WECC Western Electricity Coordinating Council

Overview

Environmental Recommendations for Transmission Planning

Final Report of the Environmental Data Task Force—May 6, 2011
As Approved by the SPSG May 24, 2011

On March 15, 2010, the Western Electricity Coordinating Council (WECC) Board established the Scenario Planning Steering Group (SPSG) as part of the Regional Transmission Expansion Planning (RTEP) project. With funding and support from the United States Department of Energy (DOE), WECC initiated the first-ever effort to develop 10- and 20-year transmission plans for the Western Interconnection comprising parts of 14 western states, two Canadian provinces, and part of Baja California, Mexico. Tasked with providing strategic guidance on scenario development, modeling tools, and key scenario assumptions, the SPSG created the Environmental Data Task Force (EDTF) to develop recommendations on the type, quality, and sources of data on land, wildlife, cultural, historical, archaeological, and water resources, exploring ways to transform those data into study cases to inform the 10-year transmission plan and integrate them into the models.

On January 20, 2011, the EDTF embarked on a case study to pursue its goal. After dozens of stakeholder interviews and collection of more than 12,000 environmental data layers (including those identified by EDTF prior to the case study), the case study produced important insights. This report highlights the case study findings and EDTF's recommendations for incorporating environmental data into transmission planning.

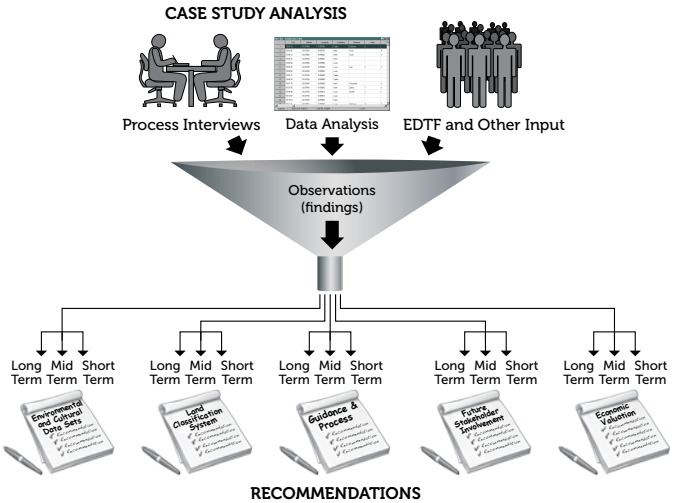
For more information on WECC, SPSG, EDTF, and the RTEP project, please contact Mr. Byron Woertz, Jr., WECC Senior Project Manager (bwoertz@wecc.biz) or visit http://www.wecc.biz/Pages/Default.aspx.

The 24 members of EDTF represent industry, state government, tribes, and environmental interests. Although diverse, the EDTF has a limited scope and does not represent all stakeholders affected by (or that may affect) transmission planning including, but not limited to local and state planners, agricultural interests, private landowners, water providers, realtors, economic development interests, and the tourism industry. Despite this limitation, the EDTF and SPSG represent the first time such diverse groups have collaborated in regional transmission planning. The EDTF's work and the RTEP project in general are open to all stakeholders and members of the public.

Case Study

EDTF's case study included interviewing a diverse group of stakeholders and analyzing environmental data for four potential transmission line projects. The EDTF used more than 20 observations or findings from the case study to draft recommendations for incorporation of environmental information into transmission planning. Transmission planning in this context refers to WECC's regional transmission planning process as well as planning that occurs at the subregional level. This document describes the EDTF's recommendations for incorporation into the first 10-year regional transmission plan WECC will submit to the DOE in 2011. The EDTF's recommendations are also appropriate for consideration in the 20-year transmission plan or components of the regional transmission planning process.

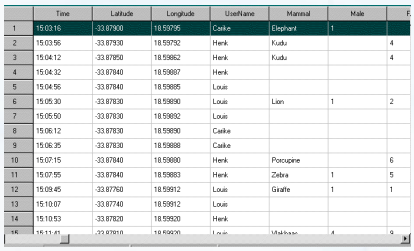
Process for Developing Recommendations



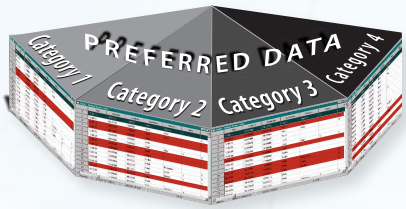
Recommendations

The recommendations summarized in this Overview and supporting findings are presented in more detail in the attached report.

Through a collaborative effort, the EDTF reduced their initial 16 recommendations to the following 5 in descending priority:



	Time	Latitude	Longitude	UserName	Mammal	Male	F
1	15:03:16	-33.87900	18.59795	Caike	Elephant	1	
2	15:03:56	-33.87930	18.59792	Henk	Kudu		4
3	15:04:12	-33.87850	18.59862	Henk	Kudu		4
4	15:04:32	-33.87840	18.59897	Henk			
5	15:04:56	-33.87840	18.59885	Louis			
6	15:05:30	-33.87830	18.59890	Louis	Lion	1	2
7	15:05:50	-33.87830	18.59892	Louis			
8	15:06:12	-33.87830	18.59890	Caike			
9	15:06:35	-33.87830	18.59888	Caike			
10	15:07:15	-33.87840	18.59880	Henk	Porcupine		6
11	15:07:55	-33.87840	18.59883	Henk	Zebra	1	5
12	15:09:45	-33.87760	18.59912	Louis	Giraffe	1	1
13	15:10:07	-33.87740	18.59912	Louis			
14	15:10:53	-33.87820	18.59920	Henk			



1. Environmental and Cultural Data Sets

Develop and maintain a catalog of environmental and cultural data sets preferred for transmission planning.

The EDTF produced an initial catalog of spatially explicit (GIS) environmental and cultural data sets preferred for transmission planning.

The EDTF recommends the development of workarounds for significant data that are inaccessible or unavailable.

The EDTF recommends using this preferred catalog of data sets (or subsequent iterations) to plan for and evaluate potential transmission alternatives.

The EDTF recommends that the data set catalog be shared with a larger, diverse stakeholder group for further review and refinement.

The EDTF recommends that a process be put in place to ensure that up-to-date and appropriate data sets are included in the catalog moving forward.

The EDTF also recommends that WECC determine an appropriate forum for hosting and maintaining the data catalog.

The EDTF recommends including in the Transmission Expansion Planning Policy Committee (TEPPC) Planning Protocol a process to review and validate data sets for update and inclusion by appropriate stakeholders, either the EDTF or its successor.

2. Land Classification System

Apply a risk classification system to categories of land areas using the preferred data sets in Recommendation 1 to plan and evaluate potential transmission alternatives.

EDTF developed an initial environmental and cultural resource risk classification system that organized land areas (area types) by their suitability for transmission development based on their environmental and cultural sensitivities and constraints. EDTF then organized area types into the four risk classification categories:

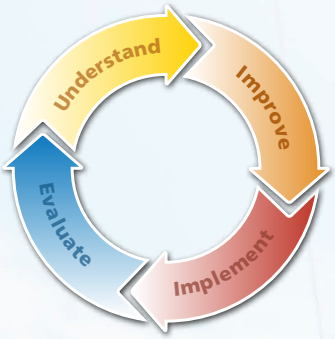
1. Least Risk of Environmental or Cultural Resource Sensitivities and Constraints (e.g., Designated Energy Corridors)
2. Low to Moderate Risk of Environmental or Cultural Resource Sensitivities and Constraints (e.g., Other Public Lands)
3. High Risk of Environmental or Cultural Resource Sensitivities and Constraints (e.g., National Monuments)
4. Areas Presently Precluded by Law or Regulation (e.g., Wilderness Areas)

The EDTF will work with WECC and its technical contractors to integrate this approach into their long-term planning tools and the transmission planning process (e.g., 10- and 20- year plans).

The EDTF recommends that the risk classification system be shared with a larger, diverse stakeholder group for further review and refinement.

3. Guidance & Process

The EDTF recommends that it, in cooperation with WECC staff, draft an amendment to the TEPPC Planning Protocol (for consideration by TEPPC) to augment the existing WECC regional transmission planning process with a comparison of future transmission alternatives based on criteria derived from the environmental and cultural data sets (see Recommendation 1). The EDTF recommends that this proposed amendment also describe a process for maintaining and updating these data sets; reporting results of comparing transmission alternatives (i.e., future transmission lines and transmission options stemming from the transmission planning process) based on these environmental and cultural criteria; providing workarounds for data gaps; and describing an integrated and complementary approach for considering these data sets with respect to generation evaluation and transmission planning.



4. Future Stakeholder Involvement

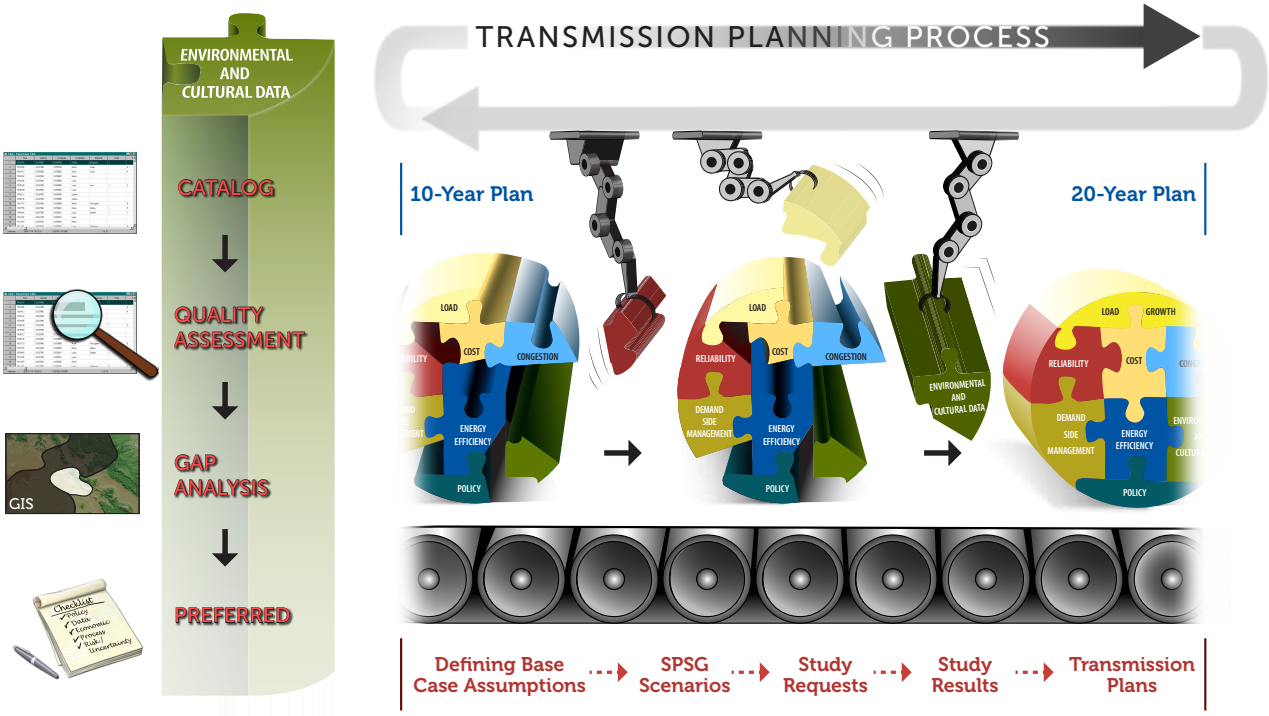
EDTF recommends working with WECC staff to conduct regular outreach (e.g., share lessons learned, leverage complementary efforts, and incorporate feedback from previous planning cycles), including and beyond current RTEP stakeholders, to inform evaluation and improvement of the integration of environmental and cultural information into regional transmission planning.

5. Economic Valuation

In 2011, EDTF will work with technical contractors to explore existing data on the economic values of environmental/cultural goods and services for use in the long-term planning tool.

For use in the 2013 plans, EDTF will evaluate methods and recommend a rigorous, defensible and risk-based approach to incorporate values of environmental/cultural goods and services into the regional transmission planning process.

Transmission Planning Process



TIMELINE

April 4

Draft (Version 1) Report Issued
EDTF Webinar

April 4-15

Comment Period

April 20

EDTF Methods Subgroup Meeting

April 21

EDTF Meeting

April 28

EDTF Webinar

April 29

Draft (version 2) Report Issued

May 6

Final EDTF Report to SPSG Issued

May 23-24

SPSG Meeting - Consider EDTF Recommendations

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Interwest Energy Alliance
SPSG, Federal Lands Conservation

Patrick Crist
NatureServe
Environmental Data Expert

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Kip Sikes
Idaho Power Company
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Western States Water Council
Water Conservation

Carl Zichella*
Natural Resources Defense Council
SPSG, Resource Conservation

** Indicates members of the EDTF Planning Team.*

For more information, please see attached report or contact Mr. Byron Woertz, Jr., WECC Senior Project Manager (bwoertz@wecc.biz).

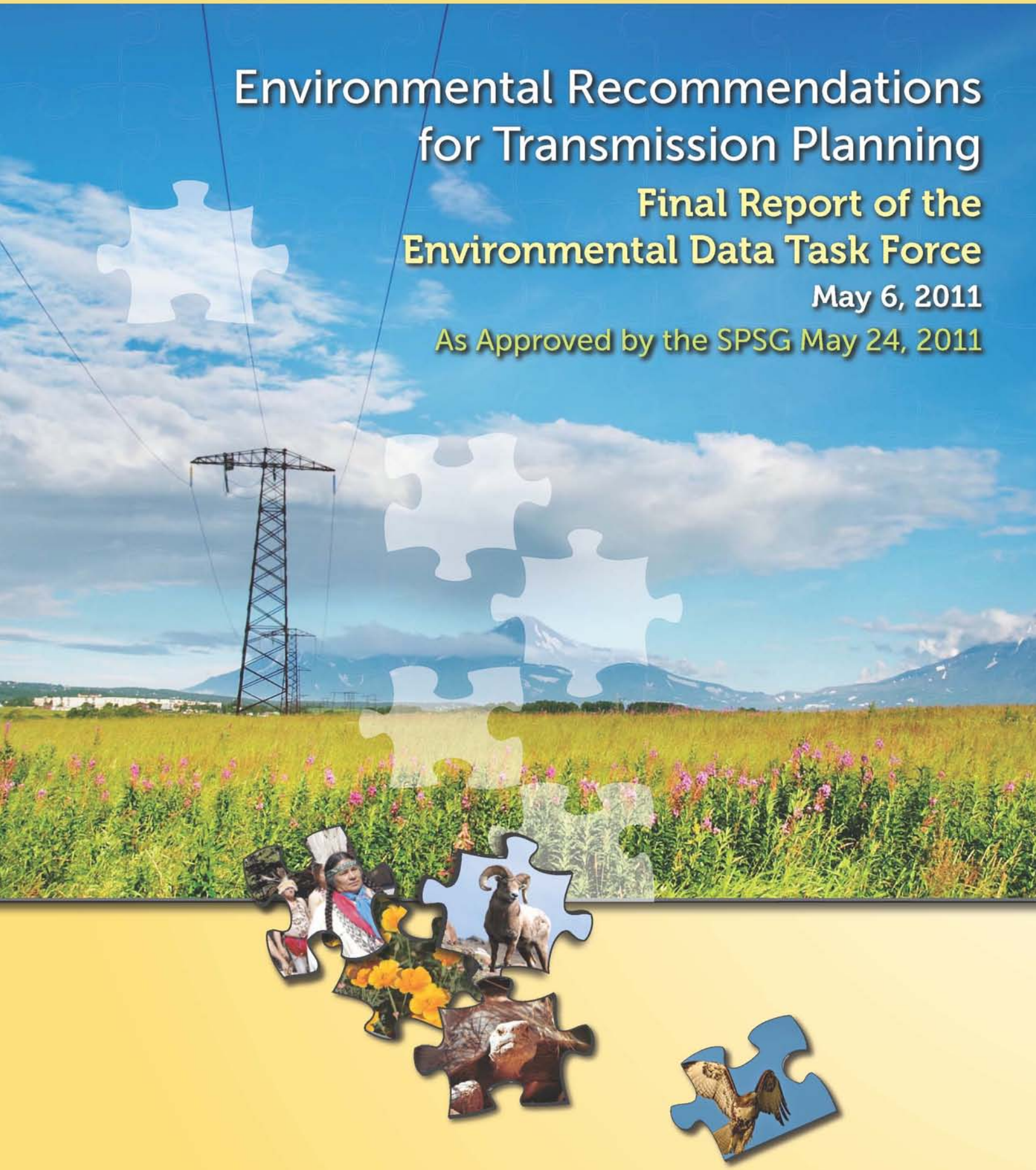
Overview and attached report prepared by ICF International, technical support contractor to WECC, SPSG, and EDTF.

Environmental Recommendations for Transmission Planning

Final Report of the Environmental Data Task Force

May 6, 2011

As Approved by the SPSG May 24, 2011



WECC Western Electricity Coordinating Council

Environmental Data Task Force — Incorporating Environmental Data in Transmission Planning

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Environmental Recommendations for Transmission Planning

Final Report of the Environmental Data Task Force

Prepared For:

Scenario Planning Steering Group

Prepared By:

ICF INTERNATIONAL

May 6, 2011

(As Approved by the SPSG May 24, 2011)

DISCLAIMER: This document is not intended to satisfy, replace, or conflict with policies, regulations, or other requirements for siting or permitting electric transmission facilities including, but not limited to the National Environmental Policy Act (NEPA), California Environmental Quality Act (CEQA), State Environmental Quality Acts, and Certificate of Public Convenience and Necessity (CPCN).

Project sponsors volunteered the potential transmission line projects identified in this report for inclusion in the case study. Analysis of environmental information relative to these transmission line projects was conducted as part of a case study solely to inform future transmission planning. Analytical results described in this report do not reflect on the merits of individual transmission line projects. No endorsement or criticism of these transmission line projects is intended or implied by this report.

ACKNOWLEDGEMENTS: The authors wish to acknowledge the leadership and guidance provided by Mr. Byron Woertz, Jr., Western Electricity Coordinating Council (WECC) Senior Project Manager, Ms. Pam Eaton, Interim Chair of the Environmental Data Task Force (EDTF), and members of the EDTF Planning Team – Gary Graham, Susan Henderson, and Carl Zichella. Special thanks also to the following members of the EDTF Methods Subgroup for their review and comments on interim deliverables: Doug Allen, Patrick Crist, Pam Eaton, Daly Edmunds, Gary Graham, Susan Henderson, Arne Olsen, Paul Orbuch, Cory Scott, and Carl Zichella. Thanks also to Ms. Janet Thomson of Kearns & West, Inc. for facilitating EDTF meetings which resulted in useful input to this report. Lastly, the authors thank the sponsors of potential transmission line projects analyzed in the case study, stakeholders interviewed for the Process Interviews, and all members of the EDTF for their thoughtful questions, enthusiasm, and guidance.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

The Environmental Data Task Force submitted the Final Environmental Recommendations for Transmission Planning Report to the Scenario Planning Steering Group (SPSG) on May 6, 2011 for their consideration. On May 24, 2011, the SPSG approved the report with the following revisions:

- *Risk Classification Category 1 revised as follows: "Low Risk of Environmental…" to "Least Risk of Environmental…"*
- *Risk Classification Category 2 revised as follows: "Moderate Risk of Environmental…." to "Low to Moderate Risk of Environmental…"*
- *Risk Classification Category 2 revised as follows: "… is likely to encounter…" to "…may encounter…"*
- *Recommendation 5 revised as follows: "…contractors to incorporate existing data…" to "…contractors to explore existing data…"*
- *The following language was added to the cover page and title page: "As Approved by the SPSG May 24, 2011"*

ENVIRONMENTAL RECOMMENDATIONS FOR TRANSMISSION PLANNING

1.0 Introduction

As part of the Regional Transmission Expansion Planning (RTEP) project, the Western Electricity Coordinating Council (WECC) Scenario Planning Steering Group (SPSG) formed the Environmental Data Task Force (EDTF) in June 2010 to **"develop recommendations on the type, quality, and sources of data on land, wildlife, cultural, historical, archaeological, and water resources (in coordination with work conducted via the State-Provincial Steering Committee), exploring ways to transform that data into study cases and into the models."**[1] Throughout this report, these resources are referred to as environmental and cultural information or data.

Consideration of environmental and cultural information during regional transmission planning and in parity with electric demand, generation resources, energy policies, technology costs, impacts on transmission reliability, and emissions is anticipated to facilitate collaborative and comprehensive transmission planning for the Western Interconnection. The resulting transmission plans will consider environmental and cultural information before transmission alternatives are proposed for development.

Structure of this report:

1.0 Introduction

2.0 Recommendations for Incorporation of Environmental and Cultural Data into the Transmission Planning Process

3.0 Observations and Findings from the case study

Supporting Appendices

Non-transmission alternatives (e.g., demand-side management, distributed generation, conservation, and energy efficiency) will also be considered during the regional transmission planning process; however, despite these efforts, the need for new transmission is anticipated to enable renewable energy development. Siting, permitting, and constructing new renewable generation resources may require 2 to 3 years. These same steps for high voltage transmission can require 7 to 10 years. The regional transmission plans prepared by the WECC Transmission Expansion Planning Policy Committee (TEPPC) will not address siting, permitting, and construction; however, there is a link between these transmission plans and subsequent proposals to build transmission lines. For example, one anticipated benefit of incorporating environmental and cultural information upfront in the transmission planning process is to reduce the potential for conflict with these resources during subsequent siting, permitting, and construction.

High voltage transmission lines have a relatively small direct footprint on the ground; however, large, interstate transmission lines can also indirectly and cumulatively impact wildlife, cultural and historical features, and water resources. The Western Governors' Association Wildlife Corridors Initiative[2] describes the potential impacts of transmission lines on wildlife; as this Initiative makes clear there is an important relationship between wildlife and their habitat. The Western Governors' Association is coordinating development of a state wildlife decision support system (DSS) that, when complete, will provide seamless wildlife data across state boundaries to better consider wildlife and habitat relationships during transmission planning.

[1] Scope of Work for SPSG Environmental Data Task Force Version 1.1, November 17, 2010.

[2] Western Governors' Association Wildlife Corridors Initiative, June 2008 Report available at: http://www.westgov.org/component/joomdoc/doc_download/66-wildlife-corridors

The EDTF conducted a case study and a series of webinars to develop 16 recommendations (see Version 1 of the Environmental Recommendations Report[3]) to address their scope of work. Subsequently, the EDTF met on April 21, 2011 to consolidate overlapping recommendations and delete out of scope recommendations; to inform other groups and process, out of scope observation made during the case study analysis have been retained in Section 3. This Environmental Recommendations Report describes the resulting 5 recommendations, as modified to reflect EDTF input since Version 2 of the Environmental Recommendations Report[4] released on April 29, 2011. This report, including the 5 recommendations, was submitted to the SPSG on May 6, 2011, for their consideration.

Case Study

SPSG's technical support contractor, ICF International (ICF), applied the approach outlined in the Environmental Data Task Force Case Study Technical Approach - Version 1-3[5] to conduct a case study consisting of two distinct but interrelated parts: interviewing a diverse cross-section of stakeholders involved in transmission planning (herein referred to as **Process Interviews**) and cataloging, compiling, and analyzing data (herein referred to as **Data Analysis**). Both parts contributed important, but distinct, information relevant to EDTF's goals.

As shown in Figure 1, the findings and observations from the case study, as well as information from other stakeholder-driven studies and input from EDTF members, form the basis for the recommendations discussed in Section 2.0 of this report. The goal of this report is to identify methods for incorporating environmental and cultural information into the planning and evaluation of transmission alternatives as part of the transmission planning process.

Case study components:

1. ***Process Interviews** with a diverse cross-section of stakeholders involved in transmission*
2. *A **Data Analysis** consisting of cataloging, compiling, and analyzing environmental and cultural data*

Process Interviews contributed to a better understanding of the multiple levels of transmission planning (e.g., local, subregional, and regional) and whether/how environmental and cultural data are considered. Understanding the levels of transmission planning and the relationship of one level to another is essential for determining what methods are currently used, or could be used, to incorporate environmental and cultural data in transmission planning. Specifically, the case study Process Interviews were designed to improve understanding of:

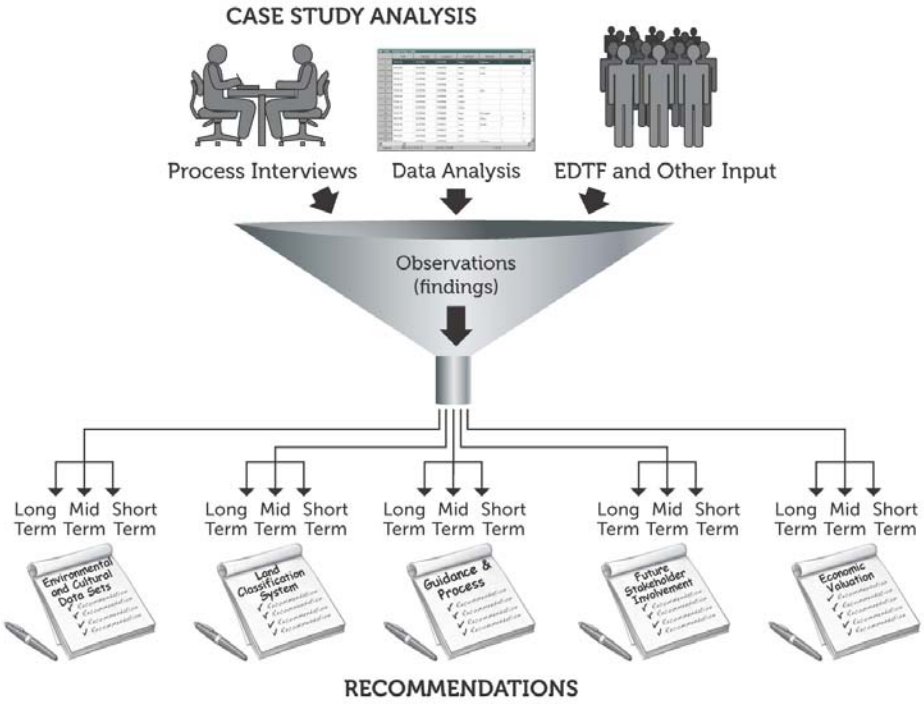
- Types of transmission planning conducted
- Types of environmental and cultural information needed
- Steps in the transmission planning process
- Limitations to incorporating environmental and cultural information
- Intrinsic consideration of environmental and cultural information by transmission planners
- Opportunities for incorporating environmental and cultural information

[3] *Environmental Recommendations for Transmission Planning Process Draft Version 1. April 4, 2011. http://www.wecc.biz/*

[4] *Environmental Recommendations for Transmission Planning Process Draft Version 2. April 29, 2011. http://www.wecc.biz/*

[5] *Environmental Data Task Force Case Study Technical Approach - Version 1-3, January 17, 2011. http://www.wecc.biz/*

Figure 1. Recommendations Development Process



The **Data Analysis** revealed findings related to the use of environmental and cultural data in the siting of transmission line projects and the challenges of incorporating similar data and analytics in the transmission planning process. The Data Analysis examined four potential transmission line projects[6] using geographic information systems (GIS) to learn about environmental and cultural data relative to transmission planning including, but not limited to:

- Availability
- Limitations
- Gaps
- Quality
- Potential applications

Prior to the identification of the four potential transmission line projects analyzed in the Data Analysis, the EDTF began the process of identifying available and regionally relevant data sets. During the examination of the four potential projects, the case study findings resulted in an expanded list of relevant data sets.

For reference, the questions and statements raised by EDTF members, and subsequently used to inform the approach for this analysis, appear in Appendix B. In addition, Appendix C contains an overview of the methods used to develop the observations and findings in Section 3.0 and Appendix D provides supporting analytics related to the data observations and findings.

[6] Appendix C identifies the four potential transmission line projects. As technical support contractor to the WECC and SPSG, ICF prepared this report. ICF is not currently and has not previously been involved in any of the four potential transmission line projects examined as part of the case study.

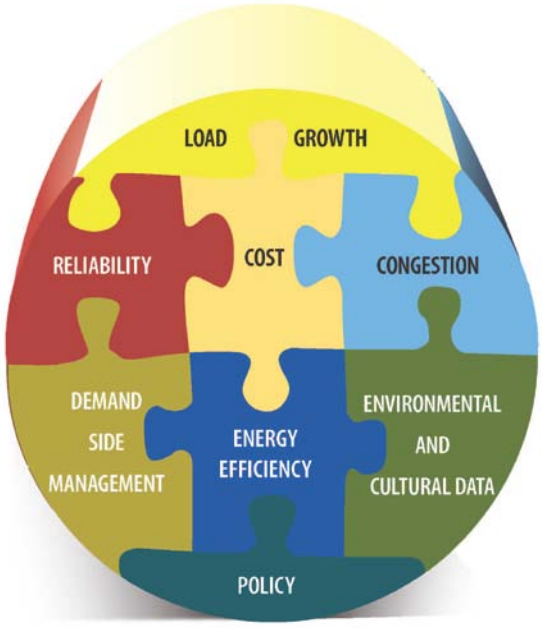
2.0 Recommendations for Incorporation of Environmental and Cultural Data into the Transmission Planning Process

This section identifies the EDTF's recommendations for incorporating environmental and cultural data into the transmission planning process. The supporting observations and case study findings appear in Section 3.0.

Environmental and cultural data includes land (including visual resources), wildlife, cultural, historical, archaeological, and water resources data.

Developing recommendations for incorporating environmental and cultural data into the transmission planning process requires a common understanding of "environmental and cultural data", 'transmission alternatives", and "transmission planning process." For purposes of this report, "environmental and cultural data" includes land (including visual resources), wildlife, cultural, historical, archaeological, and water resources data. As described in this report, "transmission alternatives" includes future transmission lines and transmission options stemming from the "transmission planning process". The "transmission planning process" is a series of related actions intended to achieve stated objectives including, but not limited to maintaining reliability of the Bulk Power System while addressing load growth, congestion, reliability, and public policy (e.g., Renewable Portfolio Standards, greenhouse gas emission reductions). Figure 2 depicts select related components comprising the transmission planning process as it pertains to local, subregional, and regional transmission planning. These components are part of the RTEP project managed by the WECC TEPPC. Reference to "transmission planning process" in this report refers to the RTEP project.

Figure 2. Transmission Planning Process Components



To date, the EDTF has focused primarily on transmission; however, members understand the inherent linkage between transmission and resource generation. Transmission connects generation to load; hence the location of generation affects the location of transmission and ultimately, the potential impacts of this transmission on environmental and cultural resources. Although the data sets, classification system, and processes described in this report focus on transmission (per EDTF's scope of work), note that some also apply to generation.

Sections 2.1 through 2.5 describe the EDTF's recommendations for incorporating environmental and cultural information into the transmission planning process. Section 2.6 describes work in progress, next steps, and provides a rough order of magnitude cost for each recommendation. The 5 recommendations are interrelated and listed below in descending priority order:

1. Environmental and Cultural Data Sets
2. Land Classification System
3. Guidance and Process
4. Future Stakeholder Involvement
5. Economic Valuation

The description of each recommendation includes the timeframe for implementation (including discrete actions in the short, mid, and long-terms). Figure 3 shows the relationship of these recommendations to one another. For example, the Land Classification System recommendation relies on data sets generated by the Environmental and Cultural Data Sets recommendation; implementation of the Environmental and Cultural Data Sets and Land Classification System recommendations relies on the Guidance and Process recommendation. The Future Stakeholder Involvement recommendation reflects the dynamic nature of environmental and cultural information as well as the continual improvement of Guidance and Process.

Figure 3. Relationship of the Recommendations

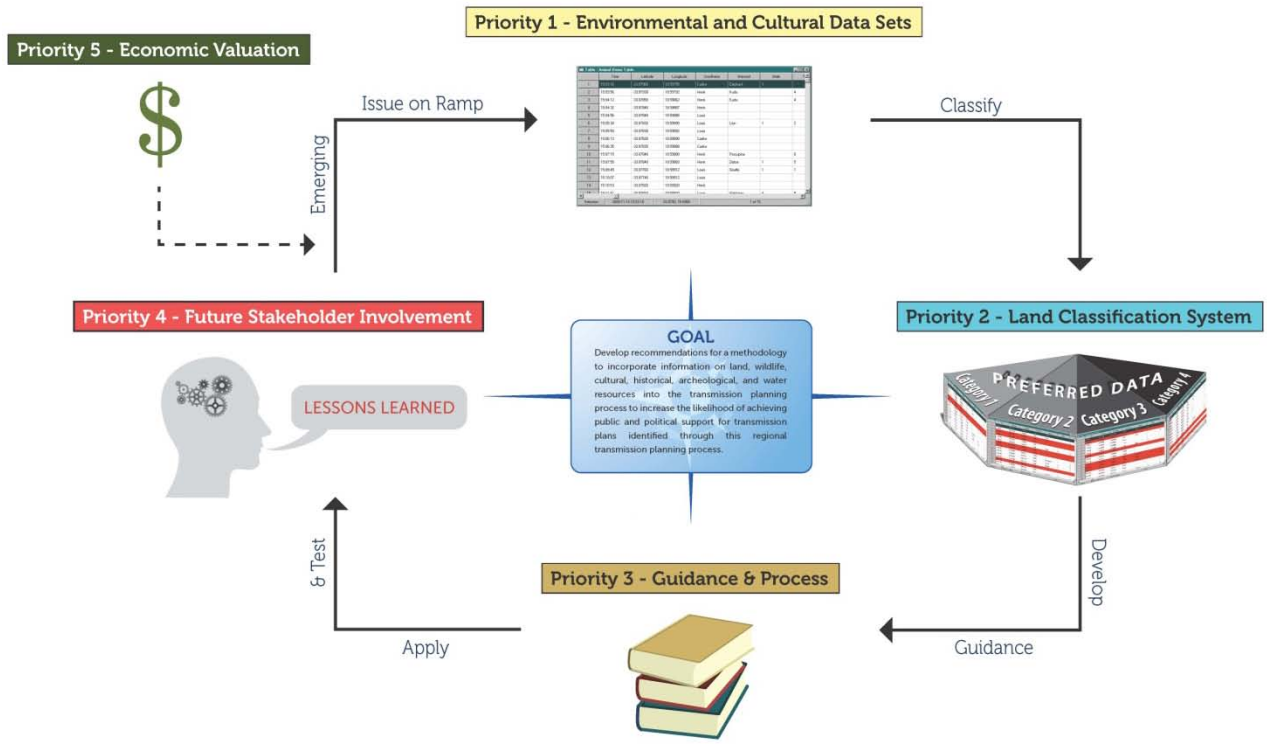
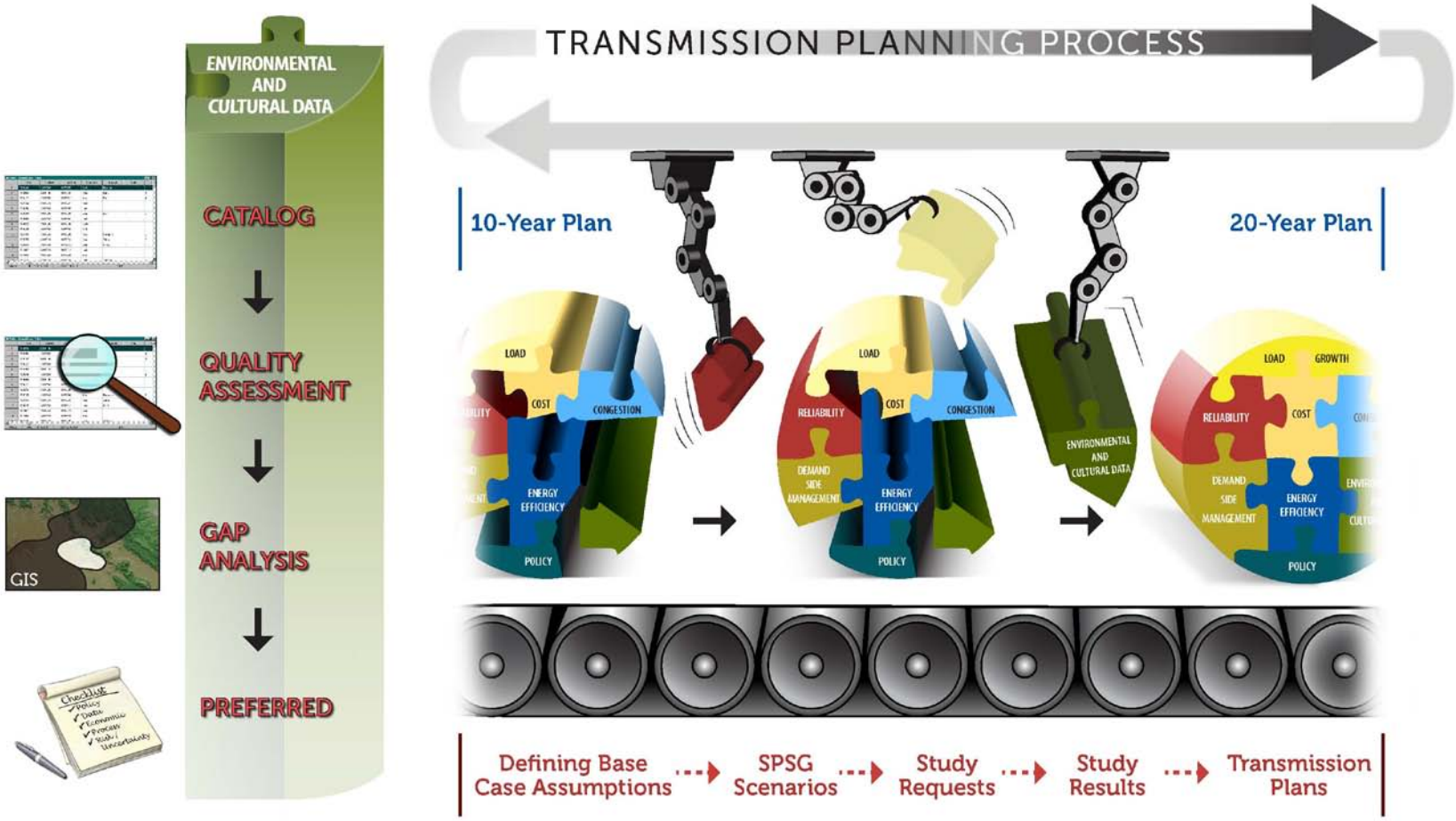


Figure 4 illustrates the incorporation of environmental and cultural data in the transmission planning process via the long-term planning tool currently under construction by the WECC TEPPC. The EDTF's recommendations provide methodologies and processes to achieve this goal. In the near term, these recommendations focus on the 2011 10-Year Regional Transmission Plan. Each recommendation also identifies short-, mid-, and long-term implementation components. **Short-term** is the current period through submittal of the first 10-Year Regional Transmission Plan on September 30, 2011; **mid-term** is September 30, 2011 through 2013; and **long-term** is the period after 2013.

Figure 4. Incorporating Environmental and Cultural Data into the Transmission Planning Process



2.1 Environmental and Cultural Data Sets

The EDTF produced an initial catalog of spatially explicit (GIS) environmental and cultural data sets preferred for transmission planning. The EDTF recognizes "preferred" refers to the quality of readily available data sets and recommends:

- Developing workarounds for relevant data that are inaccessible or unavailable.
- Using this catalog of data sets (or subsequent iterations) to plan for and evaluate potential transmission alternatives.
- Sharing the data set catalog with a larger, diverse stakeholder group for further review and refinement.
- Implementing a process to ensure that up-to-date and appropriate data sets are included in the catalog moving forward.
- Determining an appropriate forum for hosting and maintaining the data catalog.[7]
- Including in the TEPPC planning protocol a process to review and validate data sets for update and inclusion by appropriate stakeholders, either the EDTF or its successor.

Implementation Timeframe

Short-term (through 9/30/2011)	Mid-term (9/30/2011 – 2013)	Long-term (beyond 2013)
• Coordinate with Western Electricity Coordinating Council (WECC) staff and technical contractors preparing the Study Case Development Tool (SCDT) and the Network Expansion Tool (NXT) to ensure alignment of terminology and compatibility between the input requirements of these long-term planning tools and the preferred data set catalog. • Make the data set catalog available for review and use by a diverse group of stakeholders.	• Work with WECC staff and technical contractors preparing the SCDT and the NXT to integrate the preferred data set catalog with these long-term planning tools. • Through use of the SCDT and NXT, apply the preferred data set catalog (and workarounds for inaccessible or unavailable data) to plan and evaluate potential regional transmission alternatives. • Perform annual updates of the preferred data set catalog, including opportunities for input by diverse stakeholders.	• Perform annual updates of the data set catalog, including opportunities for input by diverse stakeholders. • Transfer the data set catalog to the appropriate entity for hosting and incorporating any annual updates.

2.2 Land Classification System

The EDTF developed an initial environmental and cultural resource risk classification system (see Figure 5), consisting of categories 1 (lowest risk) to 4 (highest risk), that organized land areas (area types) by their suitability for transmission development based on their environmental and cultural sensitivities or constraints (see Section 3 or Appendix D of this document for a list of categorized area types).[8] The EDTF recommends applying this risk classification system (or future iterations) to the environmental and cultural data sets (see Environmental and Cultural Data Sets recommendation in Section 2.1) to plan and evaluate potential transmission alternatives. The EDTF recommends developing procedures for applying this risk classification system, including identifying outcomes of the evaluation to potential transmission alternatives. The EDTF will work with WECC and its technical contractors to integrate this approach into

[7] The data set catalog is a listing of data themes, files, and sources appropriate for use in transmission assessments; it is not a database of the actual data.

[8] Tables 5 and 6 in Section 3 illustrate classification systems from several other studies which EDTF reviewed in the development of the four-category risk classification system identified in this section. These classification systems vary widely in the number of categories and criteria for assigning area types to categories.

their long-term planning tools and the transmission planning process (e.g., 10-year plan). The EDTF recommends that the risk classification system be shared with a larger, diverse stakeholder group for further review and refinement.

Proposed Risk Classification System Categories[9]

1. **Least Risk of Environmental or Cultural Resource Sensitivities and Constraints:** Areas with minimal identified environmental or cultural resource constraints and with existing land uses or designations that are compatible with or encourage transmission development. These areas would present few or minimal environmental and cultural mitigation requirements and are least likely to result in project delays.[10]
2. **Low to Moderate Risk of Environmental or Cultural Resource Sensitivities and Constraints:** Areas where development may encounter one or more environmental or cultural resource sensitivities or constraints that would require low to moderate permit complexity or mitigation costs. This category also includes areas in the Protected Areas Database of the United States (PAD-US) dataset that have an unknown land use designation or degree of restriction to transmission development.
    a. Areas which contain ecosystems or species that are at low to moderate risk (see Table D-2 for further explanation)
    b. Audubon State Important Bird Areas
    c. Natural hazard areas (e.g., flood zones)
    d. Agricultural lands except for Prime Farmland
    e. Other incompatible land uses, property ownership patterns (e.g., small parcel sizes with various ownerships), or population density (e.g., urban fringe areas)
    f. Areas which are included in the PAD-US dataset that are not further categorized based upon known policies, regulations, or land use designations (see Table D-2 for examples)[11]
3. **High Risk of Environmental or Cultural Resource Sensitivities and Constraints:** Transmission development is likely to encounter one or more environmental or cultural resource sensitivities or constraints that will substantially increase permitting complexity and which could result in project delays and high mitigation costs. This category also includes areas identified as avoidance areas (based on environmental and cultural sensitivities) in Canada from the Western Renewable Energy Zones (WREZ) Phase 1 Report[12].
    a. Designated critical habitat for federally listed species

[9] In order to allow the creation of a seamless (without gaps) data coverage for the Western Interconnection, definitions for categorizing area types that are not purely environmental or cultural in nature (e.g., Military Bases and Ranges) have been included in the Proposed Risk Classification System Categories.

[10] This category reflects environmental and cultural sensitivities and does not address legal, financial, safety, reliability, or engineering considerations. Private land will only fall into this category if it meets both listed criteria.

[11] The PAD-US recommendations considers "protected areas" to be any lands dedicated to the preservation of biological diversity and to other natural, recreation and cultural uses, and managed for these purposes through legal or other effective means (http://www.protectedlands.net/padus/design.php). Many of these areas with known laws, regulations, or policies that may apply to commercial development fall into either Category 4 (e.g., Wilderness Areas) or Category 3 (e.g., National Monuments); however, the dataset also includes areas under local jurisdiction, where uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a risk of encountering environmental or cultural constraints or increased permitting complexity.

[12] Western Renewable Energy Zones - Phase 1 Report. Western Governors' Association. June 2009. http://www.westgov.org/rtep/219

b. Mapped, state-designated wildlife corridors and crucial big game winter range/severe winter range[13]
c. Audubon Globally Important Bird Areas
d. Areas mapped by state or federal agencies as core habitat areas for key imperiled federal candidate or listed wildlife species
e. *Agricultural areas designated as Prime Farmland [PARKING LOT]*[14]
f. Federal, state, or provincial sites that do not preclude transmission development but substantially limit it due to land use designations whose primary purpose is to protect natural and cultural resources
g. State or provincial wildlife management areas or designated migration corridors
h. Military bases and ranges
i. Areas with irreplaceable natural or cultural resources (see Table D-2 for further explanation)

4. **Areas Presently Precluded by Law or Regulation:** Areas where transmission development is presently precluded by federal, state, or provincial law, policy[15], or regulation, and areas identified as exclusion areas (based on environmental and cultural sensitivities) in Canada from the WREZ process.

Implementation Timeframe

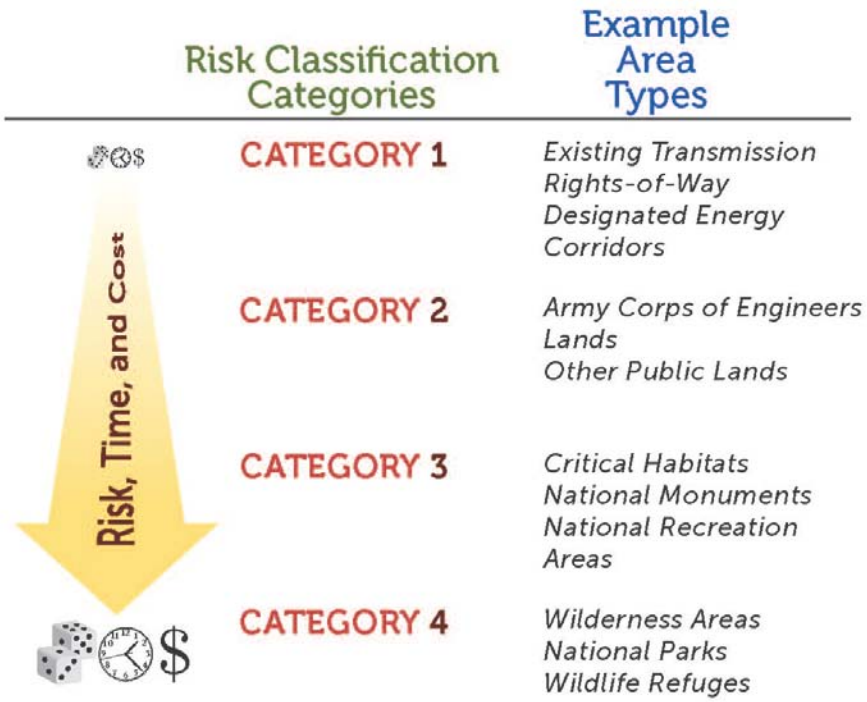
Short-term (through 9/30/2011)	Mid-term (9/30/2011 – 2013)	Long-term (beyond 2013)
• Coordinate with Western Electricity Coordinating Council (WECC) staff and technical contractors preparing the Study Case Development Tool (SCDT) and the Network Expansion Tool (NXT) to ensure alignment of terminology and compatibility between these long-term planning tools and the results of applying the risk classification system.	• Perform an annual review and as necessary, refine the risk classification system based on emerging issues, changing circumstances, and updates to the environmental and cultural data set catalog. • Work with WECC staff and technical contractors to integrate the results of applying the risk classification system into their long-term planning tools and the transmission planning process. • Apply the results of the risk classification system (and future iterations) to plan and evaluate potential transmission alternatives.	• Perform an annual review and, as appropriate, refine the risk classification system. • Apply the results of the risk classification system (and future iterations) to plan and evaluate potential transmission alternatives.

[13] The Western Governors' Wildlife Council is working with state wildlife agencies to develop Decision Support Systems that will utilize landscape-level mapping to show crucial wildlife habitat and wildlife corridors. These Decision Support Systems will provide valuable data to inform transmission planning in the future; however, until they are completed, available data from state agencies pertaining to wildlife habitat or other sources may provide workaround sources of data to inform transmission planning.

[14] Issues marked as "Parking Lot" are still under consideration by the EDTF; these portions of the category definitions may change following issuance of this report.

[15] Policy refers to official agency management direction (such as Secretarial Orders, Instruction Memoranda, or land use plans) that governs on the ground land uses.

Figure 5. Relationship of Proposed Categories to Risk, Time, and Cost



2.3 Guidance and Process

The EDTF recommends that it, in cooperation with WECC staff, draft an amendment to the TEPPC Planning Protocol (for consideration by TEPPC) to augment the existing WECC regional transmission planning process with a comparison of future transmission alternatives based on criteria derived from the environmental and cultural data sets (see Recommendation 1). The EDTF recommends that this proposed amendment also describe a process for maintaining and updating these data sets; reporting results of comparing transmission alternatives (i.e., future transmission lines and transmission options stemming from the transmission planning process) based on these environmental and cultural criteria; providing workarounds for data gaps; and describing an integrated and complementary approach for considering these data sets with respect to generation evaluation and transmission planning.

Implementation Timeframe

Short-term (through 9/30/2011)	Mid-term (9/30/2011 – 2013)	Long-term (beyond 2013)
• Draft a process for ensuring the preferred data set catalog remains up-to-date and for using the preferred data set catalog to plan and evaluate transmission alternatives. • Draft a process for ensuring the risk classification system remains up-to-date and for using the results of applying the risk classification system to plan and evaluate transmission alternatives.	• Draft and submit for the Transmission Expansion Planning Policy Committee's (TEPPC's) consideration, an amendment to the TEPPC planning protocol that includes a process for: (1) reviewing and validating environmental and cultural data sets; (2) reviewing and updating the risk classification system; and (3) applying the preferred data set catalog and risk classification system to plan and evaluate transmission alternatives. In addition, identify the appropriate forum for hosting and maintaining the data set catalog and classification system. • Perform an annual review and update of the data catalog and classification system, including opportunities for input by diverse stakeholders.	Not applicable

2.4 Future Stakeholder Involvement

EDTF recommends working with WECC staff to conduct regular outreach (e.g., share lessons learned, leverage complementary efforts, and incorporate feedback from previous planning cycles), including and beyond current RTEP stakeholders, to inform evaluation and improvement of the integration of environmental and cultural information into regional transmission planning.

Implementation Timeframe

Short-term (through 9/30/2011)	Mid-term (9/30/2011 – 2013)	Long-term (beyond 2013)
• Draft an outreach plan that includes: target organizations; the goals, approach, and timeframe of outreach; and a process for obtaining input from outreach efforts.	• Work with Western Electricity Coordinating Council (WECC) staff to conduct annual outreach to diverse stakeholders within and outside of the Regional Transmission Expansion Planning (RTEP) project. • Prepare an annual report and work with WECC staff to apply lessons learned from stakeholders to the transmission planning process.	• Continue to perform annual outreach, prepare annual outreach reports, and work with WECC staff to apply lessons learned from stakeholders to the transmission planning process.

2.5 Economic Valuation

In 2011, EDTF will work with technical contractors to explore existing data on the economic values of environmental/cultural goods and services for use in the long-term planning tool.

For use in the 2013 plans, EDTF will evaluate methods and recommend a rigorous, defensible and risk-based approach to incorporate economic values of environmental/cultural goods and services into the regional transmission planning process.

Implementation Timeframe

Short-term (through 9/30/2011)	Mid-term (9/30/2011 – 2013)	Long-term (beyond 2013)
• Work with Western Electricity Coordinating Council (WECC) staff and technical support contractors to explore existing data on the economic values of environmental/cultural goods and services for use in the long-term planning tool.	• As necessary, work with WECC staff and technical support contractors to incorporate existing data on the economic values of environmental/cultural goods and services into the long-term planning tool. • Through a case study or other means, evaluate methods and recommend a rigorous, defensible, and risk-based approach to incorporate economic values of environmental/cultural goods and services into the regional transmission planning process.	• Apply the recommended approach for incorporating economic values of environmental/cultural goods and services into the regional transmission planning process via the long-term planning tool.

2.6 Future Work

This section describes future work should the recommendations be adopted and non-binding, rough order of magnitude cost estimates for each recommendation.

2.6.1. Work in Progress

The EDTF made substantial progress in developing the data catalog and classification system described in the first two recommendations Environmental and Cultural Data Sets and Land Classification System; however, as is the nature of data, gaps exist and data are dynamic. For example, whereas environmental and cultural resources over much of the Western Interconnection (see Figure 6) are mapped, qualitative and sensitive information on private and tribal lands is not included in the data catalog because this data is inaccessible. As part of the Environmental and Cultural Data Sets and Land Classification System recommendations, workarounds will need to be developed to address these and other data gaps. It is envisioned that these workarounds will be documented in the Guidance and Process recommendation and will in turn be continually improved through the Future Stakeholder Involvement recommendation.

2.6.2. Rough Order of Magnitude Cost Estimate

Table 1 provides an initial rough order of magnitude cost estimate to implement each recommendation. The rough order of magnitude costs are based on multiple assumptions including, but not limited to the following:

1. Costs reflect the estimated level of effort for a contractor to support the implementation activities identified in the Implementation Timeframe box of each recommendation (see Sections 2.1 through 2.5).
2. Costs for conducting one annual review of the data inventory spreadsheet[16] and risk classification system in the mid-term (September 30, 2011 – December 31, 2013) are included.
3. Costs for meeting rooms, meeting food/drink, audio/visual rental, telephone lines, Internet connections, and non-governmental organization reimbursement are not included.

[16] *Data Inventory Spreadsheet, Version 6 May 6, 2011. http://www.wecc.biz/*

4. Costs for WECC staff and WECC technical support contractors developing the Study Case Development Tool (SCDT) and Network Expansion Tool (NXT) are not included.
5. Costs for the third and subsequent annual updates for the Environmental and Cultural Data Sets and Land Classification System recommendations are not included because it is assumed the data inventory spreadsheet and risk classification system are transferred to a non-WECC entity for maintenance after December 31, 2013.

Table 1. Rough Order of Magnitude Cost Estimate to Implement EDTF Recommendations

Recommendation	Total
1 – Environmental and Cultural Data Sets	$250,000
2 – Land Classification System	$250,000
3 – Guidance and Process	$125,000
4 – Future Stakeholder Involvement	$175,000
5 – Economic Valuation	$200,000
Total	*$1,000,000*

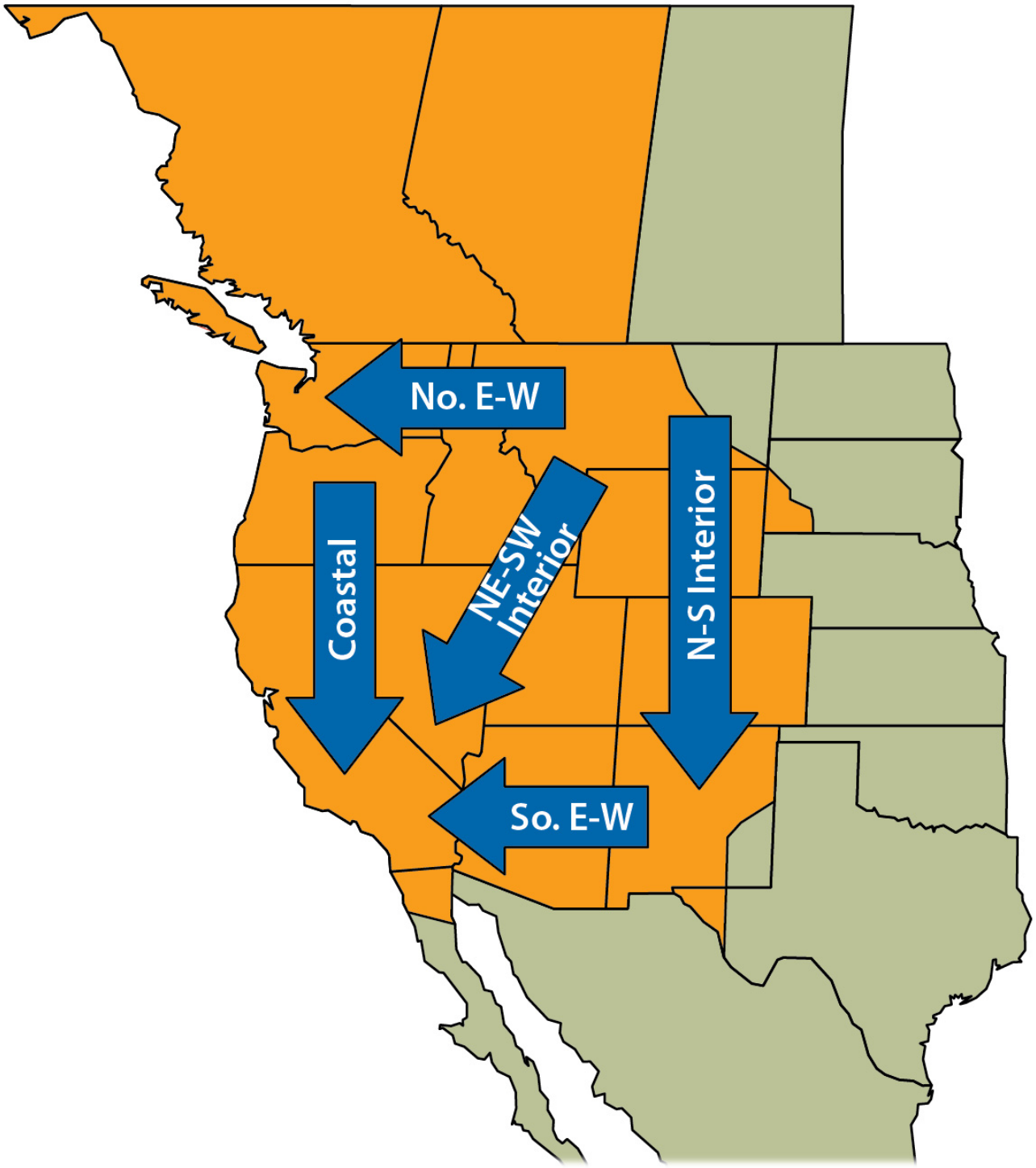
2.6.3. Next Steps

On April 15, 2011, WECC hosted the 20-Year Regional Transmission Plan *Stakeholder Kickoff Webinar*. The webinar included a presentation by WECC technical support contractors describing the SCDT and the NXT. If EDTF's recommendations are adopted, the next step is for WECC and their technical support contractors to convene a meeting for the purposes of aligning terminology and coordinating efforts between developers of the long-term planning tools (i.e., SCDT and NXT) and implementation of EDTF's recommendations. Table 2 provides a format for capturing other tasks that will need to be completed if the recommendations are adopted.

Table 2. Unfinished Tasks and Proposed Schedule for Completion

Unfinished Task	Schedule for Completion
Review and consider replacing the Conservation Biology Institute Protected Areas Database Version 1-1. with the U.S. Geological Survey Protected Areas Database Version 1-2 in the list of preferred data.	Short-term (through 9/30/2011)
Resolve "parking lot" area type classifications: - Prime Farmland - Wetlands - National Historic Trails - Proposed Conservation Area	Short-term (through 9/30/2011)
Review NatureServe's Multi-Jurisdictional Database of Species Occurrence, Ecological Systems Map, and Landscape Conditions Map for inclusion in the list of preferred data.	Short-term (through 9/30/2011)
Consult with Tribes on area type classifications.	Short-term (through 9/30/2011)
Develop environmental criteria to compare transmission alternatives and a process to apply them; use criteria from other processes as a starting point.	Mid-term (9/30/2011 – 2013)
Develop data workarounds for cultural, private lands, and other inaccessible or unavailable data.	Mid-term (9/30/2011 – 2013)
Incorporate the state wildlife Decision Support Systems (DSS) and other state data (such as data layers for state forests, parks and wildlife management areas) into the preferred data as they become available and, as appropriate.	Mid- (9/30/2011 – 2013) to Long-term (beyond 2013)
Continue to collect new GIS datasets as they become available and update already existing datasets as needed.	Long-term (beyond 2013)

Figure 6. Boundary of Western Interconnection and Western Electricity Coordinating Council Path Groups



3.0 Observations and Findings

This section documents the observations and findings from the case study analysis. Insights from these observations and findings resulted in the recommendations listed in Section 2.0 of this document.

Section 3.0 Organization

The development of the recommendations was a multi-step, iterative process that began with the case study. Both during and after completion of the case study analysis, the EDTF and technical support contractor assembled and analyzed information that became the observations (summarized in Section 3.1 below) and, subsequently, resulted in the recommendations in Section 2.0. During this process, three reports (the Preliminary Recommendations Report[17]; Version 1 of the Environmental Recommendations Report, and Version 2 of the Environmental Recommendations Report) were released, reviewed, and commented on by the EDTF. In addition, during this period the EDTF and the EDTF methods subgroup hosted multiple webinars and in-person meetings to discuss and refine the results and direction of the case study analysis and the resulting recommendations, including a series of weekly recommendations-development webinars involving the full EDTF. The process leading to the final version of the Environmental Recommendations Report has, therefore, been an evolutionary one. As the EDTF understanding of the issues associated with incorporating environmental and cultural information into the transmission planning process evolved, some of the case study findings presented in this section have become less obviously traceable to the EDTF's final proposed recommendations. However, in order to document the rigorous process the EDTF undertook to reach the proposed recommendations, this document retains this information.

3.1 Summary Case Study Observations

Table 3 summarizes observations from the Process Interviews and Data Analysis components of the case study analysis. Observations are categorized as: (1) Within the EDTF's scope of work to address through recommendations to the SPSG; and (2) Outside of the EDTF's scope of work. Observations within the EDTF's scope of work were used to develop EDTF's recommendations identified in Section 2.0. Table 3 lists out of scope observations to inform other organizations (e.g., TEPPC) who may have jurisdiction over or interest in these issues. Select, un-summarized observations made by stakeholders during the Process Interviews appear in Appendix E.

Observations in Table 3 contain a short title (in bold text), a summary of the observation (where appropriate), and an observation number (e.g., Data-1 or Process-3). The text portion of the observation number identifies the topic area into which the observation was grouped during the case study analysis. These topic areas included **Data**, **Economics**, **Policy**, **Process**, and **Risk/Uncertainty**; no Risk/Uncertainty-related observations within EDTF's scope of work were identified. The use of these topic areas served to group like observations and facilitated their review during the case study analysis; similarly, these topic areas are retained in this document to facilitate the review of the observations by the reader. The final column in Table 3 links the observations to the EDTF recommendation(s) they influenced.

In addition, Table 3 lists the component(s) of the case study (Process Interviews and/or Data Analysis) that contributed to each summary observation. In many instances, similar or related observations were made during multiple interviews and/or during the Data Analysis. If one or more Process Interviews contributed to the observation, the associated stakeholder type is also listed (see Section 3.2 for list of

[17] *Preliminary Environmental Recommendations for the Transmission Planning Process. February 14, 2011 (Revised February 21, 2011). http://www.wecc.biz/*

stakeholder types). It is important to note that observations included in Table 3 and elsewhere in this report sometimes reflect the opinion of stakeholders and have not been independently verified. In addition, the association of stakeholder types in Table 3 (and elsewhere in this report) with specific observations or recommendations does not necessarily indicate approval or endorsement by these organizations.

Table 3. In Scope and Out of Scope Observations from the Process Interviews (including the contributing stakeholder groups) and Data Analysis and the Recommendation(s) They Influenced

Observation Number and Observation	Process Interviews							Data Analysis[2]	Recommendation(s) the Observation Influenced[3]
	WECC/TEPPC	SPG	WGA	Transmission Developer	State Agency	Federal Agency	NGO		
In Scope[1]									
Data-1. Variable availability and utility of data across the Western Interconnection. Completeness and compatibility of data in adjacent counties, states, or field offices of the same federal agency vary across the region.	X	X		X	X		X	X	Environmental and Cultural Data Sets; Guidance & Process; Land Classification System; Future Stakeholder Involvement
Data-2. Clear categorization of land use constraints. Some land use designations (e.g., wilderness) clearly and statutorily prohibit development whereas other lands may allow development with various impacts, cost, and permitting requirements.	X	X		X	X			X	Land Classification System; Future Stakeholder Involvement
Data-3. Management and processing requirements increase with scale. Requirements for managing and processing data increase as the scale of the planning area increases.								X	Future Stakeholder Involvement; Guidance & Process
Data-4. Excluding select lands from development may force development onto other lands. Excluding select lands from transmission development may force development onto other lands of value to other stakeholders.				X					Guidance & Process; Land Classification System; Future Stakeholder Involvement
Data-5. Gaps on private, state, and tribal lands. Select environmental and cultural data on private, state, and tribal lands may not exist (i.e., not collected or developed), may not exist in digital format, or may not be accessible for various reasons and are thus not readily available.	X					X		X	Future Stakeholder Involvement; Environmental and Cultural Data Sets; Guidance & Process
Data-6. Constraints for DoD installations inject uncertainty into the planning process. Specific geographic and activity constraints associated with DoD installations are not always readily apparent, thereby inserting a measure of uncertainty in transmission planning.		X		X					Land Classification System; Future Stakeholder Involvement

Table 3. In Scope and Out of Scope Observations from the Process Interviews (including the contributing stakeholder groups) and Data Analysis and the Recommendation(s) They Influenced

Observation Number and Observation	Process Interviews							Data Analysis[2]	Recommendation(s) the Observation Influenced[3]
	WECC/TEPPC	SPG	WGA	Transmission Developer	State Agency	Federal Agency	NGO		
Data-7. Metrics measured during planning matter – align with goals. Environmental metrics measured at the planning level should align with the goals for considering these data.				X				X	Guidance & Process
Data-8. Value of transmission siting analytic methods may differ for planning. The value and appropriateness of applying certain analytic methods at the transmission siting scale may differ when applied at the planning scale.								X	Guidance & Process
Data-9. Select data are only considered inherently or informally in planning. Experienced transmission planners inherently consider select environmental information; however, consideration is not formally documented at the regional level.	X	X		X	X				Guidance & Process; Future Stakeholder Involvement; Land Classification System
Data-10. Appropriate scale of environmental information. What scale of environmental and cultural data is useful for each stage of transmission planning (i.e., regional, subregional, local), or, alternatively, what data are available and for what stage of transmission planning are they useful?	X		X	X			X	X	Guidance & Process; Future Stakeholder Involvement; Environmental and Cultural Data Sets
Economics-1. Cost of avoiding environmental and cultural constraints as well as mitigating environmental and cultural impacts. Mitigating (includes avoiding and/or minimizing) the environmental and cultural impacts of transmission lines adds to the cost of the transmission line project. These costs may vary depending on the affected resources, ecosystem services, or jurisdictions. The cost to mitigate and comply with environmental regulations for siting a transmission line is not compiled throughout the Western Interconnection and is, therefore, not available for consideration in transmission planning.	X			X					Economic Valuation

Table 3. In Scope and Out of Scope Observations from the Process Interviews (including the contributing stakeholder groups) and Data Analysis and the Recommendation(s) They Influenced

Observation Number and Observation	Process Interviews							Data Analysis[2]	Recommendation(s) the Observation Influenced[3]
	WECC/TEPPC	SPG	WGA	Transmission Developer	State Agency	Federal Agency	NGO		
Economics-2. Considering the value of environmental and cultural features/areas in the transmission planning process. Transmission planning does not consider the value of environmental features/areas and a process to consider these values is not currently in place.[4]									Economic Valuation
Policy-1. Considering environmental and cultural information during generation planning. Case study analyses indicate the effectiveness of considering environmental and cultural information during transmission planning may be enhanced by also considering these data during the planning of renewable energy generation. Environmental and cultural resources may best be protected by considering the planning of generation prior to or concurrent with the planning of transmission; the location of generation affects the nature and extent of potential impacts from transmission that is proposed to connect the generation to load.	X		X	X	X		X	X	Guidance & Process
Policy-2. Early consideration of siting processes. The feasibility of alternatives stemming from transmission planning and ability to streamline alternative implementation (i.e., permitting and development) may be enhanced through early consideration of other processes which typically occur during siting (e.g., NEPA and WECC Path Rating Review).	X			X			X		Economic Valuation; Guidance & Process
Policy-3. Inconsistent regulations across various agencies and jurisdictions. Various federal, state, and local government environmental and cultural regulations across the jurisdictions that encompass a transmission project are time consuming and cumbersome to the transmission sponsor or developer, frustrating for stakeholders, and complicate the consideration of mitigation/compliance requirements at a screening level during transmission planning.	X		X	X		X	X		Guidance & Process; Economic Valuation

Table 3. In Scope and Out of Scope Observations from the Process Interviews (including the contributing stakeholder groups) and Data Analysis and the Recommendation(s) They Influenced

Observation Number and Observation	Process Interviews							Data Analysis[2]	Recommendation(s) the Observation Influenced[3]
	WECC/TEPPC	SPG	WGA	Transmission Developer	State Agency	Federal Agency	NGO		
Policy-4. Environmental and cultural criteria to screen transmission alternatives. A list of environmental criteria to screen transmission alternatives might serve as a useful screen during future transmission planning, preparation of future 10-year plans by SPGs, compilation of future foundational transmission projects by SCG for inclusion in WECC's 10-year Regional Transmission Plan, or at other stages in transmission planning or siting.	X	X					X		Land Classification System; Guidance & Process
Process-1. Environmental and cultural information is constantly changing. Environmental and cultural information affecting transmission planning is a moving target subject to continual change based on emerging issues, changing circumstances, and advances in science and technology.	X	X		X					Guidance & Process; Future Stakeholder Involvement; Environmental and Cultural Data Sets
Process-2. Maintaining a diverse and engaged stakeholder group. Sustained engagement of diverse stakeholders in transmission planning allows the group to leverage their collective knowledge of environmental and cultural data in transmission planning for purposes of developing more feasible transmission alternatives.	X	X		X	X	X			Guidance & Process
Process-3. Balancing electrical requirements and environmental and cultural considerations. Consideration of environmental and cultural information may occur after transmission alternatives are developed rather than concurrent with the development of transmission alternatives.		X		X	X		X		Guidance & Process
Process-4. Diversity of stakeholders needed in planning to support subsequent siting. The electrical engineers have critical input to transmission planning; however, it is not sufficient. More stakeholders and more perspectives from more disciplines should be brought into the process in a constructive manner to support the process.	X	X		X	X	X	X		Guidance & Process

Table 3. In Scope and Out of Scope Observations from the Process Interviews (including the contributing stakeholder groups) and Data Analysis and the Recommendation(s) They Influenced

Observation Number and Observation	Process Interviews							Data Analysis[2]	Recommendation(s) the Observation Influenced[3]
	WECC/TEPPC	SPG	WGA	Transmission Developer	State Agency	Federal Agency	NGO		
Process-7. Collaboration with the SPSG. Work collaboratively with the SPSG for a list of basic criteria that could be used in the future to assess the potential impacts of transmission projects on environmental and cultural resources.	X								Guidance & Process
Out of Scope[1]									
Policy-5. Transmission developers (i.e., regulated, independent, etc.) are subject to inconsistent environmental and cultural regulations. This regulatory inconsistency can lead to competing transmission projects without a well-established purpose and need, resulting in confusion and conflict in land use planning and permitting processes and an inefficient use of time and resources.		X		X					Not applicable
Process-5. Consider non-wire transmission alternatives. Formally consider and document the analysis of non-wire alternatives such that subsequent proposals to build new transmission lines can credibly demonstrate the need for a wire alternative.	X						X		Not applicable
Process-6. Transparency of environmental and cultural considerations. Improving the transparency of environmental and cultural considerations by SPGs and their constituent transmission developers.				X	X				Not applicable
Process-8. Identify broader public benefits in alternatives from transmission planning.				X			X		Not applicable

Table 3. In Scope and Out of Scope Observations from the Process Interviews (including the contributing stakeholder groups) and Data Analysis and the Recommendation(s) They Influenced

Observation Number and Observation	Process Interviews							Data Analysis[2]	Recommendation(s) the Observation Influenced[3]
	WECC/TEPPC	SPG	WGA	Transmission Developer	State Agency	Federal Agency	NGO		
Risk/Uncertainty-1. Consideration of permitting uncertainty. The perception exists that the risk or uncertainty associated with the potential for delay or failure to successfully permit a transmission alternative is not assessed during transmission planning.	X			X			X		Not applicable

[1]See Environmental Data Task Force scope of work.
[2]Data Analysis refers to observations that resulted from either the data compilation or modeling portions of the case study Data Analysis.
[3]This column provides the recommendation title; the full text of these recommendations appears in Section 2.0.
[4]Observation originated from EDTF members, not the case study.

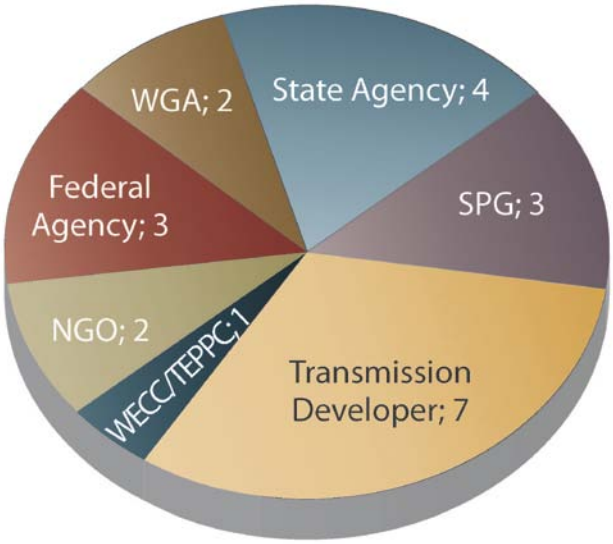
DoD	Department of Defense
EDTF	Environmental Data Task Force
NEPA	National Environmental Policy Act
NGO	Non-governmental organization
SPG	Sub-regional planning group
SPSG	Scenario Planning Steering Group
TEPPC	Transmission Expansion Planning Policy Committee
WECC	Western Electricity Coordinating Council
WGA	Western Governors' Association

3.2 Process Interviews (Non-spatial)

The Process Interview component of the case study consisted of interviews with 37 individuals from 22 organizations, across 7 stakeholder types (see Figure 7 and Appendix C). Table 3 summarizes the observations identified during these interviews; the full observations made by stakeholders during these interviews appear in Appendix E.

The EDTF Planning Team (a sub-group of EDTF) identified potential interviewees and interview questions; EDTF and interviewees suggested other potential stakeholders to contact for interviews as well as additional interview questions. Initially, potential interviewees received an email that included the interview questions; follow up telephone calls to each candidate determined their interest in participating. Scheduled telephone interviews ranged in length from 30 minutes to over 1 hour. In some instances, interviewees simply chose to complete and return the questionnaire. In all other cases, notes were taken during the telephone interview and subsequently provided to the interviewee to review for accuracy and completeness.

Figure 7. Number of Process Interviews by Stakeholder Organization Type



NOTE: Each organization interviewed only appears once in this figure, regardless of the number of individuals interviewed from that organization; see Appendix C for the number of individuals interviewed by stakeholder type.

NGO	Non-governmental organization	WECC	Western Electricity Coordinating Council
SPG	Sub-regional planning group	WGA	Western Governors' Association
TEPPC	Transmission Expansion Planning Policy Committee		

3.3 Data Analysis (Geospatial or GIS)

The Data Analysis component of the case study resulted in a series of "findings." These findings were generated through the compilation of environmental and cultural data, and by developing and running the geospatial (GIS) models described in Appendix C of this document and the Environmental Data Task Force Case Study Technical Approach - Version 1-3. Input from EDTF members and reviews of findings in other relevant studies and reports were also considered in developing findings (see Appendix F for a high level review and summary of select other stakeholder-driven processes). Each finding includes a brief statement of the issue, which may be represented as either a challenge or opportunity, encountered

during the Data Analysis, followed by the potential implication of the finding for the use or incorporation of environmental and cultural data into transmission planning.

3.3.1. Data Compilation

The data compilation effort encountered several issues that affected the ability to effectively compile data. Several of these issues are commonly encountered by geospatial data consumers working in multiple industries and geographies. Some of the issues, described in the findings below, relate to the way in which providers of geospatial data prepare and distribute their data. Data providers should be acknowledged for the service that they perform, but improvements to the data provision processes could substantially enhance the ability of data consumers to efficiently and effectively incorporate environmental and cultural data into transmission planning. Table 4 provides an overview of data compilation findings 1 through 7; detailed explanations of each finding follow the overview table.

The Data Analysis component of the case study involved Data Compilation and GIS-Based Modeling.

In addition to general findings made while cataloging, collecting, and reviewing data for the Data Analysis, a number of issues within specific topics of data (e.g., agricultural lands or wildlife corridors) arose. Appendix E lists these topic-specific observations, as well as their potential implications for alternatives.

Finding 1: Data Gaps: Data does not exist or does not exist in a GIS-accessible format

Issue Observed: Select data identified by EDTF members and other sources as important to the transmission planning process do not exist as digital data layers, do not exist in a GIS-accessible format, or have not been produced by a data provider. For example, EDTF members suggested natural resources data on private land as important to consider during transmission planning. The case study revealed that comprehensive digital layers of this type of data do not exist. Also mentioned was a national scale database proposed for development by the U.S. Fish and Wildlife Service (USFWS) to inform risks to birds, wildlife and habitat for use in high-level siting decisions for wind development. This database, while under consideration by the USFWS, is still in the early stages of development.[18] A similar issue was encountered during the compilation of cultural resource data.

Implication: Data gaps may require workarounds to provide complete consideration of environmental and cultural resources.

Data gaps are common in environmental and cultural analyses, particularly for plant and animal species and cultural resources distribution data, and generally result from resources only being recorded in locations where surveys have been performed. In non-surveyed areas, an absence of data does not imply an absence of resource, as the presence or absence of the resource is simply unknown. To address this data gap, scientists may employ GIS-based modeling methods as proxies for mapping actual recorded data. For example, organizations have developed GIS-based species habitat suitability models for Habitat Conservation Plans in the West to characterize lands in which it is expected that a species of plant or animal will occupy. These models are based on observable conditions such as elevation, vegetation, soils, and water availability. Public agencies also develop such models, for example the U.S. Geological Survey Desert Tortoise model. Similarly, cultural resources models estimate the probability of resource sensitivity, based on "mappable" criteria, and the experience and professional judgment of subject matter experts.

[18] *Personal Communication between Joe Walsh, ICF International, and Rachel London, U.S. Fish and Wildlife Service, Arlington, Virginia. 2011.*

Table 4. Select Data Layers and Examples that Informed Data Compilation Findings 1 through 7

Data Layer	Data Provider	Finding 1: Data Gaps	Finding 2: Inaccessible Data	Finding 3: Data Format	Finding 4: Documentation	Finding 5: Quality	Finding 6: Seamlessness	Finding 7: Accessible High Quality Environmental and Cultural Data
California Wildlife Habitat Relationships	California Department of Fish and Game	-	-	-	No metadata included	-	-	-
Conservation Easements, Grassland Reserve Program, Wetlands Reserve Program	Natural Resources Conservation Service	-	Data requires a request to a specific staffer	-	-	-	-	-
Cultural Resources	State Historic Preservation Offices	Data may not exist or may be stored in non-GIS formats	Data not accessible	-	-	-	-	-
Natural Resources on Private Lands	-	Data may not exist	Some data requires execution of a license agreement	-	-	-	-	-
PAD-US 1.1[1]	Conservation Biology Institute	-	-	-	-	-	-	Provides a seamless list of WECC-wide initiative data for use in transmission planning
Multi-Jurisdictional Database of species occurrence	NatureServe	-	Data available for a fee	-	-	-	-	Provides a seamless list of WECC-wide initiative data for use in transmission planning
Soils/Prime Farmland	Natural Resources Conservation Service	-	-	Data requires pre-processing for use in GIS	-	-	-	-

Table 4. Select Data Layers and Examples that Informed Data Compilation Findings 1 through 7

Data Layer	Data Provider	Finding 1: Data Gaps	Finding 2: Inaccessible Data	Finding 3: Data Format	Finding 4: Documentation	Finding 5: Quality	Finding 6: Seamlessness	Finding 7: Accessible High Quality Environmental and Cultural Data
Visual Resources	Bureau of Land Management	-	Data stored at the individual BLM Field Office level	-	-	-	Lack of seamlessness	-
Wildlife Habitat/Corridors[2]	States	-	-	-	-		Lack of seamlessness; area types abruptly end at state lines[3]	-
WREZ Exclusion Areas[4]	National Renewable Energy Laboratory/Black & Veatch	-	Data layers not identified	-	Partial metadata included. No lineage; layers that contributed to exclusions cannot be discovered.	Attributes are insufficient to identify individual area types.	-	-
Canadian Environmental and Cultural Data	Environment Canada	-	Data not consistently available in a digital format	-	-	-	-	-

[1]During final production for this report the U.S. Geological Survey Gap Analysis Program version 1.2 of the PAD-US data set was released; the EDTF recommends the use of this more recent data set for future efforts.
[2]In addition to corridor data provided by state agencies, non-governmental organizations collect and make available wildlife corridor data for portions of the Western Interconnection. Though not identified as preferred data by the EDTF, the data inventory spreadsheet contains additional information about these data sources.
[3]The Western Governors' Association is currently working with states to make wildlife data layers seamless for crucial habitat across the Western U.S. by 2013.
[4]Western Renewable Energy Zones - Phase 1 Report

BLM Bureau of Land Management
GIS Geographic Information System
PAD Protected Areas Database
WREZ Western Renewable Energy Zones

Finding 2: Inaccessible data: Data exists but is not accessible

Issue Observed: Select data layers identified as important for transmission planning were not accessible. Specifically, data were either difficult to discover and/or the data, once discovered, were not readily available from the data provider. Reasons for data inaccessibility vary, but tend to include a human factor. For example, when data are only available through a request to a person, rather than via an automated website or FTP site, miscommunications and delays may occur. Alternately, some data that could likely be made publicly available requires a license agreement before the data can be provided (see Appendix G for an example).

For example, EDTF identified the WREZ - Phase 1 Report data as potentially useful for transmission planning. While the WREZ project website provided a download of the final exclusions data layer, this layer did not contain the identification of each excluded area type (i.e., whether it was a wilderness area, state park, etc.) in the attribute table or metadata (metadata was absent or partially complete). Because the WREZ exclusions data layer was derived or interpreted from other source data layers, a data user would need additional supporting documentation and/or the additional data layers that were used to derive the exclusions to fully understand the information provided in the data layer.

A second example is Canadian environmental and cultural data sets. During the case study, Environment Canada indicated that some datasets are not yet in a digital format or have been digitized but not yet vetted for public use. Some province-level data sets are available, although some (e.g., Alberta) are only available for a fee. An aggregated form of some Canadian protected area data (e.g., Alberta Wilderness Areas or British Columbia Ecological Reserves) is available as part of the WREZ data layer; however, as described in the preceding paragraph, this data layer does not contain identifying information for each area type, making it impossible to remove or update boundaries for specific area types.

Implication: When the data collected and used in one study is inaccessible to future studies, the ability to carry over data sets and lessons learned, and to replicate analysis, is diminished. Analyses that incorporate environmental and cultural data are most effective where they allow future projects to apply and benefit from their data and methods.

Accessibility of data is a key issue for transmission planners attempting to incorporate environmental and cultural data into planning efforts. The case study found that data collection is in large part a process of discovery. Many data sets are well known, quite accessible, and routinely used on planning projects. However, other non-proprietary data sets that could be publicly available are neither publicized nor readily available to users. Inaccessible data sets may not be available through public websites or web searches, or may be stored in places that make their discovery unlikely. In some cases, a user may be required to make personal contact via phone or email with an individual provider, request the data, and wait for the data to be delivered (on the schedule of the provider) before they can begin to review and apply the data. Such difficult to navigate data distribution processes may cause delays and impediments to data collection, and may result in potentially useful data layers not being considered.

Another aspect of data accessibility is monetary cost – data may be available, but the provider might charge a fee for its use, thereby reducing its accessibility to some projects. Although most public agencies provide geospatial data at no or nominal charge, some exceptions exist. For example, the California Natural Diversity Database[19] (CNDDB) charges users an annual subscription fee, and the Nevada Natural Heritage Program[20] charges users a per-record fee for geospatial data of species occurrences. Data costs from value-added commercial data providers (such as those providing locations of hazardous waste sites or transmission facilities) can be substantial. Data costs and/or license agreements could inhibit the use of some potentially useful data during planning. In addition, the availability of data for a fee could prove difficult for the TEPPC/WECC process that is open, transparent

[19] *California Natural Diversity Database. Department of Fish and Game, State of California. April 2011. http://www.dfg.ca.gov/biogeodata/cnddb/*

[20] *Nevada Natural Heritage Program. Department of Conservation and Natural Resources, State of Nevada. April 2011. http://heritage.nv.gov/reqintro.htm*

and includes publicly available data. Licensing fees may contradict or restrict the ability to use such data in the transmission planning process for analysis at the regional and sub-regional level.

Finding 3: Data format: Data not in ESRI GIS format

Issue Observed: The case study generally obtained geospatial environmental and cultural data layers in ESRI GIS formats (typically shapefile, geodatabase, and grid formats - see the data inventory spreadsheet for details). Data in these formats may not be directly readable by non-GIS software and models used in transmission planning. In addition, some geospatial environmental and cultural data layers were not in a format that was compatible with GIS software, and required preprocessing. For example, the Natural Resources Conservation Service State Soil Geographic (STATSGO) soils data required preprocessing of data tables in certain versions of Microsoft® Access, and joining of tables to area types in the shapefile. Such preprocessing requires time that, subsequently, needs to be understood and considered when assessing planning process schedules.

Implication: If transmission planning models are not compatible with geospatial data in ESRI format, a data translation mechanism (either an existing ESRI geoprocessing tool or a new software application) would be needed before GIS modeling could occur.

Finding 4: Documentation: Data layers are not documented

Issue Observed: Several data layers collected were missing electronic metadata and other forms of documentation (see Table 4 for examples).

Implication: A lack of metadata or other documentation reduces a data user's ability to understand the content, value, and limitations of a data set. By not fully understanding data layers, improper application of the data or a lack of confidence in the results of geospatial analyses may occur. Subsequently, these issues may affect a decision-makers' ability to defend decisions based on that undocumented data. Ideally, every geospatial environmental and cultural data layer would be accompanied by complete Federal Geographic Data Committee compliant metadata.

Finding 5: Quality: Data does not meet quality or fitness-for-use standards

Issue Observed: Through implementation of the Data Quality Protocol: Identification of Preferred Geospatial Data Sets[21], the case study found several data layers to be deficient in one or more data quality components (see Table 4 for examples).

Implication: Using data that do not meet quality standards limits the effectiveness of spatial analysis results and could potentially affect transmission planning decisions. Ideally, all preferred data layers would achieve the highest ratings in all quality fitness-for-use criteria and would meet quality standards appropriate for regional transmission planning.

Finding 6: Seamlessness: Data is not seamless across jurisdictions

Issue Observed: Seamlessness (i.e., whether a data layer contains complete coverage of area types within the Western Interconnection) was found to be a data quality component that was lacking for multiple data layers. A lack of seamlessness may result in abrupt changes of area types at administrative boundaries, such as state lines.

Implication: Using non-seamless data can result in an analysis that considers one type of environmental or cultural resource across one area location, but not in another geographic location. This condition can bias planning decisions by suggesting that a lack of mapped sensitive area types indicates an absence of those area types.

[21] *Data Quality Protocol: Identification of Preferred Geospatial Data Sets. January 12, 2011 (Draft) Approved With Comments by the EDTF on January 20, 2011 - Revised to Address EDTF Comments on January 23, 2011. http://www.wecc.biz/*

The Western Governors' Association is leading the development of state wildlife and water availability GIS data sets that are consistent across state boundaries. One of the Western Governors' Wildlife Council's primary tasks is "to establish a useful and consistent source of mapped biological information across the Western States that decision makers and the public can use to identify and better understand crucial wildlife habitat and corridors."[22] When the project is complete (currently scheduled for 2013) a Western Interconnection seamless database will be available for use in transmission planning.[23] However, other similar data seamlessness issues, such as with visual resource data layers on Bureau of Land Management (BLM)-administered lands, would still remain.

Finding 7: Accessible high quality environmental and cultural data is available

Issue Observed: Great strides have been made in the development, packaging, and delivery of geospatial data to meet the increasing demands of data consumers over the past 10 to 20 years. Findings 1 and 2 noted that the case study Data Analysis encountered specific issues with data gaps and data accessibility. While the examples of data gaps or inaccessible environmental and cultural data in Findings 1 and 2 are real, the general trend is towards increasingly abundant geospatial data being delivered to end users in innovative, efficient, and convenient ways. However, for some area types, such as private lands, it must be acknowledged that substantial data gaps still exist.

Examples of the "packaging" of geospatial data are the PAD-US data set, which currently exists in two versions -- U.S. Geological Survey Gap Analysis Program PAD-US 1.2[24] edition and the Conservation Biology Institute PAD-US 1.1[25] (CBI Edition), and NatureServe's Multi-Jurisdictional Database of species occurrence. While the Data Analysis used the CBI Edition, the U.S. Geological Survey Edition, which is produced by a government agency, was updated during the preparation of this report and now represents the more recent data source for use in regional transmission planning. Both PAD-US datasets represent a largely successful attempt to assemble data sets from disparate sources, apply a standard template of data attributes, document with metadata, and deliver essential planning data in a repackaged form convenient for end users. In addition, NatureServe's Multi-Jurisdictional Database of species occurrence provides, for a fee, a compilation of species occurrence locations and attributes that have been compiled from the natural heritage (or equivalent) programs that operate at the state level. While users may obtain element occurrences data directly from the individual state programs, the NatureServe Multi-Jurisdictional Database provides several advantages:

- A one-stop source of compiled data that is seamless across the Western Interconnection.
- Global conservation status rank values (which may or may not appear in the individual state natural heritage program data sets).
- A standard data structure to allow for data comparisons across state boundaries.

Although it contains attributes that may be valuable for regional transmission planning, it should be noted that the information in the Multi-Jurisdictional Database is only as recent as the last update received from the state heritage programs. Therefore, this compiled data set may not be as current as the individual state sources.

An example of innovative and efficient information delivery is the prevalence of GIS map servers that deliver map applications and data through websites. At a basic level, these "web maps" allow a user to

[22] Western Governors' Association Wildlife Corridors Initiative Report. June 29, 2008. http://www.westgov.org/component/joomdoc/doc_download/66-wildlife-corridors

[23] In addition to corridor data sets provided by state or federal agencies, non-governmental organizations also publish wildlife corridor data sets. Though none of these non-governmental data sets were identified as preferred for use in transmission planning by the EDTF, these data sources are listed in the data inventory spreadsheet.

[24] U.S. Geological Survey, National Biological Information Infrastructure, Gap Analysis Program (GAP). Protected Areas Database of the United States (PAD-US) Version 1.2. http://www.nbii.gov/portal/server.pt/community/maps_and_data/1850.

[25] Conservation Biology Institute. May 2010. http://consbio.org/what-we-do/protected-areas-database-pad-version-4

view, query, and often download environmental, cultural, and planning data of interest on-demand. One example of a simple web map is the Western Regional Partnership Web Mapping Application[26]. More advanced web mapping sites provide geoprocessing capability that will derive new decision-supporting information based on user requests; an example is the State DSS currently under development through the Western Governors' Association, which when complete may allow a user to sketch a proposed interstate transmission facility on a map and request feedback on its potential impacts. Some GIS web mapping servers allow users to embed GIS data from the website into their own desktop mapping software without the need to download the data; examples of these systems are ESRI's ArcGIS Online and the Mojave Desert Ecosystem Program Map Viewer[27].

Implication: Improvements in geospatial data development and delivery provide opportunities for transmission planners to gather data, perform geospatial analyses, and generate results quickly under aggressive schedules. This Data Analysis illustrated the potential speed at which such efforts can occur, where analysis results from the Environmental Exclusion and Environmental Suitability models (see Appendix C for descriptions of these models) for the four potential transmission line projects were obtained within 2 to 3 weeks of data compilation and assessment for inclusion in the preferred data layer list. A summary of the EDTF's Risk Classification System Categories proposed for use within the Western Interconnection appears in Appendix D of this document; detailed information on the preferred data layers is available in the data inventory spreadsheet.

Finding 8: Data scale and granularity

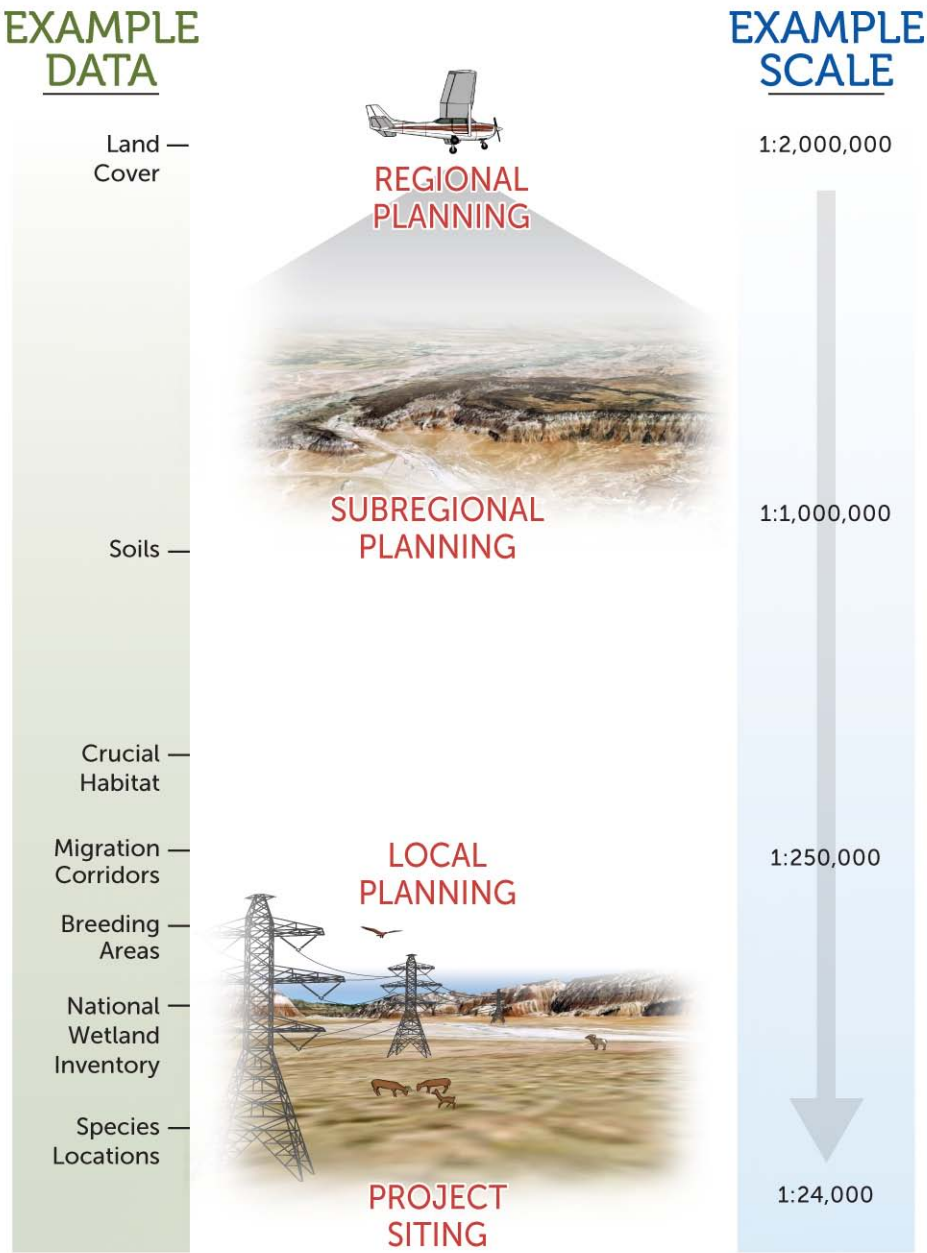
Issue Observed: The case study collected geospatial data sets compiled at various map scales, and at various levels of granularity, for incorporation into exclusions and suitability models. There is a general relationship between map scale and the granularity (also referred to as "resolution") of area type geometry – compilation at larger map scales tends to produce highly granular feature geometry. Transmission planners face the question, what is the "right" map compilation scale for use in transmission planning?

Ideally, mapping specifications such as scale and area type resolution are driven by a structured process that defines user requirements (i.e., they are specified to meet the quality objectives of the planning process). What scale of data is appropriate for transmission planning at a given level (e.g., regional or sub-regional) is driven by the need for map area type accuracy, which may be based on factors such as length of the transmission alternatives, path width, the nature of land uses encountered in the path, and the ability of planners to avoid or mitigate sensitive area types at the local siting level. Currently, users often do not have a choice in map scale – a unique, required data set may only be available from one source in one scale; map scale is often driven by supply, not demand.

In general, the case study results indicated that data layers compiled at a map scale in the range of 1:2,000,000 to 1:500,000 (scales used by the U.S. Geological Survey state topographic map series) were appropriate for regional transmission planning in a geographic area the size of the Western Interconnection. Figure 8 shows some example data layers and scales, and the levels of transmission planning such scales of data are generally most appropriate.

[26] *Western Regional Partnership Web Mapping Application. https://wrpinfo.org/MapIntro.aspx*
[27] *Mojave Desert Ecosystem Program Map Viewer. Mojave Desert Ecosystem Program 2010. http://www.mojavedata.gov/flexviewer_new/mapviewer.html*

Figure 8. Example Scales of Data by Level of Transmission Planning



Implication: Differences in data scale and granularity mean that transmission planners must understand these issues to ensure data are effectively used in transmission planning. Given the variety of scales at which public geospatial data sets are compiled, transmission planners may risk using geospatial data sets whose area types have been mapped at an inappropriate scale for an intended purpose. In general, the following situations may occur:

- Data compilation at a very small map scale (e.g., 1:10,000,000) results in mapped area types that are horizontally misplaced (up to 3 miles, for example) and represented by very general geometry (i.e., at low resolution). Small or detailed area types could be missing at these scales, and areal features, such as abandoned mining operations, could be represented as single points rather than

polygons. Using data at very small scales could result in errors or omissions in data that carry over to analysis results, which may or may not be acceptable to a particular planning application.

- Data compiled at a very large scale (e.g., 1:12,000) and across a large Area of Interest (AOI) could result in large GIS files containing very detailed data, resulting in "data overload," i.e., data which is far more detailed than needed for the intended purpose. While this situation does not present a problem in data accuracy or resolution, processing such data can strain computer resources and inflate project schedules as analysts cope with designing and running analytical models to handle large amounts of data (for example, a multiple map overlay can run for hours, rather than minutes).
- Data layers that have been converted from vector form (points, lines, and polygons) into a rasterized grid cell form become degraded in accuracy. This loss of accuracy is generally an acceptable tradeoff because rasterized data sets provide improvements in data storage and processing speed, and enable certain operations that are not available for vector-type data. When converting from vector to raster formats, analysts should select a grid cell size that provides an acceptable level of area type generalization.

As evidenced above, using data at any scale carries potential risks and issues; understanding these potential limitations and weighing them against project requirements may allow for the collection and consideration of data that meets transmission planners' needs at whichever level of planning they operate.

Finding 9: Other studies provide data and approaches

Issue Observed: As described in Appendix C, the Data Analysis considered a number of other studies that are either completed or currently underway, throughout the U.S. Many of these other studies, for example the BLM Rapid Ecoregional Assessments[28], are compiling geospatial data and analysis approaches that could be of value for regional transmission planning.

Implication: Reviewing and leveraging results from other regional planning studies may provide value for regional transmission planning, including providing data, technical tools, and approaches that have been vetted through stakeholder processes.

3.3.2. GIS-Based Models

This section describes findings stemming from the construction, application, and refinement of GIS-based models, described in Appendix C, to the four potential transmission line projects. As with the data compilation findings above, the model findings are presented as a series of numbered issues, each followed by supporting observations and potential implications.

Environmental Exclusion Areas Model

Finding 10: Defining exclusion area criteria

Issue Observed: The Environmental Exclusion Areas Model, using the methodology described in Appendix C, identified area types that would potentially preclude transmission development within the AOIs of the four potential transmission line projects. The initial model, as described in the Preliminary Recommendations Report, applied a "conservative" set of precluded area types, based on the criteria used in other studies (i.e., WREZ, the Renewable Energy Transmission Initiative [RETI] Phase 1B Final

[28] *Introduction - Rapid Ecoregional Assessments (REAs). Bureau of Land Management. 2010. http://www.blm.gov/wo/st/en/prog/more/climatechange/reas.html*

Report[29], and The Final Report of the Arizona Renewable Resource and Transmission Identification Subcommittee[30] [ARRTIS]) and on the professional judgment of subject matter experts. The model output appeared to indicate that for each of the four AOIs analyzed, sufficient non-precluded lands remained, which would allow for a transmission corridor to be developed to connect the project endpoints within the AOIs. It is important to note that engineering and economic factors were not part of this analysis and were not considered in reaching this conclusion.

Implication: The identification of area types as precluding transmission development can substantially affect the amount of geographic area that is considered available when developing transmission alternatives. Especially in the West, designated area types such as Wilderness Study Areas, can cover vast amounts of land, and a decision to either include or preclude such lands from consideration for transmission alternatives can influence whether a project moves forward. Therefore, such decisions should be made deliberately and with sufficient stakeholder input.

If a large percentage of lands within an AOI preclude transmission development, the entire AOI may be rendered unfeasible for transmission development. The geometric shapes of these area types can also contribute to this condition; for example, a long linear feature such as a protected waterway could bisect an AOI and effectively block the ability for a corridor to be drawn between two endpoints. Because precluded areas are generally statutorily or otherwise restricted, the choice of what to include in an analysis would appear straightforward; however, a detailed examination of the areas initially evaluated in the case study Preliminary Recommendations Report revealed the issue to be more complex. For example, development may be explicitly prohibited by statute or regulation for some area types (e.g., Wilderness Areas), while the restrictions in other area types may vary substantially based on the enabling legislation or area-specific management plans (e.g., BLM Areas of Critical Environmental Concern). In addition, development sometimes occurs, through grandfathering, in areas with statutory or regulatory prohibitions against development. Moreover, Congress can change statutes and grant exemptions or waive prohibitions on development. Given the relatively long amount of time it may take to develop and build a transmission line (approximately 7 to 10 years), changes in statute can and do occur during the life of projects; such changes may therefore affect, speeding up or slowing down, project timeframes.

Finding 11: Lack of Western Interconnection list of areas where transmission development is precluded by law or regulation

Issue Observed: Neither the case study nor discussion with EDTF members identified an existing, definitive Western Interconnection set of areas that statutorily prohibit transmission line development. Therefore, following development of the Preliminary Recommendations Report, the initial definition of what constituted an area that precluded transmission development (referred to as **Category 4**[31] areas in Section 2.2 of this document) and the list of area types that met this definition were revised for Version 1 of the Environmental Recommendations Report (April 4, 2011). Based on comments received from EDTF members on the Version 1 report, the definition and list of area types were refined for Version 2 of the Environmental Recommendations Report (April 29, 2011), and, based on additional EDTF comments, were further refined for this final report. Revision to the definitions and list of area types were based on:

- Input from EDTF members;
- A comparison of other stakeholder-driven processes (i.e., RETI, WREZ, ARRTIS) that included a description of their criteria and the inclusion of state and provincial areas that currently precluded development identified by the WREZ process; and

[29] *Renewable Energy Transmission Initiative Phase 1B Final Report. Renewable Energy Transmission Initiative. January 5, 2009. Updated with Revisions March 4, 2009 http://www.energy.ca.gov/2008publications/RETI-1000-2008-003/RETI-1000-2008-003-F.PDF*

[30] *Final Report of the Arizona Renewable Resource and Transmission Identification Subcommittee. Arizona Renewable Resource and Transmission Identification Subcommittee. September 2009. http://www.westconnect.com/filestorage/ARRTIS%20Final%20Report.pdf*

[31] *Categories 1, 2, and 3 are discussed under Finding 13.*

- A review of legal requirements and agency policies to determine whether they precluded transmission line development (see Appendix D).

This comparison focused on identifying areas that were statutorily excluded from transmission and related development.

Though all three of the stakeholder-driven processes shown in Table 5 identified statutorily precluded areas, they did not all include the same criteria. In part, this may be attributable to the differing geographies considered by the studies (e.g., RETI in California and ARRTIS in Arizona), which changes the list of potential area types available for consideration/inclusion (i.e., some areas may not occur in California and may, therefore, not have been considered in RETI). In the case of the WREZ study, the identification of area types that precluded development was intended to inform the siting of generation, rather than transmission facilities; although there is significant overlap in the considerations for siting generation and transmission, determinations of a list of precluded areas for one are necessarily applicable to both.

Implication: Without a standard, stakeholder-vetted list of (and process for using) areas that preclude transmission, confusion and inconsistent consideration during transmission planning could occur. To develop its proposed list of area types that precluded transmission, the EDTF reviewed the list of areas from other stakeholder-driven process and the areas presented in Version 1 of the Environmental Recommendations Report. Using the definition of Category 4 areas presented in Section 2.0 of this document, the EDTF developed the list of areas shown in Table 5. It is important to note that this list represents a snapshot in time, as it was based on current laws and regulations and area types for which mappable GIS data layers exist. Because it relies on currently available GIS data, the list of area types in Table 5 is not comprehensive and does not include several area types identified as relevant for consideration in regional transmission planning (either through communication with EDTF members or by the WREZ process) for which geospatial data was incomplete, inaccessible, or did not currently exist. Appendix D contains a list of these other area types. The maintenance of the information in Table 5 and the definitions presented in Section 2.0 will likely require continuing stakeholder involvement to ensure the best available data layers and changes in laws, policies, and regulations are captured; future maintenance should likely involve a review of the areas listed in Appendix D to determine if data has become available.

Table 5. The EDTF's Recommended Land Area Types that Preclude Transmission Development (Category 4 areas) Compared to Other Stakeholder-Driven Studies[1]

Area Type *[Organized by country and alphabetically by area type name]*	RETI[2]	WREZ[3] *[electrical generation study]*	ARRTIS[4]
California State Wilderness Area	✓	✓	
National Primitive Area		✓	✓
National Wildlife Refuge	✓	✓	✓
Units of the National Park System	✓	✓	✓
Wilderness Area	✓	✓	✓
Wilderness Area (Recommended)		✓	
Wilderness Study Area	✓	✓	✓
Alberta Eastern Slopes Zones 1 & 2		✓	
Alberta Ecological Reserve		✓	
Alberta Heritage Rangeland		✓	
Alberta Natural Area		✓	

Table 5. The EDTF's Recommended Land Area Types that Preclude Transmission Development (Category 4 areas) Compared to Other Stakeholder-Driven Studies[1]

Area Type *[Organized by country and alphabetically by area type name]*	RETI[2]	WREZ[3] *[electrical generation study]*	ARRTIS[4]
Alberta Provincial Park		✓	
Alberta Provincial Recreation Area		✓	
Alberta Wilderness Area		✓	
Alberta Wildlands Park		✓	
Alberta Willmore Wilderness Park		✓	
British Columbia Parks		✓	
British Columbia Conservancy		✓	
British Columbia Ecological Reserve		✓	
British Columbia Motor Vehicle Closure Area		✓	
British Columbia Protected Area		✓	
British Columbia Recreational Area		✓	
Migratory Bird Sanctuary (Canada)		✓	
Marine Protected Area (Canada)		✓	
National Park (Canada)		✓	
National Wildlife Area (Canada)		✓	

NOTE: With the exception of area types within Canada, all areas listed in this table were obtained from the Conservation Biology Institute PAD-US 1.1 data set.
NOTE: For additional information on any of the area types, refer to Appendix D.
[1]This table reflects the EDTF's recommended list of Category 4 areas in the final report; Exclusion areas identified in the case study of the four potential transmission line projects appear in the Preliminary Recommendations Report, the list of "strawman" exclusion areas reviewed by the EDTF during development of the list of Category 4 areas in this table appear in Version 1 of the Environmental Recommendations Report, and the list of preliminary exclusion areas agreed to by the EDTF methods subgroup on April 20, 2011 appear in Version 2 of the Environmental Recommendations Report.
[2]Renewable Energy Transmission Initiative, Final Phase 1B Report; this report was applicable only to the State of California.
[3]Western Renewable Energy Zones Initiative; this process dealt with electrical generation and the areas identified as precluding development may, therefore, not necessarily preclude development of transmission lines.
[4]Final Report of the Arizona Renewable Resource and Transmission Identification Subcommittee; this report was applicable only to the State of Arizona.

ARRTIS Arizona Renewable Resource and Transmission Identification Subcommittee
EDTF Environmental Data Task Force
RETI Renewable Energy Transmission Initiative
WREZ Western Renewable Energy Zones

Environmental Suitability Model

Finding 12: Multiple methods for defining and applying environmental suitability (risk classification) categories exist

Issue Observed: As described in the Preliminary Recommendations Report and Appendix C of this report, the initial version of the Environmental Suitability Model used a 1 to 9 rating (with 1 being most suitable and 9 being least suitable) to assign relative suitability to areas within the four project AOIs. This initial model run applied a set of suitability data layers and rating assignments, based on the suitability criteria

used in other studies (i.e., Electric Power Research Institute-Georgia Transmission Commission [EPRI-GTC] Overhead Electric Transmission Line Siting Methodology[32], RETI, and ARRTIS), the professional judgment of subject matter experts, and area types within each project's AOI. The model output showed that for each of the project AOIs, the distribution of areas within each suitability rating category provided adequate areas of high and moderate suitability for transmission development to allow the connection of the project end points. It is important to note that engineering and economic factors were not part of this analysis and were not considered in reaching the conclusion in the previous sentence. The Data Analysis did not adjust area type suitability ratings (i.e., changing the ratings of area type to make them more or less suitable for transmission develop) to achieve this result.

Implication: The ability of transmission planners to identify potentially suitable transmission paths or corridors depends, in part, on the amount and geographic distribution of lands that are rated as highly or moderately suitable within an AOI. Especially in the West, designated area types such as sensitive habitats, can cover vast amounts of land, and a decision to apply a given suitability rating can affect planning, feasibility, and costs for transmission, generation, and a variety of other projects. Therefore, such decisions should be made deliberately and with sufficient stakeholder input.

Finding 13: Definition of environmental suitability (risk classification) categories and the area types considered

Issue Observed: Following the suitability analyses conducted for both the Preliminary Recommendations Report and Version 1 of the Environmental Recommendations Report, and EDTF member comments on Version 2 of the Environmental Recommendations Report the environmental suitability (or risk classification) category definitions and the list of area types (e.g., Native American Allotments or National Historic Trails) were revised. Similar to the process described under Finding 11 for currently precluded (Category 4) areas, revisions were based on reviews of other relevant stakeholder-driven processes (i.e., RETI, WREZ, ARRTIS, EPRI-GTC), comments from the EDTF on previous versions of the Environmental Recommendations Report, and input from subject matter experts. In addition, these revisions included the review and, where appropriate, incorporation of features from a draft methodology[33] for assigning environmental suitability ratings. These revisions resulted in the EDTF proposed Risk Classification System Category definitions presented in Section 2.0 of this document and the list of recommended area types and categories in Table 6. Specifically, these revisions consisted of:

- Reviewing area types and, where appropriate, adding and removing areas. In particular, EDTF members requested the inclusion of state and province level area types (e.g., state parks) with identified constraints and resource sensitivities mentioned in the WREZ process.
- Replacing the suitability categories used in the Preliminary Recommendations Report (which assessed suitability on a 1 to 9 scale) and Version 1 of the Environmental Recommendations Report (which assessed suitability on a scale of *Highly Constrained, Moderately Constrained,* and *Opportunity)* with the categories described in detail in Section 2.0 of this document. The categories recommended by the EDTF consist of[34]:
    - **Category 1 -** Least Risk of Environmental or Cultural Resource Sensitivities and Constraints
    - **Category 2** – Low to Moderate Risk of Environmental or Cultural Resource Sensitivities and Constraints
    - **Category 3 -** High Risk of Environmental or Cultural Resource Sensitivities and Constraints

[32] *EPRI-GTC Overhead Electric Transmission Line Siting Methodology. Electric Power Research Institute-Georgia Transmission Commission. February 2006. http://my.epri.com/portal/server.pt*

[33] *Eastern Interconnection Planning Collaborative DRAFT Sensitivity Categorization. NatureServe. Unpublished draft document.*

[34] *Category 4 areas are those presently precluded from transmission development by law or regulation; these areas are discussed under Finding 11.*

Based on comments from the EDTF between Version 2 of the Environmental Recommendations Report and this document, the definitions for these categories were revised. In addition to showing the categorization of area types, Table 6 also displays the categories assigned to similar areas in other relevant studies.

Area types are not necessarily mutually exclusive, and may overlap. In instances where overlaps occur, the highest level of constraint would generally be expected to apply. However, in instances where, for example, a designated energy corridor overlaps a higher constraint area, the lower level of constraint may in fact apply. The use and application of these risk classification categories will require evaluation and refinement beyond the preliminary GIS data and analyses performed for this case study analysis to address such issues.

Implication: As described under Finding 11, without a standard, stakeholder-vetted set of risk classification category definitions and list of area types to consider when developing transmission alternatives, inconsistent consideration during transmission planning could occur. As with the currently precluded (Category 4) areas, the appropriate area types to include and the categories into which those areas are grouped has been addressed in various ways (see Table 6 for examples). The EDTF's recommended list shown in Table 6 represents a snapshot in time, as it was based on current laws and regulations and area types for which mappable GIS data layers exist. For area types where the EDTF is continuing discussions on the appropriate risk classification category (indicated by cells with the words Parking Lot), an initial draft categorization has been provided. Following further coordination, the EDTF intends to provide categorizations for these area types.

Table 6. The EDTF's Recommended Land Area Types and Risk Classification System Category Ratings (Category 1, 2, and 3 areas) Compared to Other Studies

Area Type *[Organized by country and Risk Classification System Category]*	Proposed Risk Classification System Category[1]	Other Studies				
		RETI Category[2]	WREZ[3] *[electrical generation study]*	WWEC[4]	ARRTIS Sensitivity[5]	EPRI-GTC[6]
Areas Following Existing Linear Corridors	1					✓
Designated Energy Corridors	1					
Existing Transmission ROW	1					1
Agricultural Land (excluding Prime Farmland)	2					1-2
Army Corps of Engineers Land	2					
Flood Zone	2				Moderate	✓
Important Bird Area (State-level)	2		Exclusion			
Other Land Administered by U.S. Federal Agencies (Bureau of Land Management, U.S. Forest Service, Bureau of Reclamation, Bureau of Indian Affairs, U.S. Department of Defense)	2					8[7]
Other Private Non-profit Land	2					
Other Public Land	2					✓
Other Water District Land	2					
Private Land - Unknown Restriction	2					
Private Land - Unrestricted for Development	2					
Private University Land	2					
Urban Fringe Area	2					9
USDA Agricultural Research Center	2					
USDA Experimental Range (Agricultural Research Center)	2					

Table 6. The EDTF's Recommended Land Area Types and Risk Classification System Category Ratings (Category 1, 2, and 3 areas) Compared to Other Studies

Area Type *[Organized by country and Risk Classification System Category]*	Proposed Risk Classification System Category[1]	Other Studies				
		RETI Category[2]	WREZ[3] *[electrical generation study]*	WWEC[4]	ARRTIS Sensitivity[5]	EPRI-GTC[6]
Native Allotment	*2* *Parking Lot[8]*					
American Indian/Native American Reservation	*2/3* *Parking Lot[8]*			✓	High	
Area of Critical Environmental Concern	3	Category 2 Lands	Exclusion/ Avoidance	✓	High	
California State Wetland	3	Category 1 (Exclusionary) Lands	Exclusion			
Critical Habitat (birds, plants, freshwater fish, mammals, reptiles, amphibians, insects)	3	Category 2 Lands	Exclusion		High	✓
Important Bird Area (Global)	3					
Military Range/Installation	3		Exclusion	✓	Exclusion	Avoidance
National Conservation Area	3	Category 1 (Exclusionary) Lands	Exclusion/ Avoidance	✓	Exclusion	
National Monument	3	Category 1 (Exclusionary) Lands	Exclusion	✓	Exclusion	Avoidance
National Recreation Area	3	Category 1 (Exclusionary) Lands		✓		
Natural Resources Conservation Service Easement	3					

Table 6. The EDTF's Recommended Land Area Types and Risk Classification System Category Ratings (Category 1, 2, and 3 areas) Compared to Other Studies

Area Type *[Organized by country and Risk Classification System Category]*	Proposed Risk Classification System Category[1]	Other Studies				
		RETI Category[2]	WREZ[3] *[electrical generation study]*	WWEC[4]	ARRTIS Sensitivity[5]	EPRI-GTC[6]
Pronghorn Migration Corridor, Bridger-Teton National Forest (Wyoming)	3		Exclusion			
Research Natural Area	3		Avoidance	✓	Exclusion	
Research Natural Area - Proposed	3		Avoidance		High	
U.S. Forest Service Roadless Area	3	Category 1 (Exclusionary) Lands	Exclusion/ Avoidance	✓	Exclusion	✓[9]
Special Interest Area	3		Avoidance			
Special Management Area	3			✓		
State Forest	3		Exclusion[9]			
State Mapped Crucial Big Game Winter Range/Severe Winter Range	3		Exclusion		High	
State or Federally Mapped Habitat Areas for Candidate or Listed Wildlife Species	3	Category 1 (Exclusionary) Lands			High	
State Park	3	Category 1[10] (Exclusionary) Lands	Exclusion[10]		High	Avoidance
State Wildlife Area	3	Category 1[10] (Exclusionary) Lands	Exclusion[10]			

Table 6. The EDTF's Recommended Land Area Types and Risk Classification System Category Ratings (Category 1, 2, and 3 areas) Compared to Other Studies

Area Type *[Organized by country and Risk Classification System Category]*	Proposed Risk Classification System Category[1]	Other Studies				
		RETI Category[2]	WREZ[3] *[electrical generation study]*	WWEC[4]	ARRTIS Sensitivity[5]	EPRI-GTC[6]
Washington State Natural Area Preserve	3		Exclusion			
Washington State Natural Resource Conservation Area	3		Exclusion			
Wild and Scenic River; National River; Wild & Scenic Riverway	3	Category 1 (Exclusionary) Lands	Exclusion	✓	Exclusion	Avoidance
Wildlife Corridor Mapped by State Agency	3	Category 1 (Exclusionary) Lands	Exclusion		High	
National Historic Trail	*3* *Parking Lot*[8]	Category 1 (Exclusionary) Lands		✓	Exclusion	
Prime Farmland	*3* *Parking Lot*[8]					
Wetland (mapped in regional databases)	*3* *Parking Lot*[8]	Category 1 (Exclusionary) Lands	Exclusion		Exclusion	9
British Columbia Endangered Species and Ecosystems – Sensitive Occurrence and Non-sensitive Occurrence	3		Avoidance			
British Columbia Old Growth Management Area	3		Avoidance			
British Columbia Ungulate Winter Range	3		Avoidance			
British Columbia Wildlife Management Area	3		Avoidance			

Table 6. The EDTF's Recommended Land Area Types and Risk Classification System Category Ratings (Category 1, 2, and 3 areas) Compared to Other Studies

Area Type *[Organized by country and Risk Classification System Category]*	Proposed Risk Classification System Category[1]	Other Studies				
		RETI Category[2]	WREZ[3] *[electrical generation study]*	WWEC[4]	ARRTIS Sensitivity[5]	EPRI-GTC[6]
Canadian Forces Bases	3		✓			
Existing Conservation and Mitigation Banks (Canada)	3		Exclusion/ Avoidance			

NOTE: This table reflects the EDTF's recommended risk classification categories; the recommendations for suitability determinations specific to the four potential transmission line projects analyzed during the initial case study appear in the Preliminary Recommendations Report.
NOTE: For additional information on any of the area types, refer to Appendix D.
[1]Area types are not necessarily mutually exclusive, and may overlap. In instances where overlaps occur, the highest level of constraint would generally apply. However, in instances where, for example, a designated energy corridor overlaps a higher constraint area, the lower level of constraint may in fact apply. The use and application of these risk classification categories will require evaluation and refinement during implementation to address such issues.
[2]Renewable Energy Transmission Initiative, Final Phase 1B report.
[3]Based on the Western Renewable Energy Zones Initiative; this process dealt with electrical generation and may, therefore, not necessarily be relevant to the development of transmission lines. Some wildlife categories are not rated because they do not fall into the WREZ Qualified Resource Areas. It is anticipated that many of the data layers supporting wildlife criteria will be obtained from the Western Governors' Association's Decision Support System (DSS) initiative, when available.
[4]West-wide Energy Corridor Final Programmatic Environmental Impact Statement included only one category of areas to be avoided, which included such areas as Wild and Scenic Rivers, Roadless Areas, as well as Special Recreation Management Areas. These areas are denoted with a checkmark.
[5]Final Report of the Arizona Renewable Resource and Transmission Identification Subcommittee used a scale of high sensitivity, moderate sensitivity, and low sensitivity to development.
[6]Criteria were considered in the EPRI-GTC Overhead Electric Transmission Line Siting Methodology study using the 1 to 9 rating scale employed in the Preliminary Recommendations Report. However, certain area types, such as critical habitat, listed in this table represent an aggregation of area types identified and ranked separately in the EPRI-GTC study. These area types are denoted with a checkmark. The EPRI-GTC study also identified "Avoidance" areas as areas "not suitable for locating overhead transmission lines." Many of these areas, such as Wilderness Areas and Superfund Sites, are identified as "Exclusion" areas in other studies.
[7]Applies only to National Forest System lands.
[8]The EDTF is continuing discussions on the appropriate risk classification category for this area type. The initial draft categorization may be revised following further coordination and review by EDTF members.
[9]Although U.S. Forest Service Roadless Areas are not specifically rated in the EPRI-GTC report, the report classifies National Forest System land as having low suitability (8) for transmission line development.
[10]These ratings were provided by the referenced studies for state-specific area types, such as California State Parks or Idaho State Wildlife Management Areas, but were generalized for representation in this table.

ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee	RETI	Renewable Energy Transmission Initiative
BLM	Bureau of Land Management	USDA	United States Department of Agriculture
DoD	Department of Defense	WREZ	Western Renewable Energy Zones
EDTF	Environmental Data Task Force	WWEC	West-Wide Energy Corridor
EPRI	Electric Power Research Institute		

Finding 14: Adaptability of suitability models from other studies

Observation: A strategy in developing a suitability analysis approach for the Data Analysis was to adapt the approach used in other studies, with the goal of gaining benefit from the stakeholder input and vetting performed for the other studies. The case study found that while it is possible to adapt general approaches, such as the EPRI-GTC 1 to 9 rating scale, the uniqueness of each study makes it impractical to replicate another study's approach to suitability categorization. Even the EPRI-GTC methodology, which is intended to be generally applicable to other siting studies, addressed a limited set of criteria, applicable to a limited geographic area that did not include several criteria of concern in the West today (e.g., Native American Reservations). Moreover, as the scale of the area analyzed increases from project siting to regional transmission planning, the number of area types and difficulty in assigning suitability categories also increases. Analysis approaches are not "one size fits all" and require substantial adaptation to address the particular criteria and geographic area of interest for a particular planning effort.

Implication: It is a challenge to implement and recommend a single suitability analysis approach that can be universally applied throughout all areas within the Western Interconnection and that provides meaningful insights at the regional transmission planning level. Categories and area types need to be defined broadly enough to accommodate conditions encountered in a variety of ecoregions and administrative areas. For example, one area type included in the initial suitability analysis was "Sage Grouse Brood Rearing and Core Areas." Upon revisiting the suitability analysis to examine how it could be applied to the Western Interconnection, this criterion was broadened to "Mapped Core Areas Habitat Areas for Key Special Status Wildlife Species" to facilitate its application to areas where sage-grouse do not occur. In addition, it is important to recognize that the suitability models applied in the case study only consider environmental and cultural data – not economic or engineering factors. While environmental suitability models may have some benefit during transmission planning, to yield meaningful results, these models will need to be integrated into other models or analyses that provide a comprehensive consideration of transmission planning factors (e.g., cost, reliability, etc.); finding ways to accomplish this integration is one of the objectives of the EDTF.

Least-Environmental-Cost Paths Model

Finding 15: Least-Environmental-Cost Paths Model

Observation: The case study completed model runs for the Least-Environmental-Cost Paths Model. As described in Appendix C of this document, the Least-Environmental-Cost Paths Model used the results of the suitability and exclusion models to find relatively suitable paths connecting two endpoints within each AOI (see Appendix C and the Area of Interest Protocol[35] for discussion of AOI delineation). In addition to defining suitable paths, the model identified a discrete line representing the single least cost (environmental) path connecting the endpoints. An application of this model to routing data for one of the four potential transmission line projects revealed the line plotted by the Least-Environmental-Cost Paths Model followed a similar path to the preferred alignment of the project proponent.

Implication: The data collected for the suitability and exclusion models was sufficient to yield a reasonable line route for each AOI, based on visual inspection (i.e., lines connecting endpoints did not appear unreasonably circuitous). It is important to note that engineering and economic factors were not part of this analysis and were not considered in reaching the conclusion in the previous sentence.

Finding 16: Forcing model to use disturbed areas

Observation: Following release of the Preliminary Recommendations Report, the Least-Environmental-Cost Paths Model was modified to force the model to favor disturbed areas (e.g., abandoned mining areas, hazardous waste sites). Since the disturbed areas were small in size compared to the overall AOI,

[35] *Case Study Area of Interest - Delineation Protocol January 12, 2010 (Draft). http://www.wecc.biz/*

the assumption was that the line would 'island hop' from disturbed area to disturbed area across large expanses of areas with lower suitability. The model results validated this hypothesis as shown in Table 7, where over 400 miles of the path moved from areas of high suitability for transmission development (rating 1) into areas of lower suitability for transmission development (ratings 5, 6, and 9).

Implication: Disturbed lands tend to be small relative to overall AOIs, scattered, and generally do not follow conveniently linear patterns. Planning transmission corridors around disturbed lands can result in corridors that are unsuitable based on other criteria. However, disturbed lands could still be considered for generation development or for transmission development in selected areas where use conflict with other resources are minimal or determined to be acceptable.

Table 7. Comparison of Results from Initial and Revised Least-Environmental-Cost Paths Models

Line A	Total Line Length (miles)	Line Length Through Suitability Ratings (miles)									
		0	1	2	3	4	5	6	7	8	9
Initial Least Cost Path	737	-	737	-	-	-	3	18	-	-	6
Forced into disturbed areas	304	11	293	-	-	-	151	262	-	-	10

Relative Mitigation Costs Model

Upon analysis of the output derived from the Least-Environmental-Cost Paths Model, it was determined that without significant real-world mitigation cost input from specific project proponents the Relative Mitigation Costs Model would not yield results that were significantly different from the Least-Environmental-Cost Paths Model.

Although WECC's long-term planning tool is under development, through incorporating environmental and cultural information, it may be possible to explore relative mitigation costs of transmission alternatives. A Relative Mitigation Costs Model might be effective when the following conditions exist:

- There are substantial differences in mitigation costs associated with different environmental constraints. For example, the cost of mitigation per mile associated with crossing a wildlife migration corridor is substantially different than the cost per mile for crossing an Important Bird Area.
- There are substantial differences in local, county, state and federal regulations regarding amount and type of mitigation for specific types of projects and construction.
- There is adequate empirical data on the above factors to allow realistic mitigation cost factors based on suitability criteria and on jurisdictional areas to be entered into the model.
- Mitigation costs reflect the total economic cost (economic and ecological value).

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Environmental Recommendations for the Transmission Planning Process

Final Report of the Environmental Data Task Force

APPENDIX A

Acronyms and Abbreviations

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ACEC	Area of Critical Environmental Concern
AOI	Area of Interest
ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CBI	Conservation Biology Institute
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CPCN	Certificate of Public Convenience and Necessity
DoD	Department of Defense
DSS	Decision Support System
EA	Environmental Assessment
EDTF	Environmental Data Task Force
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
GPS	Geographic Positioning System
GTC	Georgia Transmission Commission
ICF	ICF International
N/A	Not available
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NXT	Network Expansion Tool
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
PAD	Protected Areas Database
R.S.C.	Revised Statutes of Canada
RETI	Renewable Energy Transmission Initiative
RNA	Research Natural Area
RTEP	Regional Transmission Expansion Planning
SCDT	Study Case Development Tool
S.C.	Statutes of Canada
SPG	Sub-regional Planning Group
SPSG	Scenario Planning Steering Group
STATSGO	State Soil Geographic

TBD	To be determined
TEPPC	Transmission Expansion Planning Policy Committee
U.S.C.	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WECC	Western Electricity Coordinating Council
WGA	Western Governors' Association
WREZ	Western Renewable Energy Zones

Environmental Recommendations for the Transmission Planning Process

Final Report of the Environmental Data Task Force

APPENDIX B

Environmental Data Task Force (EDTF) Questions

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Questions and statements included in Table B-1 reflect input from Environmental Data Task Force (EDTF) members during development of the Case Study approach. Some of the original questions and statements were determined to be out of scope relative to the EDTF's scope of work and are not included in Table B-1; the complete list of original EDTF questions can be viewed in the Preliminary Recommendations Report.. Table B-1 reflects a collection of questions, statements, and opinions of individual members of the EDTF. Responses to questions should be considered working drafts and subject to change as information becomes available.

Table B-1. EDTF Questions and Statements

Question Number	Question
EDTF Questions	
1	What are the preferred data (e.g., types, scale) for incorporating in the process? **Response**: Preferred data are those environmental and cultural data sets that can inform transmission planning and that meet certain data quality parameters. Preferred data identified at the time of this report are included in Appendix D. Preferred data for regional transmission planning may change over time; should consider geospatial and nonspatial data; should consider available data and workarounds for inaccessible data; and should be of a scale and format compatible with long-term planning tools (e.g., study case development tool and network expansion tool) for transmission planning. In general, preferred data can be quantified and occur at a scale conducive to interstate transmission planning.
2	What is the purpose of incorporating the data in the process? **Response**: To help plan and evaluate potential transmission solutions by informing transmission planners and decision makers.
3	When (at what stage) should data be incorporated in the process? **Response**: In general, environmental and cultural data sets should be applied during the development and evaluation of potential transmission solutions.
4	How will the data be used or interpreted in the process? **Response**: In general, environmental and cultural data sets will be classified according to a risk classification system (see Appendix D) developed by the EDTF and the results will be used to plan and evaluate potential transmission solutions through use of long-term planning tools and other means during transmission planning.
5	Who will be using and interpreting the data? **Response**: EDTF recommends guidance and processes for using and interpreting environmental and cultural data sets be developed.
EDTF members identified questions and statements[1]	
6	For transmission line projects considering being a part of the WECC's regional transmission planning process: What data structure and level of detail are preferred for the project sponsor's environmental data and analyses? **Response**: See response to Question 1 – preferred data.
7	What limitations (e.g., gaps) exist in environmental data that may in turn constrain the development of study requests and scenarios for the regional transmission planning process? **Response**: Sensitive cultural and tribal data, and select data associated with private lands are generally inaccessible and unavailable in a digital geospatial format. Data gaps also include qualitative data from tribes, private landowners, and other stakeholders not represented by committees and task forces currently involved in the Regional Transmission Expansion Planning (RTEP) project.

Table B-1. EDTF Questions and Statements

Question Number	Question
8	For environmental data that might be incorporated in the regional transmission planning process: What is the relative importance of this data being seamless across administrative boundaries such as states? **Response**: Environmental and cultural data sets that are seamless across administrative boundaries such as states contribute to the consistent planning and evaluation of potential transmission solutions.
9	Based on discussions with EDTF members, "buckets of information" are interpreted to mean level of constraints (e.g., high, medium, low). Are existing environmental data sufficient to classify lands analyzed in the case study as to the level or category of constraint they pose to transmission line development? **Response**: Yes, see Appendix D.
10	What environmental data need to be developed to ensure environmental data are available and in the appropriate format, scale, etc., for incorporation in future regional transmission plans? **Response**: Workarounds for inaccessible data including, but not limited to tribes, private lands, and stakeholders not currently involved in RTEP should be developed to consider this data during transmission planning.
11	Are data and methods for estimating the relative cost of avoiding, minimizing, and mitigating potential environmental impacts from proposed transmission lines currently practical and if not is it possible to develop these data and methods? **Response**: Yes, data and methods are currently practical. Benefits transfer is one such method.
12	Are existing data and methods sufficient to exclude certain recognized environmental and topographic constraints such as national parks early in the transmission planning process such that subsequent transmission line siting would avoid these areas without further analysis? How can data be used to identify better options rather than solely screening out options that have significant impacts? **Response**: Current data are generally sufficient to exclude recognized environmental and topographic constraints during regional transmission planning (see Appendix D); however, siting transmission lines may require additional data collection and/or analysis to determine local environmental and topographic constraints. In addition, subsequent siting analysis may reveal routes for avoiding and/or minimizing potential impacts to constraints identified at the planning level.
13	What environmental data are necessary to incorporate into the regional transmission planning process and at what stage(s) in the planning process should these data be considered to ensure consideration and potential avoidance of environmental impacts early in the process? **Response**: See responses to Questions 1 and 3.
14	Are the case study's analyses of potential projects able to identify secondary effects? **Response**: The case study analysis of potential transmission projects did not attempt to identify secondary effects.
15	What methods can capture environmental information, resulting from transmission line siting projects, for incorporation into regional transmission planning? **Response**: Several analytic methods used for transmission line siting can also be applied to regional transmission planning. For example, GIS overlay analysis of area types based on a risk classification system (see Appendix D). A limiting factor when trying to apply siting methods to planning is the scale or granularity of the data. For example, species occurrence data and local constraints are not suitable for regional transmission planning.

Table B-1. EDTF Questions and Statements

Question Number	Question
16	What regional (multi-state) environmental data sets can be most effective for informing regional transmission planning? **Response**: Preferred data sets are identified in Appendix D. Select data sets under development which hold promise for informing regional transmission planning include the decision support system efforts led by the Western Governors' Association for state wildlife data and for water availability and capacity. In addition, the Bureau of Land Management is conducting rapid ecoregional assessments which may produce useful regional data sets for transmission planning.
17	What scale of environmental data is currently available and is most effective for informing regional transmission planning? **Response**: Quantitative, state-level and federal data that are seamless across administrative boundaries are currently most effective informing regional transmission planning.
18	There is a desire for the case study to inform regional transmission planning for the purpose of avoiding, minimizing, and mitigating impacts to natural and cultural resources.
19	There is a desire for the case study analysis of potential projects to identify new environmental solutions, not currently incorporated into regional transmission planning.
20	There is a desire for the case study to result in lessons learned or other findings that can be used to inform future transmission line projects.
21	There is a desire for the case study to provide BMPs that could be used to guide the process of going from transmission planning to transmission siting.

[1]The following questions are ICF's interpretations of member questions and statements shown in the Environmental Data Task Force Case Study Technical Approach - Version 1-3, approved January 20, 2011.

BMP Best Management Practice
EDTF Environmental Data Task Force
GIS Geographic Information System
RTEP Regional Transmission Expansion Planning
WECC Western Electricity Coordinating Council

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Environmental Recommendations for the Transmission Planning Process

Final Report of the Environmental Data Task Force

APPENDIX C

Methods

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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C. Methods

The Environmental Data Task Force (EDTF) case study employed the approach outlined in the Environmental Data Task Force Case Study Technical Approach - Version 1-3 to develop the observations and recommendations presented in this report. The case study approach consisted of two distinct but interrelated parts: stakeholder interviews (**Process Interviews**) and cataloging, compiling, and analyzing data (**Data Analysis**). The methods used to produce the recommendations in Section 2.0 and the case study observations and findings in Section 3.0 are described in the Data Quality Protocol: Identification of Preferred Geospatial Data Sets and the Area of Interest Protocol. This appendix supplements the aforementioned documents.

In addition to the case study analyses, reports and relevant information produced by other related studies and stakeholder-driven processes were reviewed to determine how their methods, findings, and recommendations could be applied to the analyses in this report or, more broadly, to the EDTF scope of work. This information is incorporated, where appropriate, throughout this report; Section C.2 of this appendix includes a summary of data-related methodologies used in other studies and how they were considered in the Data Analysis. In addition, Appendix F contains a high level review and summary of three stakeholder-driven processes (Renewable Energy Transmission Initiative [**RETI**], Western Renewable Energy Zones [**WREZ**], and Arizona Renewable Resource and Transmission Identification Subcommittee [**ARRTIS**]), describing their potential applicability to the EDTF's scope of work.

> *Recommendations resulting from the case study, and EDTF and other input, appear in Section 2.0.*
>
> *Observations and Findings for the case study appear in Section 3.0.*

C.1 Process Interviews (Non-spatial)

From late January through mid-March 2011, Process Interviews included 37 individuals from 22 organizations representing seven stakeholder categories (see Table C-1). The EDTF Planning Team identified the organizations/individuals to contact as interviewees. During the interviews, interviewees suggested other potential stakeholders to contact.

Interview questions were similarly developed with input from the EDTF Planning Team and interviewees. Initially, candidate interviewees received an email, including an attachment of questions (see Appendix E for the final interview questionnaire), and were then contacted by telephone to determine their interest in participating in the Process Interviews. Scheduled telephone interviews ranged in length from 30 minutes to over 1 hour. In some instances, interviewees chose to complete the questionnaire on their own and return it by email. In other cases, the interviewer took notes during the telephone interview and recorded responses to relevant questions. Interviewees were provided with a copy of notes taken during interviews and requested to review the notes for accuracy and completeness.

Table C-1. Process Interviews, as Represented by the Number of Organizations Contacted and Interviewed

Stakeholder Category	Number of Organizations Contacted	Number of Organizations Interviewed	Number of Individuals Interviewed
Federal Agency	5	3	4
Non-Governmental Organization	3	2	2
State Agency	5	4	7
Subregional Planning Group	3	3	4
Transmission Developer	7	7	12
Western Electricity Coordinating Council/Transmission Expansion Planning Policy Committee	1	1	4
Western Governors' Association	2	2	5
Total	26	22	37*

Note: One individual spoke separately as a transmission developer and Subregional Planning Group member, this individual was counted only once in the total number of interviewees.

The objectives for the Process Interviews included the following:

- Identify the various transmission planning processes involving Western Electricity Coordinating Council (WECC) stakeholders.
- Determine the nature and extent of environmental considerations inherent in existing transmission planning processes.
- Understand the relationship between existing transmission planning processes and WECC's regional transmission planning process.
- Identify opportunities for incorporating environmental information into the various steps of the regional transmission planning process.

Interview questions broadly fell into three categories:

1. *Transmission planning process* (e.g., What is your basic transmission planning process? How does your process relate to the Transmission Expansion Planning Policy Committee (TEPPC) process or other transmission planning processes? When and/or how do you consider environmental and cultural data in your process?).
2. *Using environmental information in transmission planning* (e.g., What type and scale of data do you use? What gaps or constraints do you see in environmental information?).
3. *Other issues associated with considering environmental information in transmission planning* (e.g., How do you deal with regulatory and policy shifts? How should mitigation be used? How should societal costs be weighed?).

A matrix illustrating the Summary Observations, including the stakeholder group whose input contributed to each, appears in Section 3.0. Key, un-summarized observations made by stakeholders during the Process Interviews appear in Appendix E.

C.2 Data Analysis (Geospatial or GIS)

The Data Analysis investigated the limitations (including data gaps, issues of scale, and other data challenges) and potential applications of existing environmental and cultural data as they apply to transmission planning. The analytical process involved the compilation and assessment of environmental and cultural data sets and their usability in transmission suitability modeling. The Data Analysis was developed through geospatial processing, expert consultation, and review of relevant transmission and generation studies.

With project sponsor approval, the EDTF case study applied the Data Analysis to four potential transmission line projects from the Subregional Coordination Group's Major Project List:

- Centennial West Clean Line
- Gateway West Transmission Project Phase 2
- Navajo Transmission Project
- SunZia Southwest Transmission Project

The EDTF selected the four projects based on willing project sponsors, the projects' length and proximity to load, and the expectation that the projects would intersect lands with one or more of the following environmental characteristics:

- Biodiversity
- Scenic
- Interstate
- Sensitive wild areas (roadless and wilderness characteristics)
- Cultural complexity
- Topographical complexity
- Meaningful source data

C.2.1 Review of Other Studies

The Data Analysis considered a number of other studies, either completed or currently underway, that included environmental data and addressed power generation or transmission. Table C-2 identifies these studies and includes the project status and the relevance of the study to data compilation and the analysis approach used in this report. The EDTF case study reviewed these other studies to identify data sources and/or approaches that could be applied to the Data Analysis and, more broadly, to Regional Transmission Expansion Planning (RTEP). These other studies were selected for review based on comments from EDTF members and the professional judgment of subject matter experts. The studies listed in Table C-2 represent a body of knowledge, data and methodologies, and products potentially adaptable to RTEP.

Table C-2. Summary of Other Studies Considered During Development of the Data Analysis, and Their Applicability to the Data Compilation and Modeling Approaches

Project/Study/ Program of Interest	Status	Project Type	Applicability of providing geospatial data to RTEP/Data Analysis	Applicability of providing geospatial analysis approach to RTEP/Data Analysis
Final Report of the Arizona Renewable Resource and Transmission Identification Subcommittee (ARRTIS)	Final report published September 2009.	Siting for renewable energy generation facilities.	The report indicates that data are not available from the project; data should be obtained from public agencies.	The project used both an exclusions and suitability analysis; the suitability criteria are provided in Section 4 of the report. The ARRTIS report used a High-Medium-Low rating system. Some criteria are Arizona-specific.
BLM Rapid Ecoregional Assessments	In progress.	Identification of areas of high ecological value within an ecoregion that may warrant conservation, adaptation, or restoration.	Data were not available for the Data Analysis. Once available, data may be useful to RTEP. Data will be limited to BLM-administered lands.	The approaches used to perform the assessment may have value to RTEP, but were not available for consideration in the Data Analysis.
Boardman to Hemingway Transmission Line Project Siting Study	Final report published August 2010.	Siting for electrical transmission line.	Data cover a small portion of Idaho and part of Oregon; it is unknown whether the data would be available from the project proponent.	The project used an exclusions, avoidance, and opportunities analysis and considered construction and mitigation costs.
Clark County Multiple Species Habitat Conservation Plan[1]	In progress, with preliminary data layers available.	Habitat Conservation Plan.	Data layers for habitat, vegetation, and species distributions could be used in RTEP; coverage is limited to Clark County, Nevada.	Analysis approach is focused on modeling species habitat suitability, and is not applicable to RTEP.
Desert Renewable Energy Conservation Plan[2]	In progress, with preliminary data layers available. ICF, the EDTF's technical support contractor, is a consultant participant in this project.	Habitat Conservation Plan and Natural Community Conservation Plan.	Data coverage is limited to part of southern California.	Analysis approach is focused on modeling species habitat suitability and is not applicable to RTEP.

[1] *Clark County Multiple Species Habitat Conservation Plan. http://www.clarkcountynv.gov/Depts/dcp/Pages/default.aspx*
[2] *Desert Renewable Energy Conservation Plan. http://www.drecp.org/*

Table C-2. Summary of Other Studies Considered During Development of the Data Analysis, and Their Applicability to the Data Compilation and Modeling Approaches

Project/Study/ Program of Interest	Status	Project Type	Applicability of providing geospatial data to RTEP/Data Analysis	Applicability of providing geospatial analysis approach to RTEP/Data Analysis
EPRI-GTC Overhead Electric Transmission Line Siting Methodology	Final report published in 2006.	Siting methodology for electrical transmission lines.	Study area is located in Georgia. Data not applicable as study area is outside the Western Interconnection.	The analysis approach is a GIS-based corridor suitability approach for transmission lines, although not thoroughly applicable to RTEP due to study area and local siting focus. The study used a 1-9 suitability rating scale. EPRI is an authoritative source for setting analysis standards.
Renewable Energy Transmission Initiative (RETI) Phase 1B Final Report	Final Phase 1B report completed in January 2009.	Identification of renewable energy zones.	Data are readily accessible; however, study area is limited to California.	Project used both an exclusion and suitability analysis approach.
Solar Energy Development Programmatic EIS[3]	Draft EIS published in 2010; under public review until April 2011.	Assesses potential impacts from developing solar generation facilities in solar energy zones.	Data are readily accessible through website download.	Analysis approach addresses energy zones and impact assessment; the analysis approach is therefore not directly applicable to RTEP.
Western Governors' Association, State Decision Support Systems (DSSs)	Montana and Arizona DSSs are essentially complete, but final data is only publically available for Montana. Data for other western states are in development.	General purpose tool for considering natural resources in development decisions.	Data were generally not available for the Data Analysis. Once available, data and guidance materials may be useful to RTEP.	It is expected that the DSSs will include criteria and suitability-for-development analysis operations applicable to RTEP.
Western Regional Corridor Study[4]	Final report published in 1992.	Utility corridor mapping effort to aid land management planning.	Data are not available for electronic download.	Study used a stakeholder group consisting of utilities and government agencies and operated over an 11 state area in the western U.S.
Western Regional Partnership Web Mapping Application	In progress. Application is online and undergoing refinement.	General purpose tool for viewing and sharing geospatial data.	Data are accessible through website download.	Not applicable.

[3] *Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States. U.S. Department of Energy. December, 2010. http://solareis.anl.gov/*
[4] *Western Regional Corridor Study. Western Utility Group. 1992.*

Table C-2. Summary of Other Studies Considered During Development of the Data Analysis, and Their Applicability to the Data Compilation and Modeling Approaches

Project/Study/ Program of Interest	Status	Project Type	Applicability of providing geospatial data to RTEP/Data Analysis	Applicability of providing geospatial analysis approach to RTEP/Data Analysis
Western Renewable Energy Zones (WREZ)	Phase I report published June 2009.	Identification of renewable energy zones.	Data (final exclusions data layer, and contributing data layers) are partially accessible through website download.	Project used an exclusions analysis; the EDTF Data Analysis considered these precluded areas.
West-wide Energy Corridor Programmatic Environmental Impact Statement[5]	Final Programmatic EIS published in 2008.	Environmental impact assessment for proposed energy infrastructure within defined corridors.	Data are readily accessible through website download.	Analysis approach included an avoidance analysis considered in the EDTF Data Analysis.

BLM	Bureau of Land Management	ICF	ICF International
EDTF	Environmental Data Task Force	RETI	Renewable Energy Transmission Initiative
EIS	Environmental Impact Statement	RTEP	Regional Transmission Expansion Planning
EPRI	Electric Power Research Institute	WECC	Western Electricity Coordinating Council
GIS	Geographic Information System	WREZ	Western Renewable Energy Zones
GTC	Georgia Transmission Corporation		

The following section summarizes relevant information from review of the studies listed in Table C-2.

- *Data Compilation:* Many of these other studies offer perspectives on data quality and accessibility, as well as the use of one data set in preference to another. These studies include identification, collection, compilation, and processing of geospatial data using Geographic Information Systems (GIS). In each case, the studies expended a substantial effort to develop and add value to geospatial databases or to review data layers collected from other sources. Many of the data layers in these project databases are available from their original sources (e.g., critical habitat from the U.S. Fish and Wildlife Service [USFWS]), but some of the data layers were developed specifically for a particular study (e.g., WREZ exclusion areas) and not otherwise discoverable or accessible to WECC or to transmission project proponents.
- *Data Analysis Approaches:* Most of the other studies reviewed used GIS to perform spatial analyses using a variety of approaches with a range of complexity. According to these studies, their analysis approaches were generally vetted before they were applied, often through some collaborative or stakeholder-driven process. In particular, where these approaches were developed through a stakeholder-driven process, the EDTF case study assumed they may have value for informing the Data Analysis. Where relevant approaches were identified in these studies, the EDTF case study adopted, either in whole or in part, these approaches. For example, several of the analyses used a suitability rating system (that may include a category of precluded

[5] *West-wide Energy Corridor Final Programmatic Environmental Impact Statement. 2008. U.S. Department of Energy and U.S. Department of the Interior Bureau of Land Management. http://corridoreis.anl.gov/documents/fpeis/index.cfm*

areas) where rating values on a numeric scale (e.g., 1 to 9 for Electric Power Research Institute-Georgia Transmission Corporation [EPRI-GTC], or High-Medium-Low for ARRTIS) were applied to certain mapped features. For the initial Data Analysis suitability modeling presented in the Preliminary Recommendations Report, the EDTF case study used the 1 to 9 EPRI-GTC scale and assigned suitability ratings based, in part, on those in the RETI, ARRTIS, and EPRI-GTC studies.

In addition to the studies mentioned in Table C-2, transportation planning tools and model approaches may provide insight and valuable lessons learned that could aid in the development of methods and tools applicable to regional transmission planning. For example, the QuantM tool used in roadway planning incorporates least environmental cost along with least engineering (and land acquisition) costs. While not currently adapted for use in transmission planning, the fact that transportation and transmission both address long linear projects suggests tools such as QuantM may be adaptable to transmission planning.

- *Data Delivery*: Many of the studies provide interactive web mapping applications that deliver decision-support information to the end user. While such an application was not required or developed for the Data Analysis, the EDTF case study considered potential recommendations for the use of such an information-delivery strategy for future geospatial data distribution to transmission line project proponents and others.

The EDTF case study also identified the following limitations in adopting data and approaches from these studies.

- *Data Compilation:* Large regional studies, such as the BLM's Rapid Ecoregional Assessments or the Western Governors' Association's State Decision Support System (DSS) initiatives, may provide the best potential for incorporating data at the regional transmission planning level; local siting-level studies will likely be less useful in RTEP.
- *Data Analysis Approaches:* The analysis approaches employed by some other studies are not directly applicable to the EDTF case study. For example, some of these analysis approaches do not address transmission planning and/or siting and, therefore, do not necessarily address concerns relative to regional transmission planning. Rather than regional screening, they focus on energy generation zones or on assessing the impacts for identified alternatives.

C.2.2 Data Compilation

Compilation of geospatial environmental and cultural data included defining, cataloging, inquiring, collecting, organizing, and reviewing multiple data sets obtained from multiple data sources across the Western Interconnection. The EDTF case study documented the data catalog in a Microsoft® Excel spreadsheet, which was updated as new information becomes available or was refined. Version 6 of the data inventory spreadsheet is available on the EDTF webpage, and findings from the data cataloging effort appear in Section 3.3 and Appendix D of this document.

Generally stated, the goal in GIS data compilation for large scale projects (including transmission planning projects) was to sort through available data sets to capture data that:

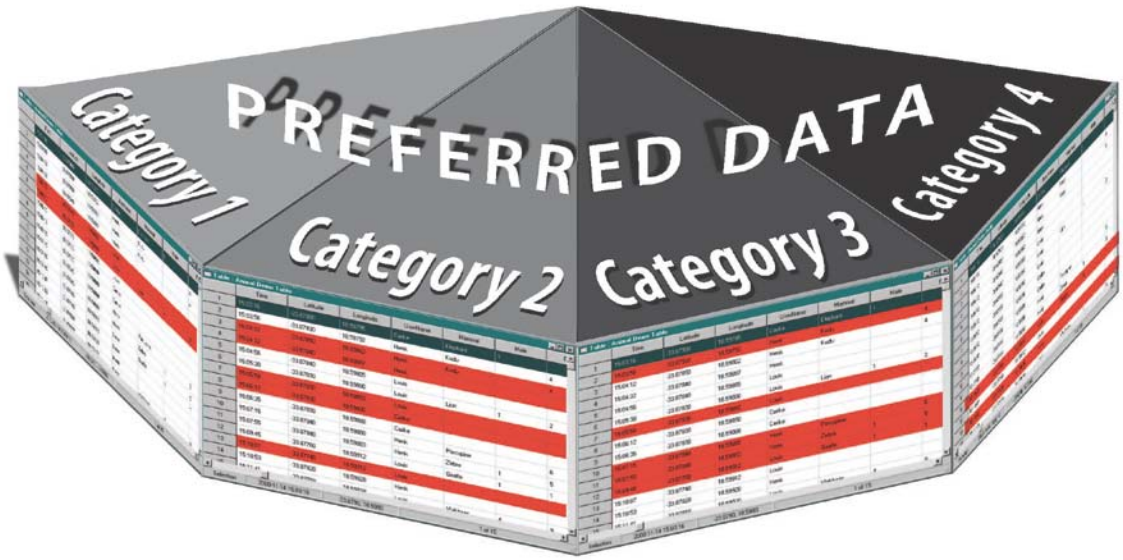
- Was readily and freely accessible to end users;
- Originated from an authoritative organization;
- Was in ready-to-use common GIS formats;
- Met quality and fitness-for-use standards (see the Data Quality Protocol);
- Included well documented electronic metadata and supporting documentation, if needed; and
- Was maintained, updated, and supported by the organization providing data.

The intention of meeting these requirements was to have a data compilation process that was efficient and effective and resulted in a catalog that was usable for transmission planners and developers.

The EDTF case study performed the following steps during data compilation:

1. **Define**. Based on the definition of environmental and cultural data presented in Section 2.0, and consistent with EDTF's scope of work, environmental and cultural data layers identified for consideration in transmission planning included, but were not limited to, data layers used in other regional energy planning studies (see Table C-2); data layers considered in National Environmental Policy Act (NEPA) and similar environmental analyses; and data layers identified by the EDTF and other stakeholders.
2. **Catalog**. The EDTF case study developed a structured data inventory spreadsheet for compilation of data layer information, including source, availability, quality, and fitness-for-use criteria.
3. **Inquire**. The EDTF case study researched and identified data sources for the identified data layers through web searches, professional contacts, and known data sources.
4. **Collect**. The EDTF case study acquired data from sources through web downloads, File Transfer Protocols, media transfers, and emails. The EDTF case study noted instances where desired data layers were nonexistent or inaccessible.
5. **Organize**. Once collected, the EDTF case study saved data into a project file-folder structure on a GIS server.
6. **Review**. For collected data sets, the EDTF case study performed a high-level quality and fitness-for-use assessment, and documented results in the data inventory spreadsheet, per the Data Quality Protocol.
7. **Identify Preferred Data Sets**. As displayed in Figure C-1, the EDTF case study identified selected data sets as "preferred" for use in the Data Analysis models (i.e., the Environmental Exclusion and Environmental Suitability models) based upon EDTF recommendations, inclusion in previous similar studies, and professional knowledge of the data sets. Area types (e.g., National Parks or State Forests) within these data sets that the EDTF determined relevant to regional transmission planning were then classified, using the definitions identified in Section 2.0 of this document, into Risk Classification Categories. The list of preferred data sets and how relevant area types within these data sets were categorized appears in Appendix D.

Figure C-1. Use of Preferred Data in the Case Study Data Analysis



The EDTF case study applied the following assumptions to the data set compilation steps:

- Data sets were limited to commonly used and professionally accepted environmental and cultural data themes, such as those referenced in other regional studies (see Step 1, **Define**, above) and those required for consideration in NEPA, California Environmental Quality Act (CEQA), and other environmental documentation.
- Data sets were limited to public domain or layers that could be reasonably obtained from available sources within typical project timeframes and budgets.
- Data sets were limited to those provided in a standard GIS format, such as ESRI shapefiles, geodatabases, and rasters.
- Data sets were limited to those of a national, statewide, or regional mapping scale. Data compilation excluded county-level, municipal, water district, utility district, and similar local data, as well as project-specific data provided by project proponents; these data sets are generally too detailed to support broad regional planning efforts.
- Collected data sets were not edited, corrected, or modified, except for certain preprocessing steps such as map projection conversion, that facilitate use of the data in the Data Analysis.

As the case study data compilation effort ended and the EDTF began to develop recommendations, the understanding of how the results of the data compilation efforts could be most appropriately leveraged by transmission planners and those engaged in transmission development evolved. Ultimately, this evolution identified the need to:

- Include state and province level data layers in the list of preferred data layers. Because of the complexity involved in identifying state and province-level area types relevant to considering transmission alternatives at the regional level, the initial list of these area types (see Appendix D) relies heavily on the substantial stakeholder-driven work done for the WREZ process.
- Include placeholders for information believed to be available, either due to its inclusion in other studies such as WREZ or based on input from EDTF members; however, these data were not cataloged in time for inclusion in this report.
- Perform additional processing of data prior to its use in transmission modeling, especially for large complex data sets such as the Protected Areas Database of the United State (PAD-US) 1.1 Conservation Biology Institute (CBI) Edition data set[6] where designations assigned in the metadata may contain multiple and assorted area type names for a single polygon. The PAD-US data set contains multiple attribute fields to designate the ownership and status of lands. In particular, the database contains a field to indicate Primary Designation (e.g., other Department of Defense land) and another to indicate Secondary Designation, (e.g., the name of a particular land parcel) and other fields to indicate additional names and designations of the features (e.g., whether that parcel is held in fee). For some of the Primary Designations (in particular the "other" designations such as "other Department of Defense" or "other U.S. Forest Service" lands), careful reviews of the Secondary Designations field showed that some of the identified polygons could be placed into other Primary Designations as well (e.g., some parcels identified as "other Department of Defense" lands would be appropriate in the "Military Range/Installation" Primary Designation as well). The user of the PAD-US data set therefore cannot simply query a single designation field to select features of interest, but rather must understand the definitions of these fields and perform complex queries to extract features of interest. For example, if a user was interested in Department of Defense land that was not part of a military range, they would need to perform a line-by-line review of features marked "other Department of Defense lands" to identify and remove named military ranges in the Secondary Designations field.

[6] During final production for this report the U.S. Geological Survey Gap Analysis Program version 1.2 of the PAD-US data set was released; the EDTF recommends the use of this more recent data set.

C.2.3 Models

The Case Study Technical Approach, Version 1-3 described a general geospatial analysis approach comprised of four sequential steps necessary to derive the following new informational data layers:

1. Environmental Exclusion Areas
2. Environmental Suitability
3. Least-Environmental-Cost Paths
4. Relative Mitigation Costs

Using this general approach as a guide, the EDTF case study built a draft set of GIS analysis models (in the ESRI ArcGIS rev. 9.3.1 Model Builder environment) to implement the four approaches: Environmental Exclusion Areas Model, Suitability Model, Least-Environmental-Cost Paths Model, and Relative Mitigation Costs Model.

The Environmental Exclusion Areas and Suitability models applied two basic methods:

1. Criteria Selection: identification of feature types, or criteria, used in the map overlay process. For example, these feature types could include National Monuments, Wilderness Areas, wildlife corridors, etc.
2. Classification Category Assignment: assignment of a rating or category to each of the overlaid area types (in the case of the Suitability Model, a rating scale of 1 to 9 was initially used; in the case of the Environmental Exclusion Areas Model, the rating was binary where the presence of a feature indicated the area was statutorily precluded from transmission development).

The model-building process requires the articulation of a set of "if-then" decision rules (e.g., if an area is a Wilderness Area, then it is precluded). These decision rules were based on the professional judgment of subject matter experts, EDTF member input, and/or methods used in other studies (see Table C-2). The decision rules were implemented in the GIS models in the form of explicit database queries, selections, and calculations. It is possible for decision rules to be modified in the models; in fact, the modeling process often involves the exploration of various decision rule strategies and their impact on modeling results. Following the Preliminary Recommendations Report and Version 1 of the Environmental Recommendations Report, the EDTF case study reassessed the decision rules used in the Environmental Exclusion Areas and Suitability models.

Environmental Exclusion Areas Model

The Environmental Exclusion Areas Model produced a new data layer of polygons that represented exclusion areas. It is recognized, however, that statutory protection is not absolute. For example, areas can be statutorily protected from development, but it is not uncommon for pre-statute development to be "grandfathered" in and/or for exceptions to be granted. The model included exclusion areas from the PAD-US data set; all of the areas included as exclusions in the Data Analysis were identified as statutorily excluded in either the RETI, WREZ, or ARRTIS studies (see Table 5 in Section 3.0). The PAD-US is a "protected areas" data set for the United States that displays numerous types of protected areas, such as National Parks and Wilderness Areas.

*For the case study **Category 4 areas included** areas where transmission development is presently precluded by federal, state, or provincial law, policy, or regulation, and areas identified as exclusion areas (based on environmental and cultural sensitivities) in Canada from the WREZ process.*

The EDTF case study completed three model runs of the Environmental Exclusion Areas Model. One model took a conservative approach, including areas beyond those precluded by statute but that would, nonetheless, likely propose substantial issues for transmission planners. Following release of the Preliminary Recommendations Report (February 22, 2011), the EDTF case study completed a second

model run for Version 1 of the Environmental Recommendations Report (April 4, 2011) that included a more restrictive definition of precluded area types, but limited the areas considered to the federal level (e.g., National Parks or National Recreation Areas). Based on comments received on Version 1 of the Environmental Recommendations Report and other direction from EDTF members, the analysis was rerun to further limit the definition of precluded areas (currently referred to as Category 4 areas) to include only areas where transmission development is precluded by laws or regulations (see Section 2.2 for the current definition of Category 4 areas). In addition, the analysis was broadened to include state and province level area types that were included in the WREZ process. Legal citations and other information for Category 4 areas included in the third model run appear in Appendix D. The findings from the Environmental Exclusion Areas Model runs appear in Section 3.0.

Environmental Suitability Model

The Environmental Suitability Model produced a new data layer of polygons with an attribute indicating the relative suitability of the polygonal area for transmission development. In the Preliminary Recommendations Report, this layer was derived by a multiple polygon overlay of several input data layers whose features were assigned a rating value on a scale of 1 to 9 (1 being most suitable and 9 being least suitable). This approach is similar to that used in the EPRI-GTC Overhead Electric Transmission Line Siting Methodology.

The assignment of suitability values to a class of features is a somewhat subjective process that is reliant on subject matter expert professional judgment and, often, active stakeholder participation. In many cases, polygons from more than one input layer overlaid or intersected each other (e.g., a wildlife corridor might intersect with a research natural area). In cases of overlay or intersection, the final suitability rating reflected the maximum numeric value of the intersecting features. See Table 5 in Section 3.0 for a list of the suitability criteria used in the Preliminary Recommendations Report.

The Risk Classification Category definitions for Categories 1–3 appear in Section 2.2.

For the Data Analysis, an initial draft set of suitability ratings was applied to allow expedient implementation of the model and generation of early draft results for review by the EDTF. Following release of the Preliminary Recommendations Report, the EDTF case study reassessed and refined the suitability scale, input data, and suitability ratings (see Version 1 of the Environmental Recommendations Report). When refining suitability ratings for Version 1 of the Environmental Recommendations Report, the EDTF case study considered the suitability classification rating systems employed in other studies as guidance (see Table 5 in Section 3.0). However, the different characteristics of other studies (e.g., differences in Areas of Interest, ecoregions, types of facilities proposed, or scales of analysis) made it impractical to simply adopt another study's input data and suitability rating approach wholesale. Therefore, based on professional judgment, and in consideration of the RETI, WREZ, ARRTIS, and EPRI-GTC studies, Version 1 of the Environmental Recommendations Report included a suitability scale of opportunity, moderately constrained, and highly constrained (opportunity being most suitable for transmission development and highly constrained being least suitable) and generated a list of "strawman" suitability ratings. Based on comments received on the strawman suitability ratings in Version 1 of the Environmental Recommendations Report (April 4, 2011) and other direction from EDTF members, the classification system was further revised for Version 2 of the Environmental Recommendations Report and this final report (see Section 2.2 for the current classification system). The revised system consists of Categories 1 through 4[7] (with Category 4, or area types that preclude transmission development, representing the highest **risk of environmental or cultural resource sensitivities and constraints** for transmission development and Category 1 representing the lowest risk). The EDTF current proposed justification for the classification of area types into these categories appears in Appendix D. Findings from the different approaches to the Environmental Suitability Model and classification systems appear in Section 3.0.

[7] *Category 4 is discussed in the Environmental Exclusion Areas Model subsection above.*

Least-Environmental-Cost Paths Model

The Least-Environmental-Cost Paths Model produced a new data layer that showed relatively suitable paths connecting two end points within each Area of Interest at the least environmental cost. The results of this model type are a function of a combination of linear distance and environmental cost. It is further noted that this model is intended to calculate environmental "cost" based on suitability ratings assigned to individual data layers; it does not include, account for, or calculate engineering, economic, or capital costs.

Following release of the Preliminary Recommendations Report, the EDTF case study received several comments in regard to the consideration of disturbed lands in transmission planning. As proxies to investigate the potential to incorporate these lands into transmission planning, the EDTF case study re-ran the Least-Environmental-Cost Paths Model and adjusted the parameters of the algorithm to maximize the use of disturbed lands. To simulate disturbed lands, the EDTF case study downloaded an Environmental Protection Agency (EPA) data set entitled 'EPA_OCPA_Renewable_Energy_Shapefile' that included abandoned mine lands, brownfields, federal and non-federal superfund sites and resource conservation and recovery sites. Because the data set only contained points and did not have a value identifying the geographic extent represented by each point, an assumption was applied in the model so that each point represented a land area equivalent to a square, 0.93 miles (1.5 kilometers) on each side. Because it includes only point data, the 'EPA_OCPA_Renewable_Energy_Shapefile' data set was not a preferred data set for regional transmission planning (see Appendix D). Section 3.0 presents the results of the revised model.

Relative Mitigation Costs Model

Relative Mitigation Costs Models translate relative environmental suitability for the least-environmental-cost paths (optimum and suboptimum) into relative mitigation costs. The results of this model (like the Least-Environmental-Cost Paths Model) are a function of the linear distance of a path and mitigation costs encountered along the path.

Environmental Recommendations for the Transmission Planning Process

Final Report of the Environmental Data Task Force

APPENDIX D

Environmental Data Analytics

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This appendix contains detailed suplemental information for environmental data layers that are identified in the Environmental Data Task Force's (EDTF's) proposed *Environmental and Cultural Data Sets* and *Land Classification System* recommendations (see Sections 2.1 and 2.2). In support of these recommendations and the findings and observations from the Data Analysis component of the case study, this appendix includes:

1. Table D-1. Preferred Data Layers
2. Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities and Constraints
3. Table D-3. Classified Area Types by Modified Scenario Decision Factor Subject Matter Areas
4. Table D-4. Other Areas for Consideration in Regional Transmission Planning for Which Data were Incomplete or Non-existent
5. Table D-5. Observations and Implications for Specific Data Layers

Case study data compilation involved defining, cataloging, inquiring, collecting, organizing, and reviewing multiple data sets, each containing one or more data layer, from multiple sources.

Table D-1 includes the Preferred Data Layers proposed for consideration in transmission planning. These data layers were identified by EDTF members, from similar studies, and by subject matter experts. These data layers represent an initial list of currently available data that may allow for the consideration of environmental and cultural resources during regional transmission planning; placeholders have been used where data layers are believed to be available, either due to their inclusion in other studies such as the Western Renewable Energy Zones (WREZ) Phase 1 Report or input from EDTF members, but could not be cataloged in time for inclusion in this report. The Data Quality Protocol: Identification of Preferred Geospatial Data Sets contains the data quality standards against which data layers were measured. Data layers were generally identified as "preferred" if they met the criteria described in the Data Quality Protocol and they were considered relevant to regional transmission planning. The data compilation efforts and the determination of what layers should be recommended as preferred for use in regional transmission planning are ongoing. The EDTF recognizes that, to remain relevant, it may be necessary to annually update the preferred data list in Table D-1 including providing opportunities for input by diverse stakeholders (see Section 2.0).

Table D-2 describes the EDTF's current recommended list of "area types" (e.g., Wilderness Areas, State Parks, Private Lands) and their associated Risk Classification System Categories for use in transmission planning. For each area type, Table D-2 also includes:

1. The designating and managing entity
2. A brief description of the area type
3. A justification (including legal citations where applicable) for the EDTF's proposed classification

In Table D-2, the phrase "Parking Lot" in the Classification Category column indicates the area types that the EDTF could not reach consensus on prior to the publication of this document.

Table D-3 organizes all Area Types classified in Table D-2 by subject matter. EDTF modified the preliminary Subject Matter Areas identified to group Scenario Decision Factors in the Western Electricity Coordinating Council's long-term planning tool to create the subject matter groupings in Table D-3.

Table D-4 contains a list of area types mentioned as important for consideration in transmission planning by members of EDTF or included in the WREZ Phase 1 Report, for which data were incomplete or non-existent. This table also contains preliminary (i.e., unvetted by the EDTF) classifications for these area types. These preliminary classifications are supplied for discussion purposes only and would be revised once or if data layers became available.

Table D-5 contains observations and implications pertaining to specific data layers included in the data catalog. Supplementing the information presented in Section 3.3.1 Data Compilation, Table D-5 provides

greater explanation for considering certain environmental information in regional transmission planning and how characteristics (e.g., availability, extent, or seamlessness) of the representative geographic information system (GIS) data layers may affect their use in modeling. For a list of all data layers cataloged, including those not identified as preferred, see the data inventory spreadsheet.

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Area of Critical Environmental Concern, BIA, BLM, NPS, USFS Wilderness Area; BLM, USFS Wilderness Study Area; USFS National Primitive Area; USFWS National Wildlife Refuge; Units of the NPS (excluding National Trails); USFS, USFWS, Wilderness Area (Recommended); BLM National Conservation Area; BLM, NPS, USFS National Historic Trail; BLM, NPS National Monument; NPS, USFS National Recreation Area; NPS National Rivers and Wild & Scenic Riverways; BLM, NPS, USFS, USFWS Research Natural Area; BLM, NPS, USFS, Research Natural Area Proposed; USFS Special Interest Area; BLM, USFS Special Management Area; Tribes, BIA American Indian/Native American Reservation; Army Corps of Engineers Land; Tribes, BIA Native Allotment; Other Land Administered by U.S. Federal Agencies; Other Private Non-profit Land; Other Public Land; Other Water District Land; Private Land - Known Restriction; Private Land - Unrestricted for Development; Private University Land; USDA Agricultural Research Center; USDA Experimental Range; State Park[4]; State Wildlife Management Area[4]; State Forest (Oregon, Washington)[4]	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[5]	N/A	http://app.databasin.org/app/pages/datasetPage.jsp?id=f10a00eff36945c9a1660fc6dc54812e	Good	Data provides consistent, seamless coverage across the Western Interconnection in the United States.	N/A
Agricultural Land (excluding Prime Farmland)	Department of the Interior	Gap Analysis Data, Northwest-Southwest	http://lc.gapanalysisprogram.com/landcoverviewer/Downloads.aspx	TBD	Currently in raster format.	These data layers are used for agricultural land on private and non-private lands. Disturbed lands are also derived from this data set.
Alberta Eastern Slopes Zones 1 & 2	AltaLIS	N/A	http://srd.alberta.ca/MapsFormsPublications/Maps/ResourceDataProductCatalogue/Default.aspx	TBD[6]	N/A	Data is available from the source provided; however, it was not compiled and assessed for quality because it is not available to the public free of charge.

[1] For collected data sets, the EDTF case study performed a high-level quality and fitness-for-use assessment, and documented results in the data inventory spreadsheet, per the Data Quality Protocol. See the Data Quality Protocol for more information about how the EDTF considered data quality.
[2] The links in the spreadsheet should bring the user to the closest webpage for downloading the data. In some cases, the user will need to click on a data layer name within the web page, select from a dropdown list, or take similar steps to actually download the data file, as the URL will not necessarily perform those actions itself.
[3] See the Data Quality Protocol for an explanation of Overall Usability descriptors. The descriptors used to describe Overall Usability are based upon multiple characteristics presented in the data inventory spreadsheet that are not all presented in Table D-1.
[4] As they become available and as appropriate, State wildlife Decision Support Systems (DSS) and other state data (such as data layers for state forests, parks and wildlife management areas) may be incorporated in the preferred data list.
[5] See Note regarding the PAD-US database in Table D-1 Notes.
[6] This Area Type was included as a preferred data layer based on its inclusion as an Avoidance or Exclusion area in the Western Renewable Energy Zones (WREZ) Phase 1 report. While the data set created for the WREZ report is publicly available, the metadata associated with this data set, which should identify the names/area type of individual polygons, was absent or partially complete. This lack of metadata made it impossible to independently verify which area types were included in the data set. As of the publication of this report, the missing metadata or a substitute data set for this area type had not been identified.

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Alberta Ecological Reserve	AltaLIS	N/A	http://srd.alberta.ca/MapsFormsPublications/Maps/ResourceDataProductCatalogue/Default.aspx	TBD[5]	N/A	Data is available from the source provided; however, it was not compiled and assessed for quality because it is not available to the public free of charge.
Alberta Heritage Rangeland	AltaLIS	N/A	http://srd.alberta.ca/MapsFormsPublications/Maps/ResourceDataProductCatalogue/Default.aspx	TBD[5]	N/A	Data is available from the source provided; however, it was not compiled and assessed for quality because it is not available to the public free of charge.
Alberta Natural Area	AltaLIS	N/A	http://srd.alberta.ca/MapsFormsPublications/Maps/ResourceDataProductCatalogue/Default.aspx	TBD[5]	N/A	Data is available from the source provided; however, it was not compiled and assessed for quality because it is not available to the public free of charge.
Alberta Provincial Park	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[4]	CAN_AB_permanent_protected_areas	http://app.databasin.org/app/pages/datasetPage.jsp?id=c2f5952ef45e4a65a8149317286dd080	Good	N/A	N/A
Alberta Provincial Recreation Area	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[4]	CAN_AB_permanent_protected_areas	http://app.databasin.org/app/pages/datasetPage.jsp?id=c2f5952ef45e4a65a8149317286dd080	Good	N/A	N/A
Alberta Wilderness Area	AltaLIS	N/A	http://srd.alberta.ca/MapsFormsPublications/Maps/ResourceDataProductCatalogue/Default.aspx	TBD[5]	N/A	Data is available from the source provided; however, it was not compiled and assessed for quality because it is not available to the public free of charge.
Alberta Wildlands Park	AltaLIS	N/A	http://srd.alberta.ca/MapsFormsPublications/Maps/ResourceDataProductCatalogue/Default.aspx	TBD[5]	N/A	Data is available from the source provided; however, it was not compiled and assessed for quality because it is not available to the public free of charge.
Alberta Willmore Wilderness Park	AltaLIS	N/A	http://srd.alberta.ca/MapsFormsPublications/Maps/ResourceDataProductCatalogue/Default.aspx	TBD[5]	N/A	Data is available from the source provided; however, it was not compiled and assessed for quality because it is not available to the public free of charge.
Area Following Existing Linear Corridor	ESRI	Major Highways	ESRI Dataset	Good	N/A	Data sets recommended for inclusion by ICF subject matter experts.
Area Following Existing Linear Corridor	ESRI	Railroads	ESRI Dataset	Good	N/A	Data set recommended for inclusion by ICF subject matter experts.

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Areas which contain ecosystems or species that are at moderate risk; Areas with irreplaceable natural or cultural resources	NatureServe [Parking Lot[7]]	Multi-Jurisdictional Database of Species Occurrence	http://www.natureserve.org/getData/customData.jsp	TBD	This data layer is an aggregation of each state's Natural Heritage Program data. Data are only as current as the last data transfer from each state. The data layer has consistent attribution.	This area type was identified for consideration in regional transmission planning, but the data has not yet been compiled and assessed for quality by EDTF.
British Columbia Conservancy	N/A	TBD	N/A	TBD[5]	N/A	N/A
British Columbia Ecological Reserve	Province of British Columbia	CAN_BC_permanent_protected_areas	http://app.databasin.org/app/pages/datasetPage.jsp?id=5763d2a9624e4d5985f902aec8f1ca32	Good	This data layer is CBI's closest equivalent in Canada to the PAD-US data set.	N/A
British Columbia Endangered Species and Ecosystems - Masked Sensitive Occurrence and Non-sensitive Occurrence	Province of British Columbia	BIOT_MS_SP	https://apps.gov.bc.ca/pub/dwds/addProducts.do?orderId=577506&packagedProductId=-2#2_-2	Fair	N/A	N/A
British Columbia Motor Vehicle Closure Area	N/A	TBD	N/A	TBD[5]	N/A	N/A
British Columbia Old Growth Management Area	Province of British Columbia	OGMA_LEG_C	https://apps.gov.bc.ca/pub/dwds/addProducts.do?orderId=577506&packagedProductId=-2#2_-2	Good	N/A	N/A
British Columbia Parks	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[4]	CAN_BC_permanent_protected_areas	http://app.databasin.org/app/pages/datasetPage.jsp?id=5763d2a9624e4d5985f902aec8f1ca32	Good	This data layer is CBI's closest equivalent in Canada to the PAD-US data set.	N/A
British Columbia Protected Area	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[4]	CAN_BC_permanent_protected_areas	http://app.databasin.org/app/pages/datasetPage.jsp?id=5763d2a9624e4d5985f902aec8f1ca32	Good	This data layer is CBI's closest equivalent in Canada to the PAD-US data set.	N/A
British Columbia Recreational Area	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[4]	CAN_BC_permanent_protected_areas	http://app.databasin.org/app/pages/datasetPage.jsp?id=5763d2a9624e4d5985f902aec8f1ca32	Good	This data layer is CBI's closest equivalent in Canada to the PAD-US data set.	N/A
British Columbia Ungulate Winter Range	Province of British Columbia	WCP_UWR_SP	https://apps.gov.bc.ca/pub/dwds/addProducts.do?orderId=577506&packagedProductId=-2#2_-2	Good	N/A	N/A
British Columbia Wildlife Management Area	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[4]	N/A	http://app.databasin.org/app/pages/datasetPage.jsp?id=5763d2a9624e4d5985f902aec8f1ca32	Good	N/A	N/A

[7] *This data set was identified for consideration in regional transmission planning by the EDTF; however, this data set had not been acquired as of the publication of this report to assess its quality.*

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
California State Wetlands	Cal-Atlas geospatial clearinghouse	amer5ac_p butte5ac_p col5ac_p delta5ac_p sanjoa5ac_p sfbay5ac_p suisun5ac_p sut5ac_p yolo5ac_p	http://ftp.dfg.ca.gov/Public/BDB/GIS_Service_Center/Wetlands/Central_Valley_Wetlands_and_Riparian_GIS/	Good	N/A	N/A
California State Wilderness Area	N/A	TBD	N/A	TBD[5]	N/A	N/A
Canadian Forces Base	N/A	TBD	N/A	TBD[5]	N/A	N/A
Canadian National Parks, Canadian National Wildlife Area	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[4]	N/A	http://app.databasin.org/app/pages/datasetPage.jsp?id=5763d2a9624e4d5985f902aec8f1ca32 http://app.databasin.org/app/pages/datasetPage.jsp?id=c2f5952ef45e4a65a8149317286dd080	Good	N/A	N/A
Critical Habitat	U.S. Fish and Wildlife Service	Critical Habitat	http://criticalhabitat.fws.gov/	Good	Not all critical habitat for every species is mapped. Although it is limited in availability, the data are updated as needed.	Data sets recommended for inclusion by ICF subject matter experts.
Designated Energy Corridor	West-wide energy corridor	West-wide Energy Corridors	http://corridoreis.anl.gov/eis/fmap/arcreader/index.cfm	Good	N/A	The EDTF recommended this data layer for inclusion.
Existing Conservation and Mitigation Bank (Canada)	N/A	Existing Conservation and Mitigation Banks	N/A	TBD[5]	N/A	N/A
Existing Transmission Rights-of-way	Federal Emergency Management Agency	Transmission Line Data	http://www.mapcruzin.com/renewable-energy-us-electric-transmission-shapefiles.htm	Good	Caveats come with this data; however, considering the source is National Renewable Energy Laboratory it is believed to be accurate as of 1993.	Data layers recommended for inclusion by ICF subject matter experts.
Flood Zone	FEMA	Q3 Flood Zone Data	https://hazards.fema.gov/wps/portal/mapviewer	Good	N/A	Data layers recommended for inclusion by ICF subject matter experts.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	ConserveOnline	Range-wide Breeding Densities (Sagegrouse)	http://conserveonline.org/workspaces/sagegrouse/documents/all.html	Good	N/A	Recommend for inclusion by the EDTF.

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Alberta - Canada Lynx Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Alberta - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Alberta - Marbled Murrelet Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Alberta - Northern Spotted Owl Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Arizona - California Condor Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Arizona - Desert Tortoise Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	British Columbia - Canada Lynx Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	British Columbia - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	British Columbia - Marbled Murrelet Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	British Columbia - Northern Spotted Owl Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	California - California Condor Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	California - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Colorado - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Idaho - Canada Lynx Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Idaho - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Montana - Canada Lynx Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Montana - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Nevada - Desert Tortoise Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.

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Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Nevada - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Oregon - Canada Lynx Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Oregon - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Utah - Desert Tortoise Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Utah - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Washington - Canada Lynx Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.

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Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	N/A	Washington - Greater Sage-grouse Core Area	TBD	TBD	N/A	This area type was identified for consideration in regional transmission planning but the data has not yet been compiled and assessed for quality by EDTF. These data are at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	RETI	California - Desert Tortoise Core Area	http://www.energy.ca.gov/reti/documents/index.html	Good	Although metadata is lacking, the data layer is part of the RETI data set and has been vetted.	Identified in RETI.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	U.S. Fish and Wildlife Service	California - Northern Spotted Owl Core Area	http://criticalhabitat.fws.gov/	Good	N/A	Recommended for inclusion by ICF subject matter experts. This data is at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	U.S. Fish and Wildlife Service	Oregon - Northern Spotted Owl Core Area	http://criticalhabitat.fws.gov/	Good	N/A	Recommended for inclusion by ICF subject matter experts. This data is at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	U.S. Fish and Wildlife Service	Washington - Northern Spotted Owl Core Area	http://criticalhabitat.fws.gov/	Good	N/A	Recommended for inclusion by ICF subject matter experts. This data is at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	U.S. Forest Service	California - Marbled Murrelet Core Area	http://www.fs.fed.us/r5/rsl/clearinghouse/gis-download.shtml	Good	ICF subject matter experts recommend clipping these data with old growth forests for increased accuracy.	Recommended for inclusion by ICF subject matter experts. This data is at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	U.S. Forest Service	Oregon - Marbled Murrelet Core Area	http://www.fs.fed.us/r5/rsl/clearinghouse/gis-download.shtml	Good	ICF subject matter experts recommend clipping these data with old growth forests for increased accuracy.	Recommended for inclusion by ICF subject matter experts. This data is at the state level and will need to be combined with other states to create a Western Interconnection layer.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	U.S. Forest Service	Washington - Marbled Murrelet Core Area	http://www.fs.fed.us/r5/rsl/clearinghouse/gis-download.shtml	Good	ICF subject matter experts recommend clipping these data with old growth forests for increased accuracy.	Recommended for inclusion by ICF subject matter experts. This data is at the state level and will need to be combined with other states to create a Western Interconnection layer.

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Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	U.S. Geological Survey	Grizzly Bear Recovery Zones	http://sagemap.wr.usgs.gov/ListData.aspx	Fair	Data is a .dbf file to be joined to watershed data.	Recommended for inclusion by ICF subject matter experts.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	Wyoming Game and Fish Department	Wyoming - Greater Sage-grouse Core Area	http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/index.asp	Good	N/A	Recommended for inclusion by ICF subject matter experts. This data layer is at the state level and will need to be combined with other states to create a Western Interconnection layer.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, California	http://ca.audubon.org Audubon Society state offices must be contacted directly to request geospatial data.	Good	Seamless only for California.	Recommended for inclusion by EDTF and ICF subject matter experts.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Colorado	http://co.audubon.org Audubon Society state offices must be contacted directly to request geospatial data.	Good	Metadata is lacking.	Recommended for inclusion by EDTF and ICF subject matter experts. Although metadata is lacking the shapefile was received from the Audubon Society.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Idaho	http://iba.audubon.org/iba/viewState.do?state=US-ID Audubon Society state offices must be contacted directly to request geospatial data.	Fair	Seamless only for Idaho.	Recommended for inclusion by EDTF and ICF subject matter experts.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Montana	http://www.mtaudubon.org Audubon Society state offices must be contacted directly to request geospatial data.	Good	Seamless only for Montana.	Recommended for inclusion by EDTF and ICF subject matter experts.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Nevada	http://nevadaaudubon.org Audubon Society state offices must be contacted directly to request geospatial data.	Good	N/A	Recommended for inclusion by EDTF and ICF subject matter experts.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, New Mexico	http://nm.audubon.org Audubon Society state offices must be contacted directly to request geospatial data.	Good	N/A	Recommended for inclusion by EDTF and ICF subject matter experts.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Oregon	http://audubonportland.org/ Audubon Society state offices must be contacted directly to request geospatial data.	Good	Seamless only for Oregon.	Recommended for inclusion by EDTF and ICF subject matter experts.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Utah	http://www.wasatchaudubon.org/ Audubon Society state offices must be contacted directly to request geospatial data.	Good	Seamless only for Utah.	Recommended for inclusion by EDTF and ICF subject matter experts.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Washington	http://wa.audubon.org Audubon Society state offices must be contacted directly to request geospatial data.	Good	N/A	Recommended for inclusion by EDTF and ICF subject matter experts.
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Wyoming	http://www.audubonwyoming.org Audubon Society state offices must be contacted directly to request geospatial data.	Good	Seamless only for Wyoming.	Recommended for inclusion by EDTF and ICF subject matter experts.

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Important Bird Area (Global, State)	National Audubon Society	Important Bird Areas, Arizona	N/A Audubon Society state offices must be contacted directly to request geospatial data.	TBD	N/A	Recommended for inclusion by EDTF and ICF subject matter experts.
Marine Protected Area (Canada)	N/A	TBD	N/A	TBD[5]	N/A	N/A
Migratory Bird Sanctuary (Canada)	N/A	TBD	N/A	TBD[5]	N/A	N/A
Military Range/Installation	Conservation Biology Institute Protected Area Database (PAD-US 1.1)[4]	N/A	http://app.databasin.org/app/pages/datasetPage.jsp?id=f10a00eff36945c9a1660fc6dc54812e	Good	N/A	N/A
National Historic Trails	National Park Service	National Historic Trails	http://www.arcgis.com/home/search.html?q=owner%3ANPSGIS&focus=maps	TBD	N/A	Due to the sensitive nature of some trail data some NPS regional offices require detailed descriptions of geospatial data needs prior to distribution.
Natural Resources Conservation Service Easements	Natural Resources Conservation Service	Grassland Reserves	Unable to download via webpage, data contact is Steven.Nechero@ftw.usda.gov	Good	N/A	Recommended for inclusion by EDTF.
Prime Farmland	Natural Resources Conservation Service	Prime Farmland	http://soildatamart.nrcs.usda.gov/	N/A	SSURGO is a nationwide database and the data quality should be consistent across the Western Interconnection; however, the data set is not seamless and multiple layers will comprise the Western Interconnection.	Recommended for inclusion by EDTF and ICF subject matter experts.
Pronghorn Migration Corridor, Bridger-Teton National Forest (Wyoming)	Wyoming Game and Fish Department	ant08mr	ftp://gf.state.wy.us	Good	N/A	N/A
Proposed Conservation Area	N/A	TBD	N/A	TBD	N/A	This area type was identified for consideration in regional transmission planning but available data has not yet been compiled and assessed for quality by EDTF.

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
State Mapped Crucial Big Game Winter Range/Severe Winter Range	Colorado Division of Wildlife	BighornSummerRange09012010, BighornWinterRange09012010, BighornWinterConcentrationArea09012010, BighornSummerConcentrationArea09012010, ElkSummerRange09012010, ElkWinterRange09012010, ElkWinterConcentrationArea09012010, ElkSummerConcentrationArea09012010, MuleDeerSummerRange09012010, MuleDeerWinterRange09012010, MuleDeerWinterConcentrationArea09012010, MuleDeerSummerConcentrationArea09012010, PronghornSevereWinterRange09012010, PronghornWinterRange09012010, PronghornWinterConcentrationArea09012010,	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp	Fair	The data set has limited attribution, but is complete and detailed.	The EDTF recommended crucial habitat and wildlife corridors for inclusion.
State Mapped Crucial Big Game Winter Range/Severe Winter Range	Montana Fish, Wildlife and Parks	distributionElk	http://fwp.mt.gov/doingBusiness/reference/gisData/dataDownload.html	Good	N/A	The EDTF recommended crucial habitat and wildlife corridors for inclusion.
State Mapped Crucial Big Game Winter Range/Severe Winter Range	New Mexico Department of Game and Fish	winter range	http://www.wildlife.state.nm.us/recreation/hunting/index.htm Data was obtained directly from Lance Tyson at New Mexico Department of Game and Fish.	Poor	Data set has limited attribution.	The EDTF recommended crucial habitat and wildlife corridors for inclusion. Although it is lacking in detailed attribution, the data comes from New Mexico Department of Game and Fish.
State Mapped Crucial Big Game Winter Range/Severe Winter Range	Oregon Department of Fish and Wildlife	eor_deerwrodfw200907 eor_elkwrodfw200907	http://rainbow.dfw.state.or.us/nrimp/default.aspx?pn=dataresources	Good	Data set has limited attribution.	The EDTF recommended crucial habitat and wildlife corridors for inclusion.
State Mapped Crucial Big Game Winter Range/Severe Winter Range	Wyoming Game and Fish Department	ant10cr bhs08cr elk10cr mdr10cr	ftp://gf.state.wy.us	Good	N/A	The EDTF recommended crucial habitat and wildlife corridors for inclusion.
U.S. Forest Service Roadless Areas	U.S. Forest Service	Roadless Area	http://corridoreis.anl.gov/eis/fmap/arcreader/index.cfm	Good	Updated as needed.	N/A
Urban Fringe Area	ESRI	US Populated Places	ESRI Dataset	Good	N/A	Recommended for inclusion by EDTF.
Washington State Natural Area Preserve	Department of Natural Resources	TBD	http://www.dnr.wa.gov/Pages/default.aspx	TBD[5]	N/A	N/A
Washington State Natural Resource Conservation Area	Department of Natural Resources	TBD	http://www.dnr.wa.gov/Pages/default.aspx	TBD[5]	N/A	N/A
Wetlands (mapped in regional databases)	U.S. Fish and Wildlife Service	Wetlands	http://www.fws.gov/wetlands/Data/DataDownload.html	Good	N/A	N/A
Wild and Scenic River	U.S. Geological Survey	Wild and Scenic Rivers	http://www.rivers.gov/maps.html	Good	Updated as needed; 24,000 Wild and Scenic River segments have been added to the data set since 2000.	N/A

Table D-1. Preferred Data Layers – May 6, 2011

Description			Source and Distribution Information	Data Quality Comments[1]		
Area Type(s)	Source Organization	Data Layer	URL Link to Data[2]	Overall Usability[3]	Quality Comments	Preferred Data Comments
Wildlife Corridor Mapped by State Agency	Arizona Game and Fish Department	wildlife_corridors	http://www.gf.state.az.us/	Poor	Data set was prepared to support decisions in the Lake Havasu Field Office Resource Management Plan. The data represents wildlife corridors for a small part of the state.	The EDTF recommended crucial habitat and wildlife corridors for inclusion. Although data only covers part of Arizona, it is the only data available.
Wildlife Corridor Mapped by State Agency	Colorado Division of Wildlife	BighornMigrationCorridors09012010 ElkMigrationCorridors09012010 MuleDeerMigrationCorridors09012010 PronghornMigrationCorridors09012010	http://ndis.nrel.colostate.edu/ftp/ftp_response.asp	Fair	Data layers have limited attribution, but are complete and detailed.	The EDTF recommended crucial habitat and wildlife corridors for inclusion.
Wildlife Corridor Mapped by State Agency	Wyoming Game and Fish Department	ant08mr	ftp://gf.state.wy.us	Good	N/A	The EDTF recommended crucial habitat and wildlife corridors for inclusion.
Wildlife Corridor Mapped by State Agency	Wyoming Game and Fish Department	ant08mr bhs08mr elk08mr mdr08mr	ftp://gf.state.wy.us	Good	N/A	The EDTF recommended crucial habitat and wildlife corridors for inclusion.

BIA	Bureau of Indian Affairs	PAD	Protected Areas Database
BLM	Bureau of Land Management	RETI	Renewable Energy Transmission Initiative
DOD	Department of Defense	TBD	to be determined
EDTF	Environmental Data Task Force	USFS	U.S. Forest Service
NPS	National Park Service	USFWS	U.S. Fish and Wildlife Service

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TABLE D-1 NOTES

Footnotes [compiled from table above]

1. For collected data sets, the EDTF case study performed a high-level quality and fitness-for-use assessment, and documented results in the data inventory spreadsheet, per the Data Quality Protocol. See the Data Quality Protocol for more information about how the EDTF considered data quality.
2. The links in the spreadsheet bring the user to the closest webpage for downloading the data. In some cases, the user will need to click on a data layer name within the web page, select from a dropdown list, or take similar steps to actually download the data file, as the URL will not necessarily perform those actions itself.
3. See the EDTF Data Quality Protocol for an explanation of Overall Usability descriptors. The descriptors used to describe Overall Usability are based upon multiple characteristics presented in the data inventory spreadsheet that are not all presented in Table D-1.
4. As they become available and as appropriate, State wildlife Decision Support Systems (DSS) and other state data (such as data layers for state forests, parks and wildlife management areas) may be incorporated in the preferred data list.
5. See Note regarding the PAD-US Database following Table D-1.
6. This Area Type was included as a preferred data layer based on its inclusion as an Avoidance or Exclusion area in the Western Renewable Energy Zones (WREZ) Phase 1 report. While the data set created for the WREZ report is publicly available, the metadata associated with this date set, which should identify the names/area type of individual polygons, was absent or partially complete. This lack of metadata made it impossible to independently verify which area types were included in the data set. As of the publication of this report, the missing metadata or a substitute data set for this area type had not been identified.
7. This data set was identified for consideration in regional transmission planning by the EDTF; however, this data set had not been acquired as of the publication of this report to assess its quality.

NOTE on the PAD-US Database

The PAD of the United States is a geospatial data inventory of protected areas compiled from various sources. The PAD-US Partnership defines Protected Areas as lands dedicated to the preservation of biological diversity and to other natural, recreation and cultural uses, and managed for these purposes through legal or other effective means[8]. PAD is currently published in two forms:

- PAD-US, maintained by the U.S. Geological Survey Gap Analysis Program; currently at version 1.2, released March 2011. *For future efforts, the EDTF recommends the use of this more recent data set.*
- PAD-US (CBI Edition), maintained by the Conservation Biology Institute; currently at version 1.1, released in May 2010.

The case study Data Analysis utilized the PAD-US (CBI Edition) rather than the U.S. Geological Survey version as the source for several of the exclusions and suitability data layers, for the following reasons:

- The data analysis was performed in large part prior to the release of PAD-US, version 1.2.
- While the PAD-US and PAD-US (CBI Edition) were both at version 1.1, the CBI Edition version was generally considered at the time to be more accurate and robust than the U.S. Geological Survey version.

[8] *Greeninfo Network, 2011. http://www.protectedlands.net/padus/faqs.php*

- The PAD-US (CBI Edition) is a seamless data layer that has all United States land within the Western Interconnection identified and categorized.

The Data Analysis utilized the PAD-US (CBI Edition) as the source for both federal and state protected areas. It is possible in some cases to obtain, from other sources, data for state protected features (such as state parks) that are more detailed than that provided by either edition of PAD-US. However, PAD-US and PAD-US (CBI Edition) provide a streamlined and seamless approach for considering state features in regional transmission planning.

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Existing Transmission Rights-of-way	N/A	1	Existing rights-of-way for transmission lines.	These areas are likely to have minimal identified environmental or cultural resource constraints and land uses or designations that are compatible with or encourage transmission development.
Designated Energy Corridor	Designation and Administration: Bureau of Land Management, U.S. Departments of Energy, Agriculture, and Defense	1	On January 14, 2009, more than 6,000 miles of energy transport corridors on federal lands were designated in 11 Western States. The decision was based on analyses presented in the Final Programmatic Environmental Impact Statement released on November 28, 2008 by the BLM and the U.S. Departments of Energy, Agriculture, and Defense as part of their work to implement Section 368 of the Energy Policy Act of 2005.	*Section 368 of the Energy Policy Act of 2005* The Final Programmatic Environmental Impact Statement for the Designation of Energy Corridors on Federal Land in the 11 Western States identifies energy corridors to facilitate future siting of electricity transmission and distribution facilities on federal lands in the West to meet the region's increasing energy demands while mitigating potential harmful effects to the environment. Future use of the corridors should reduce the proliferation of rights-of-way across the landscape and minimize the environmental footprint from development, as well as providing a record from which to tier future environmental permitting efforts, reducing permitting complexity and minimizing the risk of environmental constraints for transmission projects proposed for these areas.
Area Following Existing Linear Corridor	N/A	1	Areas within existing linear corridors, such as state and federal highways or railroads.	These areas are likely to have minimal identified environmental or cultural resource constraints and land uses or designations that are compatible with or encourage transmission development.
Agricultural Land (excluding Prime Farmland)	Designation: Applicable State Agency Administration: Applicable Local Government	2	Some states have laws regarding the preferential assessment of agricultural land. This means that farm and ranch assessments are usually based on the land's capability to produce agricultural products. States use varying criteria to define agricultural lands.	*Applicable state farmland assessment laws* Based on the laws regarding their preferential treatment, agricultural lands present a low to moderate risk of environmental constraint to transmission development.
Area which contains ecosystems or species that are at moderate risk	N/A	2	Area which contains ecosystems or species that are "vulnerable" (NatureServe Global Rank of G3 or equivalent based upon state-supplied criteria or data).	TBD
Army Corps of Engineers Land	Designation and Administration: U.S. Army Corps of Engineers	2	Lands maintained to provide river and harbor navigation, flood damage reduction, water supply, hydroelectric power, recreation, environmental restoration, and wildlife protection.	*Various federal laws authorizing projects under the Corps Civil Works Program* The Civil Works Program includes water resource development activities such as flood control, navigation, recreation, and infrastructure, and environmental stewardship. As a part of implementing the Civil Works Program, the U.S. Army Corps of Engineers is responsible for administration of federal lands near many of its facilities. These lands are included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
Flood Zone	Designation: Federal Emergency Management Agency Administration: Applicable Local Government	2	Geographic areas, regardless of ownership, that the Federal Emergency Management Agency has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area (e.g., 100 year flood zone).	*Executive Order 11988: Floodplain Management* Executive Order 11988 requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Transmission development may encounter low to moderate permit complexity or mitigation costs in these areas.

[9] The categories assigned to the listed area types are only meant to capture environmental and cultural constraints and resource sensitivities, not financial, safety, or engineering considerations. Category 4 (Exclusion Areas) includes areas that preclude transmission development by federal, state, or provincial law, regulation, or policy. Categories 3, 2, and 1 represent degrees of risk, from highest to lowest, of encountering environmental or cultural resource sensitivities or constraints. See the Category definitions preceding this table for additional information.

[10] State and Province level data sets were based on areas included in the Western Renewable Energy Zones (WREZ) Phase 1 report and may not be a complete list of available data sets. The EDTF will continue to work to complete and update this information following the release of this report.

[11] "Designation" refers to the agency that designates an area through a legal, regulatory, or policy process; areas may also be designated through a statutory process (e.g., by an Act of Congress), in which case no agency is identified. Some Area Types that are indicative of resource sensitivities are not designated through a legal framework. These areas may be identified by non-governmental organizations (e.g., Important Bird Areas), in which case no agency is identified, or by various state agencies (e.g., state mapped wildlife corridors) that are not specified in these cases. "Administration" refers to the agency responsible for managing or administering applicable laws, regulations, or policies, of a given Area Type. Area Types may be administered by multiple federal agencies (e.g., Wilderness Areas), depending on the jurisdiction in which they are located, or various state agencies (e.g., state wildlife areas are designated under each state's legal or regulatory framework) that are not specified in these cases.

[12] See the Category definitions preceding this table for additional information. The classification categories in this column are intended to apply to transmission only. For information on the classification of lands for energy generation, please see the Western Renewable Energy Zones Phase 1 report.

[13] The justifications in this column contain any applicable regulation, policy, or statute influencing the Category classification and any additional supporting information explaining the rationale for the classification.

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Important Bird Area (State-level)	Designation: N/A (identified and mapped by the National Audubon Society, not a government agency) Administration: N/A	2	Important Bird Areas are sites identified by the National Audubon Society that provide essential habitat for one or more species of bird. This network of sites is comprised of state level Important Bird Areas.	The National Audubon Society identifies and prioritizes Important Bird Areas throughout the United States that are important either at the state or global level to the conservation of birds. To qualify as an Important Bird Area, sites must support at least one of the following criteria: • Species of conservation concern (e.g., threatened and endangered species) • Restricted-ranges species (i.e., species vulnerable because they are not widely distributed) • Species that are vulnerable because their populations are concentrated in one general habitat type or biome • Species, or groups of similar species (e.g., waterfowl or shorebirds), that are vulnerable because they occur at high densities due to their congregatory behavior Based on these criteria, these areas are likely to present environmental sensitivities that would likely result in low to moderate permit complexity or mitigation cost for transmission development.
Native Allotment	Designation and Administration: Tribes/Bureau of Indian Affairs	2 Parking Lot[14]	Native Allotments provide for the division of tribally held lands into individually-owned parcels.	*Dawes General Allotment Act (25 U.S.C. 331)* Native Allotments are included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity. Native Allotments may also pose additional property ownership complexities.
Other Land Administered by U.S. Federal Agencies	Designation and Administration: Bureau of Land Management, U.S. Forest Service, Bureau of Reclamation, Bureau of Indian Affairs[15], U.S. Department of Defense	2	Land administered by federal agencies without specific special designations or applicable policy or regulations beyond general administrative statutes (e.g., lands administered by the BLM's Shoshone, Idaho District without special designation, specified use, or legal status).	*Various federal statutes, regulations, and policy* Other land managed by various U.S. federal agencies is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations within each jurisdiction may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
Other Private Non-profit Land	N/A	2	Land held by private non-profit entities (e.g., land trusts or conservancies).	Other Private Non-profit Land is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
Other Public Land	N/A	2	Land held by a public entity (e.g., county, municipality, university).	Other Public Land is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
Other Water District Land	N/A	2	Land held by a water district (e.g., Los Angeles Department of Water & Power).	Other Water District Land is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
Private Land - Unknown Restriction	N/A	2	Land held by a private entity with unknown development restrictions.	Private Land – Unknown Restriction is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
Private Land - Unrestricted for Development	N/A	2	Land held by a private entity that has no development restrictions.	Private Land – Unrestricted for Development is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.

[14] The EDTF was not able to come to consensus on the appropriate risk classification category for this area type. The draft categorization may be revised following further coordination and review by EDTF members.
[15] The EDTF was not able to come to consensus on the appropriate risk classification category for lands administered by the Bureau of Indian Affairs. The current classification may be revised following further coordination and review by EDTF members.

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Private University Land	N/A	2	Land held by private universities.	Private University Land is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
Urban Fringe Area	Designation: U.S. Census Bureau Administration: N/A	2	Urban Fringe Areas include U.S. Census Bureau Designated Places (closely settled, unincorporated communities that are locally recognized and identified by name) with a 0.25-mile buffer.	*67 Federal Register 84 (May 1, 2002)* *"Qualifying Urban Areas for Census 2000" U.S. Census Bureau – Urban and Rural Classifications"* Urban Fringe Areas is a data layer created as part of the Data Analysis case studies, designed to address EDTF requests for consideration of lands on the urban-rural interface that comprise incompatible land uses, property ownership patterns (e.g., small parcel sizes with various ownerships), or population density (e.g., urban fringe areas) for transmission development.
USDA Agricultural Research Center	Designation and Administration: U.S. Department of Agriculture	2	The U.S. Department of Agriculture uses these lands for agricultural and ecological research.	U.S. Department of Agriculture Agricultural Research Center is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
USDA Experimental Range (Agricultural Research Center)	Designation and Administration: U.S. Department of Agriculture	2	The U.S. Department of Agriculture uses these lands for agricultural and ecological research.	U.S. Department of Agriculture Experimental Range is included in the PAD-US database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a low to moderate risk of encountering environmental or cultural constraints or increased permitting complexity.
American Indian/Native American Reservation	Designation: Statutory Administration: Tribes/Bureau of Indian Affairs	2/3 Parking Lot[14]	Federal territory managed by Native American tribes for the Bureau of Indian Affairs.	Reservations are lands held in trust under the auspices of the Bureau of Indian Affairs for the benefit of designated tribes, but managed by the tribal governments which are sovereign nations. Reservation lands are subject to tribal land use planning, and land use decisions are made by tribal officials. American Indian/Native American Reservations are included in the PAD-US[16] database; however, uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development.
Area of Critical Environmental Concern	Designation and Administration: Bureau of Land Management	3	Areas designated by the BLM to protect and prevent irreparable damage to "important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards."	*Federal Land Policy and Management Act of 1976 (43 U.S.C. 702(a))* *BLM Guidelines for ACECs and RNAs* Areas of Critical Environmental Concern are designated through the BLM's resource management planning process to protect and prevent damage to specific environmental features. Based upon the purpose of designating these areas, transmission development is likely to encounter one or more environmental or cultural resource constraints that could substantially increase permit complexity and/or mitigation costs.
Area with irreplaceable natural or cultural resources	N/A	3	Areas with irreplaceable natural or cultural resources such as "critically imperiled" or "imperiled" ecosystems or species (NatureServe Global Rank of G1, G2, or equivalent based upon state-supplied criteria or data), Natural Heritage Program Conservation Sites, or National Historic Preservation Sites.	TBD

[16] *The PAD-US considers "protected areas" to be any lands dedicated to the preservation of biological diversity and to other natural, recreation and cultural uses, and managed for these purposes through legal or other effective means (http://www.protectedlands.net/padus/design.php). Many of these areas with known laws, regulations, or policies as they may apply to transmission development fall into either Category 1 (e.g., Wilderness Areas) or Category 2 (e.g., National Monuments); however, the dataset also includes areas under local jurisdiction (e.g., private lands), where uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a risk of encountering environmental or cultural constraints or increased permitting complexity.*

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
California State Wetland	Designation: State of California Administration: California Coastal Commission, California Department of Fish and Game	3	Wetlands are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. These areas generally include swamps, marshes, bogs, and similar areas large enough to be mapped at the regional scale. (Note: Multiple California state laws and policies having varying definitions of wetlands.)	*Executive Order W-59-93 (August 23, 1993)* California's wetland policy states that there shall be no net loss in the short-term and an increase in the long-term in wetlands. Therefore, transmission development in these areas is likely to encounter constraints that could substantially increase permit complexity and/or mitigation costs.
Critical Habitat	Designation and Administration: U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, National Marine Fisheries Service	3	Defined by the Endangered Species Act, a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat can be designated on state, federal, or private land.	*Endangered Species Act (16 U.S.C. Sec 1533)* Critical habitat designated for threatened or endangered species presents a high risk of constraint to transmission development because of the greater likelihood of impacts to these species, particularly birds, from large transmission lines in the form of collision or electrocution risks. Critical habitat for plants and freshwater fish may also present a particularly high risk of environmental constraints to transmission development because these species are typically much less mobile than other species, and critical habitat is typically delineated within actual habitat rather than potential habitat. Thus, these sites represent areas where transmission development is likely to encounter constraints that could substantially increase permit complexity and/or mitigation costs.
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	Designation: State, Provincial or Federal Agencies Administration: N/A	3	Areas that have been delineated by state or federal agencies as containing habitat elements critical to the survival of species that are candidates for listing or listed for protection under the Endangered Species Act.	Certain special status wildlife species that are listed or candidates to be listed as threatened or endangered, have enough population and habitat data available that specific areas have been identified by federal or state agencies as critical to the survival of the species. These species tend to be wide ranging but require specific habitat elements. These important habitat elements (e.g., breeding areas), which may be delineated as "core areas," may or may not correspond to U.S. Fish and Wildlife Service critical habitat or recovery units. Examples of species for which habitat "core areas" have been delineated and would be considered to be highly constrained include desert tortoise, northern spotted owl, marbled murrelet, and greater sage-grouse. Due to their identified importance to species' survival and formal delineation, these areas pose a high risk of constraint, where transmission development is likely to encounter constraints that could substantially increase permit complexity and/or mitigation costs.
Important Bird Area (Global)	Designation: N/A (identified and mapped by the National Audubon Society, not a government agency) Administration: N/A	3	Important Bird Areas are sites that provide essential habitat for one or more species of bird. This network of sites is comprised of state level Important Bird Areas (see Important Bird Area [State-level] above). Some Important Bird Areas are prioritized as globally significant by the U.S. Important Bird Areas Committee, a panel of nationally recognized bird experts.	The National Audubon Society designates and prioritizes Important Bird Areas throughout the United States that are important either at the state or global level[17] to the conservation of birds. To qualify as an Important Bird Area, sites must support at least one of the following criteria: • Species of conservation concern (e.g., threatened and endangered species) • Restricted-ranges species (i.e., species vulnerable because they are not widely distributed) • Species that are vulnerable because their populations are concentrated in one general habitat type or biome • Species, or groups of similar species (e.g., waterfowl or shorebirds), that are vulnerable because they occur at high densities due to their congregatory behavior[18] Sites designated as Global Important Bird Areas have global conservation significance and are less common than Important Bird Areas of state significance. Due to their global significance, these areas pose a high risk of environmental constraints that could substantially increase permit complexity and/or mitigation costs for transmission development.

[17] *Internationally, continental Important Bird Areas are also recognized, but there are none designated in the United States.*
[18] *National Audubon Society web site. Accessed April 24, 2011: http://web4.audubon.org/bird/iba/iba_intro.html*

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Military Range/Installation	Designation: Statutory Administration: U.S. Department of Defense	3	A grouping of facilities or land administered by the U.S. Department of Defense that supports particular military functions.	*Multiple authorities, including 10 U.S.C. 2667* Many land use planning authorities currently exist that permit the Secretary of Defense, the secretaries of the military departments, or both to make decisions regarding real property under their control. A U.S. Government Accountability Office study, *Defense Infrastructure: Services' Use of Land Use Planning Authorities* (July 2008), found that Section 2667 of Title 10, U.S. Code, Leasing of Nonexcess Property of Military Departments, was used the most frequently. Approval of any non-military activities is only allowed pursuant to the base plan and with approval of the appropriate base commander. Given that operations on military bases and ranges are highly sensitive to incompatible uses, transmission development is likely to encounter constraints that could substantially increase permit complexity.
National Conservation Area	Designation: Statutory Administration: Bureau of Land Management	3	Designated by U.S. Congress, these lands feature scientific, cultural, ecological, historical, and recreational values.	*National Landscape Conservation Act (part of the Omnibus Public Land Management Act of 2009; 16 U.S.C. 7202)* National Conservation Areas are typically created to conserve, protect, enhance, and manage lands administered by the BLM for the benefit and enjoyment of present and future generations. Restrictions vary, but typically transmission development in these areas is likely to encounter constraints that could substantially increase permit complexity.
National Historic Trail	Designation: Statutory Administration: Bureau of Land Management, National Park Service, U.S. Forest Service	3 Parking Lot[14]	Included in the National Trails System, a network of historic trails created by the National Trails System Act of 1968.	*National Trails System Act (16 U.S.C. 1241)* Under the Act, the applicable agency must study and prepare a plan for each trail to promote the purpose for which it was created (e.g., recreational, historic or scenic values). The plans developed under the Act and management of National Trails must be harmonized with and complementary to any established multiple-use plans for the specific area in order to ensure continued maximum benefits from the land. However, due to the importance of Trails' settings to their historical and scenic values, federal agencies' plans are likely to contain measures to preserve the viewsheds in the vicinity of the Trails that are likely to substantially increase permit complexity and/or mitigation costs.
National Monument	Designation: Presidential Proclamation Administration: Bureau of Land Management, U.S. Forest Service, National Park Service	3	Authorized by the Antiquities Act of 1906, the President of the United States may, by proclamation, declare landmarks, structures, and other objects of historic or scientific interest situated on lands owned or controlled by the government to be National Monuments.	*Antiquities Act of 1906 (16 U.S.C. 431-433)* When designated, National Monuments may be subject to valid, existing rights, even where inconsistent with the monuments purposes. Thus, each monument proclamation and land use plan must be consulted to determine what, if any, transmission development is allowed. However, transmission development generally is likely to encounter constraints that could substantially increase permit complexity.
National Recreation Area	Designation: Statutory Administration: Bureau of Land Management, National Park Service, U.S. Forest Service	3	A designation for a protected area in the United States, often centered on large reservoirs and emphasizing water-based recreation. Areas with this designation are established by Congress and managed by different federal agencies, most of which operate within the U.S. Department of the Interior or U.S. Department of Agriculture.	*Federal Executive Branch Policy Governing the Selection, Establishment, and Administration of Recreational Areas by the Recreational Advisory Council Circular No. 1, March 26, 1963* National Recreation Area (NRA) is a designation for a protected area of federal land that is often centered on large reservoirs or other water bodies and emphasizing water-based recreation for a large number of people. There does not appear to be any general prohibition against commercial activities in NRAs; however, given their intended use, transmission development is likely to encounter constraints that could increase permit complexity and/or mitigation costs.
Natural Resources Conservation Service Easement	Designation and Administration: U.S. Department of Agriculture Natural Resources Conservation Service	3	Land management easements between the Natural Resources Conservation Service and private landowners used to prevent development or to preserve natural and other values the land may hold. These easements include those designed for farm and ranch lands protection, emergency watershed protection, and wetlands and grasslands protection.	*Section 382 of the Federal Agriculture Improvement and Reform Act of 1996, Public Law 104-127; Food, Conservation, and Energy Act of 2008 (2008 Farm Bill)* Land management easements between the NRCS and private landowners used to prevent development or to preserve natural and other values the land may hold. Given their purpose, transmission development in Natural Resources Conservation Service easements is likely to encounter constraints that could substantially increase permit complexity and/or mitigation costs.

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Prime Farmland	Designation: U.S. Department of Agriculture Natural Resources Conservation Service and/or Applicable State Agency Administration: Applicable Local Agency	3 Parking Lot[14]	Prime and unique farmlands are designations assigned by the U.S. Department of Agriculture to farmlands that are the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and are also available for these uses.	*Farmland Protection Policy Act (7 U.S.C. 4201); Prime and Unique Farmlands; 7 CFR Part 657 and 7 CFR Part 658* The Farmland Protection Policy Act (FPPA) is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be federally owned or currently used for cropland.
Pronghorn Migration Corridor, Bridger-Teton National Forest (Wyoming)	Designation and Administration: U.S. Forest Service, Wyoming Game and Fish Department	3	In May 2008, the U.S. Forest Service approved an amendment to the Bridger-Teton National Forest Land and Resource Management Plan that designated an official pronghorn migration corridor on approximately 47,000 acres of National Forest System lands from Lakes Road north of Pinedale in Sublette County, Wyoming to the Forest boundary with Grand Teton National Park northeast of Kelly in Teton County, Wyoming.	*National Forest Management Act 16 U.S.C. 1600* In May 2008, the U.S. Forest Service approved an amendment to the Bridger-Teton National Forest Land and Resource Management Plan, which designated an official pronghorn migration corridor. The purpose of this amendment is to ensure that projects, activities, and facilities authorized by the U.S. Forest Service on National Forest System lands within the corridor allow for continued successful pronghorn migration. Therefore, transmission development in this corridor is likely to encounter environmental constraints that will substantially increased permit complexity and/or mitigation costs.
Research Natural Area	Designation and Administration: Bureau of Land Management, National Park Service, U.S. Forest Service, U.S. Fish And Wildlife Service	3	Research Natural Areas are permanently protected and maintained in natural conditions for the purposes of conserving biological diversity, conducting non-manipulative research and monitoring, and fostering education.	*BLM Guidelines for ACECs and RNAs Under the authority of The Organic Act of 1897; National Forest Management Act (36 CFR Sec. 219.25; 36 CFR 251.23); U.S. Fish and Wildlife Service, Service Manual* Research Natural Areas are designated to preserve examples of significant natural ecosystems, to provide for ecological and environmental education, and to preserve gene pools of various plant and animal species. While the applicable land use plan would determine what is allowable in individual areas, the purposes of these areas mean that transmission development is likely to encounter constraints that could substantially increase permit complexity.
Research Natural Area - Proposed	Designation and Administration: Bureau of Land Management, National Park Service, U.S. Forest Service, U.S. Fish And Wildlife Service	3	Managed to maintain their natural conditions for the purposes of conserving biological diversity, conducting non-manipulative research and monitoring, and fostering education.	*BLM Guidelines for ACECs and RNAs Under the authority of The Organic Act of 1897; National Forest Management Act (36 CFR Sec. 219.25; 36 CFR 251.23); U.S. Fish and Wildlife Service, Service Manual* Areas proposed as Research Natural Areas are likely to contain sensitive environmental or cultural resources. Transmission development in these areas is likely to encounter constraints that could substantially increase permit complexity and/or mitigation costs. Proposed Research Natural Areas are proposed by each agency and are managed similar to designated Research Natural Areas to allow preservation of identified sensitive resources.
Special Interest Area	Designation and Administration: U.S. Forest Service	3	The Regional Forester administratively designates Special Interest Areas to protect and manage for public use and enjoyment those special recreation areas with scenic, geological, botanical, zoological, paleontological, archaeological, or other special characteristics or unique values.	*36 CFR Part 294—Special Areas and Forest Service Manual, Sec. 2372* The Regional Forester administratively designates Special Interest Areas to protect or enhance, and, where appropriate, develop and interpret for public education and recreation, areas of unusual characteristics. These areas are highly protected and, therefore, transmission development is likely to encounter constraints that could substantially increase permit complexity.
Special Management Area	Designation and Administration: Bureau of Land Management, U.S. Forest Service	3	Established in land use plans, these lands are managed to preserve special values, including recreation, wildlife, and geological features.	*BLM Land Use Planning Handbook H-1601-1* *USFS Land Management Planning Handbook (FSH 1909.12)* Special Management Areas include various special designations on BLM or National Forest System lands. They are designated through the U.S. Forest Service's and BLM's land use planning processes and are managed to preserve special values such as recreation or wildlife. Due to these management objectives, transmission development is likely to encounter constraints that could substantially increase permit complexity.
State Mapped Crucial Big Game Winter Range/Severe Winter Range	Designation: Applicable State Agency Administration: Applicable Federal, State, or Local Government	3	Crucial winter habitat for big game (e.g., elk, deer, pronghorn, or bighorn sheep) identified and mapped by state game and fish agencies.	State wildlife agencies identify crucial big game winter range or severe winter range for mobile and far-ranging species, such as elk, deer, or pronghorn that move to certain habitats during the winter, when they are generally considered to be most vulnerable to environmental stressors. As regional transmission development may impact wildlife species' preference to inhabit affected parts of their winter ranges, these areas are likely to increase permitting complexity and/or mitigation costs.

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
State Mapped Wildlife Corridor	Designation: Applicable State Agency Administration: Applicable Federal, State, or Local Government	3	Migration or movement corridors for wildlife mapped by state wildlife agencies.	Migration or movement corridors are mapped by state wildlife agencies for certain highly mobile and far-ranging species, such as elk, deer, or pronghorn. These areas are likely to substantially increase permitting complexity and/or mitigation costs for transmission development if said development is deemed to affect wildlife species' ability or preference to move through identified corridors.
State Forest	Designation: Applicable State Legislation Administration: Applicable State Agency	3	State forests are owned by states and generally managed to provide economic, environmental, and social benefits to state residents. Revenue from timber sales may go to state or local governments.	Although regulations, management prescriptions, and allowable uses vary by state or by forest, state forest land is generally used to produce forest products while considering other values such as recreation, watershed, wildlife, and aesthetic enjoyment. Although transmission development is generally not precluded on these lands, potential conflicts with timber harvesting practices and other natural resource values would likely pose a high risk of constraints or substantial permit complexity and/or mitigation costs.
State Park	Designation: Applicable State Legislation Administration: Applicable State Agency	3	State parks protect and preserve a collection of culturally and environmentally sensitive structures and habitats, threatened plant and animal species, ancient Native American sites, and historic structures and artifacts important to each state's heritage.	Although regulations, management prescriptions, and allowable uses vary by state (e.g., some states may allow utility easements identified in state park plans), due to the protective nature of state parks, transmission development is likely to encounter constraints that could substantially increase permit complexity and/or mitigation costs in these areas.
State Wildlife Area	Designation and Administration: Applicable State Wildlife Agency	3	State wildlife management areas are managed by state agencies for wildlife habitat values, often providing for hunting, fishing, and other public enjoyment of wildlife habitat.	*Applicable state laws or regulations* Uses that are not in keeping with the wildlife and recreational purposes of these lands are generally restricted.
U.S. Forest Service Roadless Area	Designation and Administration: U.S. Forest Service	3	Roadless areas are inventoried federal land with prohibitions on road construction, road reconstruction, and timber harvesting on National Forest System lands.	*2001 Roadless Area Conservation Rule (36 CFR 294)* The Roadless Area Conservation Rule is designed to prohibit road construction, reconstruction, and timber harvest activities in inventoried roadless areas to prevent the alteration and fragmentation of the landscape. Current management is pursuant to U.S. Department of Agriculture Secretary's Memoranda (pending new rules; *see Secretarial Memorandum No 1042-154* and *Secretarial Memorandum No. 1042-155).* Though subject to certain exceptions, this rule prohibits road construction and reconstruction, thereby substantially increasing the complexity of transmission development in these areas.
Washington State Natural Area Preserve	Designation: Statutory Administration: State of Washington	3	Natural Area Preserves protect the best remaining examples of many ecological communities in Washington, including rare plant and animal habitat.	*Revised Code of Washington 79.70* Washington Natural Areas Program protects outstanding examples of the state's extraordinary diversity. These lands represent the finest natural, undisturbed ecosystems in state ownership, often protecting one-of-a-kind features. Natural Area Preserves are one of the two types of natural areas managed by the Department of Natural Resources. The other type of natural area includes Natural Resources Conservation Areas (discussed below). Washington State Natural Area Preserves allow environmental education and low impact public use where they do not impair the resource values of the area. Based upon the allowable uses in these areas, transmission development is likely to encounter environmental constraints that will substantially increase permitting complexity and/or mitigation costs.
Washington State Natural Resource Conservation Area	Designation: Statutory Administration: State of Washington	3	Conservation areas protect outstanding examples of native ecosystems, habitat for endangered, threatened and sensitive plants and animals, and scenic landscapes.	*Revised Code of Washington 79.70* Like the Natural Area Preserves, the Washington State Natural Resource Conservation Areas allow environmental education and low impact public use where they do not impair the resource values of the area. Based on the allowable uses in these areas, transmission development is likely to encounter constraints that will substantially increase permit complexity and/or mitigation costs.

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Wetlands (mapped in regional databases)	Designation: U.S. Fish and Wildlife Service (National Wetlands Inventory), U.S. Army Corps of Engineers (jurisdictional) Administration: U.S. Army Corps of Engineers, U.S. Environmental Protection Agency	3 Parking Lot[14]	Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports hydrophytes; (2) the substrate is predominantly undrained, hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.[19]	*Clean Water Act – Section 404 (33 U.S.C. 1251-1387) U.S. Army Corps of Engineers Wetland Delineation Manual* Section 404 of the Clean Water Act establishes the major federal program regulating activities in wetlands. Section 404 is jointly administered by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency, which regulates the discharge of dredged or fill material into "waters of the United States," including those wetlands delineated by the U.S. Army Corps of Engineers. Discharge of dredged or fill material requires a permit from the U.S. Army Corps of Engineers. Under Section 404(c), the Administrator of the Environmental Protection Agency may prohibit or restrict the use of any defined area as a disposal site if it is determined that the discharge may cause unacceptable adverse effects on municipal water supplies, wildlife, shellfish beds and fishery areas, or recreational areas. Direct impacts to wetlands may be avoided during siting of transmission towers; unavoidable impacts require a permit from the U.S. Army Corps of Engineers.
Wild and Scenic River; National Rivers and Wild & Scenic Riverways	Designation: Statutory Administration: National Park Service, Bureau of Land Management, U.S. Forest Service	3	Designated by Congress as part of the National Wild and Scenic River System for their outstanding natural, cultural, or recreational values.	*The National Wild and Scenic Rivers Act (16 U.S.C. 1271)* The National Wild and Scenic River System was created to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The purposes of these designations means transmission development is likely to encounter constraints that could substantially increase permit complexity.
Proposed Conservation Area	TBD	TBD (Parking Lot[14])	Areas proposed for conservation via federal or state legal, regulatory, or policy processes (e.g., Citizen's Proposed Wilderness Areas).	TBD
California State Wilderness Area	Designation: Statutory Administration: State of California	4	California State Wilderness Areas are "recognized as areas where the earth and its community of life are untrammeled by man and where man himself is a visitor who does not remain."	*California Public Resources Code Section 5019.68* According to Public Resources Code Section 5019.68, California State Wilderness Areas are "recognized as areas where the earth and its community of life are untrammeled by man and where man himself is a visitor who does not remain." This level of protection generally precludes transmission development.
National Primitive Area	Designation and Administration: U.S. Forest Service	4	A National Primitive Area is a land designation previously used by the U.S. Forest Service. Although there are still lands with this title, most are now known as Wilderness Areas and are administered in the same manner as Wilderness Areas.	*Forest Service L-20 Regulation for Primitive Areas (1929); Forest Service U-Regulations for Wilderness and Wild Areas (1939); Wilderness Act of 1964 (16 U.S.C. 1331)* A National Primitive Area is a land designation previously established by the U.S. Forest Service in 1929 with the L-20 regulations. Stricter regulations for these protected areas began in 1939 with passage of the U-Regulations, which replaced the term Primitive Area with Wilderness Area and Wild Area and were used by the U.S. Forest Service until the passage of the federal Wilderness Act of 1964. The Wilderness Act created the National Wilderness Preservation System and gave federal protection to these U.S. Forest Service administrative areas. National Primitive Areas are administered in the same manner as Wilderness Areas, thereby precluding transmission development pending final determinations on their suitability for designation as Wilderness Areas.
National Wildlife Refuge	Designation and Administration: U.S. Fish and Wildlife Service	4	The National Wildlife Refuge System, managed by the U.S. Fish and Wildlife Service, is a system of public lands and waters set aside to conserve fish, wildlife, and plants.	*National Wildlife Refuge Administration Act (16 U.S.C. 668dd)* Each wildlife refuge is managed under a refuge management plan primarily for the purposes of restoration, enhancement, and preservation of wildlife and habitat resources. Based upon these purposes, transmission development would generally be precluded in these areas.

[19] *Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U. S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/1998/classwet/classwet.htm (Version 04DEC98). NOTE: This definition is used by the U.S. Fish and Wildlife Service to delineate wetlands. Data for wetlands were obtained from the U.S. Fish and Wildlife Service's National Wetlands Inventory; however, the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency administer the Clean Water Act as it applies to wetlands and these agencies, for regulatory purposes, may define wetlands differently.*

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Units of the National Park System (excluding National Recreation Areas and National Trails)	Designation: Statutory Administration: National Park Service	4	Units of the National Park System are established to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."	*National Park Service Organic Act (16 U.S.C. 1)* The purpose of National Parks are to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." Based upon their purpose for designation, transmission development is generally precluded in these areas.
Wilderness Area	Designation: Statutory Administration: Bureau of Land Management, National Park Service, U.S. Forest Service	4	Designated by the U.S. Congress, Wilderness Areas are places where the earth and its community of life are essentially undisturbed. They retain a primeval character without permanent improvements and generally appear to have been affected primarily by the forces of nature.	*Wilderness Act of 1964 (16 U.S.C. 1331)* The Wilderness Act is the most protective of all federal land use legislation, providing that "Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act…" This level of protection generally precludes transmission development.
Wilderness Area (Recommended)	Designation and Administration: U.S. Forest Service, Bureau of Land Management, National Park Service	4	Recommended Wilderness Areas are those areas (generally identified during the preparation or revision of land management plans) that the administering agency recommends to Congress as candidates for designation as Wilderness. Although they are typically subject to strict controls, only Congress can designate Wilderness Areas.	*Wilderness Act of 1964 (16 U.S.C. 1331); National Forest Management Act (16 U.S.C. 1600) and 36 CFR 219; Federal Land Policy and Management Act (43 U.S.C. 1782)* Potential Wilderness Areas refer to forest land identified and evaluated during the development or revision of Forest Plans for administrative recommendation to Congress for Wilderness designation. The intent is to identify and evaluate all National Forest System lands that meet the definition of Wilderness in section 2(c) of the 1964 Wilderness Act. Recommended Wilderness Areas are those areas that the U.S. Forest Service deems to have met this definition and are recommended to Congress for designation. Under the Federal Land Policy and Management Act, the BLM may also make recommendations of areas as suitable or unsuitable for wilderness designation. These areas are managed to preserve their suitability for designation as Wilderness, thereby generally precluding transmission development, pending final determinations by Congress.
Wilderness Study Area	Designation and Administration: Bureau of Land Management, U.S. Forest Service	4	Areas determined to contain wilderness characteristics by the BLM or U.S. Forest Service.	*Wilderness Act of 1964 (16 U.S.C. 1331)* *Interim Management Policy and Guidelines for Lands Under Wilderness Review H-8550-1* Wilderness Study Areas are areas that have been evaluated and inventoried for their wilderness potential and typically meet the requirement for wilderness designation, pending final determinations by Congress. Wilderness Study Areas are typically managed in the same manner as Wilderness Areas to prevent degradation of their wilderness characteristics. These areas, therefore, generally preclude transmission development.
British Columbia Endangered Species and Ecosystems –Sensitive Occurrence and Non-sensitive Occurrence	Designation: BC Ministry of Environment Administration: N/A	3	Occurrences of endangered species and ecosystems as mapped by the BC Ministry of Environment.	*BC Wildlife Act* British Columbia has no stand-alone endangered species act. The provincial Wildlife Act protects virtually all vertebrate animals from direct impacts. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
British Columbia Old Growth Management Area	Designation and Administration: BC Ministry of Forests, Lands and Natural Resource Operations	3	Legally established and spatially defined areas of old growth forest that are identified during landscape unit planning or an operational planning process.	*BC Oil and Gas Activities Act Environmental Protection and Management Regulation (B.C. Reg. 200/2010), Sec. 32 (Old-growth management areas established)* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
British Columbia Ungulate Winter Range	Designation and Administration: BC Ministry of Environment	3	British Columbia Ungulate Winter Range is an area containing habitat necessary to meet the winter habitat requirements of various ungulate species.	The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.

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British Columbia Wildlife Management Area	Designation: Statutory Administration: BC Parks, BC Ministry of Environment	3	A conservation land requiring a special level of protection and management may sometimes be designated as a "wildlife management area" under Section 4 of the BC Wildlife Act.	*BC Wildlife Act, Section 4* British Columbia Wildlife Management Areas include management objectives that allow certain land uses (e.g., recreation, grazing, agriculture, forestry) in these areas. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Canadian Forces Base	Designation: Statutory Administration: Canadian Forces, Department of National Defense	3	A grouping of facilities or land administered by the Canadian Armed Forces that supports particular military functions.	Allowable uses on Canadian Forces Bases would be subject to approval of the appropriate base commander. Operations on military bases and ranges are highly sensitive to incompatible uses. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Existing Conservation and Mitigation Bank (Canada)	Designation and Administration: BC Ministry of Environment, Province of Alberta	3	A mitigation or conservation bank is a site, or group of sites, where natural habitats (e.g., wetlands, riparian or upland areas) are restored and conserved by an investor for the purpose of providing compensatory mitigation for future authorized impacts.	*Fisheries Act; 2007 Provincial Wetland Restoration/Compensation Guide (Alberta); Interim Guidelines for Wetland Protection and Conservation in British Columbia, 2009* The Fisheries Act requires projects to achieve a "no net loss" productive capacity through habitat banking investments. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Alberta Ecological Reserve	Designation: Statutory Administration: Alberta Tourism, Parks and Recreation	4	The primary intent of an Ecological Reserve is strict preservation of natural ecosystems, habitats and features, and associated biodiversity. These areas contain representative, rare and fragile landscapes, plants, animals and geological features.	*Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act, Sections 8 & 10* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Alberta Eastern Slopes Zones 1 & 2	Designation and Administration: Province of Alberta	4	The Eastern Slopes of Alberta's Rocky Mountains cover an area of approximately 35,000 square miles of mainly forest-covered mountains and foothills. *A Policy for Resource Management of the Eastern Slopes* defines eight zones to emphasize realizing resource opportunities in the area. Zone 1 is the Prime Protection Zone and Zone 2 is the Critical Wildlife Zone.	*1984 Policy for Resource Management of the Eastern Slopes (amended)* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Alberta Heritage Rangeland	Designation: Statutory Administration: Alberta Tourism, Parks and Recreation	4	Alberta Heritage Rangelands are areas that preserve and protect natural features that are representative of Alberta's prairies where grazing is used to maintain their ecological integrity grassland ecology. Carefully managed cattle grazing has contributed to the ecological integrity of very large tracts of these areas; heritage rangelands ensure ongoing protection while continuing the traditional grazing approach that has preserved these grasslands for many years.	*Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act, Sections 8 & 10* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Alberta Natural Area	Designation: Statutory Administration: Alberta Tourism, Parks and Recreation	4	Natural areas include natural and near-natural landscapes of regional and local importance protected for nature-based recreation and heritage appreciation.	*Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act, Sections 8 & 10* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Alberta Provincial Park	Designation: Statutory Administration: Alberta Tourism, Parks and Recreation	4	Alberta Provincial Parks protect both natural and cultural landscapes and features. They also support a range of outdoor activities in natural, modified and man-made settings.	*Provincial Parks Act, Sections 9 & 10* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Alberta Provincial Recreation Area	Designation: Statutory Administration: Alberta Tourism, Parks and Recreation	4	Alberta Provincial Recreation Areas support a range of outdoor activities in natural, modified and man-made settings, with outdoor recreation as their primary purpose.	*Provincial Parks Act, Sections 9 & 10* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Alberta Wilderness Area	Designation: Statutory Administration: Alberta Tourism, Parks and Recreation	4	Wilderness areas preserve and protect natural heritage, where visitors are provided with opportunities for non-consumptive, nature based outdoor recreation.	*Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act, Sections 8 & 10* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Alberta Wildlands Park	Designation: Statutory Administration: Alberta Tourism, Parks and Recreation	4	Wildland parks are large, undeveloped natural landscapes that retain their primeval character to preserve and protect natural heritage and provide opportunities for backcountry recreation.	*Provincial Parks Act, Sections 9 & 10* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
Alberta Willmore Wilderness Park	Designation: Statutory Administration: Alberta Tourism, Parks and Recreation	4	Though similar in its intent to Wildland Parks, this area was established under its own legislation in 1959.	*Willmore Wilderness Park Act, Section 4* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
British Columbia Conservancy	Designation: Statutory Administration: BC Parks, British Columbia Ministry of Environment	4	A conservancy is Crown land, designated under the Park Act or by the Protected Areas of British Columbia Act, whose management and development is constrained by the Park Act.	*See British Columbia Parks* The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
British Columbia Ecological Reserve	Designation: Statutory Administration: BC Parks, British Columbia Ministry of Environment	4	Ecological Reserves are Crown lands set aside for ecological purposes, reserved from further disposition that might otherwise be granted under any other Act or law in British Columbia.	*Ecological Reserve Act; Protected Areas of British Columbia Act* The Ecological Reserve Act restricts most activities and precludes all extractive activities. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
British Columbia Parks	Designation: Statutory Administration: BC Parks, British Columbia Ministry of Environment	4	British Columbia's Parks are protected Crown lands that contain nationally and internationally significant natural and cultural features and outdoor experiences.	*Park Act, Sections 8 & 9; Protected Areas of British Columbia Act* The Park Act stipulates that a park use permit may not be issued respecting an interest in land or natural resources "unless, in the opinion of the minister, to do so is necessary to preserve or maintain the recreational values of the park involved." The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
British Columbia Motor Vehicle Closure Area	Designation: Statutory Administration: British Columbia Ministry of Environment	4	The Public Access Prohibition Regulation restricts motorized vehicle use in certain areas of British Columbia in consideration of resource sensitivities.	*BC Wildlife Act, Public Access Prohibition Regulation (B.C. Reg. 187/2003)* The Public Access Prohibition Regulation restricts motorized vehicle use in certain areas of British Columbia in consideration of resource sensitivities. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
British Columbia Protected Area	Designation: Statutory Administration: BC Parks, British Columbia Ministry of Environment	4	Protected area designations under the Environment and Land Use Act are by order in council.	*Environment and Land Use Act; Park Act; Park and Recreation Area Regulation* British Columbia Protected Areas are managed in accordance with any special conditions included in the areas establishing order, specified provisions of the *Park Act*, and provisions of the *Park and Recreation Area Regulation*. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
British Columbia Recreational Area	Designation: Statutory Administration: BC Parks, British Columbia Ministry of Environment	4	A recreation area is defined as Crown land reserved or set aside for public recreational use.	*Park Act; Park and Recreation Area Regulation; Mineral Tenure Act* British Columbia Recreational Areas differ from other parks in that the minister has greater discretion in issuing park use permits. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.

Table D-2. Classification of Area Types According to Risk of Environmental or Cultural Resource Sensitivities or Constraints[9]

Area Type[10] *[Organized by country and Risk Classification Category]*	Agency[11]	Risk Classification Category[12]	Area Type Description	Justification[13] (Applicable policy/statute [*ital*] and/or rationale for the classification [where applicable])
Marine Protected Area (Canada)	Designation: Statutory Administration: Fisheries and Oceans Canada, Environment Canada	4	A Marine Protected Area is a protective designation for an area that is ecologically significant, with species and/or properties that require special consideration and includes marine parks, national wildlife areas, whale sanctuaries and areas closed to commercial fishing for conservation reasons.	*Oceans Act (S.C. 1996, c. 31)* *Species at Risk Act (S.C. 2002, c. 29)* *Canada Wildlife Act; R.S.C., 1985, c. W-9* The EDTF's initial classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated input from Canadian stakeholders.
Migratory Bird Sanctuary (Canada)	Designation: Statutory Administration: Canadian Wildlife Service, Environment Canada	4	While Environment Canada is the agency responsible for Migratory Bird Sanctuaries, the actual properties can be owned federally, provincially, or privately.	*Migratory Birds Convention Act (S.C. 1994, c. 22)* *Species at Risk Act (S.C. 2002, c. 29)* The Migratory Birds Convention Act prohibits the taking, injuring, destruction, or molestation of migratory birds, their nests, or eggs within established sanctuaries. The EDTF's current classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated Canadian stakeholder input and public comment.
National Park (Canada)	Designation: Statutory Administration: Parks Canada	4	Canadian National Parks are a country-wide system of representative natural areas of Canadian significance.	*Canada National Parks Act (S.C. 2000, c. 32)* *Species at Risk Act (S.C. 2002, c. 29)* Canadian National Parks are protected for the purposes of public understanding, appreciation and enjoyment, while being maintained in an unimpaired state for future generations. The EDTF's initial classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated input from Canadian stakeholders.
National Wildlife Area (Canada)	Designation: Statutory Administration: Canadian Wildlife Service, Environment Canada	4	National Wildlife Areas are created and managed for the purposes of wildlife research, conservation, and interpretation.	*Canada Wildlife Act; R.S.C., 1985, c. W-9* *Species at Risk Act (S.C. 2002, c. 29)* The mandate of both National Wildlife Areas and Marine Wildlife Areas is exclusively for protection of wildlife. The EDTF's initial classification of area types under Canadian jurisdiction is based on determinations made by the WREZ process, which incorporated input from Canadian stakeholders.

BLM	Bureau of Land Management	S.C.	Statute of Canada
CFR	Code of Federal Regulations	TBD	to be determined
EDTF	Environmental Data Task Force	U.S.C.	United States Code
PAD	Protected Areas Database	WREZ	Western Renewable Energy Zones
R.S.C.	Revised Statutes of Canada		

TABLE D-2 NOTES

Footnotes [compiled from table above]

9. The categories assigned to the listed area types are only meant to capture environmental and cultural constraints and resource sensitivities, not financial, safety, or engineering considerations. Category 4 (Exclusion Areas) includes areas that preclude transmission development by federal, state, or provincial law, regulation, or policy. Categories 3, 2, and 1 represent degrees of risk, from highest to lowest, of encountering environmental or cultural resource sensitivities or constraints. See the Category definitions preceding this table for additional information.
10. State and Province level data sets were based on areas included in the Western Renewable Energy Zones (WREZ) Phase 1 report and may not be a complete list of available data sets. The EDTF will continue to work to complete and update this information following the release of this report.
11. "Designation" refers to the agency that designates an area through a legal, regulatory, or policy process; areas may also be designated through a statutory process (e.g., by an Act of Congress), in which case no agency is identified. Some Area Types that are indicative of resource sensitivities are not designated through a legal framework. These areas may be identified by non-governmental organizations (e.g., Important Bird Areas), in which case no agency is identified, or by various state agencies (e.g., state mapped wildlife corridors) that are not specified in these cases. "Administration" refers to the agency responsible for managing or administering applicable laws, regulation, or policy, of a given Area Type. Area Types may be administered by multiple federal agencies (e.g., Wilderness Areas), depending on the jurisdiction in which they are located, or various state agencies (e.g., state wildlife areas are designated under each state's legal or regulatory framework) that are not specified in these cases.
12. See the Category definitions preceding this table for additional information. The classification categories in this column are intended to apply to transmission only. For information on the classification of lands for energy generation, please see the Western Renewable Energy Zones Phase 1 report.
13. The justifications in this column contain any applicable regulation, policy, or statute influencing the Category classification and any additional supporting information explaining the rationale for the classification.
14. The EDTF was not able to come to consensus on the appropriate risk classification category for this area type. The draft categorization may be revised following further coordination and review by EDTF members.
15. The EDTF was not able to come to consensus on the appropriate risk classification category for lands administered by the Bureau of Indian Affairs. The current classification may be revised following further coordination and review by EDTF members.
16. The PAD-US considers "protected areas" to be any lands dedicated to the preservation of biological diversity and to other natural, recreation and cultural uses, and managed for these purposes through legal or other effective means (http://www.protectedlands.net/padus/design.php). Many of these areas with known laws, regulations, or policies as they may apply to transmission development fall into either Category 1 (e.g., Wilderness Areas) or Category 2 (e.g., National Monuments); however, the dataset also includes areas under local jurisdiction (e.g., private lands), where uncertainty exists as to how applicable laws, policies, or land use designations may restrict transmission development, presenting a risk of encountering environmental or cultural constraints or increased permitting complexity.
17. Internationally, continental Important Bird Areas are also recognized, but there are none designated in the United States.

18. National Audubon Society web site. Accessed April 24, 2011: http://web4.audubon.org/bird/iba/iba_intro.html
19. Cowardin, L.M., V. Carter, F.C. Golet, E.T. LaRoe. 1979. "Classification of wetlands and deepwater habitats of the United States." U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/1998/classwet/classwet.htm (Version 04DEC98). NOTE: This definition is used by the U.S. Fish and Wildlife Service to delineate wetlands. Data for wetlands were obtained from the U.S. Fish and Wildlife Service's National Wetlands Inventory; however, the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency administer the Clean Water Act as it applies to wetlands and these agencies, for regulatory purposes, may define wetlands differently.

Table D-3. Classified Area Types Organized by Subject Matter[20]

Area Type[21] *[by subject matter area and alphabetical order]*	Risk Classification Category
Protected Areas	
Alberta Eastern Slopes Zones 1 & 2	4
Alberta Ecological Reserve	4
Alberta Heritage Rangeland	4
Alberta Natural Area	4
Alberta Provincial Park	4
Alberta Provincial Recreation Area	4
Alberta Wilderness Area	4
Alberta Wildlands Park	4
Alberta Willmore Wilderness Park	4
Area of Critical Environmental Concern	3
British Columbia Conservancy	4
British Columbia Ecological Reserve	4
British Columbia Motor Vehicle Closure Area	4
British Columbia Old Growth Management Area	3
British Columbia Parks	4
British Columbia Protected Area	4
British Columbia Recreational Area	4
British Columbia Wildlife Management Area	3
California State Wetland	3
California State Wilderness Area	4
Existing Conservation and Mitigation Bank	3
Marine Protected Area (Canada)	4
Migratory Bird Sanctuary (Canada)	4
National Conservation Area	3

[20] The Subject Matter Areas included in this table were modified from the Subject Matter Areas initially identified as Scenario Decision Factors in the Western Electricity Coordinating Council's long-term planning tool.
[21] This table contains all Area Types contained in Table D-2. See Table D-2 for more information regarding each Area Type's Risk Classification Category.

Table D-3. Classified Area Types Organized by Subject Matter[20]

Area Type[21] *[by subject matter area and alphabetical order]*	Risk Classification Category
National Historic Trail	3 (Parking Lot[22])
National Monument	3
National Park (Canada)	4
National Primitive Area	4
National Recreation Area	3
National Wildlife Area (Canada)	4
National Wildlife Refuge	4
Natural Resources Conservation Service Easement	3
Prime Farmland	3 (Parking Lot[22])
Proposed Conservation Area	TBD (Parking Lot[22])
Research Natural Area	3
Research Natural Area - Proposed	3
U.S. Forest Service Roadless Area	3
Special Interest Area	3
Special Management Area	3
State Forest	3
State Park	3
State Wildlife Area	3
Units of the National Park System (excluding National Recreation Areas and National Trails)	4
Washington State Natural Area Preserve	3
Washington State Natural Resource Conservation Area	3
Wild and Scenic River; National Rivers and Wild & Scenic Riverways	3
Wilderness Area	4
Wilderness Area (Recommended)	4
Wilderness Study Area	4

[22] *The EDTF continues to work towards consensus on the appropriate risk classification category for this area type. The draft categorization shown in this table may be revised following further coordination and review by EDTF members.*

Table D-3. Classified Area Types Organized by Subject Matter[20]

Area Type[21] *[by subject matter area and alphabetical order]*	Risk Classification Category
Land Use Factors	
Agricultural Lands	2
American Indian/Native American Reservation	2/3 (Parking Lot[22])
Army Corps of Engineers Land	2
Canadian Forces Base	3
Military Range/Installation	3
Native Allotment	2 (Parking Lot[22])
Other Land Administered by U.S. Federal Agencies	2
Other Private Non-profit Land	2
Other Public Land	2
Other Public Land	2
Other Water District Land	2
Prime Farmland	3
Private Land – Unknown Restriction	2
Private Land – Unrestricted for Development	2
USDA Agricultural Research Center	2
USDA Experimental Range	2
Natural or Cultural Resource Factors	
Areas which contain ecosystems or species that are at moderate risk	2
Areas with irreplaceable natural or cultural resources	3
British Columbia Endangered Species and Ecosystems – Sensitive Occurrence and Non-sensitive Occurrence	3
British Columbia Ungulate Winter Range	3
Critical Habitat	3
Habitat Areas for Candidate or Listed Wildlife Species Mapped by State, Provincial, or Federal Agencies	3
Important Bird Area (Global)	3
Important Bird Area (State-level)	2
Pronghorn Migration Corridor, Bridger-Teton National Forest (Wyoming)	3
State Mapped Crucial Big Game Winter Range/Severe Winter Range	3
State Mapped Wildlife Corridor	3
Wetlands (mapped in regional databases)	3 (Parking Lot[22])

Table D-3. Classified Area Types Organized by Subject Matter[20]

Area Type[21] *[by subject matter area and alphabetical order]*	Risk Classification Category
Other Relevant Factors	
Area Following Existing Corridor	1
Designated Energy Corridor	1
Existing Transmission Rights-of-Way	1
Flood Zone	2

[20]This table contains all Area Types contained in Table D-2. See Table D-2 for more information regarding each Area Type's Risk Classification Category.

[21]The Subject Matter Areas included in this table were modified from the Subject Matter Areas initially identified to group Scenario Decision Factors in the Western Electricity Coordinating Council's long-term planning tool.

[22]The EDTF continues to work towards consensus on the appropriate risk classification category for this area type. The draft categorization shown in this table may be revised following further coordination and review by EDTF members.

Table D-4. Other Areas for Consideration in Regional Planning for which Data were Incomplete or Non-Existent

Area Type	Risk Classification Category[23]
Bureau of Land Management Resource Management Plan designated lands which have development constraints, such as:	
• Right-of-way avoidance areas	3
• Seasonal restriction areas	3
• Special Recreation Management Areas	3
• Areas designated as "open" off-highway vehicles	2
• No Surface Occupancy restriction areas	3
• Wildlife Management Areas (and Sikes Act tracts)	3
• Lands inventoried by BLM and found to have wilderness characteristics	3
• Bureau of Land Management lands managed for wilderness characteristics	3
Bureau of Land Management Visual Resource Management Class I and Class II	3
British Columbia Biodiversity Areas	3
Existing Conservation and Mitigation Banks (those specific states where development is excluded are listed on the exclude list)	3
Lands acquired by an approved Habitat Conservation Plan or Natural Community Conservation Plan (California only) that are legally protected[24]	3
Lands acquired through federal funds for conservation purposes (i.e., Pittman-Robinson or Section 6 grants)	3
Lands proposed for designation in federal legislation (Omnibus Public Land Management Act of 2009, California Wild Heritage Act of 2007, California Desert and Mountain Heritage Act, Sequoia-Kings Canyon National Park Wilderness Act, and Eastern Sierra and Northern San Gabriel Wild Heritage Act)	3
Lands targeted for acquisition by an approved Habitat Conservation Plan or Natural Community Conservation Plan (California only)[24]	3
State Wildlife Agency conservation easements	3
U.S. Forest Service Administratively Withdrawn Areas	3
U.S. Forest Service Backcountry, Non-motorized Land Management Zones	3
U.S. Forest Service Congressional Reserved Areas - includes Riparian Conservation Areas	3
U.S. Forest Service Critical Biological Areas	3
Canadian Marine Wildlife Areas	4
Canadian National Historic Sites	4
State-held conservation easements where policy precludes development (can only map if data individually submitted by states)	4

[23] The classifications in this table are preliminary. These classifications are for discussion purposes only and have not been vetted by the Environmental Data Task Force.
[24] Modified version of the area type included in the Western Renewable Energy Zones study based on Environmental Data Task Force member comments.

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Table D-5. Observations and Implications for Specific Data Layers

Data Layer	Observation	Implication
Private Lands	Members of EDTF noted that data sets containing environmental and cultural features on private lands are important to planning, but this data does not generally exist in the public domain.	Large tracts of private land that could be analyzed for transmission suitability have no data available for analysis. A lack of data for private lands compared to the abundance of data on public lands could inadvertently bias location of transmission solutions onto private lands. Publicly available data sets that contain some information on private lands include the National Land Cover Data, fauna migration patterns and corridors, and watersheds; use of these and similar data sets may provide a work around.
Agricultural Lands	Agricultural lands provide both opportunities and constraints for transmission development throughout the West. Much of the agricultural land in the West is privately held and the agricultural or natural resource features on these lands are not available in GIS format. The RETI project acknowledged the importance of agricultural lands, but did not reach consensus on how to apply them in screening.[25]	Absence of geospatial data on agricultural lands would limit the ability to assess the opportunities or natural resources constraints on these lands. Extracting agricultural land categories from the publicly available National Land Cover Data could provide a work around. National Land Cover Data is based on remotely-sensed imagery and covers the Western U.S. regardless of land jurisdiction and ownership. Using seamless, remotely-sensed data sets such as National Land Cover Data can be used as proxies for agricultural and some natural resources mapping on non-public lands.
Conservation Easements and Habitat Conservation Plans	Because of the large scale and fine detail involved in data related to most conservation easements and Habitat Conservation Plans, the data is often difficult to identify and obtain without assistance from parties directly involved or with on the ground knowledge of particular easements or Habitat Conservation Plans. No one agency or non-governmental organization compiles and centralizes the data.	Valuable data available on the internet could remain undiscovered because of inadequate identification and labeling. Attempts to obtain such data may result in delays and additional costs to planning efforts if the issue remains unaddressed.
Land Disturbance	Disturbed areas and brownfield sites provide opportunities for transmission siting in areas with low resource value. The Environmental Protection Agency developed a data set of disturbed land and brownfield sites that covers the Western Interconnection; however, the data set only includes point features.	Locations of brownfields and other disturbed areas are referenced through point coverage, rendering the overall geographic extent of disturbance unknown. Unless additional data for sites by county or by state become available, an assumption about buffer distances (e.g., 1 mile) would need to be applied to all points to allow disturbance features to be considered during modeling. Such an approach would still require more detailed analysis during project siting.

[25] *Renewable Energy Transmission Initiative, Phase 1B Final Report Update, February 24, 2009.*

Table D-5. Observations and Implications for Specific Data Layers

Data Layer	Observation	Implication
Wildlife Corridors/ Wildlife Habitat	Several members of EDTF and other stakeholders indicated the importance of considering wildlife corridors/habitat in transmission planning models, as the development of energy facilities and corridors may have an impact on the ability of wildlife to migrate, forage, and breed. Geospatial data on wildlife corridors/habitat is not consistently available throughout the Western Interconnection. The Data Analysis included wildlife corridors/habitat data in the suitability model, where available.	The absence of standard and seamless coverage for wildlife corridors/habitat features may bias geospatial analyses; however, an absence of data does not imply an absence of resources. The difficulty of compiling wildlife corridors/habitat data from multiple sources can present delays and additional costs to transmission planning efforts, and may discourage some planners from using such data. The current limitations of geospatial data for wildlife corridors/habitat are well documented[26] and solutions, in particular the DSS, will help to address the issue. The EDTF recognizes the importance of wildlife corridors/habitat data and acknowledges the regional efforts currently underway by the Western Governors' Wildlife Council initiative to establish a seamless and standardized geospatial data set.
Visual Resources	Members of EDTF recommended the inclusion of visual resources and scenic quality in the Data Analysis. The Data Analysis found limitations in the availability of visual resources geospatial data. First, this data is typically mapped only on public lands (generally by the BLM and U.S. Forest Service). Second, the data is fragmented and available only by contact with the local offices of BLM and U.S. Forest Service; no central location compiles this data. RETI produced similar observations.[27]	Linear transmission facilities can present visual impacts to the landscape, and effective transmission planning and siting practices can avoid and mitigate impacts. A lack of visual resources and scenic quality geospatial data may result in an inadequate consideration of potential visual impacts. Attempts to obtain such data may result in delays and additional costs to planning efforts.
Cultural Resources	Members of EDTF recommended the inclusion of cultural (paleontological, archaeological, and anthropological) resources in the Data Analysis. The Data Analysis found limitations in the availability of such data.	A lack of cultural resources data during the transmission planning process may result in inadequate consideration of these resources leading to poor corridor routing and other decisions. Attempts to obtain such data may result in delays and additional costs to planning efforts. Early coordination with agencies and the State Historic Preservation Offices would be needed to allow adequate time to collect and analyze cultural data.
Tribal Resources	Members of EDTF recommended the inclusion of Tribal resources data in the Data Analysis, and invited Tribal representatives to provide such data. To date, no data have been obtained, although Tribal representatives have stated their desire to review specific projects that may be considered and to identify any resulting concerns and issues on Tribal lands.	A lack of Tribal resources data during the transmission planning process may result in inadequate consideration of these resources leading to poor planning decisions. While it would be faster to obtain Tribal resource data in advance of specific planning initiatives, working within the processes and timelines required by individual Tribes is necessary and must be figured into the planning process.

[26] *Western Governors' Association, Wildlife Corridors Initiative, June 2008 Report.*
[27] *Environmental Working Group Interim Draft Phase 1B Report, August 15, 2008, p. 12.*

Table D-5. Observations and Implications for Specific Data Layers

Data Layer	Observation	Implication
Land Use/Zoning	Some EDTF members recommended consideration of data representing land use/zoning constraints to transmission development, particularly in urban fringe areas. However, land use/zoning data is typically maintained at the local jurisdictional level and therefore impractical to obtain for large scale regional planning purposes.	An absence of urban or zoning constraints may result in the consideration of urban areas during transmission planning. Similar to agricultural lands, applying the approach from the Data Analysis of using the National Land Cover Data to extract "developed" categories and also applying a buffer surrounding U.S. Census designated places (closely settled, unincorporated communities that are locally recognized and identified by name) could provide a work around for including seamless urban and urban fringe areas proxies in modeling.

BLM	Bureau of Land Management	RETI	Renewable Energy Transmission Initiative
DSS	decision support system	WECC	Western Electricity Coordinating Council
EDTF	Environmental Data Task Force		

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Environmental Recommendations for the Transmission Planning Process

Final Report of the Environmental Data Task Force

APPENDIX E

Stakeholder Input from Process Interviews and Interview Questionnaire

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The Environmental Data Task Force (EDTF) Case Study included Process Interviews conducted from January to March 2011. The interviewees represented a diverse array of stakeholders from the following types of organizations: transmission developers, federal agencies, state agencies (i.e., utility commissions and energy offices), non-governmental organizations, Western Governors' Association, Western Electricity Coordinating Council (WECC), and Subregional Planning Groups (SPGs). See Appendix C for a detailed explanation of the interview process. Table E-1 includes select input from representatives of each stakeholder type that was considered in formulating the Summary Observations in Section 3.1, Table 2 of this report. Input identified in Table E-1 reflects opinions expressed by individual stakeholders and does not necessarily agree with the opinions of the authors, EDTF members, WECC, or the stakeholder groups they are associated with.

Following Table E-1 are the interview questionnaire and other materials provided to stakeholders contacted for interviews. These interview materials are not edited and appear as they were submitted to stakeholders.

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
Non-governmental organization	Existing environmental data needs to be better organized and more accessible. Data reliability and usability should also be standardized. Because data often has flaws, prioritizing data needs and a identifying a method for continuous improvement of data would be valuable to the transmission planning process.	Data-1
SPG	The best tool or mechanical process to augment close coordination with land use agencies for the planning process would be to employ early in the process an electronic version of the Western Regional Corridor Study that is periodically updated, GPS and spatially related, coordinated and approved by land use agencies to meet long term planning goals.	Data-1
State Agency	Connect the federal 368 energy corridors over private/state lands to develop energy corridors for the transmission planning process.	Data-1
Transmission Developer	The availability of seamless environmental data across state boundaries is useful.	Data-1
WECC/TEPPC	Access to more environmental data at the subregional level would make people more comfortable about moving projects through the planning process.	Data-1
WECC/TEPPC	There is a need for quality and consistent data for different environmental values that can link state and sub-region geographic areas across the West.	Data-1
Federal Agency	Avoidance areas could be considered in the up-front electrical characteristics of the planning process – mainly from a center-line impedance adjustment standpoint.	Data-2
SPG	The Western Regional Corridor Study provides valuable information.	Data-2
SPG	A corridor tool for estimating which corridors are feasible for the electrical design and project routing would help improve the planning process.	Data-2

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
SPG	Developing the geographical topology corridor planning tool from the top down policy perspective, with broad state and local government processes, will help improve the planning process.	Data-2
SPG	Starting the process with routing on an approved corridor from the Western Corridor Study has great value.	Data-2
SPG	It would be valuable to make available an electronic and annually updated version of the Western Regional Corridor Study that is annually approved by land planning agencies.	Data-2
SPG	A Corridor Study Report that indicates preferred corridors and incorporates all environmental issues as best as possible without identifying specific projects could be used early in the planning process.	Data-2
SPG	Development of a Regional Corridor Study could begin in the WECC Long Range Planning process. The corridor study should be an integral part of the transmission provider and sub-regional planning process. It should also guide top down proposed long range projects.	Data-2
SPG	Once resource plans are known, the transmission electrical design begins and should immediately be guided by corridor information.	Data-2
State Agency	Projects proposed on previously disturbed sites can be easier to permit. Greenfields are generally assumed to have a higher environmental concern, and, as such, permitting a project on a greenfield can be more difficult. It would be beneficial to identify and make available disturbed lands data across the West (e.g., agricultural areas that have lost their water rights).	Data-2
State Agency	The identification of exclusion areas is useful.	Data-2
State Agency	Incorporating environmental information into a pre-screen could identify red/yellow/green flags for corridors.	Data-2
Transmission Developer	Assumptions about exclusion areas are not absolute. Sometimes a transmission corridor might already exist or might be suitable in the future in an exclusion area.	Data-2
Transmission Developer	Consistency in how avoidance areas are formulated and treated would be beneficial for the planning process.	Data-2
Transmission Developer	Similar to the WREZ zone type level for where potential resources can develop, a high-level acceptable transmission corridor identification where one would have a high success rate of getting a line in this general area.	Data-2
WECC/TEPPC	Screening level data would be useful in ruling out alternatives that are not feasible (fatal flaw analysis) early in the process. It would also be valuable to identify areas where it is easier to obtain a permit, such as known corridors.	Data-2
WECC/TEPPC	In the TEPPC plan it would be helpful to have an overlay of environmental information so when TEPPC is working on a specific transmission alternative or a particular resource generation zone it can determine whether any environmental concerns are raised.	Data-2

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
SPG	It would be helpful to have avoidance areas documented (e.g., cultural) to know what is off limits and why. While exclusion zones are meant to be "absolute" (e.g., wilderness areas), there are land uses that some may consider exclusion zones, but that may allow transmission development (e.g., wildlife management areas).	Data-2, Data-6
Transmission Developer	Establishing trade-offs to reduce environmental harm, such as by avoiding quality habitat while developing on marginal habitat, may need to be measured on a project-by-project basis, based on the conditions of the area.	Data-4
Federal Agency	Access to better information on private, state, and tribal lands would help decision makers.	Data-5
State Agency	The confidential nature of cultural information can pose challenges during the planning process. Even when cultural information is available and is identified as important by stakeholder groups, confidentiality issues can preclude making full use of the data.	Data-5
WECC/TEPPC	Access to better quality water data would help planners more fully understand water constraints, such as water for solar thermal, water for renewables.	Data-5
Transmission Developer	Identifying no fly zones near military installations would be helpful in transmission planning if they could be incorporated into the avoidance criteria.	Data-6
Transmission Developer	Developing a broad understanding of how society values certain resources, such as viewsheds, would be valuable.	Data-7
Transmission Developer	A balance is required in planning for transmission with various competing interests that involve customers, local populations, environmental issues, and economic development opportunities. No single metric can capture the full breadth of these issues. As such, the assumptions and values that inform any new metric must be clearly identified.	Data-7
SPG	Considering environmental data would be helpful at the conceptual stage, after problem identification, and during the formulation of alternatives. Currently, this type of information is incorporated as inherent knowledge from experience.	Data-9
State Agency	Can the environmental work that has been done on existing projects be reviewed and factored into the TEPPC process? Can information or clarity on the environmental work that has already been done on existing projects be obtained?	Data-9
State Agency	One of the things we did was, as people go through our process, they will be able to substantively rely on the proceeding. If they have given us a lot of information as part of the proceeding about certain aspects of the project, we will give them weight on that.	Data-9
Transmission Developer	Environmental information is already a part of regional transmission planning efforts, but there are benefits of discussing and formalizing how this information is used in the planning process. This process could facilitate the early identification of risks, and an opportunity to identify the ongoing extensive efforts to incorporate environmental information into planning and streamline this process where possible.	Data-9

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
Transmission Developer	To improve the process, planners could document the high level assumptions and environmental considerations considered during the development of long-term conceptual plans.	Data-9
WECC/TEPPC	There is a need to develop a framework about how to apply environmental information into regional transmission planning.	Data-9
Non-governmental organization	Broad-scale environmental data should be compiled and incorporated early in the process. Subsequent project-specific NEPA processes can focus on incorporating site-specific data.	Data-10
Transmission Developer	It is difficult to consider the visual impacts of a project at a regional planning phase, when a line on a map could represent a corridor that is 50 miles wide.	Data-10
Transmission Developer	Environmental information at any scale that helps to identify sensitive environmental resources (i.e., fatal flaws) during the transmission planning process would be useful.	Data-10
Transmission Developer	A challenge to identifying environmental information in the transmission planning phase is the scale of the information with respect to the regional planning area. A huge gap in scale exists between regional system planning, which occurs at a macro/multi-state scale, and the siting and environmental planning process, which requires an analysis of environmental and land use conditions at a micro/local scale. A review of environmental conditions at a macro level may suggest that a geographic area is unsuitable for transmission development. However, at a micro level that same data may reveal areas of opportunity to avoid or mitigate environmental conflicts.	Data-10
Transmission Developer	If environmental information is incorporated too early, it can bog down the planning process.	Data-10
WECC/TEPPC	One concern about incorporating environmental information is that it can be done too rigorously. Screening that is applied too finely could preclude development that would otherwise be appropriate. On the other hand, screening on a regional scale may not capture all local issues. The limitations of environmental screening at the regional scale need to be clearly defined.	Data-10
Western Governors' Association	It would be valuable to identify which scales of environmental data are most useful for each stage of transmission planning (i.e., regional, subregional, local), or, alternatively, to develop an inventory of available data and identify the stage of transmission planning for which the data are most useful.	Data-10
Transmission Developer	Mitigation costs are a relatively small dollar amount that they do not influence the planning process, especially for large projects. Even when mitigation costs are more than expected, they often would not affect alternative selection.	Economics-1
Transmission Developer	The scale of transmission costs to avoid or mitigate for environmental impacts needs to be understood relative to the benefits that transmission enables with respect to overall environmental objectives and electricity costs.	Economics-1
Transmission Developer	Mitigating environmental impacts such as by establishing trade-offs (e.g., conservation areas and mitigation banks) is a siting issue to a transmission developer, and not a transmission planning issue.	Economics-1

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
Transmission Developer	During the regional planning phase, it would be useful to determine criteria that require considerable mitigation or low permit feasibility, which equates to time.	Economics-1
WECC/TEPPC	Consideration of environmental information could be useful during the comparative capital cost discussion in transmission planning.	Economics-1
WECC/TEPPC	Environmental information used as an input or assumption in production-cost modeling would be valuable.	Economics-1
Non-governmental organization	Transmission planning cannot be done without generation planning, which cannot be done without analysis of environmental data such as conflicting land uses, wildlife, etc.	Policy-1
Non-governmental organization	It would be beneficial to reintegrate transmission planning and generation planning.	Policy-1
State Agency	The incorporation of environmental consideration associated with the generation resources into transmission planning is important.	Policy-1
State Agency	It is important to include the consideration of state-specific information about generation so that lines are not being planned to nowhere.	Policy-1
State Agency	Transmission siting follows generation location. Incorporating environmental constraints would be useful in identifying resource limitations for power plants (e.g., water availability). Utilities are trying to get access to preferred generating resources to meet loads at the lowest cost.	Policy-1
Transmission Developer	With respect to regional transmission planning, the most important environmental information is associated with the resources and not the transmission.	Policy-1
Transmission Developer	Transmission is proposed on defined need which is established by load that cannot be served, reliability, or generation additions. Environmental considerations that can inform load and generation resource decisions (e.g., carbon policy, air shed issues, etc.), will help determine transmission.	Policy-1
Transmission Developer	It is important to choose generation solutions that facilitate efficient transmission.	Policy-1
Transmission Developer	If the resources can get permitted and developed, the transmission can be designed to minimize environmental impact as part of sound project development and permitting.	Policy-1
Transmission Developer	There is a need for synchronization between generation and transmission plan implementation.	Policy-1

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
WECC/TEPPC	Incorporating environmental information (e.g., wind, water availability, location of avian flyways) that constrains the size and location of generation sources into current models could better inform transmission planning.	Policy-1
WECC/TEPPC	It would be helpful to be able to look at generation location, transmission, cost, and reliability at the same time.	Policy-1
WECC/TEPPC	Incorporating environmental criteria that constrains the location of generation sources, such as renewable energy zones, is important to transmission siting. Using environmental data to site generation locations will have a greater effect than transmission siting.	Policy-1
WECC/TEPPC	To account for uncertainty, look at different alternatives for generation zones and see which lines are congested, then analyze critical network needs and compare to historical analysis of congested lines.	Policy-1
Western Governors' Association	There is a need to package generation options, associated transmission options and to assess the environmental effects from alternatives at the same level of planning.	Policy-1
Non-governmental organization	The Wilderness Society's standard NEPA scoping questionnaire is a good example of environmental information that may be required for transmission development.	Policy-2
Transmission Developer	As transmission development and construction progress, there is an increased desire to expedite the development process because more is invested.	Policy-2
Transmission Developer	Early identification of corridors is valuable as developers can keep the discussion of these corridors moving forward and start consultation early in the context of the need for future transmission. Having environmental issues identified for these corridors would be helpful to inform the public and create awareness.	Policy-2
Transmission Developer	Some transmission developers are working to identify transmission line corridors ahead of time (longer than 10 years).	Policy-2
WECC/TEPPC	It would be valuable to identify potential environmental permitting hurdles (i.e., more site-specific at the mitigation level) that may inhibit generation and transmission siting.	Policy-2
Federal Agency	It would be beneficial if state and local government had a planning process that identified transmission line corridors.	Policy-3
Non-governmental organization	There is a need for a federal "backstop" siting authority.	Policy-3
State Agency	It would be valuable to link this work to specific siting and permitting statutes.	Policy-3

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
State Agency	Developers need to address all critical environmental attributes, but they may not know what the attribute is until it surfaces from local stakeholders, usually in opposition to a proposed transmission line. Establishing set state standards lowers the risk for transmission developers by facilitating the identification of more of these critical environmental attributes up front.	Policy-3
Transmission Developer	At times, different government agencies can disagree about the same regulatory requirements, which can affect the development process.	Policy-3
Transmission Developer	The legal construct of some states makes routing decisions difficult to address upfront because each county and town has local jurisdiction over siting with different requirements. In addition, the jurisdictional entities must receive the CPCN and prove need before siting and permitting. This adds to the complication of adding additional input at the planning phase.	Policy-3
Transmission Developer	Adhering to separate local government environmental regulations is not only time consuming and cumbersome to the transmission sponsor or developer, but it is complicated and frustrating for the stakeholders. A state level siting authority where transmission sponsors and developers, regulators, environmental organizations and the general public can help develop projects is desirable.	Policy-3
Transmission Developer	It would be beneficial to have a state agency facilitate the permit process instead of local jurisdictions, as it can be more difficult to garner local buy-in if the benefits of a transmission project are more widely dispersed.	Policy-3
Transmission Developer	There is a lot of variability in what permitting agencies require which makes it difficult to apply a consistent approach. For example, some agencies require cultural and biological surveys, whereas others do not.	Policy-3
WECC/TEPPC	It would be beneficial if federal agencies coordinated more on NEPA projects and then with lead state environmental agencies.	Policy-3
WECC/TEPPC	Consolidating county-by-county permitting into state authority would streamline the permitting process.	Policy-3
Western Governors' Association	It would be valuable to know if and/or how the case study results may inform policy development.	Policy-3
Non-governmental organization	As many important ecological factors as possible should be considered in the transmission planning process.	Policy-4
SPG	In the planning process, the sooner realistic and achievable routing can be estimated, the better electrical topology, cost estimates, and project timing can be determined.	Policy-4
SPG	Environmental data could be used in the SPG process.	Policy-4
WECC/TEPPC	Environmental information could be used as a screening tool to prioritize which study requests are most valuable to pursue.	Policy-4

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
WECC/TEPPC	Environmental information would be helpful at the screening stage for evaluating which potential transmission projects could get to the planning phase.	Policy-4
WECC/TEPPC	It is very important to get environmental information that informs specific transmission project comparisons. Environmental information could be incorporated at the resource zone, generation source locations, transmission project, and at the step to identify paths or corridors for specific upgrades/projects.	Policy-4
SPG	To improve planning, require project sponsors to have committed before entering the permitting and land acquisition process.	Policy-5
SPG	Land planning problems can occur when routing and right-of-way acquisition begins before project developers obtain committed customer need. The result is that competing projects with different levels of sponsorship are in the land planning process which can lead to confusion and land planning problems.	Policy-5
Transmission Developer	It would be helpful to have consistent policies that are required of all transmission developers (regulated, independent, etc.), related to purpose and need and environmental regulations.	Policy-5
SPG	Some SPGs do not take proposed air, ash and water regulations directly into account. Instead, they look at the impacts that something like closing a particular plant will have on reliability, etc.	Process-1
State Agency	Some of the policy changes that could affect transmission development include the administration's priorities for distributed generation vs. remote generation, the mix of in-state vs. out-of-state generation, and whether or not there is a cap on out of state generation.	Process-1
Transmission Developer	It is important for policymakers to carefully consider the impacts that changing a particular policy will have on other policy objectives (e.g., changing wilderness policy vs. renewable energy development).	Process-1
Transmission Developer	Transmission planning utilizes information from resource planning departments and load forecasts for local transmission planning to address legislative renewable standards.	Process-1
WECC/TEPPC	A 25-year investment is difficult to finance when regulatory requirements could change.	Process-1
Federal Agency	It would be beneficial to develop a single group and contact list that identifies the appropriate persons to contact at WECC during the planning and development process.	Process-2
Federal Agency	It would be beneficial to establish a more direct line of communication between land management agencies and transmission planning organizations to facilitate data sharing.	Process-2

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
State Agency	Resource planning assumptions should be consistent. They should align with states' resource planning efforts and whether or not they have already tried to address environmental concerns and are moving forward with scenarios based on existing renewable portfolio standards.	Process-2
State Agency	Early outreach is important for stakeholders.	Process-2
Transmission Developer	Instead of first working to identify transmission routes, some developers are instead trying to learn about the range of constraints to better engage with diverse stakeholder groups early in the process.	Process-2
Transmission Developer	Challenges presented by some stakeholders and outside organizations often cannot be characterized early in the planning process, only once the alternatives are identified after the system planning process. Improving how challenges from stakeholders and outside organizations are assessed may improve the process.	Process-2
Transmission Developer	Incorporating the same knowledge and assumptions used across regional stakeholders would make the planning process more efficient.	Process-2
Transmission Developer	The overall WECC process is well structured but lots of work needs to be done ahead of time and there is no well structured process for meaningful engagement of stakeholders for this early work.	Process-2
WECC/TEPPC	One of the lessons learned from previous development projects is the importance of getting stakeholder involvement very early in the process.	Process-2
Non-governmental organization	The transmission planning process starts with electrical engineering but becomes a multifaceted effort across a broad range of stakeholders, so an analytical technique to bring non-electrical information to decision makers is needed. In an integrated approach, transmission planning usually means generation planning.	Process-3
SPG	Transmission planning involves reviewing impacts of the proposed projects on two sets of topologies: electrical and geographical.	Process-3
SPG	Projects can be delayed when electrical topology is designed before good geographical land use planning is conducted. As a result, many times the electrical design ends up being changed when land use realities are determined.	Process-3
State Agency	Is it possible to illuminate or rank the TEPPC building blocks based on the environmental component? Can environmental information being developed be incorporated in the cases in the future, so they are not just ranked based on the electrical and cost dimensions?	Process-3
State Agency	It might be valuable to incorporate environmental information into consideration of transmission study requests.	Process-3

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
Transmission Developer	A priority in the planning process is to provide reliable service. Addressing this need in the planning phase is imperative. If sufficient planning does not take place to address reliability, another transmission line might be required to be constructed sooner to improve reliability to a given area. This is one example of a critical environmental consideration that can be overlooked by many stakeholders.	Process-3
Federal Agency	The sooner stakeholder groups are involved in the up-front traditional electrical engineering planning process, the better they will be informed when it comes to making the "acceptableness" decision. This will also extend the "planning" process by several years.	Process-4
Non-governmental organization	In addition to incorporating environmental data, it would be useful to incorporate data about people and organizations with local knowledge and influence in a particular geography. The data could be used to characterize risk and ensure local knowledge is incorporated in the planning process.	Process-4
Non-governmental organization	The transmission planning process needs perspective outside the electrical engineers…you need to involve local landowners and environmental groups – eminent domain won't always solve siting problems.	Process-4
Non-governmental organization	More perspectives from more disciplines need to be incorporated into transmission planning. Diverse stakeholders, from electrical engineers to environmental groups, need to be involved in the process in a constructive manner in order to better support the process.	Process-4
SPG	It would beneficial to have a measured approach regarding mitigation but would be difficult because values may vary across stakeholders.	Process-4
SPG	The process could be improved by separating it from the private landowner process and focusing on environmental aspects. It is preferable not to involve land owners until there are route alternatives for them to consider.	Process-4
State Agency	At the transmission planning stage, it is difficult to bring in the landholders because the planners do not yet know where the line will be placed. It is important to be proactive when engaging landholders.	Process-4
Transmission Developer	Given the diversity of stakeholders involved in transmission planning, it is difficult to prioritize the myriad of competing interests.	Process-4
Transmission Developer	There is a significant need to consider local issues and easily accessible environmental information will not likely include all the issues of importance to local communities. Specific efforts with the public as well as local and state officials need to be incorporated into the process to ensure all these critical issues are identified (e.g., newly zoned areas, viewsheds of concern, protected agriculture within a local community).	Process-4
WECC/TEPPC	The current approach addressing land ownership issues (e.g., placing transmission on public vs. private land) needs to be improved. Mainly the public and private land issues arise during the permitting stage. Private landowners and public agencies may be at odds when it comes to siting decisions.	Process-4

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
Non-governmental organization	The basic assumptions that are made when a project is proposed are focused on load growth (built only by the load serving entity) and do not consider the other ways that the need could be addressed besides more transmissions lines. It is important to show that energy efficiency and demand side management assumptions have been considered to avoid challenges and protests to proposed projects.	Process-5
WECC/TEPPC	It would help to have several alternatives, including non-transmission alternatives, as solutions to critical network needs. Applying environmental information and developing constraint mapping at this stage would better facilitate selection of the best alternative to solve the critical network need.	Process-5
WECC/TEPPC	Environmental information should be incorporated at the strategic level, when considering non-wire alternatives.	Process-5
State Agency	It would be beneficial to have more transparency on the environmental work that has been done for existing projects.	Process-6
Transmission Developer	It is essential that EDTF ask all developers of projects within the 10 year planning process, both the foundational projects and the potential projects, certain questions, including: A) What phase of development are they in relative to the generic project schedule? B) What environmental data are they using within their planning process to develop potential project corridors? C) What type of permitting process do they need to undergo (e.g., EIS, Environmental Assessment, state NEPA process, combined environmental impact and project need review or CPNC?) D) What the status is of the permitting process with respect to milestones achieved, agencies involved, reasonable range of alternatives being reviewed, etc.? The answer to these questions will provide the EDTF with far more relevant information about the projects and what environmental data has been used in the planning/development of the projects than can be gleaned from the geo-spatial analysis of the potential projects.	Process-6
Non-governmental organization	Bringing broader societal concerns into planning is a way to bring projects into planning that are environmentally beneficial in consideration of broader (i.e., state, national, or global) issues.	Process-8
Non-governmental organization	In many of the projects in the SPGs or for utility developers, not enough thought goes into identifying the broader purposes and benefits of transmission projects, or the project is only considered from the proponent's point of view. Other stakeholders, if involved, could add value during project design. When considering the need for projects, they should be viewed from the public good point of view (e.g., will the project improve local economic conditions, reduce emission, etc.).	Process-8
Transmission Developer	A better job needs to be done of educating/informing the public.	Process-8
Non-governmental organization	In general, local environmental issues (e.g., endangered plant species) cannot be practically input into the regional transmission planning process. The most cost-effective use of site-specific environmental information to inform regional transmission planning may be to incorporate it into the risk analyses or anticipated due diligence.	Risk/Uncertainty-1
Transmission Developer	The fundamental economics portrayed in the transmission planning process will clear up regulatory uncertainty.	Risk/Uncertainty-1

Table E-1. Stakeholder Input from Process Interviews

Stakeholder Group	Observation	Section 3.0 Summary Observation
Transmission Developer	Regulatory certainty in the siting process would help the planning process.	Risk/Uncertainty-1
Transmission Developer	Environmental information and the risk/probability of success need to be considered during the planning process.	Risk/Uncertainty-1

CPCN	Certificate of Public Necessity and Convenience	SPG	Subregional Planning Group
EA	Environmental Assessment	TEPPC	Transmission Expansion Planning Policy Committee
EIS	Environmental Impact Statement	WECC	Western Electricity Coordinating Council
GPS	Geographic Positioning System	WREZ	Western Renewable Energy Zones
NEPA	National Environmental Policy Act		

Transmission Planning Process – Stakeholders Interview Questions
January 31, 2011

As technical support contractor to the Western Electricity Coordinating Council (WECC) and the Scenario Planning Steering Group (SPSG), ICF International (ICF) is supporting the Environmental Data Task Force (EDTF) in their goal to:

> *Develop recommendations for a methodology to incorporate information on land, wildlife, cultural, historical, archaeological, and water resources (in coordination with work conducted via the State-Provincial Steering Committee) into the transmission planning process (scenario development, transmission study planning and development of the 10-Year Regional Transmission Plan and the 20-Year Regional Transmission Target Plan).*

To inform the EDTF's recommendations for a method to incorporate **environmental information** into the transmission planning **process**, ICF is conducting a case study using two primary methods: a data-driven, geospatial analysis and a process focused, nonspatial analysis. The geospatial method consists of cataloging, collecting, and applying (using geographic information system [GIS]) available environmental data to potential transmission line projects. Using these potential transmission line projects, ICF hopes to inform what environmental data and which GIS methods typically applied to transmission line siting/routing projects might also have application to a larger regional transmission planning scale. The non-spatial method consists of interviewing a representative group of stakeholders involved in transmission planning to better understand the process (see definition in EDTF goal). A key purpose of these process interviews is to learn what environmental considerations are inherent and what opportunities exist for incorporating environmental information.

ICF identified an initial list of stakeholders to interview that included WECC staff, land managers, load serving entities, developers, etc. Table E-2 provides a core list of questions these stakeholders may be asked. Because this is a diverse list of stakeholders, they will have varying levels of transmission planning knowledge and, subsequently, not all questions in Table E-2 will be applicable to all stakeholders. For example, the stakeholder from a land management agency may issue right-of-way permits for transmission lines and generation facilities, but would not prepare transmission plans. When reporting data and findings, respondents will only be identified by their organization type.

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Table E-2. Initial List of Interview Questions

Question	Response	Organization	Date
PROCESS			
1. Referring to the diagrams beginning on Page 10 of this document, please tell us how your transmission planning process relates to one or more of the diagrams in these figures.			
2. If your organization engages in a transmission planning process that differs from those shown in the figures beginning on Page 10 (e.g., the West-wide Energy Corridor planning process), please tell us about the process you use.			
3. What is the scope of your planning process? Please tell us at what level (e.g., state or regional) your planning process is applied.			
4. What is the frequency of your planning process or involvement?			
5. Does your planning process feed into or integrate input from other transmission planning processes?			
6. What is it about the planning process that could be improved (in general or from an environmental perspective)?			
7. What assumptions are made in the transmission planning process that relate to environmental issues?			
8. What if any advantages do you envision from incorporating environmental information into regional transmission planning?			
9. What would be the value to your organization or to your customers of accelerating the speed at which transmission line projects could be permitted/built?			

Table E-2. Initial List of Interview Questions

Question	Response	Organization	Date
10. Please explain the process or mechanics your organization uses (or would use if information was available) for incorporating environmental information into your transmission planning process.			
11. Please describe the nature and extent of environmental considerations in your Integrated Resource Plan (IRP) process.			
12. What is the connection, if any, between your transmission planning process and current environmental requirements (e.g., do you have to do NEPA)?			
ENVIRONMENTAL INFORMATION			
1. Are there particular stages or steps in the planning process when consideration of environmental information would be most useful?			
2. What types (e.g., wildlife habitat, topography, air emissions, etc.) of "environmental" information does your process consider, if any?			
3. At what stages/steps in the planning process are environmental information considered and is consideration a formal (or ad hoc) part of the process?			
4. What environmental data, if any, would enable transmission development if considered early in the transmission planning process?			
5. How does your organization define "environmental" relative to information considered in transmission planning? For example, is your definition restricted to resources (e.g., wildlife habitat) or does it include land ownership (e.g., public lands), policy (e.g., air emission permitting), or other factors?			

Table E-2. Initial List of Interview Questions

Question	Response	Organization	Date
6. What are the key gaps or constraints in environmental information that limit its incorporation in transmission planning?			
7. Is there a preferred format or scale to the environmental information you use (or would use if available) in transmission planning?			
OTHER			
1. Future risks – environmental policy shifts, what regulatory changes or policy changes would enable or inhibit transmission development. Right now siting and permitting is the single largest obstacle to building transmission. The more data we "dig up" the harder it gets. How can we better use this information and process to reduce risks. (suggest the mitigation issue below as part of the answer?)			
2. People – most don't care about other enviro issues if it means a project is in their impact area – put it over there. Any final environmental impact metric must be explainable to the common people to weigh/make a value judgment beyond a purely emotional response. Why should I sacrifice to save a sage grouse (I don't eat them anyway....)?			
3. Mitigation – no such thing as "no impact", how can we establish trade-offs. Measured approach. Should this be a no net loss/gain metric (protect and enhance good habitat, while allowing development or even sacrificing marginal habitat), as opposed to a no-loss at any cost metric?			

Table E-2. Initial List of Interview Questions

Question	Response	Organization	Date
4. Societal costs – view sheds are in the eye of the beholder and difficult to define (while this is more of a spatial attribute, using as an example). What makes something worth protecting? Is it a quality of life (in the broad sense, not just people, but wildlife/species and habitat). Are there technical design approaches to minimize the specific impact (bird-friendly or unfriendly designs, visual designs, etc.). At the end of the day the societal trade-off is about the economy and the other choices that need to be made. Ideal outcome is to find the lowest-cost, lowest impact solution set, but even at that there will be financial choices made.			
5. Are there specific environmental attributes that can be identified in planning that would expedite the siting and permitting function (such as avoiding exclusion areas like National Parks)?			
6. California represents the single largest potential market for renewable energy in the West. There are implications for how California handles in-state vs. out-of-state eligibility of resources to meet its RPS requirements. How do you account for the regulatory uncertainty surrounding the deliverability requirements of renewable power into California?			
7. What state and/or regional renewable standards do you take into account in your resource/transmission planning?			
8. There are air, ash and water regulations that are being proposed and that will require significant environmental capital expenditures and lead to potentially significant closures of coal, and perhaps other thermal plants. Do you take these regulations into account in your resource and transmission plans?			

Table E-2. Initial List of Interview Questions

Question	Response	Organization	Date
9. Carbon legislation is dead – at least for now. The future of EPA regulation of GHGs under the Clean Air Act is unclear, both in how the regulations will be developed and in whether EPA will be given the resources to enforce it. How do you account for carbon uncertainty in your resource and transmission planning?			
10. What other state and/or regional environmental regulations do you take into account in your resource/transmission planning?			
ADDITIONAL STAKEHOLDER COMMENTS			
1. Is there any additional information related to your planning process, environmental data, or other topics you would like to discuss?			
2. In summary, what are your recommendations (if any) for incorporating environmental information into the transmission planning process?			
3. Do you have any recommendations relative to the CPCN, NEPA, and transmission planning processes and incorporating environmental information into transmission planning?			

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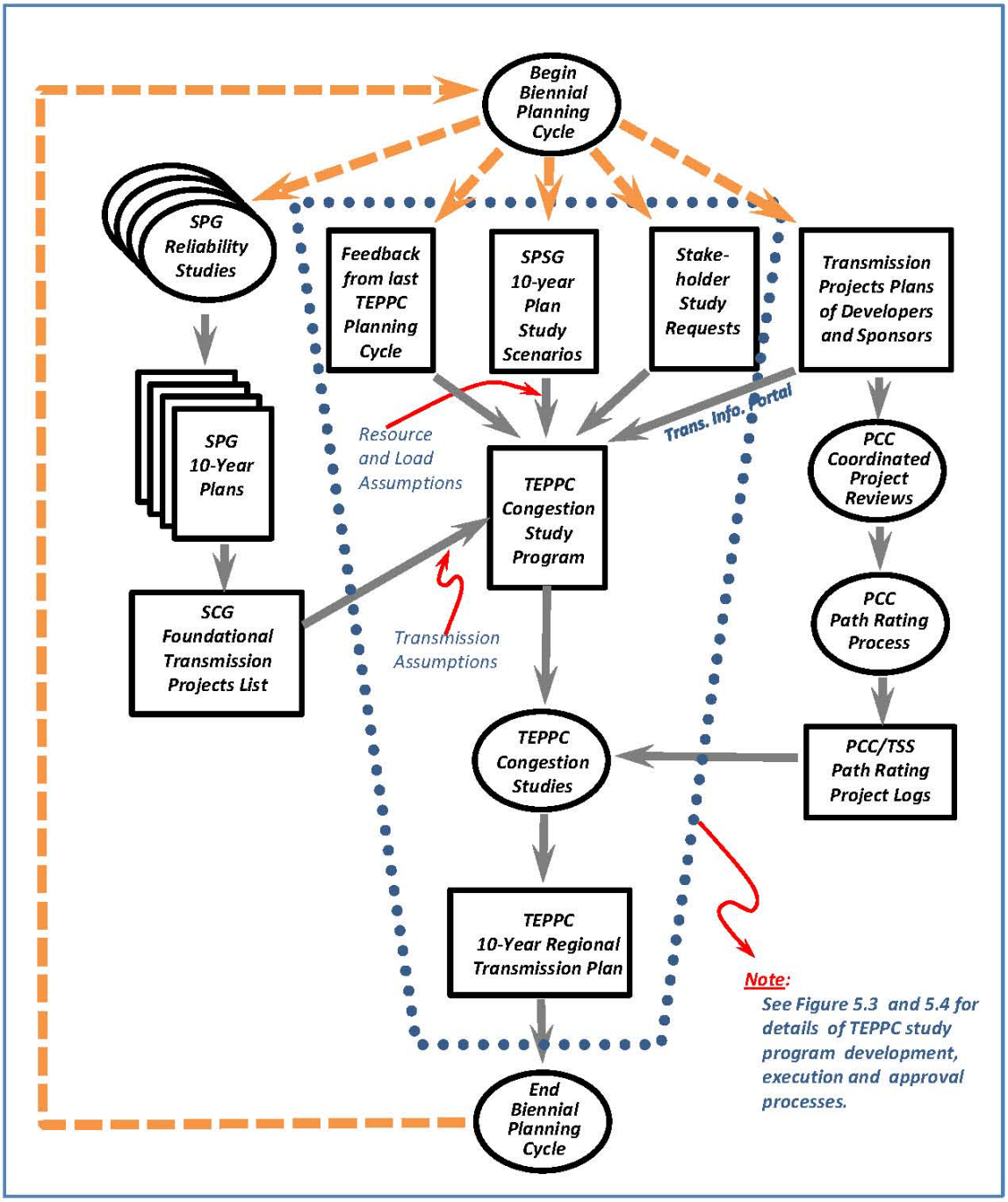
The following figures are taken from the Western Governors' Association Renewable Energy Transmission Roadmap - June 2010 and the Transmission Expansion Planning Policy Committee Regional Transmission Expansion Planning Protocol - April 26, 2010.

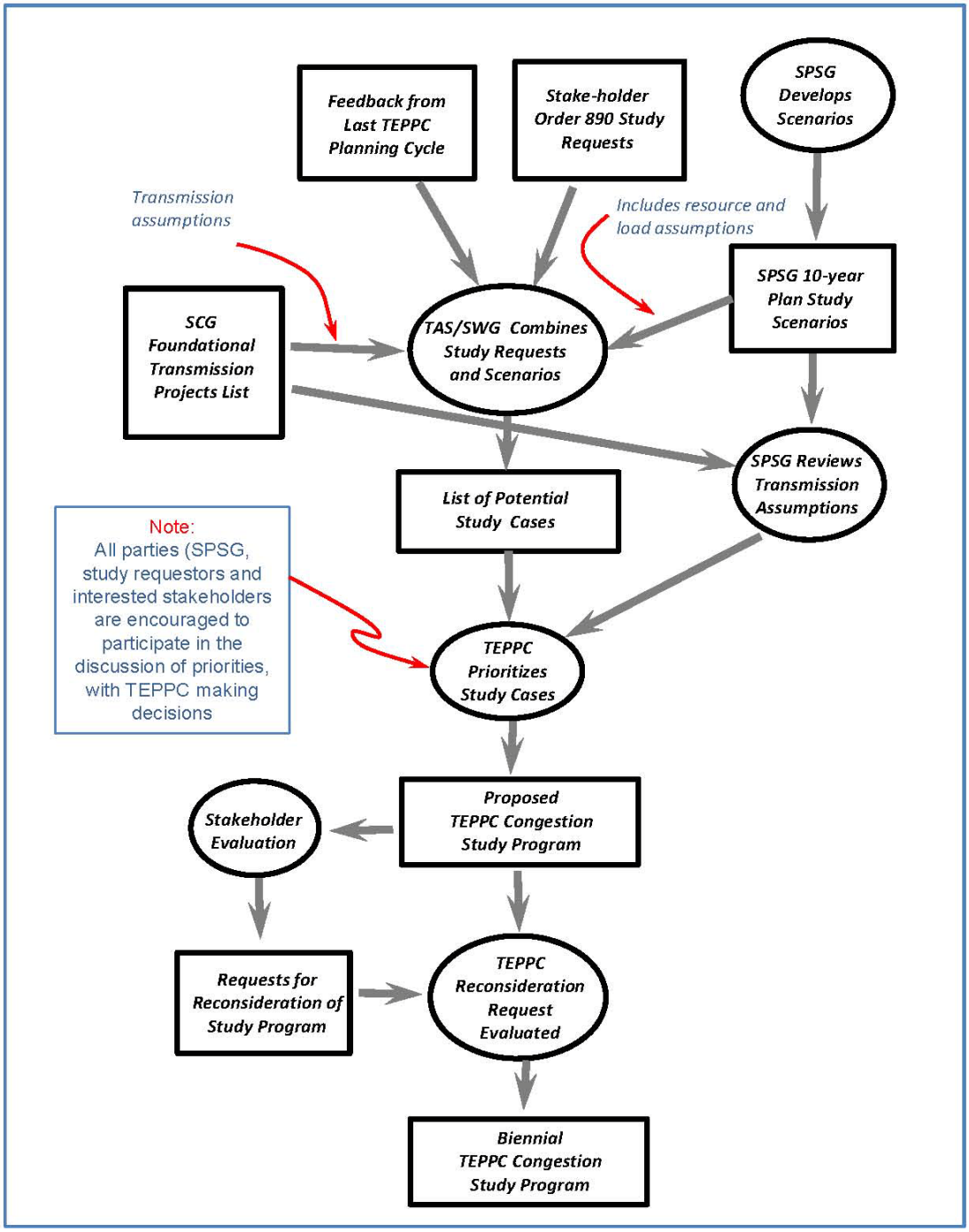
Transmission Expansion Planning Policy Committee
Transmission Planning Protocol

Figure 5.2, Information Flows for the 10-Year Plan Development Process



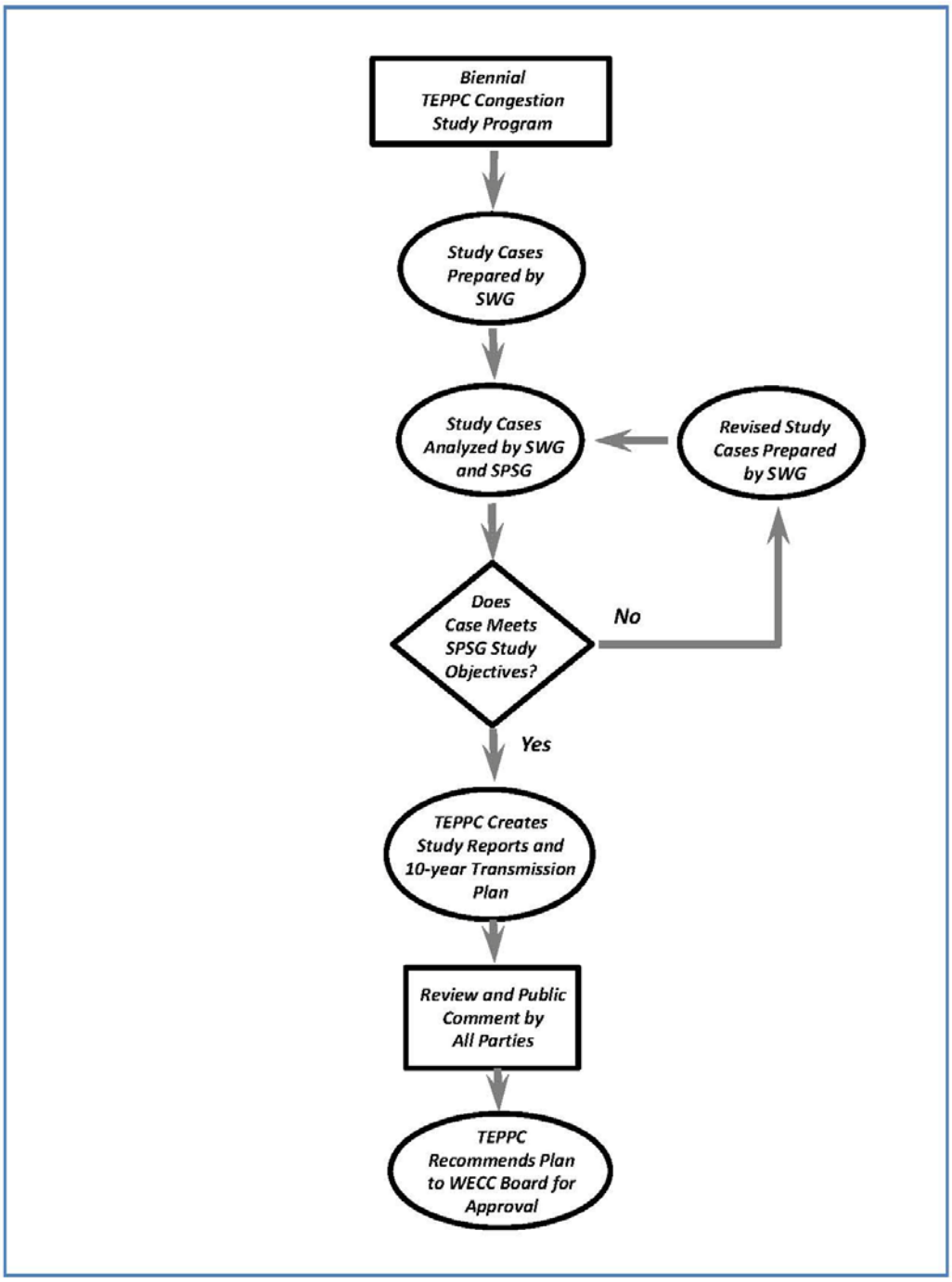
Transmission Expansion Planning Policy Committee
Transmission Planning Protocol

Figure 5.3, Study Program Development Process

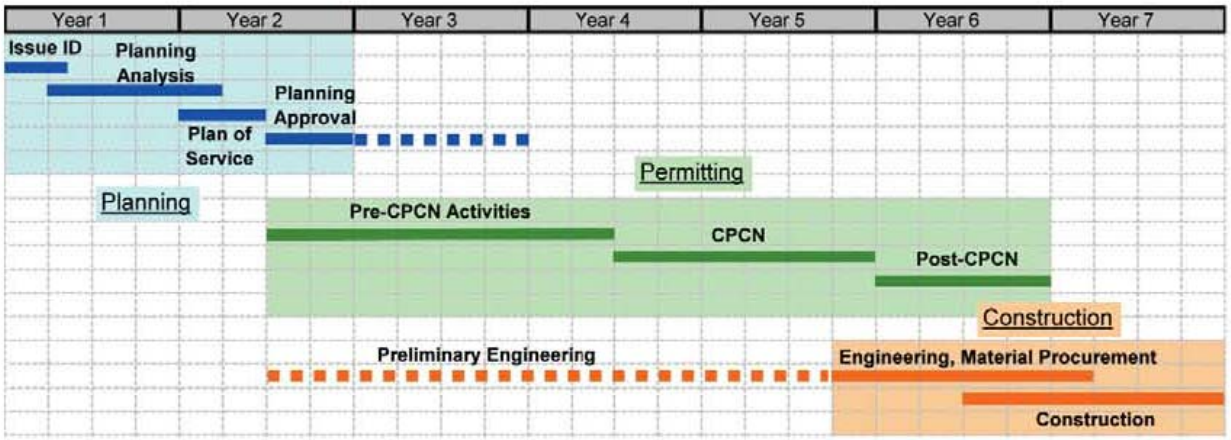


Transmission Expansion Planning Policy Committee
Transmission Planning Protocol

Figure 5.4, Study, Review and Plan Development Process



Generic Schedule for a Major Electric Transmission Project



Environmental Recommendations for the Transmission Planning Process

Final Report of the Environmental Data Task Force

APPENDIX F

Applicability of Other, Stakeholder Driven Processes to Regional Transmission Planning

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To efficiently incorporate environmental information into Western Electricity Coordinating Council (WECC) regional transmission planning it is important to understand related planning efforts in the Western Interconnection. These efforts and associated reports describe processes, data sources, evaluation criteria, and other approaches and lessons learned that can be leveraged and applied to regional transmission planning. Environmental Data Task Force (EDTF) members and stakeholders interviewed as part of the case study recommended the reports in Table F-1 be considered. Table F-1 briefly describes these other efforts and how their approaches may be relevant to regional transmission planning.

Table F-1. Applicability of Other, Stakeholder Driven Processes To Regional Transmission Planning

Report Name	Description of Approach Used in the Referenced Report	How Could the Approach be Applied to Regional Transmission Planning?
RETI Phase 1B Final Report	Identified and ranked geographic zones for renewable energy development based on economic and environmental information to inform transmission planning.	As part of regional transmission planning, identify and rank renewable energy development zones considering economic and environmental factors to inform scenario planning, justify the routing of lines to connect areas most likely to develop renewable energy resources, and inherently incorporate environmental and cultural information early in the transmission planning process.
RETI Phase 1B Final Report RETI Phase 2A Final Report[1]	Identified exclusion areas for development and classified these areas as Category 1 (absolute exclusion) and Category 2 (restrictions limit scope and location).	Identify exclusion areas where development is prohibited by statute or regulation and incorporate these areas into regional transmission planning models and spatial analysis. Identify areas where environmental or land use constraints limit development and incorporate these areas into regional transmission planning models and spatial analysis. Review Category 1 and Category 2 lands as identified in the RETI Phase 1B and 2A reports and consider for inclusion in regional transmission planning.
RETI Phase 1B Final Report	For each of the rating criteria, the RETI analysis developed a formula which uses appropriate data to provide a numerical value that is indicative of the relative magnitude of the potential environmental concern associated with each criterion.	Develop standardized formulas to quantify environmental concerns associated with each criterion (e.g., acreage within exclusion/suitability area, number of wildlife corridors crossed, acreage of disturbed lands) and to provide a score for ranking conceptual transmission routes/options. Scores could be described on a range scale (e.g., 1 – 10) and would reflect the relative magnitude associated with environmental concerns and sensitive areas.

[1] *Renewable Energy Transmission Initiative Coordinating Committee. 2009. Phase 2A Final Report. September. http://www.energy.ca.gov/2009publications/RETI-1000-2009-001/RETI-1000-2009-001-F-REV2.PDF*

Table F-1. Applicability of Other, Stakeholder Driven Processes To Regional Transmission Planning

Report Name	Description of Approach Used in the Referenced Report	How Could the Approach be Applied to Regional Transmission Planning?
RETI Phase 1B Final Report	Used buffers for sensitive areas as criteria for quantifying environmental concern.	For all exclusion and other sensitive areas apply a standardized distance buffer to account for the fact that environmental concerns/issues do not always stop at boundaries defined in the data.
RETI Phase 1B Final Report	The RETI Phase 1B report concluded that efforts should be made to identify and map "vacant or disturbed land" because of the potential value of such land for development.	Identify an approach to integrate geographic areas associated with disturbed lands as part of the regional transmission planning process.
RETI Phase 2A Final Report	Applied standardized checklist of environmental concerns and sensitive areas to identified transmission line segments.	Apply standardized checklist of sensitive areas or environmental concerns as part of a process for incorporating qualitative or inaccessible environmental/cultural data into regional transmission planning.
RETI Phase 2A Final Report	Recognized the iterative nature of transmission planning and the need to update results and approaches to correct for new information.	Consider a strategy for updating/revising regional transmission planning and associated reports to reflect newly available environmental and cultural data, changing policy or guidance for managing environmental and cultural resources, or other factors.
RETI Phase 2A Final Report	The formula used to evaluate the environmental concerns associated with transmission planning included a quantified ranking of values associated with rights-of-way. These values considered if a potential transmission line route was in an existing right-of-way, would require an expansion of an existing right-of-way, would require a new right-of-way in an existing designated corridor, could be co-located with another line, or would require a new right-of-way that was neither co-located nor in a designated corridor.	Consider existing right-of-way, designated transmission corridors, and existing transmission lines as an environmental component in regional transmission planning.
RETI Phase 2A Final Report	The formula used to evaluate the environmental concerns associated with transmission planning included a quantified ranking of values associated with construction options that affect project footprint/disturbance. The range of attributed values reflects construction options of upgrades that do not require a change to the existing footprint, rebuilding lines that increase the footprint, and construction of new lines.	Consider the range of construction and upgrade options in evaluating conceptual alternatives from regional transmission planning.

Table F-1. Applicability of Other, Stakeholder Driven Processes To Regional Transmission Planning

Report Name	Description of Approach Used in the Referenced Report	How Could the Approach be Applied to Regional Transmission Planning?
RETI Phase 2A Final Report	The RETI analysis did not take into account existing transmission corridors that are no longer considered acceptable, where changes in land classification have made expansion of existing right-of-way undesirable, or where residential and commercial development has encroached on existing right-of-way. As described in the RETI Phase 2A report, these factors can make it infeasible to add new lines to existing right-of-way.	Consider methods for incorporating data on changes in land use, development patterns, and environmental factors in existing transmission corridors or rights-of-way that restrict or limit future development.
WREZ Phase 1 Report	The WREZ process included stakeholders throughout the Western Interconnection including representatives from the United States as well as applicable Canadian provinces and northern Mexico.	Include stakeholder representatives from all applicable countries in the Western Interconnection in the EDTF.
WREZ Phase 1 Report	Analyzed wind, solar, geothermal, biomass and hydropower resource potential by examining raw data and maps from the U.S. Department of Energy's National Renewable Energy Laboratory and Idaho National Research Laboratory, the Western Governors' Association Western Bioenergy Assessment, as well as Canadian renewable resource data obtained from a variety of other sources.	Consider data sources described in the WREZ Phase 1 Report for application to incorporating environmental information into regional transmission planning.
WREZ Phase 1 Report	Solicited information from federal agencies, state agencies, and Canadian provinces to identify areas where development is precluded by statute or regulation. These areas were identified as exclusion areas in the Qualified Resource Zone analysis.	Coordinate with federal and state agencies and Canadian provinces to identify exclusion and avoidance areas and a process for applying these areas to regional transmission planning.
WREZ Phase 1 Report	Identified areas that should be avoided because of purpose, policy, or restrictions. Included these areas as avoidance areas in the Qualified Resource Zone analysis.	Review avoidance list included in WREZ Phase 1 Report and consider as avoidance areas in regional transmission planning.
WREZ Phase 1 Report	Identified a number of areas that are significant when considering renewable energy development, but which could not be mapped in this effort either because data is unavailable or because the concerns are more appropriately handled at the project level (Significant Areas for Consideration).	Identify data gaps and develop recommendations for addressing data gaps.
WREZ Phase 1 Report	For exclusion or avoidance areas where data was not complete, used data that was available and noted the process would continue to collect available data for inclusion in revised maps. Where data did not exist, the information was not used to develop the WREZ Qualified Resource Area analysis.	Identify data gaps and develop recommendations for addressing data gaps.

Table F-1. Applicability of Other, Stakeholder Driven Processes To Regional Transmission Planning

Report Name	Description of Approach Used in the Referenced Report	How Could the Approach be Applied to Regional Transmission Planning?
WREZ Phase 1 Report	The following types of land were eliminated from consideration for development based on incompatibility with renewable resource development: • Wetlands/water bodies • Surface mines • Urban areas • Airports • Military lands • Excessively sloped areas (<2% for solar, <20% for wind)	Consider the listed areas as avoidance or exclusion areas.
WREZ Phase 1 Report	Solicited public comments on draft materials and documents including outreach to tribal and local governments and relevant interest groups. The proposed responses and adjustments were reviewed and approved by the respective working groups, the responses posted to the Western Governors' Association website, and the adjustments to the draft materials made.	Solicit stakeholder and/or public comments on draft materials, processes, maps, and other word products during regional transmission planning. Use a stakeholder driven process to review comments and review work products, as appropriate.
WREZ Phase 1 Report	Coordinated with state wildlife agencies to solicit information on crucial wildlife habitats and wildlife corridors. Data requests were also sent to the environmental community, academic institutions, and industry. Data received was used to develop maps that identify the level of wildlife sensitivity within the Qualified Resource Areas. The wildlife sensitivities were based on the best currently available data and the best professional judgment of the state wildlife agencies.	Solicit qualitative and quantitative information from state wildlife agencies, the environmental community, academic institutions, industry and other appropriate entities. Use this information to inform the development of models, suitability ratings, or other processes in regional transmission planning that lend themselves to the incorporation of environmental information.
ARRTIS Final Report	Developed a dynamic GIS mapping platform to show environmental resource data layers and existing land use, ownership, and developed facilities such as transmission lines and substations.	As part of regional transmission planning develop mapping platforms or models that incorporate environmental resource data layers, land use, ownership, facilities, and other relevant information.

Table F-1. Applicability of Other, Stakeholder Driven Processes To Regional Transmission Planning

Report Name	Description of Approach Used in the Referenced Report	How Could the Approach be Applied to Regional Transmission Planning?
ARRTIS Final Report	The ARRTIS resource database was initially populated with relevant resource information from the following sources: • National Renewable Energy Laboratory • Western Governors' Association • WREZ Initiative • U.S. Forest Service • U.S. Fish & Wildlife Service • U.S. Bureau of Land Management • Arizona Game & Fish Department	Utilize existing sources of relevant information to populate model inputs and GIS data layers.
ARRTIS Final Report	Information received from agencies during the process was accepted "as-is" and was not field-verified, peer-reviewed, or otherwise cross-checked by the ARRTIS for accuracy.	Check information/data received from data providers to ensure it meets quality and fitness-for-use standards and contains appropriate documentation (e.g., metadata). If data does not meet quality standards develop recommendations to address quality of data or other data issues.
ARRTIS Final Report	Identified and incorporated exclusion areas as part of the project spatial database. Exclusion areas were defined as areas where development is prohibited by statute or regulation.	Review exclusion list included in ARRTIS and consider for exclusion areas in other regional transmission planning efforts.
ARRTIS Final Report	Identified areas with high, moderate, and low environmental sensitivity levels and incorporated these areas as part of the project spatial database. Used qualitative definitions to describe the sensitivity levels and to attribute levels (high, moderate, low) to the spatially defined areas to represent the varying levels of environmental resource constraints.	Develop standardized definitions to qualitatively rank areas with low, moderate, and high potential for environmental sensitivity and constraints. Use a stakeholder driven process to rank areas based on the standardized definitions for environmental sensitivity. Review identified sensitive areas and associated designations (high, moderate, low) from ARRTIS for potential application to regional transmission planning efforts.
ARRTIS Final Report	Categorizations regarding environmental resource sensitivity were discussed in the ARRTIS, but generally were accepted as proposed by the resource managing agency.	Use a stakeholder driven process to determine whether an environmental resource sensitivity approach is suitable to regional transmission planning.
ARRTIS Final Report	All draft and ongoing work products of the ARRTIS were presented to a variety of groups and stakeholders in a variety of venues (e.g., forums, meetings).	Develop a public and stakeholder vetting process to solicit information and feedback on work processes and products.

Table F-1. Applicability of Other, Stakeholder Driven Processes To Regional Transmission Planning

Report Name	Description of Approach Used in the Referenced Report	How Could the Approach be Applied to Regional Transmission Planning?
ARRTIS Final Report	ARRTIS participants who were not able to physically attend ARRTIS meetings were able to participate and review work products through the use of a web-based application (WebEx). In this way, participants were able to review the interim work products developed by ARRTIS, which routinely consisted of the following: • Dynamic, GIS-based maps • Data layers and resource sensitivity categorization tables • PowerPoint presentations with key concepts, meeting discussion points, and objectives Using these methods, the ARRTIS was able to allow participants from outlying portions of the state, and from outside of Arizona, to participate in the process.	Provide participation in meetings and review of draft work products (agendas, presentations, documents) via a remotely accessible web interface/application.
ARRTIS Final Report	To the extent possible, the ARRTIS worked by consensus. Data sources and technical issues were presented to, and considered by, the ARRTIS attendees in order to determine whether the information should be used in the group's analysis.	Implement a process to encourage and facilitate a working dialogue among stakeholders to resolve issues and arrive at consensus.
ARRTIS Final Report	At the beginning of stakeholder involvement, developed working assumptions to help potential participants understand the baseline conditions and expectations for the effort.	Develop working assumptions for stakeholders to understand their involvement, expectations, and desired outcomes of their involvement in the regional transmission planning process. Review the working assumptions included in the ARRTIS process for applicability to other regional transmission planning efforts.
ARRTIS Final Report	The ARRTIS provided input into the development of a database that allowed for the production of maps illustrating state wide renewable-energy resources and the general location of environmental resource sensitivity areas throughout Arizona.	Develop databases and maps depicting renewable energy resource areas and the general location of environmentally sensitive areas throughout the planning area for regional transmission planning.
ARRTIS Final Report	The ARRTIS discussed the cumulative impact of integrating multiple screening layers to the database, and the resulting amount of likely developable area that remained after these filters were applied. The Subcommittee ultimately agreed to consider all of the data layers provided and to make clear through the use of disclaimers that the information gathered was for informational purposes only and in no way intended to restrict the potential for Arizona renewable energy development, and should not be used in facility siting.	Consider and include all relevant data layers in models and GIS analysis for regional transmission planning. Use disclaimers or other methods to articulate the limitations of models, data, processes, and analyses.

Table F-1. Applicability of Other, Stakeholder Driven Processes To Regional Transmission Planning

Report Name	Description of Approach Used in the Referenced Report	How Could the Approach be Applied to Regional Transmission Planning?
ARRTIS Final Report	ARRTIS evaluated a concept in which specific points for interconnection would be identified throughout Arizona that would be in proximity to potential resource areas. It was discussed that one of the most costly components of renewable generation development is the transmission needed to interconnect the facility to the existing transmission network. The group determined that identifying specific interconnection locations would be too restrictive and outside of the expertise of the ARRTIS.	Consider identifying potential interconnection locations as a component of economic and/or environmental models in regional transmission planning.
ARRTIS Final Report	The ARRTIS Final Report described (in an appendix) a number of broader policy issues that were beyond the scope of the ARRTIS process or were unanswerable in the ARRTIS context, including: • Building for native load versus building for export • Federal and state agency coordination • Timing "mis-match" between renewable energy and transmission development	Identify policy issues, next steps, and other issues that are currently either outside the scope of immediate regional transmission planning or require additional time and effort to address. Develop recommendations and an iterative process to address the issues in the future.

ARRTIS Arizona Renewable Resource and Transmission Identification Subcommittee
EDTF Environmental Data Task Force
GIS geographic information system
RETI Renewable Energy Transmission Initiative
WREZ Western Renewable Energy Zones

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Environmental Recommendations for the Transmission Planning Process

Final Report of the Environmental Data Task Force

APPENDIX G

License Agreement

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LICENSE AGREEMENT

This Agreement is dated as of signature by both parties, and is entered into by and between **The Nature Conservancy**, a District of Columbia non-profit corporation ("**Licensor**"), and the Western Electricity Coordinating Council, a Utah non-profit corporation ("**Licensee**").

A. Licensor is the owner of the rights to the data more particularly described in the attached **Exhibit A** (collectively, the "**Data**").

B. Licensee would like to use the Data for support of transmission line planning in Western U.S. (the "**Project**"), and Licensor would like Licensee to use the Data for the Project.

Now, therefore, for valuable consideration, the receipt and sufficiency of which is acknowledged, Licensor and Licensee agree as follows:

1. **Non-Exclusive License, Term**. Licensor grants Licensee a license to use the Data in the Project (the "**License**"), but only in full compliance with all of the terms and conditions of this Agreement. The License granted by this Agreement is non-exclusive, and Licensor reserves the right to use, and to permit others to use, all or any part of the Data at any time.

The License shall be in effect for a period (the "**License Term**") beginning on the date of this Agreement, and continuing until December 31, 2011.

2. **Use of the License**. The License shall be used only in accordance with the following provisions:

(a) Extent of License. The License shall extend solely to the use of the Data itself, and shall not include or carry with it any right, title, or interest in the Data, or any rights of access to or use by Licensee to any extent of any background, supporting, underlying, or other data or other intellectual property of Licensor which may exist with respect to the Data, the content of the Data, the location where the Data was obtained, Licensor itself, or any other matter or subject, as to all of which Licensor is hereby explicitly retaining all copyright and other use rights which it may have. Licensor shall not be required, whether under this Agreement or otherwise, to incur any expense of any kind in connection with the License or the Data. Licensee agrees that Licensee shall not use, or directly or indirectly permit the use of, the Data in any manner not expressly permitted by this Agreement without the prior written consent of Licensor. Without placing any limitation on any of the foregoing provisions, Licensee acknowledges and agrees that it has no right to, and shall not, use the Data for any for-profit commercial purpose of any kind whatsoever.

(b) Protection of Licensor's Rights. Licensee shall employ its best efforts to use the Data in a manner that does not derogate from Licensor's rights in the Data, and Licensee shall take no action that will interfere with or diminish Licensor's rights in the Data.

(c) Quality Control; No Endorsements. Licensee agrees to give appropriate credit to Licensor for use of the Data, and to provide Licensor with a copy of each product of Licensee in which Licensee uses the Data. Licensee acknowledges that the License of the Data to Licensee does not create an endorsement by Licensor of Licensee or the Project, and agrees that Licensee shall not describe its relationship with Licensor as an endorsement in any communication.

(d) Compliance with Law. Licensee shall, at Licensee's sole cost and expense, ensure that its use of the Data is carried out in full compliance with all applicable statutes, laws, ordinances, rules, regulations, requirements, orders, and other directives in effect or hereinafter promulgated by any federal, state, or local governmental or quasi-governmental authority having jurisdiction over the Data or its subject(s) (in each case, an "**Applicable Law**").

3. **Status of Data**. To the best of Licensor's knowledge, without undertaking any research or investigation outside of Licensor's own internal records, Licensor believes that it is the owner of the Data and has the right to grant the License as contemplated in this Agreement. However, Licensee acknowledges and agrees that Licensor is not making, and that Licensee is not relying to any extent on, any other actual or alleged representations or warranties of any kind whatsoever concerning the Data and/or

the License; and Licensee shall make and act upon its own determinations as to the appropriateness of the Data for the Project and the accuracy of the Data.

4. Other Intellectual Property Issues. Licensor owns certain marks, namely the trademark, service mark, and collective membership mark "The Nature Conservancy" and the various versions of the Oak Leaf design used by Licensor. Licensee recognizes and acknowledges the ownership of such marks by Licensor, the value of the goodwill associated with the marks, and the validity of those marks and every registration thereof. Licensee shall not at any time use, nor permit the use of, any of such marks, or Licensor's name, logo, and/or any other property of Licensor, in connection with any materials, advertising, product, or service of any kind, whether with respect to the Project or otherwise, without the explicit prior written consent of Licensor, which Licensor may withhold in the exercise of its sole and absolute discretion.

5. Indemnification and Release. Licensee shall indemnify and defend Licensor, and the directors, officers, employees, and agents of Licensor and (in each case, an "**Indemnified Party**") against (with counsel reasonably acceptable to the Indemnified Party in each case), and shall hold the Indemnified Parties harmless of and from, any and all claims, losses, expenses, liabilities, and other damages of any kind or nature whatsoever resulting from, or related in any way to, any breach of this Agreement by Licensee, or anyone participating in the Project. In addition, Licensee releases and forever discharges Licensor and all of the Indemnified Parties of and from any and all claims, demands, actions or causes of action whatsoever which Licensee may have, or may hereafter have, against the Indemnified Parties arising out of the provision of the Data to Licensee, or otherwise with respect to the Project. This is a complete and final release and shall be binding upon the undersigned Licensee and the heirs, executors, administrators, successors, and assigns of Licensee, and covers all claims arising out of or connected with the use of the Data by Licensee, or anyone participating in the Project, and Licensee expressly waives any right under or benefit of any law of any jurisdiction whatsoever providing to the contrary.

6. Interpretation and Enforcement. The terms of this Agreement a final expression of the party's agreement with respect to the subject matter of this Agreement, and may not be contradicted by evidence of any prior or contemporaneous agreement. This Agreement constitute the complete and exclusive statement of its terms, and no extrinsic evidence of any kind which contradicts the terms of this Agreement may be introduced in any proceedings (judicial or otherwise) involving this Agreement. This Agreement may not be modified, amended or otherwise changed in any manner, except by a written amendment executed by all of the parties. This Agreement may be executed in multiple counterparts, and each executed counterpart of this Agreement shall be deemed an original for all purposes. All exhibits attached to and referred to in this Agreement are incorporated into this Agreement. The headings of the various paragraphs and subparagraphs of this Agreement are solely for reference purposes, and not to modify, explain, or place any construction on any of the provisions of this Agreement. Time is of the essence in the performance of each of the obligations of Licensee under this Agreement, but no failure of Licensor to insist upon the timely performance of any such obligation shall constitute a waiver of the right to require performance of such obligation, or act as a waiver of the right to require the performance of any other obligation of Licensee. This Agreement shall be governed by, construed in accordance with, and interpreted under, the internal law of the State of Nevada.

7. Assignment. The rights, obligations, and interest of Licensee under this Agreement shall not be assignable or delegable, in whole or in part, to any other person or entity without the prior written consent of Licensor (which Licensor may grant or withhold in the exercise of its sole and absolute discretion), and any attempt to assign or delegate any of such rights, obligations, or interest by Licensee without such prior written consent shall be void, and shall, at the option of Licensor, terminate this Agreement.

8. Notices. Except as otherwise provided in this Agreement, any notice, demand, request, consent, or approval of any kind that any party to this Agreement desires or is required to give to or make on another party under or in connection with this Agreement (in each case, a "**Notice**") shall be given or made as follows:

(a) Each Notice shall be in writing and shall be served upon the party being addressed at the most recent address(es) which the addressed party has provided for such purposes under this Agreement, by any of the following means: (i) by delivery in person; (ii) by certified U.S. mail, return receipt requested, postage

prepaid; or (iii) by reputable "overnight" courier delivery service, provided that next-business-day delivery is requested by the sender.

(b) If delivered in person, a Notice will be deemed given immediately upon delivery (or refusal of delivery or receipt). If sent by certified mail, a Notice will be deemed given on the earlier to occur of: (i) the date of first attempted delivery; or (ii) the third day after being deposited in the mail. If sent by Federal Express or other reputable "overnight" delivery service, a Notice will be deemed given on the next-business-day after being deposited with the delivery service.

(c) As an additional alternative form of delivering a Notice pursuant to this Agreement, any party may deliver a Notice to another party by telecopier or facsimile transmission (by "fax"); provided, however, that any Notice given by fax must (except to the extent, if any, otherwise explicitly stated below) also be given in one of the other methods set forth above, and each Notice delivered by fax shall be deemed given on the date of successful transmission, unless the transmission is completed on a non-business day, or after 5:00 p.m. on a business day, in the recipient's time zone, in either of which cases it shall be effective on the next following business day.

(d) By a written Notice to all other parties which is given in the aforesaid manner, any party may from time to time designate a replacement for any address or fax number which is specified below for the party giving the Notice, and the replacement address or fax number (as applicable) shall then be substituted for the one previously in effect, provided that in no case shall any such replacement increase the total number of addresses or fax numbers for Notices to such party.

(e) Subject to such right to change their addresses or fax numbers for Notices, the parties initially designate the following addresses and fax numbers to be used for Notices sent to them:

If to Licensor:	If to Licensee:
The Nature Conservancy	_____
Attn: Legal Department	Attn: _____
201 Mission Street, 4th Floor	_____
San Francisco, CA 94105	_____
Phone: 415-777-0487	Phone: _____
(for courier deliveries)	(for courier deliveries)
Fax: 415-777-0244	Fax: _____

9. **Attorneys' Fees**. In the event of any litigation between the parties to this Agreement in connection with the interpretation of this Agreement, or the enforcement of any right or obligation under this Agreement, the party prevailing in such litigation shall be entitled to payment by the other party of the court costs and attorneys' fees incurred by the prevailing party in connection with such litigation (whether incurred at the trial, appellate or administrative levels), in such amount as the court or administrative body may judge reasonable, all of which may be incorporated into and be a part of any judgment or decision rendered in such litigation.

10. **Invalidity**. If any provision of this Agreement, or the application thereof to any person(s) or circumstance(s), shall to any extent be held to be invalid, illegal, or unenforceable in any respect by any court of competent jurisdiction: (i) neither the remainder of this Agreement nor the application of such provision to any person(s) or circumstance(s), other than those as to whom or which it is held to be invalid or unenforceable, shall be affected thereby; (ii) this Agreement shall be construed as though such invalid, illegal or unenforceable provision had never been contained in this Agreement; and (iii) every provision of this Agreement shall be valid and enforceable to the fullest extent permitted by Applicable Law. If any

provision is so stricken from this Agreement, the parties agree to negotiate in good faith any modifications that may be required to effectuate the intent of this Agreement.

11. Authorization. Each party to this Agreement which is a corporation or other entity warrants to the other that it is duly organized, is validly existing, and is (where required) qualified to do business in each state where any of the Data is to be used, and that it has full right and authority to enter into and consummate this Agreement and all related documents. Each person executing this Agreement on behalf of another person or entity, or as an officer, partner, member, or other representative or agent of such other person or entity, hereby represents that the execution of this Agreement has been duly authorized by the party on whose behalf the person is executing this Agreement.

12. Survival of Representations and Obligations. The representations, warranties, covenants, agreements, and obligations of the parties which are set out in this Agreement (including, but not limited to, any indemnification obligations) shall remain in full force and effect after the expiration or termination of this Agreement, with respect to all matters occurring or accruing before such expiration or termination, in each case until and unless there is a waiver or release of such representation, warranty, covenant, agreement, or obligation by the beneficiary thereof.

In witness whereof, the parties have executed this Agreement as of the date first written above.

Licensor:	Licensee:
The Nature Conservancy,	**Western Electricity Coordinating Council,**
a District of Columbia nonprofit corporation	a Utah non-profit corporation
By: _____	By: _____
(signature)	(signature)
Name: _____	Name: _____
Title: _____	Title: _____

Exhibit A

Description of Data

ArcGIS shapefiles for 22 priority landscape sites in the State of Nevada as of December 2010.

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