculator results (Figures 3.1 and 3.2, main document); 2) high-lighted ecological nodes and linkages (Figure 3.3, main document); and 3) areas of conflict and opportunity (Figure 3.4, main document).

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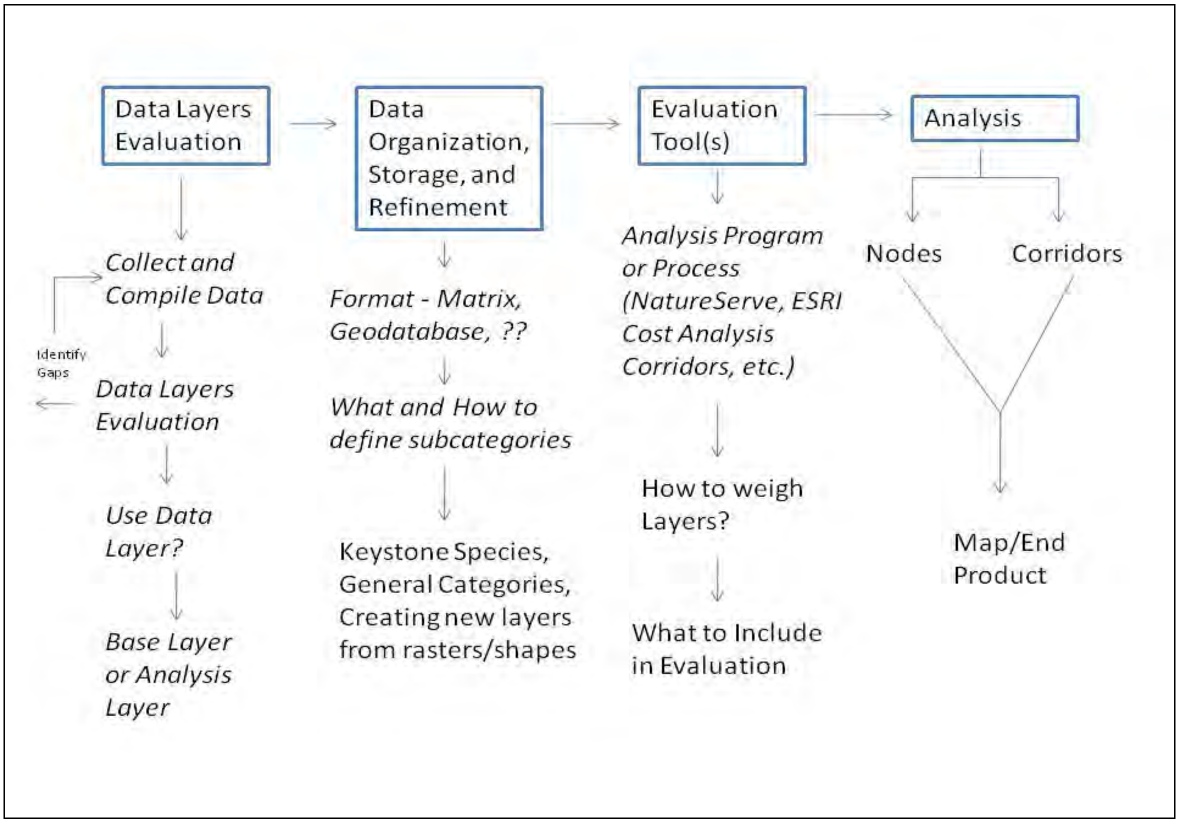

Figure C.1. Rough schematic of the various data processing, decision-making, and analytical steps required to create our data library and final mapping products.

GEOSPATIAL DATA LIBRARY

Gathering Data

Before gathering any data for the geospatial data library, the team used its collective expertise to identify data gaps and known data unavailable on GIS at that time. -We collected data from federal, state, county, municipal, utility, non-profit, and private individual sources. -Using personal contacts and knowledge of agency hierarchy, we called individual scientists, land managers, and GIS database managers to request geospatial data for the Rogue Valley. -We mined online data repositories, especially those from Jackson County and the State of Oregon. We also acquired copies of earlier conservation prioritization efforts from Oregon Department of Fish and Wildlife (ODFW; conservation opportunity areas), The Nature Conservancy (TNC; conservation portfolio sites), Jackson County (open space zoning designations), RVCOG's own Agate Desert Working Group (high conservation priority vernal pools), and others. -Local transportation plans contained very little environmental data.

Based on a strong request from our stakeholder group, we also hired an archaeological consultant to create maps of important historical and potential archaeological sites (with approval from Oregon's State Historic Preservation Office). -Before our project effort, archaeological and

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historical information had not been collected for long-term planning. The four maps created by Dr. Jeff LaLande included:

1. High-potential archaeological sensitivity zones based on the contractor's knowledge of archaeological Native land-use patterns and historic-period (post-1850) sites.
2. Locations of historic properties that are listed on the National Register of Historic Places (NRHP), based on the contractor's review of National Park Service's and Oregon SHPO's current online NRHP records.
3. Remnants of culturally-important plant communities (e.g., major black oak (*Quercus kellogii*) groves, historically important camas (*Camassia quamash*) harvesting areas).
4. Significant historical landscapes and viewscapes.

With almost 200 vetted data layers in our data library, it was necessary to create a system of organization. We grouped data layers into nine categories and named them based on the type of data they depict. A two to three character category abbreviation (e.g., bm, env, ip) was used before the file name. Categories used in the project and their subsequent abbreviations are defined below:

<u>bm = Base Map</u> - Data used as the background on which other data is laid over (e.g., aerial photos, DEM).
<u>env = Environmental</u> - Data that depicts features of the physical landscape (e.g., rivers and streams, contours).
<u>ip = Infrastructure and Political</u> - Data that depicts physical infrastructure and political boundaries (e.g., streets, taxlots, county boundary).
<u>fw = Fish and Wildlife</u> - Data depicting information about fish and wildlife not specific to any special sensitive status (e.g., species occurrence data, road kill data).
<u>veg = Vegetation</u> - Data depicting vegetation cover.
<u>rte = Rare, Threatened, and Endangered Species/Habitat</u> - Data depicting information on special status species and habitats. (e.g., USFWS Critical Habitat maps, Coho range map).
<u>cp = Conservation Planning</u> - Important places for biodiversity conservation that have been identified through a process or analysis (e.g., Threatened and Endangered species' Critical Habitat, TNC portfolio sites, Jackson County open space).
<u>cl = Conserved Lands</u> - Data depicting lands in some kind of conservation status (e.g., Public Lands, TNC preserves).
<u>ag = Agricultural Resources</u> - Data depicting agricultural related information (e.g., prime soils, vineyard locations).

The vast majority of data providers were comfortable with the data becoming widely available. We had anticipated more reluctance, especially considering the sensitive nature of

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some data (e.g., Threatened and Endangered species habitat). Only two organizations asked us not to release data to the public. The Oregon Biodiversity Information Center (ORBIC) supplies data regardless of land ownership. They control data release in order to protect private landowners. ORBIC requires data recipients to sign a limited use agreement. The Southern Oregon Land Conservancy (SOLC) was concerned about the potential misinterpretation of their conservation priority areas. Using ORBIC's agreement as a guide, we created our own data agreement for SOLC. We include this template (Appendix F) as a tool for others with similar data sharing issues.

Both ORBIC and SOLC allowed us to use their data for our analysis (below). After our analysis effort, we removed their data from our corporate library to ensure that other departments did not accidentally use it for different mapping projects.

Prioritizing Data

The project team evaluated each data layer to determine its value for the data library.

- Did the data layer meet a need we identified for analysis?
- Was the data source reliable?
- Did the data layer fully cover the area it was intended to cover, or was it missing data?
- Did the data layer have attributes associated with the displayed features (to explain what the polygons or lines represented)?

After this "first cut," we worked with the stakeholdercCommittee and Technical Review Team to refine our list further. Although time-consuming, the time spent evaluating and prioritizing data was well spent. The team stayed focused on the types of data necessary for the upcoming analysis, and the stakeholder committee members understood and participated in the decisions underlying the final data library.

Transforming Data

All of the data layers required some manipulation before they could be used for the project: reprojecting, clipping, merging, or repairing. Many had been created in different mapping projections. We chose to use the state plane projection (NAD_1983_StatePlane_Oregon_South_FIPS_3602) because this is the one used by Jackson County, a primary data source, as well as several other state and local agencies. ODOT does not use the state plane projection; however, conversion from the state plane to ODOT's standard projection is relatively simple. Other data layers covered too large of a spatial area, or included too much data. These layers were clipped to both the project area and the county line. We saved most of the layers at the larger spatial scale of the county to make the data in the data library more useful to other agencies in the Rogue Valley.

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Some data layers were incomplete. To create layers covering the entire project area, we merged compatible data layers into one. Examples include wetlands and parks (national, state, county, and city).

Our chosen raster analysis program (discussion below) required all data be in a polygon format, not lines or points. We converted our line (streams, canals, trails) and point (road kill, plant locations) data to polygons by adding buffers. Our concern was to find a balance between representing the data line or point while not artificially increasing the importance of the adjacent land due to an over-wide polygon. In regard to streams, polygon data associated with streams, e.g., riparian areas and FEMA floodplains, covered the width of the entire active channel; therefore it was not necessary to create a wide polygon for streams. The GIS team selected relatively narrow widths based on commonly used non-federal-land buffers of 50' (25' each side) for a fish-bearing stream and 25' (12.5' each side) for others. Canal line data were also buffered to 25' (12.5' per side). The Bear Creek Greenway, which parallels Bear Creek (and Interstate-5), was buffered at 30' to incorporate the width of the actual path and the 10-foot right-of-way on each side. Road kill points were buffered by the count attribute for each point: 50 feet for a count of 1-10 and 100 feet for any count greater than 10. ORBIC's point data was already buffered.

We presented our polygon dilemma to the stakeholdercCommittee. They approved our buffer width choices. This discussion was critical. In Oregon, stream "buffers" are commonly viewed as "no action" zones; therefore, it was necessary for the stakeholders to understand that these polygons were created only for the GIS analysis.

GIS Modeling

Choosing the Analytical Program

Existing GIS analysis programs are all based on Esri's ArcMap programs (e.g., Esri 2009). To the best of our knowledge, all agency GIS departments use ArcMap as a platform. Therefore, GoogleEarth (Google, Inc. 2011) or other platforms were not viable for this project.

We looked at several analytical tools and quickly focused on choosing between raster calculator programs developed by Nature Serve ("Vista;" NatureServe 2011) and a team funded by Northern Arizona University ("CorridorDesign;" Majka et al. 2007). After running many pilot tests with some of our data, we chose to use the raster calculator function of CorridorDesign.

Corridor Design (Majka et al. 2007) was very straightforward and intuitive to use. It seemed more appropriate for our pilot project where part of our responsibility was to help improve the C06 IEF process in order to make it easily repeatable by others.

The disadvantage of the raster calculator in CorridorDesign was that weighting variables (if so desired) required clipping and repeating layers. It did not have a weighting component built into it. We did not use the corridor design tool of CorridorDesign. This tool was species-

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specific and too simplistic for our needs – drawing corridors of the shortest route between two points.

Nature Serve's "Vista," on the other hand, was neither simple nor intuitive to navigate. Vista required rating species viability, weighting ecological importance, and entering other information for each data layer (NatureServe 2011), which would have been difficult for us to complete with our modest funding. -Vista highlights rare or at-risk species; this was not the focus of our ecosystem framework. -Most importantly, the complexity of Vista's approach risks alienating potential users. -We have all been part of earlier mapping efforts; those not part of the mapping process do not trust a map unless they know what each polygon represents. -The more complicated the math, the more difficult it is for uninvolved stakeholders to trust the map. Finally, we reflected on the purpose of our effort: to create a tool to aid transportation planning. We did not need a complicated analysis program.

We tested to see what would happen if we gave our entire Vista test variables the same weight; the result looked identical to that produced by CorridorDesign. -Therefore, we went with the simpler and more cost-effective program.

Selecting Data Layers for Model Analysis

Data layers for use in the analysis were selected from all of the layers compiled for the project. Potential data layers were then presented to the stakeholder group and peer review team. -With their feedback, the list was refined to 63 of the best, most complete, and most important geospatial data layers (Appendix E) from our collected library. -We used an additional six layers for our conflictaAreas overlay.

We recognized that non-synoptic data could give the false impression that rare species were not present in parts of the valley, when in fact, surveys had not yet been conducted in that area. After much debate, the only layers we included in the analysis that might not be considered synoptic are the ORBIC rare plant sites and the Medford Bureau of Land Management (BLM) rare flora and rare fauna sites. -The two layers together provide broad enough coverage of the project area to be considered synoptic even though there are holes in the sampling. -Without these data, our map would be lacking crucial information. -Local scientists continue to survey for and document these rare species over a large part of the landscape, so we anticipate that these layers will be updated regularly.

We used different layers for different modeling analyses (Appendix D). -In all of our analyses, data layers were weighted equally.

Raster Calculator

We used Corridor Designs raster calculator program to analyze the prevalence of selected environmental and ecological data across the project area (Majka et al. 2007) -We used four different modeling scenarios (below) with different data layers to achieve different analysis objectives.

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Our raster analyses required important, yet subjective decisions to interpret our results. To highlight important areas of data overlap we selected different percent-based categories for each analysis based on the number of overlapping cells. Categories were percent-based to allow for repeatability and transferability to other areas. The categories varied for each analysis. We selected categories based on the number of layers and type of data, resulting overlap, and review team feedback. Cells were color-coded based upon the data categories (percent data per cell) chosen.

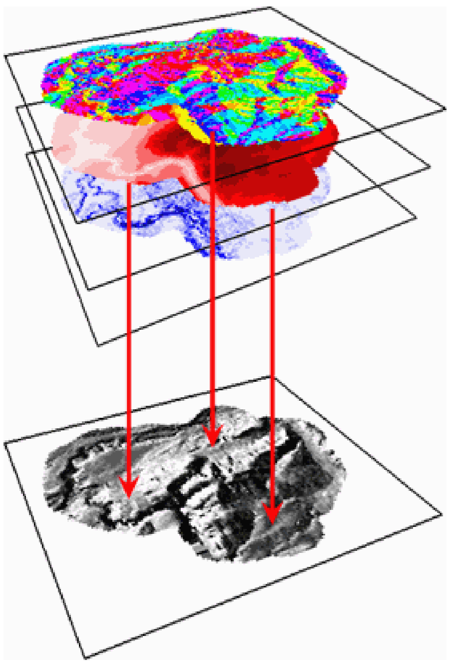

Figure C.2. Conceptual illustration of raster calculator. Image courtesy of the University of Washington, School of Environmental and Forest Sciences, http://courses.washington.edu/gis250/lessons/raster_analysis1/index.html

How a Raster Calculator Works

A raster calculator divides each data layer into discrete square or rectangular cells laid out in a grid. Each cell in each data layer grid has a value; for example, in a coho salmon (*Oncorhynchus kisutch*) data layer, all cells in a geospatial data set containing data (i.e., coho habitat) are assigned a “1” and cells without data are assigned “zero.” The raster calculator then overlays these raster datasets on top of each other (Figure C.2), calculates the number of data values for each cell, and displays the analysis result (Figure 3.1, main document) in a new dataset. For example, a particular cell near a major stream might include floodplain, coho salmon habitat, and a wetland, and as such would receive a higher score than a nearby cell with only floodplain.

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For example, in the Ecological Analysis, seven percent categories were used to display the data: -0 - 10, 10.1 - 20, 20.1 - 30, 30.1 - 40, 40.1 - 50, 50.1 - 75, and 75.1 - 100 (Figure 3.1). We then interpreted those categories. -Raster cells scoring more than 50.1% were deemed most important. -Cells scoring between 30.1% and 50% were also ecologically important, but their importance was relative to adjacent cells. -Cells scoring between 10.1% and 30% were deemed transitional. -Cells scoring between 0% and 10% were considered ecologically unimportant. These results highlighted areas that are most important from a conservation standpoint and helped us delineate core areas, nodes, and linkages. -We used known ecologically important nodes to vet the results – if these were not visible; we knew our overlap categories were too coarse.

Modeling Scenarios

We built three raster analyses as separate data frames in CorridorDesign (Majka et al. 2007) using the appropriate data layers (Table C.1). -We presented the raster calculation results to both the stakeholdercCommittee and Review Team members.

1. <u>All Values</u>: -Included all data layers selected by the Stakeholder Committee, other review committees, and project staff. -This analysis gave the project team an early idea of how resources are distributed across the landscape.

2. <u>Ecological Analysis:</u> -Included data layers that showed species, habitat, and other environmental data of importance to conservation. The goal of this analysis was to show areas of overlap of important species and habitat. -The results from this layer were used to select Node polygons as described below. -These results also informed the selection of Linkage polygons, also described below.

3. <u>Linkage Analysis:</u> -Included all data layers depicting features that potentially serve as corridors between Node polygons: linear features such as streams and ridgelines, as well as coverages depicting conserved land and native vegetation. -This data analysis was used to draw Linkage polygons.

We ran two additional raster analyses which we were unable to pursue further (Table C.2). -They are only included here because we plan to complete them in the near future as we secure additional funding.

1. <u>Conservation Analysis:</u> -Included data layers depicting land with conservation status and important places for conservation as identified through a designated process or analysis by a non-profit organization or government agency. -Data layers that depict similar data coverage types that do not overlap were merged (e.g., OWEB (Oregon Watershed Enhancement Board) conservation easements and SOLC conservation easements). -The

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goal of this analysis was to show areas of overlap of currently conserved land, special conservation designations, and institutional priorities for conservation

Table C.1. Raster Calculator Modeling Scenarios

Model Name	Data Type Selected	Model Purpose	Notes
All Values	All data layers	Preliminary Testing	Not used for Nodes or Linkages.
Ecological	Species, habitat, and other environmental data	Select Node polygons	These results also informed the selection of Linkage polygons.
Linkage	Conserved lands, native vegetation, and linear features such as streams and ridgelines	Aid for drawing linkage polygons	These results also helped delineate nodes.

Note: Data layers included in each scenario are found in Appendix D.

Table C.2. Raster Calculator Modeling Scenarios for Future Analyses Involving Existing Conservation Areas

Model Name	Data Type Selected	Model Purpose	Notes
Conservation	Land with conservation status or important for conservation as identified by a government agency or non-profit organization	For use in overlap analysis (below).	These results will help refine nodes, linkages, and conflict areas in the future.
Ecological and Conservation	Combined data layers from the Ecological and Conservation Analyses	Overlap analysis: compares important species and habitat with existing conserved lands.	Can be used to refine existing conservation plans and set new priorities.

Note: Data layers included in each scenario are found in Appendix D.

2. <u>Ecological and Conservation Analysis:</u> -Included a combination of the data layers in the Ecological Analysis and Conservation Analysis. -The goal of this analysis was to compare areas of overlap between important species and habitat with currently conserved lands, special conservation designations, and institutional priorities for conservation: -do they match up? -In the future, this layer will provide information to refine nodes, linkages, and conflict/opportunity areas (REF) in future stages of the project.

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Nodes and Linkages

To communicate important ecological concepts to a broad audience, we highlighted “ecological nodes” (highly-ranked areas) and “linkages” (moderately-ranked) between nodes.

> Ecological Nodes: –Areas of ecological importance stemming from the type and quality of habitat and presence of rare species. -Can be of varying sizes and shapes; the larger the better (Meiklejohn et al. 2009).

> Linkages: -Areas of connectivity important to facilitate the movement of multiple species and ecological processes (Hess and Fisher 2001; Meiklejohn et al. 2009). -Linkages connect nodes to each other and to areas outside the study area. -Linkages can be continuous or “stepping stones” and do tend to be “corridor”-shaped rather than circles or squares.

Nodes

Using the Ecological Analysis raster calculator results, the GIS team drafted preliminary ecological nodes. -We looked for clusters of Ecological Analysis raster cells scoring over 40.1%. We also looked at clusters of cells scoring between 30.1% and 40%; if they were adjacent to higher-scoring clusters, they were included in a node. -Small, isolated, or diffused clusters of cells in the results raster were included as nodes only if raster results over 50% or 75% occurred within those clusters.

Linkages

To create linkages, we looked for clusters of Linkage Analysis raster cells scoring above 50.1%. Clusters of cells scoring between 25.1% and 50% and Ecological Analysis raster cells scoring between 10% and 30% helped define linkages if they were adjacent to nodes or clusters of high-scoring linkage cells. -Size also mattered: -if a cluster was too small, we ignored it.

Refining Cores Areas, Nodes, and Linkages

We refined these preliminary polygons following review from the stakeholder group and Technical Review Team. -Several Technical Review Team members emphasized the ecological importance of oak woodlands; therefore, we used the oak woodland layer, as well as project team expertise, topography, and aerial photos, and other GIS layers (e.g., streams), to help decide which raster cells to include within as well as to define the extent of our ecological nodes. -We manually drew the node and linkage boundaries using ArcMap (Esri2009). -If clusters of high-scoring Ecological Analysis (node) raster cells were isolated but functioned as “stepping stones,” we incorporated them into a linkage corridor. -Finally, we field-checked nodes and linkage areas throughout the valley, confirming that our modeling results reflected reality.

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Conflict and Opportunity Areas – The REF

In ArcMap9.3 (Esri2009), we created an overlay using transportation, infrastructure, and archaeological data. -Specific data in the overlay included fish passage barriers and types (culverts, dams), animal collision data (deer, bear, cougar, and elk), utilities (power lines, substations), greenways, roads, planned transportation projects from the most recent Regional Transportation Plan, and Regional Problem Solving expanded urban reserves. -This overlay was laid on top of a map of nodes andlLinkages illustrating areas and points of potential conflict between planned road projects and ecological nodes, linkages, and archaeological sensitivity areas. -The map also highlighted sites with an ecological or environmental restoration opportunity. -For example, a high road kill site might be where a small stream crosses under a road in a culvert. -During future road work, that culvert could be replaced with a wide, cement box culvert and well-placed fencing, facilitating animals crossing under the road, not over it.

As mentioned earlier, a Regional Ecosystem Framework (REF) overlays conservation and transportation plans. -By their very nature, these plans prioritize both conservation areas and transportation projects. -Our Conflict and Opportunity map does not prioritize. -It simply provides the information in one location, thereby providing transportation planners with the environmental and ecological information necessary to prioritize future projects, adjust long-term planning scenarios, and anticipate mitigation opportunities. -The map also allows developers, city managers, and others to identify and avoid conflicts between environmental resources and urban growth projects.

We reviewed the conflict and opportunities map with both the stakeholdercCommittee and the Technical Review Team. -We incorporated some small revisions based on those discussions.

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APPENDIX D
Data Layers

Table D.1. Data layers Used in our GIS Analyses.

DATA LAYER	EXPLANATION	ANALYSIS		OVERLAY	
Study Area	Project area boundary	Base Map			
Aerial Photographs	2009 ortho photos	Base Map			
Hexagons	Hexagon grid (to aid analysis)	Base Map			
LAND MANAGEMENT & CONSERVATION					
BLM Reserves	Medford BLM Late-Successional Reserves and other District-defined reserves			Cv	
County & City Open Land	All County- and City-owned parcels not including urbanized, predominantly developed parcels (e.g., ball fields)		Link	Cv	
CSNM	Cascade-Siskiyou National Monument			Cv	
Federal Lands	All federal lands: USFS, ACOE, BOR, and Bureau of Land Management		Link	Cv	
Other Open Space	Land designated as “open space” by Jackson County, not including parks		Link	Cv	
OWEB Easements	Oregon Watershed Enhancement Board (OWEB) conservation easements		Link	Cv	
Parks	Public Parkland		Link	Cv	
FEMA Floodplain	100-year and 500-year floodplains designated by the Federal Emergency Management Authority, spring, 2011	Eco	Link	Cv	
RNAs, ACECs, & Botanic Areas	BLM Research Natural Areas (RNAs), BLM Areas of Critical Ecological Concern (ACECs), and USFS Botanic Areas	Eco		Cv	
SOLC Conservation Easements	Conservation easements and fee-owned land held by Southern Oregon Land Conservancy (SOLC)		Link	Cv	
State Lands	State of Oregon lands		Link	Cv	
TNC Preserves & Easements	The Nature Conservancy's (TNC) current preserves and held conservation easements		Link	Cv	
Open Space Reserve Zoning	Jackson County zoning designations for Open Space Reserve		Link	Cv	
USFS Reserves	USFS Late-Successional Reserves, Riparian Reserves, Wild and Scenic Rivers, Special Interest Areas, Backcountry Areas, and the Ashland Watershed (drinking water for City of Ashland, in National Forest)			Cv	

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Wilderness	Federal Wilderness and Wilderness Study Areas on BLM and USFS lands			Cv	
ECOLOGICAL ASSESSMENTS					
Bullitt Core Areas & Nodes (Level 1)	Large-scale ecologically important Core Areas and Nodes from RVCOG's February 2011 pilot effort funded by Bullitt Foundation	Eco	Link	Cv	
Bullitt Corridors (Level 1)	Large-scale ecological corridors from RVCOG's February 2011 pilot effort funded by Bullitt Foundation	Eco	Link		
TNC Aquatic Portfolio - Headwaters	The Nature Conservancy's headwater and tributary aquatic conservation priorities			Cv	
TNC Aquatic Portfolio -Streams	Rivers and major creeks identified as conservation priorities in the Nature Conservancy's East West Cascades Ecoregional Assessment			Cv	
TNC Portfolio Sites	Integrated portfolio of The Nature Conservancy's conservation sites excerpted from the statewide portfolio			Cv	
CBI Roadless Areas	Roadless areas as defined by the Conservation Biology Institute (CBI)	Eco	Link	Cv	
ODFW Conservation Opportunity Areas	ODFW Conservation Strategy Conservation Opportunity Areas			Cv	
ORBIC Wetland Restoration Hubs	Large areas with major wetlands restoration projects ongoing, from Oregon Biodiversity Institute (ORBIC)			Cv	
RPS Environmental	Lands considered unbuildable due to extreme slope (greater than 25%), wetlands, or floodplains, generated for the Regional Problem Solving (RPS) urban growth planning process (RVCOG lead)		Link	Cv	
SOLC Priorities	Southern Oregon Land Conservancy's -priority lands on which to focus its conservation efforts			Cv	
Vernal Pools SC Ranked Conserve Protect	Vernal pools in the White City area with stakeholdercCommittee rankings "Conserve", "Protect" only			Cv	

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VEGETATION AND LANDFORMS					
Hlltops TPI	Hilltops and ridges extracted from the Topographic Position Index raster	Eco	Link		
Lakes Ponds	Lakes and ponds extracted from Jackson County's "waterpoly" GIS shape file	Eco			
Streams	All waterways including small disjunct seasonal drainages, but not canals	Eco	Link		CO
Agriculture	All agricultural cover types from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources		Link		
Grassland	All grassland cover types from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources	Eco	Link		
Mature Conifer	Late-Successional ("Old growth") conifer forest from the Oregon Conservation Strategy's "strategy habitats" raster	Eco	Link		
Oak	All oak woodland cover types from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources	Eco	Link		
Ponderosa Pine	All *Pinus ponderosa* cover types from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources	Eco	Link		
Riparian	All riparian cover types from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources	Eco	Link		
Serpentine	All serpentine cover types from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources	Eco			
Shrubland	All shrubland cover types from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources	Eco	Link		
Valley Bottom	Native vegetation cover below 2,000 foot elevation; vegetation data from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources	Eco	Link		
Wetland	All wetland cover types from the Oregon Ecological Systems 2010 raster created by Oregon State University's Institute for Natural Resources	Eco	Link		

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HABITAT DATA					
Northern Spotted Owl Critical Habitat	USFWS Critical Habitat Units for *Strix occidentalis* ssp. caurina			Cv	
Critical Habitat, large-seed wooly meadowfoam	USFWS Critical Habitat Units (2010) for *Limnanthes floccosa* ssp. grandiflora	Eco		Cv	
Critical Habitat, Cook's lomatium	USFWS Critical Habitat Units (2010) for -*Limnanthes floccosa*	Eco		Cv	
VP Fairy Shrimp Critical Habitat	USFWS Critical Habitat (2006) for *Branchinecta lynchi*	Eco		Cv	
Fall Chinook Habitat	Fall run *Oncorhynchus tshawytscha* habitat from Oregon Department of Fish and Wildlife and USFS fish distributions	Eco			
Spring Chinook Habitat	Spring run *Oncorhynchus tshawytscha* habitat from ODFW	Eco			
Coho Habitat	*Oncorhynchus kisutch* (Southern Oregon/Northern California Coasts Ecologically Significant Unit) habitat from ODFW and USFS fish distribution data	Eco			
Cutthroat Habitat	*Oncorhynchus clarkii* habitat from USFS and Jackson County data	Eco			
Deer Elk Winter Range	ODFW's deer and elk winter range	Eco			
Elk Calving Areas	Suspected Elk calving areas digitized by Paul Hosten from ODFW research data	Eco			
Rainbow Habitat	*Oncorhynchus mykiss* habitat distribution from the USFS and Jackson County data	Eco			
Steelhead Summer Habitat	*Oncorhynchus mykiss* (summer anadromous run) from ODFW	Eco			
Steelhead Winter Habitat	*Oncorhynchus mykiss* (winter anadromous run) from ODFW	Eco			
Vernal Pools	The current extent of vernal pools within Jackson County derived from soil layer -- with developed and "leveled" pools removed	Eco			
SPECIES DATA					
ORBIC rare species	Rare and sensitive species data from Oregon Biodiversity Institute -- ***polygons larger than 1,500 meters removed***	Eco			
Road Kill - Deer	Deer road kill (tallies by milepost) collected by ODOT and collated by ODFW		Link		CO
Road Kill - Non-deer	All wildlife species except deer killed along state highways (tallies by milepost). -Data collected by ODOT and collated by ODFW		Link		CO

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BLM Fauna Sites	Medford Bureau of Land Management's "GeoBOB" (geographic biotic observations) data of animal sightings from the 1800s through the present	Eco			
Spotted Owl KOAC	Known Spotted Owl Activity Centers (polygons) from the Bureau of Land Management	Eco			
BLM Flora Sites	All sensitive vascular and non-vascular plant, lichen, and fungi species locations from the Medford Bureau of Land Management	Eco			
NPSO Important Plant Sites	Important plant sites identified by members of the Native Plant Society of Oregon, Siskiyou Chapter	Eco		Cv	
INFRASTRUCTURE					
Canals	Canals extracted from Jackson County's "waterline" shape file		Link		
Greenway	Completed and proposed path of the Bear Creek and Rogue River Greenway multi-use trail along Bear Creek		Link	Cv	CO
Trails	Comprehensive trails layer with both urban and wildland trails		Link		CO
Roads	All paved roads, from Jackson County				CO
Fish Barriers	Irrigation dams, road culverts, and one bridge				CO
Powerlines					CO
Power substations					CO
RPS Proposed Urban Reserve Boundaries	Proposed Urban Reserve boundaries (urban growth boundary extensions) from the Regional Problem Solving process				CO
ARCHAEOLOGY-CULTURAL RESOURCES					
Arch Sensitivity	Areas with high potential to include archaeology sites that need to be surveyed				CO

Note: ACOE = Army Corps of Engineers; BOR = Bureau of Reclamation; Cv = Conservation raster; CO = Conflict and opportunities overlay; Eco = Ecology raster; Link = Linkage raster; RVCOG = Rogue Valley Council of Governments; USFS = U.S. Forest Service; USFWS = U.S. Fish and Wildlife Service.

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APPENDIX E
INTEGRATED ECOSYSTEM FRAMEWORK

From: Venner, Marie and URS Corporation. forthcoming. Guide to the Ecological Framework. Report prepared for C06A Technical Coordinating Committee of the Strategic Highway Research Program 2, Transportation Research Board of The National Academies. 95 pp.

Table E.1. The Entire Integrated Ecosystem Framework, from SHRP 2 C06

Step 1: Build and strengthen collaborative partnerships for statewide or regional integrated planning, along with a vision to address and tangible improve priority resources of concern across agencies and programs.
1a. Identify preliminary planning region (e.g., watersheds, eco-regions, and/or political boundaries). Drivers may be environmental factors such as water quality needs or 303(d) listings, species' needs, watershed restoration needs, or rare wetlands. 1b. Identify counterparts and build relationships among agencies, including local government and conservation NGOs (stakeholders). 1c. Convene a team of stakeholders, share aspirations. Define and develop commonalities and a shared vision. Build an understanding of the benefits of a watershed/ecosystem/ recovery planning approach and develop a shared vision of regional goals for transportation, restoration, recovery, and conservation. 1d. Record ideas and vision. Develop Memoranda of Understanding on potential new processes for increasing conservation, efficiency, and predictability. 1e. Initially explore funding and long-term management options to support conservation and restoration actions and long-term management.
Step 2: Characterize resource status. Integrate conservation, natural resource, watershed, and species recovery and state wildlife action plans.
2a. Identify the spatial data needed to create understanding of current (baseline) conditions that are a by-product of past actions and understand potential effects from future actions. 2b. Prioritize the specific list of ecological resources and issues that should be further addressed in the REF or other assessment and planning. 2c. Develop necessary agreements from agencies and NGOs to provide plans and data that agencies use in their own decision-making processes. Agreements should allow data to be used to avoid, minimize, and advance mitigation, especially for CWA Section 404 and ESA Section 7. 2d. Identify data gaps and how they will be addressed in the combined conservation/restoration plan. Reach consensus on an efficient process for filling any remaining gaps. 2e. Produce geospatial overlays of data and plans outlined above, as well as supporting priorities, to guide the development of an overall conservation strategy for the planning region that identifies conservation priorities and opportunities, and evaluates stressors and opportunities for mitigation and restoration.

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2f. Convene a team of stakeholders to review the geospatial overlay and associated goals/priorities, and identify actions to support them. 2g. Record methods, concurrence, and rationales of this step based on stakeholder input (e.g., how the identified areas address the conservation/preservation or restoration needs and goals identified for the area). 2h. Distribute the combined map of conservation and restoration priorities to stakeholders for review and adoption.
Step 3: Create Regional Ecosystem Framework (Conservation Strategy + Transportation Plan).
3a. Overlay the geospatially-mapped Long Range Transportation Plan (or TIP/STIP) with conservation priorities and other land uses. 3b. Identify and show 1) areas and resources potentially impacted by transportation projects and 2) potential opportunities for joint action on conservation or restoration priorities that could count for 404 and Section 7 regulatory requirements. 3c Identify the high-level conservation goals and priorities, and opportunities for achieving them, relative to the transportation plan and other land uses/plans. 3d. Review and verify REF with stakeholders.
Step 4: Assess land use and transportation effects on resource conservation objectives identified in the REF.
4a. Work collaboratively with stakeholders to weight the relative importance of resource types (including consideration of resource retention) where needed to help establish the significance of impacts and importance for mitigating action. 4b. Identify/rate how priority conservation areas and individual resources respond to different land uses and types of transportation improvements. 4c. Develop programmatic cumulative effects assessment scenarios that combine transportation plan scenarios with existing development and disturbances, other impacting features and disturbances, and existing secured conservation areas. Include climate change threats to better understand what resources/areas may no longer be viable or what new resources may become conservation priorities in the planning region during the planning horizon. 4d. Intersect the REF with one or more cumulative effects assessment scenarios to identify which priority areas and/or resources would be affected, to identify the nature of the effect (e.g., negative, neutral, beneficial) and to quantify the effect, noting the level of precision based on the precision of the map inputs. 4e. Compare plan alternatives, and select the one that optimizes transportation objectives AND minimizes adverse environmental impacts (the least environmentally damaging practicable alternative). 4f. Identify mitigation needs for impacts that are unavoidable and that may require minimization through project design/implementation/maintenance, and that may require off-site mitigation. For impacts that do not appear practicable to mitigate in-kind, review with appropriate resource agency partners the desirability of mitigating out-of-kind (e.g., by helping secure a very high priority conservation area supporting other resource objectives).

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4g. Establish the preferred transportation plan, and quantify mitigation needs including the amount and quality of area by resource type for which impacts could not be avoided and require further mitigation attention.
Step 5: Establish and prioritize ecological actions.
5a. Identify areas in the REF planning region that can provide the quantities and quality of mitigation needed to address the effects assessment and develop protocols for ranking mitigation opportunities. Ranking should be based on the site's ability to meet mitigation targets, along with: a) anticipated contributions to cumulative effects; b) the presence in priority conservation/restoration areas of the REF; c) ability to contribute to long-term ecological goals; d) the likelihood of viability in the landscape context; e) cost; and f) other criteria determined by the stakeholders. 5b. Select potential mitigation areas according to the ranking protocols described above. 5c. To increase confidence in the mitigation component of the plan, field-validate the presence and condition of target resources for attention at mitigation sites and reassess the ability of sites to provide necessary mitigation. Revise the mitigation assessment as needed to identify a validated set of locations to provide mitigation. Compare feasibility/cost of conservation and restoration opportunities with ranking score and context of conservation actions of other federal, state, local, and NGO programs to determine overall benefit/effectiveness. Predictive species modeling can target field validation process. 5d. Develop/refine a regional conservation and mitigation strategy (set of preferred actions) to achieve ecoregional conservation/restoration goals and advance infrastructure projects. 5e. Decide on and create a map of areas to conserve, manage, protect, or restore, including documentation of the resources and their quantities to be retained/restored in each area, and the agency and mechanisms for conducting the mitigation. 5f. Obtain agreement on ecological actions from stakeholders.
Step 6: Develop crediting strategy.
6a. Diagnose the measurement need. Examine the ecological setting (including regulated resources and frameworks, non-regulated resources, and ecosystem services), examine the regulatory and social setting, and identify additional opportunities. 6b. Evaluate ecosystem and landscape needs and context to identify measurement options. 6c. Select or develop units and rules for crediting (e.g., rules for field measurement of ecological functions, approved mitigation/conservation banking, outcome-based performance standards using credit system). 6d. Test applicability of units and rules in local conditions. 6e. Evaluate local market opportunities for ecosystem services. 6f. Negotiate regulatory assurance for credit. 6g. Program implementation.

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Step 7: Develop programmatic consultation, Biological Opinion, or permit.
7a. Ensure agreements are documented relating to CWA Section 404 permitting, avoidance and minimization, ESA Section 7 consultation, roles and responsibilities, land ownership and management, conservation measures, etc. 7b. Plan for long-term management/make arrangements with land management agencies/organizations (e.g., land trusts or bankers) for permanent protection of conservation and restoration parcels. Notify and coordinate with local governments for supportive action. 7c. Design performance measures for transportation projects that will be practical for long-term adaptive management and include in 404 permit and/or Section 7 BA/BO. 7d. Choose a monitoring strategy for mitigation sites, based on practical measures above, ideally using the same metrics as those used for impact assessment, site selection, and credit development. 7e. Set up periodic meetings (at least annual) to identify what is working well and what could be improved.
Step 8: Implement agreements and adaptive management. Deliver conservation and transportation projects.
8a. Design/implement methods to complete transportation project(s) consistent with REF, conservation/restoration strategy, and agreements. 8b. Identify how advance mitigation/conservation will be funded, if this has not been done already. 8c. As needed, develop additional project-specific, outcome-based performance standards related to impact avoidance and minimization. 8d. Design transportation projects and integrate performance measures to minimize impacts to resources. 8e. Use adaptive management to ensure compliance with requirements and intent of performance measures. i. Develop and track ecoregional biodiversity, indicators of viability, and integrity. ii. Develop and track conservation status, protected and managed area status, and management effectiveness. iii. Identify remedial actions and needed plan adjustments. iv. Adjust the planning process and management processes and/or management of individual conservation areas. v. Incorporate outputs into future cumulative effects analyses for the region.
Step 9: Update Regional Integrated Plan/Ecosystem Framework.
9a. Integrate any revised conservation plans into the regional integrated plan/ecosystem framework and, where appropriate, individual resource spatial information. 9b. Update the area/resource conservation requirements, responses, and indicators in collaboration with stakeholders (e.g., assess regional goals, update to minimum required area for species and/or habitat, review confidence threshold for achieving goals, review

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weighting values of resources in REF, and evaluate responses to land use and infrastructure).

9c. Update the implementation status of areas in the REF to review those areas that are contributing to REF goals and priorities, and determine if additional conservation/protection action is required.

9d. Update the cumulative effects analysis with new developments, new disturbances, proposals and trends (e.g., ecosystem-altering wildfire, new policies, plans, proposals, and trends such as new sea level rise inundation model).

9e. Conduct regular review of progress, including effectiveness at meeting goals and objectives, current take totals, and likelihood of exceeding programmatic take allowance.

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APPENDIX F
Limited Use Agreement for Digital Data

Limited Use Agreement for Digital Data:
RVCOG as Data Recipient

ROGUE VALLEY COUNCIL OF GOVERNMENTS
155 No. 1st St., P. O. Box 3275, Central Point, OR 97502
www.rvcog.org

The Rogue Valley Council of Governments understands that some organizations or individuals consider their data to be sensitive and CONFIDENTIAL. –Because of the sensitivity of such information and the organization/individual's concern about possible misuse and misinterpretation, RVCOG agrees to the following terms and conditions with regard to the use of digital data ("your data") from the following organization or individual ("you"):

____.

To be used within the following RVCOG department ("us" and "we"): ––NATURAL RESOURCES. –

1. RVCOG is hereby granted a nonexclusive license to make copies of your data provided to us by you in digital form for use or distribution ***only*** within the department(s) specified above.
2. Subcontractors may have access to these data during the course of any given project, but will ***not*** be given a copy for their use on subsequent unrelated work.
3. Your data ***will not*** be further distributed or sold in any format. -Should individuals approach RVCOG asking for the type of data that we provide, we will refer them to you.
4. Once we are finished using your data or our project is completed, whichever comes first, we will ***delete*** your data off of our shared drives, hard drives, and any temporary file transfer media (e.g., data sticks, DVDs). -If we need the data files again at a later time, we will contact you again.
5. As a professional courtesy, we will acknowledge you and/or your organization where appropriate and prudent.

You agree to supply RVCOG with your data in an ArcGIS shapefile.

Signature: ____Date:
Name: -[Organization's Executive Director, or similar decision authority]
Title:
[phone or email]

Signature: ____Date:
Name: -[Project's Principal Investigator, or similar authority]
Title:
[phone or email]

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APPENDIX G
Stakeholder Survey Results

Table G.1. Stakeholder Committee TCAPP Survey Results, July 2011.

QUESTIONS	Average	Sample Size
Stakeholder Communication		
I am able to clearly articulate key messages with decision makers.	4.1	15
I am able to communicate the appropriate messages at the appropriate times and to the appropriate people.	4.0	15
I understand the process required to communicate my message.	4.1	15
I have ample opportunity to make my voice heard.	4.2	15
The input I provide has an influence on the decisions made by formal decision-making partners.	4.0	15
Stakeholder Understanding		
I understand the decision-making process, the proposed plans, and the purpose of the plans.	3.6	15
I have access to the information I need to make informed choices.	3.8	15
I understand the process I can use to influence the decision-making process.	3.9	15
I understand my role in the decision-making process.	3.8	15
I understand the roles of others (other stakeholders, decision makers) in the decision-making process.	3.7	15
I receive feedback on the decision-making team's status and decisions made.	3.7	15
I understand how the decisions made will affect my special interest.	3.7	15
Stakeholder Commitment		
I have a high level of individual commitment to the process and the outcomes of the decision-making process.	3.9	15
I am able to consistently participate in the process and represent my interest throughout the decision-making process.	4.0	15
There is a formal group available to support my needs during the decision-making process.	3.9	15
I have been able to engage with others of similar interest throughout the process.	3.7	15
I am able to identify, recognize, and accept interests of others and work from common interests.	4.1	15

Note: Results are ranked from 1 – 5, with 1 = Strongly Disagree and 5 = Strongly Agree. -If the respondent chose "Not Applicable," that answer was assigned a zero and not included in the analysis.

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Table G.2. Stakeholder Committee TCAPP Survey Results, January 2012.

QUESTIONS	Average	Sample Size
Stakeholder Communication		
I am able to clearly articulate key messages with decision makers.	4.0	9
I am able to communicate the appropriate messages at the appropriate times and to the appropriate people.	4.0	9
I understand the process required to communicate my message.	4.0	9
I have ample opportunity to make my voice heard.	4.1	9
The input I provide has an influence on the decisions made by formal decision-making partners.	3.9	9
Stakeholder Understanding		
I understand the decision-making process, the proposed plans, and the purpose of the plans.	4.1	9
I have access to the information I need to make informed choices.	4.0	9
I understand the process I can use to influence the decision-making process.	4.2	9
I understand my role in the decision-making process.	4.2	9
I understand the roles of others (other stakeholders, decision makers) in the decision-making process.	4.0	9
I receive feedback on the decision-making team's status and decisions made.	4.1	9
I understand how the decisions made will affect my special interest.	3.9	9
Stakeholder Commitment		
I have a high level of individual commitment to the process and the outcomes of the decision-making process.	4.1	9
I am able to consistently participate in the process and represent my interest throughout the decision-making process.	4.0	9
There is a formal group available to support my needs during the decision-making process.	3.9	9
I have been able to engage with others of similar interest throughout the process.	4.2	9
I am able to identify, recognize, and accept interests of others and work from common interests.	4.2	9

Note: Results are ranked from 1 – 5, with 1 = Strongly Disagree and 5 = Strongly Agree. If the respondent chose “Not Applicable,” that answer was assigned a zero and not included in the analysis.

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